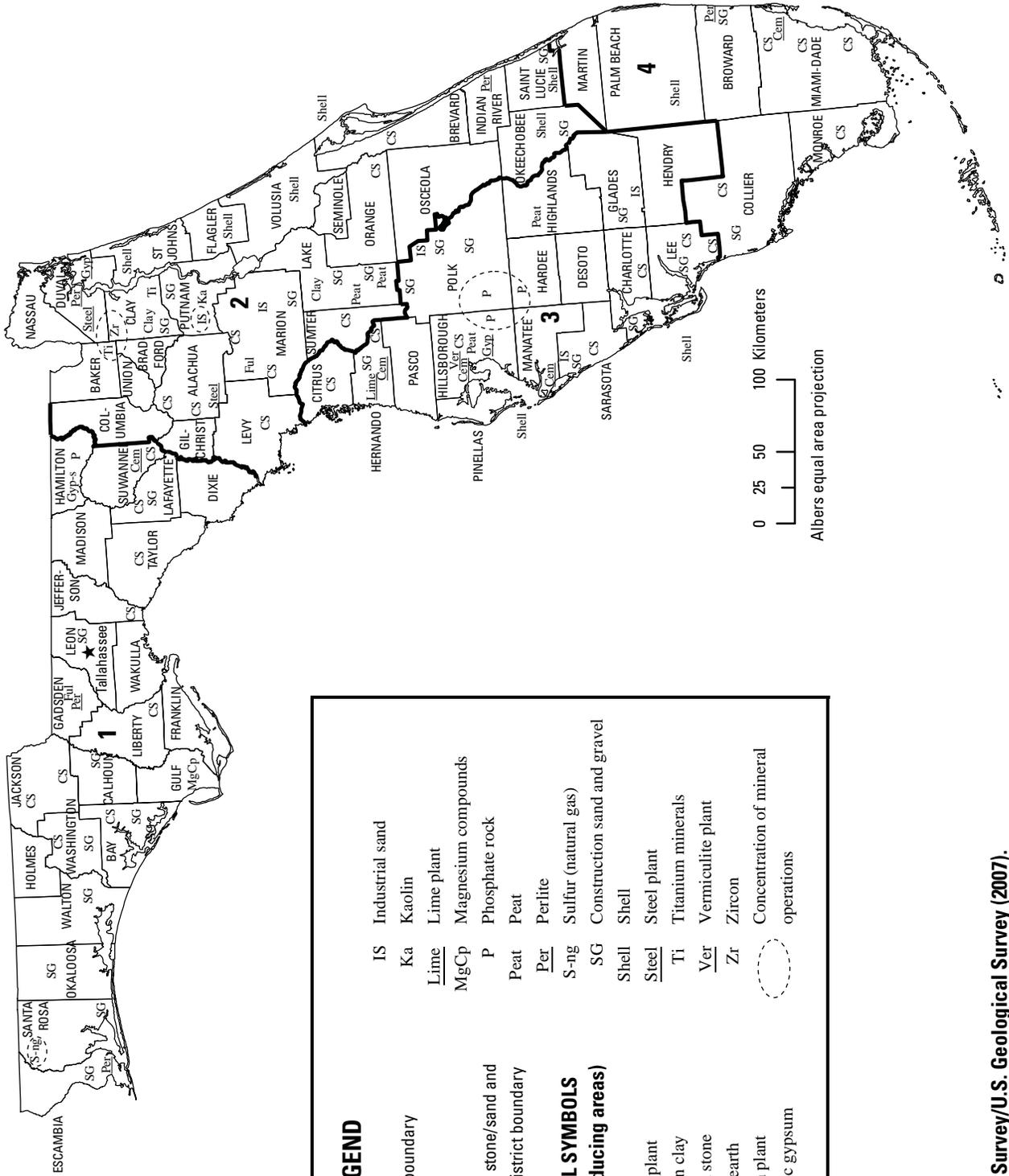




2007 Minerals Yearbook

FLORIDA [ADVANCE RELEASE]

