2009 Minerals Yearbook

FLORIDA [ADVANCE RELEASE]

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U.S. Geological Survey

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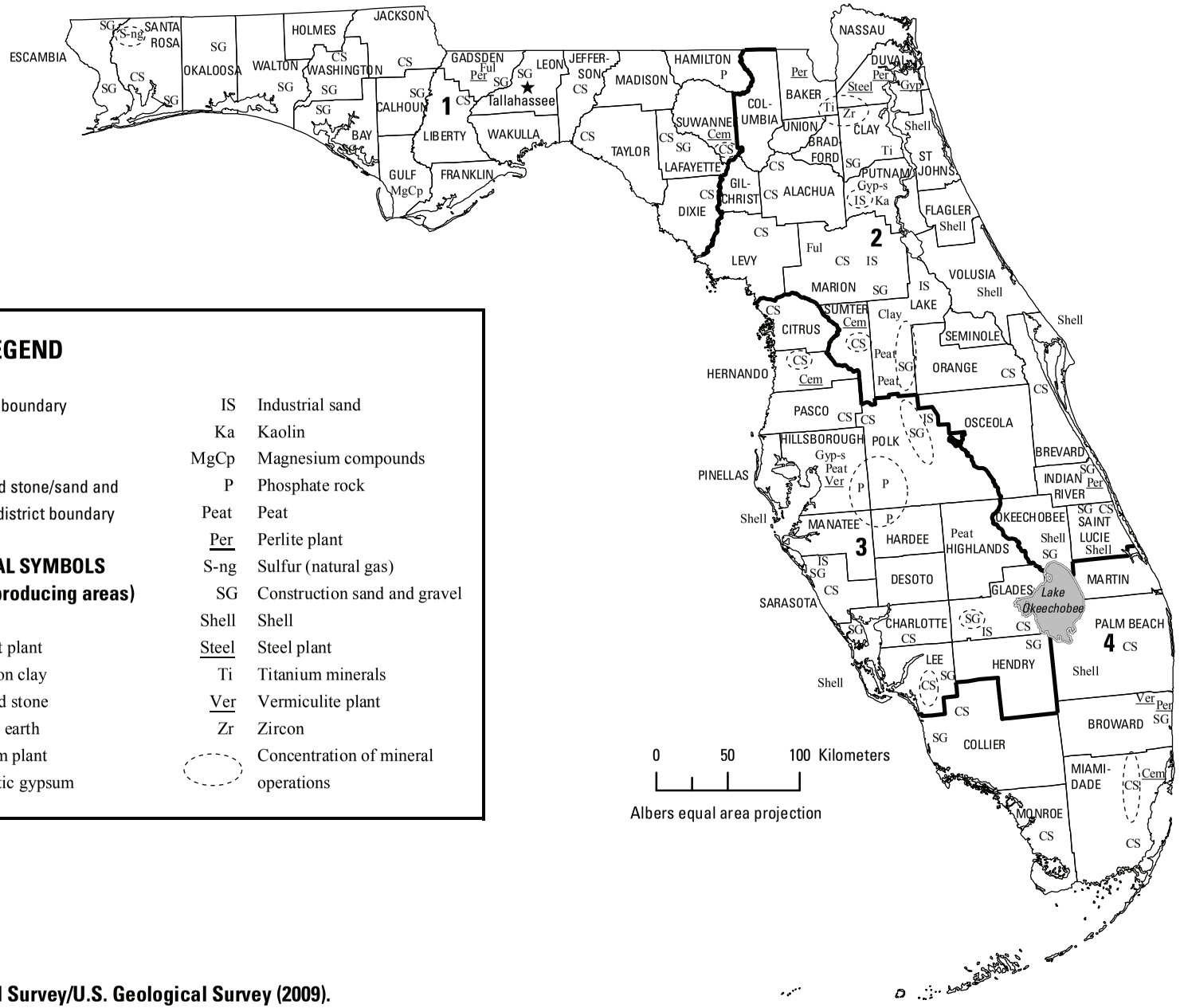
FLORIDA



