The Mineral Industry of Florida

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Florida Bureau of Geology for collecting information on all nonfuel minerals.

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The value of nonfuel mineral production in Florida in 1978 and 1979 was $1.1 billion and $1.3 billion, respectively. The State ranked first in the production of phosphate rock and titanium concentrates, and second in fuller's earth and peat. Staurolite and zircon concentrates were produced only in Florida. Nonmetals accounted for nearly all of the State's total mineral production value in 1978 and 1979. The principal nonmetals produced, in order of value, were phosphate rock, stone, cement, sand and gravel, and clays. All commodities, with the exception of magnesium compounds, staurolite, and zircon concentrates, registered an increase in production and value. Except for titanium concentrates and zircon concentrates, all commodities registered an increase in unit value.

Table 1.—Nonfuel mineral production in Florida[1]

Mineral	1977		1978		1979	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry thousand short tons	W	W	W	W	255	$13,098
Portland do	2,540	$87,561	2,766	$111,892	2,957	126,562
Clays do	581	[2]22,313	601	28,850	681	[2]31,308
Gem stones	--	--	NA	5	NA	4
Lime thousand short tons	165	7,350	180	8,182	210	11,440
Peat do	125	1,396	158	2,246	153	2,190
Sand and gravel do	20,218	38,989	21,860	36,950	21,708	39,520
Stone (crushed) do	48,558	101,435	57,354	128,905	W	W
Combined value of clays (kaolin, 1977 and 1979), magnesium compounds, phosphate rock, rare-earth concentrate, staurolite, stone (dimension, 1977), titanium concentrate (ilmenite and rutile), and zircon concentrate, and values indicated by symbol W	XX	702,832	XX	781,742	XX	1,045,549
Total	XX	961,876	XX	1,098,772	XX	1,269,671

NA Not available. W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure. XX Not applicable.

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

[2]Excludes value of kaolin; value included in "Combined value" figure.

Table 2.—Value of nonfuel mineral production in Florida, by county[1]

(Thousands)

County	1977	1978	Minerals produced in 1978 in order of value
Alachua	$2,278	$3,074	Stone.
Bay	509	663	Sand and gravel.
Brevard	2,600	W	Clays, sand and gravel, stone.
Broward	10,728	12,408	Stone, sand and gravel.
Calhoun	15	75	Sand and gravel.
Charlotte	W	W	Stone, sand and gravel.
Citrus	2,172	2,445	Stone, phosphate rock.
Clay	24,378	23,838	Ilmenite, zircon, rutile, staurolite, sand and gravel, monazite, clays.
Collier	2,877	3,521	Stone.
Dade	W	W	Cement, stone, sand and gravel.
Dixie	W	W	Stone.
Escambia	466	680	Sand and gravel.
Gadsden	W	W	Clays, sand and gravel.
Glades	W	W	Sand and gravel.
Gulf	W	W	Magnesium compounds, lime.
Hamilton	W	W	Phosphate rock.
Hardee	--	W	Do.
Hendry	W	W	Sand and gravel, stone.
Hernando	W	W	Stone, cement, lime, clays.
Highlands	678	W	Peat.
Hillsborough	W	W	Phosphate rock, cement, stone, peat.
Jackson	520	1,594	Stone, sand and gravel.
Lake	4,560	W	Sand and gravel, peat.
Lee	5,435	8,036	Stone.
Leon	W	W	Sand and gravel.
Levy	1,905	449	Stone.
Manatee	W	W	Cement.
Marion	8,204	10,189	Stone, clays, sand and gravel, phosphate rock.
Monroe	333	W	Stone.
Nassau	W	W	Titanium, zircon, monazite.
Okaloosa	24	33	Sand and gravel.
Orange	--	64	Do.
Osceola	16	--	
Palm Beach	W	90	Stone.
Pasco	1,358	W	Do.
Polk	W	640,981	Phosphate rock, sand and gravel, peat.
Putnam	W	W	Sand and gravel, clays, peat.
St. Lucie	W	307	Sand and gravel.
Santa Rosa	W	W	Do.
Sarasota	W	W	Sand and gravel, stone.
Sumter	W	W	Stone, lime.
Suwannee	W	W	Stone.
Taylor	W	W	Do.
Wakulla	W	--	
Walton	W	W	Sand and gravel.
Undistributed[2]	892,828	390,321	
Total[3]	961,876	1,098,772	

W Withheld to avoid disclosing company proprietary data; included with "Undistributed."