FLORIDA



LEGEND

- County boundary
 - ★ Capital
 - City
 - Crushed stone/sand and gravel district boundary
- MINERAL SYMBOLS
(Major producing areas)**
- IS Industrial sand
 - Ka Kaolin
 - Lime Lime plant
 - MgCp Magnesium compounds
 - P Phosphate rock
 - Peat Peat
 - Per Perlite
 - S-ng Sulfur (natural gas)
 - SG Construction sand and gravel
 - Shell Shell
 - Steel Steel plant
 - Ti Titanium minerals
 - Ver Vermiculite plant
 - Zr Zircon
 - Concentration of mineral operations
- Cem Cement plant
 - Clay Common clay
 - CS Crushed stone
 - Ful Fuller's earth
 - Gyp Gypsum plant
 - Gyp-s Synthetic gypsum

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 2007, Florida's nonfuel raw mineral production¹ was valued at \$3.38 billion, based upon annual U.S. Geological Survey (USGS) data. This was a \$140 million, or a 4.3%, increase from the State's total of \$3.24 billion in 2006, which then had increased by \$330 million, or more than 11%, from that of 2005. The State was sixth in rank (fifth in 2006) among the 50 States in total nonfuel mineral production value, of which the State accounted for nearly 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2007 with about 70% of U.S. production, producing more than four times as much as the next highest producing State. Phosphate rock is produced in only four States. The commodity's production was up slightly, but mostly owing to a significant increase in the commodity's unit value. Phosphate rock returned to being Florida's leading nonfuel mineral commodity, as it had been for the past several decades and for most of the 20th century. That mineral commodity was followed by crushed stone (first in 2006), cement (portland and masonry), construction sand and gravel, and zirconium concentrates, the combined values of the top five representing 97% of the State's total nonfuel mineral production value.

In 2007, the largest portion of Florida's increase in production value was from the increase in phosphate rock production value, up by more than \$500 million. This was followed by a significant increase in the value of rutile, up by nearly 150%; smaller increases took place in the values of industrial sand and gravel and lime. These increases were offset to a significant degree by decreases in the values of crushed stone, down by \$275 million, cement, down by \$105 million, construction sand and gravel, down by \$35 million, and magnesium compounds and zirconium concentrates, down by less than \$10 million each. Smaller decreases also took place in ilmenite, fuller's earth clay, peat, and kaolin.

In 2007, Florida again was the only State to produce rutile (a titanium mineral) and staurolite. In addition to remaining first in the quantity of phosphate rock, the State also continued to be first in masonry cement, first of two States that produced zircon concentrates, and first in peat (listed in descending order of value); second of two States that produce ilmenite (a titanium mineral); third in the production of magnesium compounds; fourth in portland cement; fifth in the production of fuller's earth clay; and was the producer of significant quantities of construction sand and gravel and industrial sand and gravel. Florida rose in rank to eighth from ninth in the production of

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 2007 USGS mineral production data published in this chapter are those available as of June 2009. 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>.

kaolin and decreased to third from second in that of crushed stone (including some imported crushed stone).

The Florida Geological Survey² (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 and estimates. The FGS data may differ from some production figures reported to the USGS.

Exploration and Development

During 2007, six new permits (four sand, one coquina/sand, and one aggregate) were issued for nonfuel mineral mining encompassing nearly 1,020 hectares (ha). Permits were issued for the expansion of 12 existing operations that encompassed nearly 3,090 ha. No new phosphate rock mines were added in 2007 because of continued public and State government opposition to mining in environmentally sensitive lands.

The Mosaic Co. continued its pursuit to gain permits to mine its planned 1,700-ha Ona-Fort Green phosphate rock mine location in Hardee County, but a legal case brought on by Charlotte, Lee, and Sarasota Counties challenging the potential mining impacts to the Peace River corridor and Charlotte Harbor continued a delay of the company's efforts to mine the deposit. The Peace River was a source of drinking water for the region and Charlotte Harbor was considered to be one of the most productive estuaries for fish and shellfish in the State.