LEGEND

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

MINERAL SYMBOLS
(Principal producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Ful	Fuller's earth
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
IS	Industrial sand
Ka	Kaolin
MgCp	Magnesium compounds
P	Phosphate rock
Peat	Peat
Per	Perlite plant
S-ng	Sulfur (natural gas)
SG	Construction sand and gravel
Shell	Shell
Steel	Steel plant
Ti	Titanium minerals
Ver	Vermiculite plant
Zr	Zircon
(dashed oval)	Concentration of mineral operations

Source: Florida Geological Survey/U.S. Geological Survey (2009).

The Mineral Industry of Florida

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

In 2009, Florida's nonfuel raw mineral production[1] was valued at $4.25 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $514 million, or a 14%, increase from the State's total nonfuel production value of $3.73 billion in 2008, which then had increased by almost $328 million, or almost 10%, from a total of $3.41 billion in 2007. The State rose to third in rank, up from fifth in 2008, which in turn was up from sixth in 2007, among the 50 States in total nonfuel mineral production value, of which the State accounted for 7.2% of the U.S. total in 2009, up from 5.25% in 2008. Florida last ranked third among the 50 States in total nonfuel mineral production value in 1985.

Florida continued to lead the Nation in phosphate rock mining in 2009, producing more than four times as much as the next highest producing State (actual values withheld—company proprietary data). Phosphate rock was the leading mineral commodity produced in Florida, followed by crushed stone, portland cement, construction sand and gravel, and zirconium concentrates.

In 2009, phosphate rock had the largest increase in production value and contributed significantly to the State's overall increase in total production value. Phosphate rock was followed by significant increases in the production value of magnesium compounds and lime, with smaller but still significant increases in production value taking place with industrial sand and gravel, kaolin, and peat (actual production value data withheld for magnesium compounds and lime—company proprietary data). There was no overall change in the production values of staurolite, of which Florida is the only producing State, and gemstones. The only mineral commodities to see increases in the quantities produced in 2009 were magnesium compounds, lime, and peat, up 19%, 20%, and almost 8%, respectively. The quantity of phosphate rock produced in 2009 was down 16% from that of 2008, industrial sand and gravel, almost 25%, and kaolin, 5%, respectively.

The largest decrease in production value took place with crushed stone, down approximately $250 million from a total of $894 million in 2008 to $643 million in 2009. Portland cement was down $211 million, or almost 41%, followed by construction sand and gravel, down $94.4 million, or 43%, and masonry cement, down $28 million, or 60%. Smaller decreases were seen in the production values of ilmenite (the only form of titanium concentrates produced in the State in 2009), zirconium concentrates, and fuller's earth. For these seven mineral commodities, production was down for each, led by crushed stone, which decreased by almost 20 million metric tons (Mt), or 29%, to 48.6 Mt in 2009 from 68.4 Mt in 2008. From a total production of 96.4 Mt in 2007, 2009 production was down by 50%. This was followed by construction sand and gravel, almost 13 Mt, or almost 45%, to 15.6 Mt in 2009 from 28.2 in 2008. As with crushed stone, production of construction sand and gravel was also down by almost 50% from 2007 to 2009.

In 2009, Florida continued to be the only State to produce staurolite. The State remained first in the quantity of phosphate rock produced and peat sales, second in ilmenite production, and third in the production of magnesium compounds. Florida rose in rank to first of two States producing zirconium concentrates and rose to sixth from seventh in the production of kaolin. The State fell to fifth from fourth in crushed stone production, to seventh from fourth in portland cement production, and to eighth from third in masonry cement production. In the Jacksonville area in the northeastern portion of the State, Gerdau Long Steel North America operated a steel mill with material obtained from domestic and foreign sources.

The Florida Geological Survey[2] (FGS), an office of the Florida Department of Environmental Protection (FDEP), provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys, estimates, and data from FDEP's Mining and Minerals Regulation Program. The FGS data may differ from some production figures reported to the USGS. Mine acreage values are approximations and may be subject to revision.