[1]The following counties are not listed because no nonfuel mineral production was reported: Baker, Bradford, Columbia, De Soto, Duval, Flagler, Franklin, Gilchrist, Holmes, Indian River, Jefferson, Lafayette, Liberty, Madison, Martin, Okeechobee, Pinellas, St. Johns, Seminole, Union, Volusia, and Washington.

[2]Includes gem stones and values indicated by symbol W.

[3]Data may not add to totals shown because of independent rounding.

Of the 50.0 million metric tons of phosphate rock produced in the United States, Florida was the predominant producer, and for the 85th and 86th consecutive years supplied more than any other State. Florida and North Carolina supplied over 85% of the domestic phosphate rock output, and Florida supplied most of the exports.

Trends and Developments.—Of the 15 ports in Florida, 12 are served by oceangoing vessels and 3 by barges.

The Port of Tampa, the seventh largest port in the Nation in terms of total tonnage, recorded a 65% increase in tonnage since 1967. In 1978, approximately 50% of the total tonnage was represented by phosphate and related products. Tampa imports substantial quantities of mineral raw materials used in fertilizer manufacture plus coal and coke. Of the total imports, 26% were mineral or related commodities. The leading export was raw phosphate rock which, along with fertilizers, accounted for 93% of total exports. There are 16 terminals located in the Tampa area to handle phosphate fertilizer and related chemicals.

The first shipment of Soviet anhydrous ammonia was made under a 20-year, $20

Table 3.—Indicators of Florida business activity

		1977	1978	1979[p]	1978-79 percent change
Employment and labor force, annual average:					
Total civilian labor force	thousands	3,519.0	3,711.0	3,835.0	+3.3
Unemployment	do	289.0	246.0	230.0	-6.5
Employment (nonagricultural):					
Mining[1]	do	9.1	9.5	10.0	+5.3
Manufacturing	do	380.9	415.5	437.7	+5.3
Contract construction	do	178.9	209.5	244.8	+16.8
Transportation and public utilities	do	185.1	194.2	209.7	+8.0
Wholesale and retail trade	do	771.0	836.9	897.4	+7.2
Finance, insurance, real estate	do	202.5	219.3	232.7	+6.1
Services	do	640.0	693.9	742.8	+7.0
Government	do	565.7	601.8	604.5	+0.4
Total nonagricultural employment[1]	do	2,933.2	3,180.6	3,379.7	+6.3
Personal income:					
Total	millions	$56,961	$65,130	$75,597	+16.1
Per capita		$6,728	$7,578	$8,532	+12.6
Construction activity:					
Number of private and public residential units authorized		108,052	[2]163,862	177,561	+8.4
Value of nonresidential construction	millions	$1,070.0	$1,403.4	$1,684.8	+20.1
Value of State road contract awards	do	$280.0	NA	$383.6	
Shipments of portland and masonry cement to and within the State	thousand short tons	4,114	4,620	4,998	+8.2
Nonfuel mineral production value:					
Total crude mineral value	millions	$961.9	$1,098.8	$1,269.7	+15.6
Value per capita, resident population		$114	$128	$143	+11.7
Value per square mile		$16,425	$18,763	$21,682	+15.6

[p]Preliminary. NA Not available.
[1]Includes oil and gas extraction.
[2]Series revised in 1978; data not comparable with those of prior years.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

billion trade pact between the U.S.S.R. and Occidental Petroleum Corp. (Oxy). The trade agreement calls for Oxy to supply 1 million tons of super phosphoric acid annually from its White Springs operation. In return, Oxy will receive ammonia, urea, and potash.