Commodities Review

Industrial Minerals

Following many years of ranking in the top 10 among the fastest growing States in terms of population growth, including that of 2000–07, Florida fell to 19th for the one-year period of 2007, primarily owing to previously inflated real estate values, hurricane-influenced homeowner insurance rates, and relatively high property taxes (GeoMidpoint, 2009). As a result, Florida's construction materials production reduced significantly in 2007, down approximately 28% for aggregate and down about 11% for all of cement (masonry cement alone was down by about 42%) (table 1).

In 2007, Florida consumed about 96 million metric tons (Mt) of crushed stone, approximately 5 Mt of which was imported from Mexico (Willet, 2009, p. 71.5). This total consumption was down from 134 Mt in 2006 (tables 1 and 2). Florida's nearly 29% reduction in crushed stone production mainly was attributed to three factors: 1) a decline in the residential and

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

commercial real estate industry, 2) the temporary closure of large scale mines in the State's Lake Belt region, and 3) several key aggregate counties imposing mining moratoriums.

Aggregates (Sand and Gravel, Construction and Stone, Crushed).—In February, Vulcan Material Co., the Nation's leading aggregate producer, acquired Florida Rock Industries, Inc., the largest Florida-owned aggregates, cement, clinker, and related products purveyor, for \$4.6 billion expanding the companies reach into the southeastern mid-Atlantic region. In April, Cemex, S.A.B. de C.V. of Monterrey, Mexico, and the third leading producer of aggregates in the world, acquired worldwide assets of Australian company Rinker Group Ltd. which included Rinker Materials Corp. of Florida for \$17 billion making Cemex the leading construction materials company in the world, the fifth leading aggregate producer in the United States, and the leading aggregates operator in Florida. Rinker Materials produced cement, clinker, and engineer building block.

Cement.—High-purity limestone was used to manufacture clinker for masonry and portland cement production. Florida ranked third, Nationally, in total cement production in 2007. Cement was produced in six counties, while cement clinker was produced only in Alachua, Dade, Hernando, and Suwannee Counties. One grinding plant that used imported clinker (primarily from Mexico) operated in Manatee County.

Clays.—Fuller's Earth and kaolin were mined in several locations in Florida. The State's fuller's earth clays were mainly of two different types, attapulgitic and montmorillonite. In 2007, Florida ranked second, Nationally, in attapulgitic production (Virta, 2008). The gellant grades of attapulgitic were particularly useful as thickeners in such items as drill muds and paints, although they also were used in oil and grease absorbents, fertilizer carriers, desiccants, other filler and extender applications, and various other products. 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 as pesticide carriers. The State's kaolin was used in ceramics manufacturing, as well as in the production of pigments and paper, and in refractories (Virta, 2008).

Phosphate Rock.—In 2007, Florida's phosphate rock production was slightly higher than that of 2006, at which time it had reached its lowest point in 40 years owing to plant closures. Also, in 2007, there were no rock export sales and fertilizer sales were down, owing to the State's phosphate companies selling off previously mined stock and competition in fertilizer sales from China. Phosphate rock was mined in the counties of Hamilton, Hardee, Hillsborough, Manatee, and Polk. Economically, the phosphate companies experienced a slight decline in total fertilizer sales owing to 1) mine and fertilizer plant closures, 2) lower fertilizer export sales, 3) higher production costs, and 4) higher natural gas prices, resulting in a 40-year low in production. In 2006, with marketable domestic production of phosphate rock at 30.1 Mt, that production decreased to less than 35 Mt for the first time since 1965, and with a slight decrease to 29.7 Mt in 2007 the decreasing trend in production continued. In 2007, seven mines were active in Florida, representing 65% of annual domestic production

capacity. The average price per metric ton increased from \$30.52 in 2006 to \$51.36 in 2007 (Jasinski, 2008).

Metals

Titanium and Zirconium.—Whereas world-wide demand for titanium increased slightly, overall a decrease took place in Florida's mine production. Although the State's rutile production showed a large increase, with regard to titanium content a more significant decrease took place in ilmenite production. E.I. du Pont de Nemours & Co., Inc. continued to operate heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties. Iluka Resources Inc. ceased mining in Green Cove Springs, FL, but the company processed stockpiled tailings for titanium and zirconium mineral concentrates (Gambogi, 2008). Ilmenite, leucoxene, and rutile were the primary minerals of interest in the heavy-mineral sand deposits of this region and were used in the manufacture of titanium dioxide pigments. Zirconium mineral concentrates were primarily used in refractories, in foundry sands, and ceramics opacification.