Exploration and Development

In 2009, the State issued 14 new permits (eight limerock, four sand, one heavy mineral, and one shell) for mining encompassing 7,350 hectares (ha). Permits were issued for the expansion or modification of 26 existing operations that encompassed almost 11,800 ha. The larger of these permits included U.S. Sugar Corp.'s Lake Harbor aggregate quarry, encompassing nearly 3,000 ha in Palm Beach County; the White Rock Quarries expansion in Miami–Dade County, encompassing 1,760 ha; the 1,400-ha expansion of the Earthsource mine, owned by Babcock Property Holdings, LLC in Charlotte County; and the 1,180-ha expansion of the Maxville satellite heavy mineral mine of Dupont Titanium Technologies (DuPont) (a subsidiary of E.I. du Pont de Nemours & Co. Inc., Wilmington, DE). Most mining operations require both State and Federal permits; legal challenges to either commonly delay the commencement of actual mining operations.

[1]The 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 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.

[2]Clint Kromhout, P.G., Geologist/Environmental Specialist III, authored the text of the State mineral industry information provided by the Florida Geological Survey.

Commodities Review

Industrial Minerals

Cement.—High-purity limestone was used to manufacture clinker for cement. The slump in the housing market continued through 2009 and depressed cement sales, resulting in decreased production. Globally, Mexico's CEMEX Inc. (CEMEX), a major producer in the State, posted its first quarterly loss in a decade. The company's Brooksville North cement plant was indefinitely idled in 2009 (van Oss, 2011, p. 16.3).

Five companies produced clinker and finished cement from six plants Statewide in 2009: CEMEX operated its Brooksville South and Miami plants; Tarmac America LLC operated its Pennsuco plant in Miami; Vulcan Materials' Florida Rock at its Newberry plant; and, Suwannee American Cement, LLC at its Bradford plant. American Cement Co., LLC had finished construction of its new cement plant at Sumterville in Sumter County at the end of 2008. The company commenced production of clinker and finished cement at the new 1-million-metric-ton-per-year plant in 2009 (van Oss, 2011, p. 16.3). In addition, Vulcan Materials' Florida Rock Industries Division idled its Port Manatee grinding plant during the year, performing cement regrinding operations at its Tampa facility.

Clays.—Fuller's earth clays and kaolin were mined in several locations within the State. The State's fuller's earth clays were mainly of two different types, attapulgite and montmorillonite. The primary Florida fuller's earth deposits are part of the Meigs-Attapulgus-Quincy District, extending from the eastern Florida panhandle northward into Georgia. In 2009, Florida continued to rank first in the Nation in the production of attapulgite and sixth for the combined production of attapulgite and montmorillonite. The gellant grades of attapulgite were particularly useful as thickeners in such items as drill muds and paints, although they also were used in fertilizer carriers, desiccants, oil and grease absorbents, other filler and extender applications, and various other products. Two companies in the Florida panhandle mined or sold gellant-grade attapulgite in 2009 (Virta, 2011, p. 18.4). The two dominant markets for the montmorillonite variety of fuller's earth were pet litter and oil and grease absorbents, while other major markets included civil engineering applications and pesticide carriers. The State's kaolin was used in ceramics manufacturing, as well as in the production of pigments and paper, and in refractories.

Phosphate Rock.—Phosphate rock mining was conducted by three companies—Mosaic Co. of Plymouth, MN (five mines), CF Industries, Inc. of Deerfield, IL (one mine), and PCS Phosphate Co., Inc. of Northbrook, IL (one mine) in the counties of Hamilton, Hardee, Hillsborough, Manatee, and Polk. These seven mines represented 65% of the domestic annual production capacity (Jasinski, 2011, p. 56.1). Three new mines were planned for the next decade to replace existing operations and were in the permitting process. Phosphate rock production and domestic consumption were at their lowest points in four decades in 2009, owing to the global economic crisis (Jasinski, 2011, p. 56.1). Phosphate rock was used primarily for producing phosphoric acid used in the manufacture of fertilizer; other uses included as an additive to animal feed. Mosaic Co. shipped beneficiated ore by barge from the Port of Tampa to processing facilities in Louisiana; PCS Phosphate Co. shipped fertilizer products from its Swift Creek Mine in Hamilton County, in northern Florida, to consumer by rail and to Morehead City, NC, for export (Jasinski, 2011, p. 56.2).