Legislation and Government Programs.—Under contract to the Environmental Protection Agency (EPA), Texas Instruments, Inc., prepared a draft Environmental Impact Statement (EIS) intended to establish guidelines for the issuance of Federal environmental permits for new phosphate mines and mills in a seven-county area. The final EIS, released in March 1978, recommended the elimination of rock drying and of slime ponds; improved recirculation of water; radiation standards; reclamation requirements; protection of wetlands; protection of ground water systems; fluorine emission standards; and recovery of uranium.

Since 1972, the Federal Bureau of Mines (Bureau), at its Tuscaloosa Research Center, has been involved in a concerted research effort to develop methods that will either eliminate the waste slimes retention areas or provide an improved waste storage system.

In-house Bureau project activity during 1978 included research on water recovery from phosphatic clay slimes; continuous flocculation dewatering and floc formation studies; and reuse and purification of low-quality waters for processing.

Further research included beneficiation of dolomitic phosphate ores, beneficiation of phosphate-bearing Hawthorn Formation limestone, recovery of phosphate from beneficiation slimes, and direct acidulation of phosphate matrix to improve recovery of P_2O_5.

Zellars-Williams, Inc., under contract to the Bureau, evaluated phosphate deposits of Florida for the Minerals Availability System. In addition to deposit characterization by district, the report covers mining and beneficiation, cost estimation, regulatory and environmental considerations, identified resources, and production capacity.

The Bureau and the Florida Bureau of Geology participated in a cooperative effort to evaluate deep phosphate occurrences

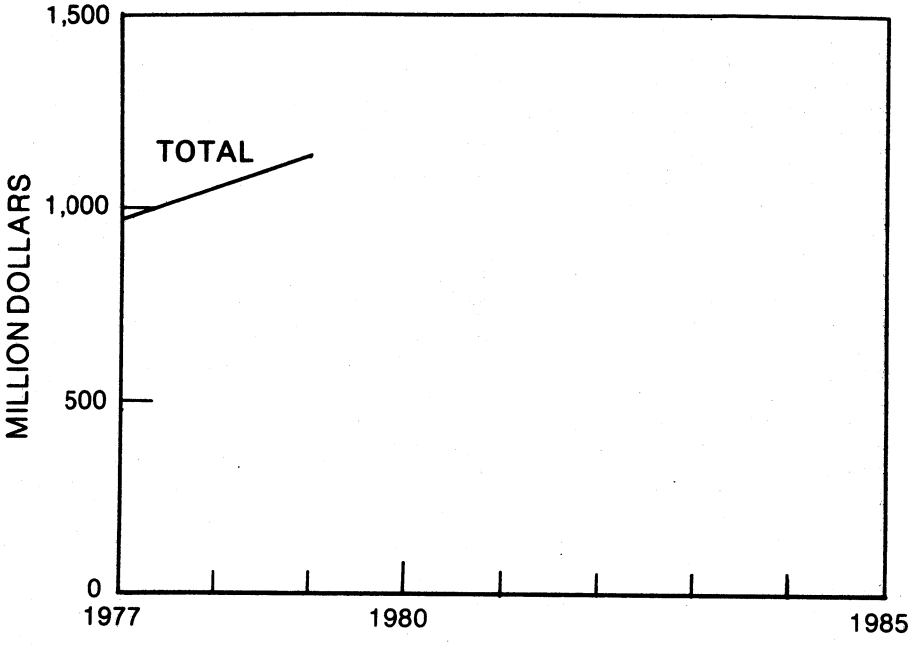

Figure 1.—Total value of nonfuel mineral production in Florida.

along Florida's east coast so that input could be made into the ongoing evaluation of the phosphate deposits of Florida. The objectives were to identify the occurrences of phosphate rock with their associated economic, physical, and environmental characteristics.

Florida's second largest phosphate producer, Agrico Chemical Co., planned an experimental mining project in St. Johns County with a grant from the Bureau. The mining technique involves drilling a well to the phosphate clay where a mining head dissolves the material and pumps it to the surface. Concern centers on whether the mining would harm the aquifer and lower water levels in the area.