Legislation and Government Programs

Environmental Issues and Legislative Activities.—In response to the temporary closures of 12 Lake Belt mines and a Florida Department of Transportation (FDOT) strategic aggregates study, Florida's legislature created a Strategic Aggregates Review Task Force (SARTF) as part of an aggregates bill, Florida Statute CS/HB 985. The closures resulted from a 2005 lawsuit challenging the permits issued to the mines. The challengers argued that the environmental impact statement (EIS) prepared by the U.S. Army Corp of Engineers and the U.S. Department of the Interior's Fish and Wildlife Service did not adequately assess the dangers potentially posed to Miami-Dade's drinking water supply and could contribute to destroying Everglades' wetland habitats. This was further evidenced by benzene having been identified in one of the Miami-Dade's well field wells. The court sided with the plaintiffs, requiring that the Army Corp of Engineers would need to draft a supplemental EIS (SEIS) for the mining permit areas before the temporary closures could be lifted. The SEIS was finished in August but the temporary closures were not lifted, pending the courts and others having adequate time to review the documents.

The aggregates bill, under which the SARTF was created, contained two provisions. One provision included language to take the power to approve or deny mining permits away from the counties and give the State complete autonomy, the idea in mind being that the State's aggregate resources were integral to the health of the State's economy. A second provision of the SARTF was to perform further research on the status and future of the State's aggregate resources, and also to meet with stakeholders, industry experts, environmental groups, and citizens in a series of public meetings around the State. The task force held preliminary organizational meetings from early August through December at which point the group submitted a report of its findings and suggestions to the State Governor. The SARTF held the first in a series of public meetings in December to discuss

improvements in policy and public investment as it relates to the availability of construction aggregate materials and related mining/land use practices in the State. The aggregates bill was a result of the FDOT study that specifically addressed the physical and economic impact should any or all of the Lake Belt aggregate mines be closed. The study exhibited an estimated economic loss of \$2.5 billion and more than 24,000 jobs from a complete closure of the Lake Belt region (Lampl-Herbert Consultants, 2007).

Mining Moratoriums and Government Programs.—Charlotte County imposed a moratorium on all mining because of growing concerns regarding the mining industry's interest in developing the county's estimated extensive resources of sand, aggregate, shell, and phosphate and the result that might have on the county's overall environmental and economic health. The increased mining interest was evidenced by a large number of mining permit applications being filed, many by farmers in addition to typical developers. The significant increase in permit requests was partly the result of the Facilitating Agricultural Resource Management Systems (FARMS) program instrumented by the Southwest Florida Water Management District, which encouraged agricultural landowners to dig pits to store rain and surface water for use on crops and groves as opposed to pumping groundwater. The FARMS program would then reimburse the owner from 50% to 75% of the cost to dig the pit. Some owners identified the pit material as a potentially lucrative byproduct of participating in the FARMS program, leading the owner to apply for a mining permit. Charlotte County imposed the moratorium to have time to identify what changes needed to be made to the county's mining ordinances, and to assess the effects that increased mining might have on the county's zoning, infrastructure, and environment.

Palm Beach County also invoked a mining moratorium on the approximate 283,000-ha Everglades Agricultural Area (EAA) to further research the environmental impacts that might result if U.S. Sugar Corp. were granted a permit to mine aggregate from its more than 2,800-ha land holdings in the EAA. The primary concerns were: 1) the potential impact to the Everglades surface water flow, 2) the lowering of the regional surficial aquifer system, and 3) the potential increase in mercury concentrations from the leaching of the EAA's famous mucky soils during mining.