FDEP records indicated that, since July 1975, 71% of land mined for phosphate has been reclaimed, as according to Florida Administrative Code 62C–16. Florida has required that all mined lands be reclaimed, as administered by FDEP's Bureau of Mine Reclamation. In 2009, more than 1,000 ha (more than 2,500 acres) of land were mined for phosphate (Florida Department of Environmental Protection, 2010, p. 2). Land mined for phosphate ore, since July 1975, totaled more than 75,000 ha, with slightly less than 54,000 ha having been reclaimed by the end of 2009 (Florida Department of Environmental Protection, 2010, p. 6).

Metals

Titanium and Zirconium.—In 2009, production of ilmenite, rutile, and zirconium concentrates continued at heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties, in the northeastern part of the State near Jacksonville. Since 1949, DuPont has mined the Trail Ridge sands east of Starke (DuPont Titanium Technologies, 2012). The company typically produced a mixed product containing ilmenite, leucoxene, and rutile—the primary minerals used as feedstock in DuPont's titanium oxide pigments (Gambogi, 2011a, p. 78.2). Iluka Resources Inc. [a subsidiary of Iluka Resources Ltd. (Perth, Australia)] completed and ended reprocessing stockpiled zirconium tailings near Green Cove Springs (Iluka Resources, Ltd., 2009, p. 44). DuPont produced zirconium as a coproduct of the processing of heavy-mineral sands from its mines near Starke. Zirconium mineral concentrates are primarily used in ceramics opacification, foundry sands, and refractories (Gambogi, 2011b, p. 85.1–85.2).

Environmental Issues, Mining Moratoriums, and Reclamation

In recent years, environmental concerns such as potential contamination of freshwater aquifers, damage to ecosystems from blasting, dust, and truck traffic issues have been at the forefront during the mine permitting process in Florida. In some areas, housing developments, ecologically vulnerable zones, or community water wells were adjacent to minable lands. Local, State, and Federal governing and regulatory bodies typically attempt to balance environmental protection with economic needs when approving and permitting mining operations, though often many permit decisions end up in court.

The South Florida Water Management District (SFWMD) and U.S. Sugar Corp. entered into an agreement allowing the SFWMD to purchase 76,000 ha of sugarcane croplands south of the lake for $1.7 billion, as part of an effort to restore the Florida Everglades by reestablishing surface water southward out of Lake Okeechobee (Cave, 2008). The proposal was held up by a law suit filed by Florida Rock Industries, claiming that Florida Rock Industries held a mining lease with U.S. Sugar covering

approximately 3,000 ha of the parcel being sold. U.S. Sugar maintained that Florida Rock broke the terms of the lease contract when it failed to acquire all of the necessary permits for mining (South Florida Business Journal, 2009). Economic, social, and legal pressure reduced the proposed purchase to 29,000 ha for a total purchasing price of $533 million (South Florida Water Management District, 2009). The proposed purchase was eventually tabled during the Florida legislative session and was unresolved at yearend.

Following a 1-year moratorium in 2008 on mining in its southeastern region, Lee County Commission analyzed amendments updating the County Plan from May 2009 through yearend for the 34,000-ha Density Reduction-Groundwater Resource (DR/GR) area in the eastern half of the county to protect groundwater resources. The DR/GR was created in 1990 to protect the county's shallow aquifers and comply with State mandates that population capacity be reduced within the area (Dover, Kohl, and Partners, 2009).