The 1978 Florida Legislature extensively amended Chapter 211, Part II, Florida Statutes in response to the recommendations of the Phosphate Land Reclamation Study Commission. The basic change enacted was a redistribution of the severance tax.

REVIEW BY NONFUEL MINERAL COMMODITIES

NONMETALS

Cement.—Shipments of both portland and masonry cement increased in 1978 and again in 1979. Production of portland cement in the State ranked eighth nationally, while masonry ranked seventh. Five companies produced portland cement; two, masonry. Most of the shipments of both portland and masonry cements were within the State.

Portland cement shipments, mainly in bulk form, were made by truck and rail. Principal consumers were ready-mix companies, building materials dealers, concrete products manufacturers, with the remaining to other contractors and government agencies.

Principal raw materials used to manufacture cement were mined within the State and included limestone, clay, sand, and staurolite. Oolitic aragonite imported from the Bahamas was used by two companies. Small amounts of gypsum, clinker, fly ash, clay, iron ore, and slag were used, but most were obtained from out-of-State sources.

Eleven rotary kilns were operated at five plants. Of the 11, 10 were wet process and 1 was dry process. Nearly 400 million kilowatt-hours of electrical energy, in addition to natural gas and minor amounts of fuel oil and coal, were consumed in the manufacture of cement. All of the power was purchased.

Maule Industries, a Miami based integrated materials supplier that has been operating under bankruptcy status since 1976, was taken over by Lone Star Industries under a court order.

Clays.—Total clay production and value increased in 1978 and 1979. Florida ranked second in the Nation in fuller's earth production. Production increased from four producers, with nine pits in Brevard, Gadsden, and Marion Counties. Main end uses were for fertilizer fillers, pet waste adsorbents, pesticides, and drilling mud.

Kaolin was produced by one company at two pits in Putnam County. Principal uses were in electrical porcelain, whiteware, and wall tile.

Common clay output and value decreased in 1978, but increased in 1979. Miscellaneous clay was produced by two companies at two pits in Clay and Hernando Counties. The clays were used in the manufacture of cement and lightweight aggregate.

Fluorine.—Fluorine in the form of fluosilicic acid was recovered at six plants as a byproduct of wet-process phosphoric acid manufacture. Fluosilicic acid was used to produce cryolite, aluminum fluoride, sodium silica fluoride, and in water fluoridation. The value of fluorine byproducts is not included in the State's mineral value.

Gypsum.—Imported gypsum was calcined at two plants in Duval County and one plant in Hillsborough County. U.S. Gypsum Co., Jim Walter Corp., and National Gypsum Co. calcined gypsum in kettles, a rotary kiln, and a holoflite unit, respectively. A total of 626,000 short tons of calcined gypsum was produced in 1978; production in 1979 increased to 659,000 tons.

Lime.—Quicklime was produced by Basic Magnesia, Inc., Gulf County; Chemical Lime, Inc., Hernando County; and Dixie Lime & Stone Co., Sumter County. Hydrated lime was produced by Chemical Lime, Inc. Lime was used for magnesia recovery, water treatment, and in sewage disposal.

Magnesia.—Basic Magnesia, Inc., Port St. Joe, Gulf County, produced caustic calcined magnesia and refractory-grade magnesia from seawater. Shipments and value in 1978 decreased 8.7% and 0.2%, respectively. Florida ranked third nationally in the recovery of magnesium compounds from seawater.

Peat.—Florida ranked second in peat production in 1978 and 1979. Nine plants produced moss, reed-sedge and humus peat from six counties. Most of the peat, shipped in bulk, was used to pack plants and shrubs, for general soil improvement, and for potting soils.

Perlite.—Four companies produced expanded perlite from crude ore shipped into the State. Production increased to 28,000 tons in 1978, and to 29,000 tons in 1979. Value increased to $2.8 million in 1978, and to $3.0 million in 1979. Production from plants in Broward, Duval, Escambia, and Indian River Counties was used for horticultural purposes, insulation, and fillers. The value of expanded perlite is not included in the State's mineral value.