The FGS continued to be 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. As part of STATEMAP, the FGS completed geologic mapping for the eastern portion of the USGS 1:100,000-scale Perry quadrangle. The completed products included a geologic map, cross sections, and a physiographic regions map. Additionally, four cores were drilled and numerous hand samples taken, all of which were archived in the FGS State Geologic Sample Repository for future reference. The completed maps and cross sections are available as part of the FGS Open-File Map Series (Green and others, 2007a) and FGS Open File Report (Green and others, 2007b).

Mine Reclamation.—Florida Department of Environmental Protection (FDEP) records indicate that about 67% of land mined for phosphate has been reclaimed since July 1, 1975; 49,000 ha out of a total of 73,000 ha of phosphate-mined land in the State have been reclaimed. Since July 1, 1975, Florida has required that all mined lands be reclaimed, as administered by FDEP's Bureau of Mine Reclamation.

References Cited

- Gambogi, Joseph, 2008, Titanium mineral concentrates: U.S. Geological Survey Minerals Commodity Summaries 2008, p. 174–175. (Accessed July 17, 2009, at <http://minerals.usgs.gov/minerals/pubs/commodity/titanium/mcs-2008-timin.pdf>.)
- GeoMidpoint, 2009, U.S. population growth 2000 – 2007, online resource: GeoMidpoint. (Accessed July 17, 2009, at <http://www.geomidpoint.com/population/growth-2007.html>.)
- Green, R.C., Paul, D.T., Petrushak, S.B., Kromhout, C., and Scott, T.M., 2007a, Geologic map of the eastern portion of the U.S.G.S. Perry 30 x 60 minute quadrangle, northern Florida: Florida Geological Survey Open-File Map Series 98, 3 plates.
- Green, R.C., Paul, D.T., Petrushak, S.B., Kromhout, C., and Scott, T.M., 2007b, Text to accompany geologic map of the eastern portion of the U.S.G.S. Perry 30 x 60 minute quadrangle, northern Florida, Open File Map Series 98: Florida Geological Survey Open-File Report 91, 32 pages.
- Jasinski, S.M., 2008, Phosphate rock [advance release], *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2007, v. I, p. 56.1–56.11. (Accessed July 17, 2009, at http://minerals.usgs.gov/minerals/pubs/commodity/phosphate_rock/myb1-2007-phosp.pdf.)
- Lampl-Herbert Consultants, 2007, Florida Department of Transportation—Strategic aggregates study—Sources, constraints, and economic value of limestone and sand in Florida: Part I—Evaluation of aggregate materials in Florida's future and Part II—Potential impacts to the economy of Florida from the curtailment of crushed stone production: Tallahassee, FL, Lampl-Herbert Consultants, March 12, 109 p.
- Virta, R.L., 2009, Clay and shale [advance release], *in* Metals and minerals: U.S. Geological Survey, Minerals Yearbook 2007, v. I, p. 18.1–18.24. (Accessed July 17, 2009, at <http://minerals.usgs.gov/minerals/pubs/commodity/clays/myb1-2007-clays.pdf>.)
- Willett, J.C., 2009, Stone, crushed [advance release], *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2007, v. I, p. 71.1–71.25. (Accessed July 17, 2009, at http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/myb1-2007-stonc.pdf.)

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

(Thousand metric tons and thousand dollars)

Mineral	2005		2006		2007	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	902	129,000 ^e	900	146,000 ^e	524	86,100 ^e
Portland	5,730	519,000 ^e	5,880	602,000 ^e	5,510	557,000 ^e
Clays:						
Common	4	W	3	W	3	W
Fuller's earth	279	39,700	W	W	W	W
Kaolin	29	3,510	23	2,900	21	2,770
Gemstones	NA	1	NA	1	NA	1
Lime	23	2,940	W	W	W	W
Peat	464	9,450	496	10,000	501	9,800
Sand and gravel:						
Construction	37,500	210,000	40,000	266,000	30,300	231,000
Industrial	715	9,410	500 ^r	8,050 ^r	441	8,110
Stone, crushed	116,000 ³	1,010,000 ³	134,000 ^r	1,400,000 ^r	95,700	1,120,000
Combined values of magnesium compounds, phosphate rock, staurolite, stone [crushed sandstone (2005)], titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	971,000	XX	810,000 ^r	XX	1,360,000
Total	XX	2,910,000	XX	3,240,000 ^r	XX	3,380,000

^eEstimated. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. 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.