Mosaic Co. received a permit in March 2009 from FDEP to expand its South Fort Meade phosphate mine from Polk County into Hardee County by approximately 3,100 ha (Mosaic Co., 2009, p. 32). Lee and Sarasota Counties had challenged this permit in court, with a State administrative law judge finding in the company's favor in December 2008. The Lee County Board of County Commissioners had voted to appeal the ruling to the Second District Court of Appeal. The company had yet to obtain a necessary wetlands permit from the U.S. Army Corp of Engineers (USACE) (Mosaic Co., 2009, p. 89). Mosaic Co. owned the aboveground assets of the South Fort Meade Mine, including the beneficiation plant and rail track. The U.S. government owned mineral rights beneath approximately 223 ha, with the company controlling the rights to mine the reserves (Mosaic Co., 2009, p. 9). The South Fort Meade Mine has an annual capacity of 6 Mt, with production in 2009 totaling 5.1 Mt (Mosaic Co., 2009, p. 7). The company reported reserves totaling 54 Mt (Mosaic Co., 2009, p. 8).

Twelve Lake Belt area mines in and around Miami-Dade County temporarily closed in 2006 in response to a 2005 lawsuit challenging the permits issued to the mines (South Florida Business Journal, 2010). Following the closure, the Florida Department of Transportation released a strategic aggregates study and, in 2007, the Florida legislature created a "Strategic Aggregates Review Task Force" (Strategic Aggregates Review Task Force, 2008.) The plaintiffs in the original lawsuit argued that the environmental impact statement (EIS) prepared by USACE and the U.S. Department of the Interior's Fish and Wildlife Service did not adequately assess the danger posed to Miami-Dade's drinking water supply and could contribute to destroying Everglades' wetland habitats, owing to benzene having been identified in one of the Miami-Dade's well field wells (South Florida Business Journal, 2010). A U.S. District Judge sided with the plaintiffs in 2007 and required USACE to draft a supplemental EIS for the mining permit areas before the temporary closures could be lifted. The Task Force presented its final report to the Governor in February 2008.

In May 2008, the 11th District Court of Appeals overturned an injunction that had halted mining in the Lake Belt area of Miami-Dade County, forcing a reexamination of the case (Southwest Florida Regional Planning Council, 2008). In January 2009, the U.S. District Court of South Florida once again suspended all nine new mining permits in the Lake Belt area (U.S. District Court of South Florida, 2009). The permits would have allowed expansion of existing aggregate mining by Titan America, Vulcan Materials' Florida Rock Industries Division, Kendall Properties and Investments, CEMEX' Rinker Materials of Florida, Saw Grass Rock Quarry Inc., Tarmac America LLC, White Rock Quarries, and the Opa-Locka West Airport. The ruling did not affect ongoing operations, but does affect plans to mine over 8,000 ha (more than 20,000 acres) adjacent to the Everglades and the Northwest groundwater well field. A local mining association filed a challenge to this latest ruling with the U.S. District Court of Appeals.

Governmental Programs

The FGS has been an active participant in the STATEMAP Program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP) through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects; (2) STATEMAP, which is a matching-funds grant program with State geological surveys; and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

The FGS completed geologic mapping for the western portion of the USGS 1:100,000-scale Ocala quadrangle. The products included a geologic map, cross sections, and a physiographic regions map. Several cores were drilled and numerous hand samples were taken and archived in the FGS State Geologic Sample Repository for future reference. The maps and cross sections are available as part of the FGS Open-File Map Series (Green and others, 2009a) and FGS Open-File Report (Green and others, 2009b).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2007		2008		2009	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	524	86,100 [e]	310	47,000 [e]	123	18,700 [e]
Portland	5,510	557,000 [e]	4,980	518,000 [e]	3,150	307,000 [e]
Clays:						
Common	3	W	2	W	W	W
Kaolin	21	2,770	19	2,520	18	3,000
Gemstones, natural	NA	1	NA	1	NA	1
Peat	501	9,800	488	9,760	527	10,100
Sand and gravel:						
Construction	30,400 [r]	232,000 [r]	28,200 [r]	219,000	15,600	125,000
Industrial	441	8,110	573	7,480	431	8,270
Stone, crushed	96,400	1,150,000	68,400 [r]	894,000 [r]	48,600	643,000
Combined values of clays (fuller's earth), lime, magnesium compounds, phosphate rock, staurolite, titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	1,360,000	XX	2,040,000	XX	3,130,000
Total	XX	3,410,000	XX	3,730,000	XX	4,250,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "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 no more than three significant digits; may not add to totals shown.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY TYPE[1]

Type	2008 Number of quarries	2008 Quantity (thousand metric tons)	2008 Value (thousands)	2009 Number of quarries	2009 Quantity (thousand metric tons)	2009 Value (thousands)
Limestone[2]	88 r	65,900 r	$867,000 r	86	46,300	$620,000
Dolomite	4	923	8,510	3	171	1,370
Shell	3	475	3,710	5	414	5,310
Miscellaneous stone	3	1,120	14,300	3	1,670	16,000
Total	XX	68,400 r	894,000 r	XX	48,600	643,000

[r]Revised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2009, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	46	785
Filter stone	W	W
Other coarse aggregate	151	3,270
Coarse aggregate, graded:		
Concrete aggregate, coarse	317	5,650
Bituminous aggregate, coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	4,430	109,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	424	5,520
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	383	2,900
Other fine aggregate	3,630	68,100
Coarse and fine aggregates:		
Graded road base or subbase	3,400	24,300
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	719	4,500
Other coarse and fine aggregates	2,620	33,200
Other construction materials	725	4,800
Agricultural:		
Limestone	W	W
Other agricultural uses	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Sulfur oxide removal	W	W
Unspecified:[2]		
Reported	12,400	186,000
Estimated	18,100	181,000
Total	48,600	643,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2009, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	1,420	21,700	W	W
Coarse and fine aggregates[5]	589	8,080	3,100	21,900	1,460	13,100	W	W
Other construction materials	--	--	--	--	725	4,800	--	--
Agricultural[6]	W	W	--	--	W	W	--	--
Chemical and metallurgical[7]	--	--	W	W	--	--	--	--
Unspecified:[8]								
Reported	1,800	26,800	1,780	26,600	2,620	38,900	6,170	93,400
Estimated	2,080	19,100	3,290	41,400	5,610	48,800	7,170	71,900
Total	5,500	77,700	9,220	111,000	13,400	160,000	20,500	294,000

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

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

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), railroad ballast, and other graded coarse aggregate.

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

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

[6]Includes limestone and other agricultural uses.

[7]Includes cement manufacture and sulfur oxide removal.

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

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	3,290	$30,300	$9.24
Asphaltic concrete aggregates and road base materials[3]	451	3,540	7.84
Fill	1,150	2,850	2.48
Other miscellaneous uses[4]	328	3,150	9.59
Unspecified:[5]			
Reported	4,380	35,300	8.06
Estimated	6,000	49,700	8.28
Total or average	15,600	125,000	8.01

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

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes golf course.

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

TABLE 6

FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	690	5,890	W	W
Asphaltic concrete aggregates and road base materials[3]	W	W	W	W
Fill	W	W	W	W
Other miscellaneous uses[4]	222	986	2,320	19,500
Unspecified:[5]				
Reported	337	2,970	636	5,080
Estimated	1,200	9,820	1,590	13,700
Total or average	2,450	19,700	4,540	38,300

Use	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	W	W
Asphaltic concrete aggregates and road base materials[3]	W	W	W	W
Fill	W	W	W	W
Other miscellaneous uses[4]	1,020	8,920	964	4,600
Unspecified:[5]				
Reported	3,410	27,200	--	--
Estimated	3,030	24,600	187	1,620
Total or average	7,460	60,700	1,150	6,220

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

[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 road and other stabilization (cement).

[4]Includes golf course.

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