³Excludes certain stones; kind and value included with "Combined values" data.

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

Type	2006			2007		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone ²	86 ^r	124,000 ^r	\$1,310,000 ^r	81	92,100	\$1,090,000
Dolomite	4	713	6,770	3	234	1,540
Shell	5	8,640	73,900	5	2,850	24,200
Sandstone	2	312	3,400	2	256	3,010
Miscellaneous stone	--	--	--	1	296	3,670
Total	XX	134,000 ^r	1,400,000 ^r	XX	95,700	1,120,000

^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
 FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	86	2,370
Filter stone	80	1,400
Other coarse aggregate	223	3,190
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	9,730	181,000
Fine aggregate (¾ inch):		
Stone sand, concrete	1,580	20,600
Screening, undesignated	1,580	18,600
Other fine aggregate	8,310	110,000
Coarse and fine aggregates:		
Graded road base or subbase	10,300	71,200
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	5,530	90,500
Other construction materials	653	4,670
Agricultural:		
Limestone	444	4,770
Poultry grit and mineral food	W	W
Other agricultural uses	110	424
Chemical and metallurgical:		
Cement manufacture	5,790	33,000
Sulfur oxide removal	W	W
Unspecified:²		
Reported	30,000	346,000
Estimated	12,000	144,000
Total	95,700	1,120,000

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
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2 ²		Districts 3 and 4 ²		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ³	13	336	378	6,630	--	--
Coarse aggregate, graded ⁴	2,810	48,200	11,800	195,000	--	--
Fine aggregate (-¾ inch) ⁵	1,710	27,600	9,740	122,000	22	274
Coarse and fine aggregates ⁶	9,300	63,900	10,300	122,000	--	--
Other construction materials	--	--	653	4,670	--	--
Agricultural ⁷	W	W	W	W	--	--
Chemical and metallurgical ⁸	W	W	W	W	353	3,950
Unspecified:⁹						
Reported	4,310	51,700	25,700	294,000	--	--
Estimated	5,300	62,000	7,000	82,000	--	--
Total	25,900	265,000	69,400	853,000	375	4,220

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.

²Districts 1 and 2 and 3 and 4 are combined to avoid disclosing company proprietary data.

³Includes filter stone, riprap and jetty stone, and other coarse aggregate.

⁴Includes concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

⁵Includes screening (undesignated), stone sand (concrete), and other fine aggregate.

⁶Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

⁷Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁸Includes cement manufacture and sulfur oxide removal.

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

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007,
BY MAJOR USE CATEGORY¹

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregate (including concrete sand)	5,780	\$54,800	\$9.47
Concrete products (blocks, bricks, pipe, decorative, etc.) ²	431	4,310	9.99
Asphaltic concrete aggregates and other bituminous mixtures	452	4,070	8.99
Road base and coverings	791	7,970	10.08
Fill	2,550	10,100	3.95
Other miscellaneous uses ³	924	8,130	8.80
Unspecified:⁴			
Reported	5,890	41,900	7.11
Estimated	13,500	100,000	7.40
Total or average	30,300	231,000	7.62

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 golf course.

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

TABLE 6
 FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007, BY USE AND DISTRICT^{1,2}

(Thousand metric tons and thousand dollars)

Use	District 1		District 2 and 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ³	W	W	W	W	--	--
Asphaltic concrete aggregates and road base materials	W	W	W	W	--	--
Fill	393	1,320	2,160	8,760	--	--
Other miscellaneous uses ⁴	843	6,070	7,540	73,200	--	--
Unspecified: ⁵						
Reported	9	64	5,880	41,800	--	--
Estimated	3,510	26,800	9,100	66,600	905	6,660
Total or average	4,760	34,200	24,700	190,000	905	6,660

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.

²Districts 2 and 3 are combined to avoid disclosing company proprietary data.

³Includes plaster and gunite sands.

⁴Includes golf course.

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