Phosphate Rock.—Florida ranked first in the Nation in the production of phosphate rock. Marketable production of phosphate rock in 1978 increased 4.8% in quantity and 11.7% in value; 1979 production decreased 4.6% from that of 1978, but value increased 14.1%.

Soft-rock phosphate was produced by four companies in 1978 and 1979, operating six mines in Citrus and Marion Counties. The soft-rock phosphate was used for direct application to the soil.

Land-pebble phosphate was produced at 22 mines by 13 companies in Hamilton, Hardee, Hillsborough, and Polk Counties. In 1978, agricultural uses accounted for 69.0%, industrial 0.7%, and exports 30.3%; with similar distribution in 1979. Normal superphosphate, triple superphosphate, wet-process phosphoric acid, and defluorinated phosphate rock were produced for agricultural uses. Industrial uses included the manufacture of elemental phosphorus and ferrophosphorus.

The economic impact on the State of the phosphate industry reached $2.5 billion in 1979. The industry had a significant impact on central Florida, primarily Columbia, Hamilton, Hardee, Hillsborough, Manatee,

and Polk Counties. Employment by the industry increased 12% in 1979, to 13,400. During 1979, an estimated $377 million was expended for expansion, replacement, and new construction, a 90% increase over 1978 expenditures.

Agrico Chemical Co.'s $20 million expansion project at its South Pierce acid facility will increase capacity to 420,000 tons per year. Completion date is scheduled for mid-1981. The company began negotiations with the Tampa Port Authority to sell its 225-acre loading terminal at Big Bend to the Authority for its expansion needs.

AMAX Inc., planned a $200 million, 4-million-ton-per-year mine in Manatee and De Soto Counties on land leased from Phillips Petroleum Co. At year's end, negotiations continued with Noranda Phosphate, Inc., for leasing of additional adjacent lands.

Beker Industries Corp. completed permitting requirements for a proposed 3-million-ton-per-year mine in Manatee County. The $80 to $100 million project is expected to go onstream in 1981; reserves are estimated to be 80 million tons.

Borden, Inc., completed their new beneficiation plant at the Big Four Mine in Hillsborough County. The facility includes systems to recycle water and scrubbers to reduce air pollution.

C. F. Industries became the first farm cooperative to mine phosphate when its new mine in Hardee County started operation in 1978. Production is planned at 1.5 to 2.0 million tons from the mine, with estimated reserves of 80 million tons.

Estech General Chemical Corp., formerly Swift Chemical Co., planned to develop a 3-million-ton-per-year mine in Manatee County by 1983. Two Japanese firms have a reported 12% interest, and Royster Co., a 20% interest in the operation.

Farmland Industries, Inc., planned to develop a 2-million-ton-per-year facility in Hardee County by 1981-82. The complex is expected to produce 2,400 tons of sulfuric acid per day, 300,000 tons per year of phosphoric acid, and 600,000 tons per year of diammonia phosphate.

Florida Phosphate Corp., a subsidiary of Great Lakes Carbon Corp., went onstream with its 100,000-ton-per-year phosphate recovery operation. The plant, north of Mulberry, will recover phosphate from debris mined earlier.

W. R. Grace & Co. and International Minerals & Chemical Corp. are jointly developing a 3- to 4-million-ton-per-year facility at Grace's Four Corner Mine in Hillsborough, Manatee, and Polk Counties. Development is scheduled for completion in 1982. W. R. Grace & Co. was awarded mining rights on 120 acres of Federal land in Polk County. The company is active in adjacent lands and owns the surface rights in the area.

International Minerals & Chemical Corp. (IMC) planned a $400 million expansion of its phosphate rock and chemical production. Included are a 2- to 3-million-ton-per-year expansion of phosphate mining and a 50% increase in chemical production at its Mulberry facility. IMC is converting its New Wales chemical plant to wet grinding and expects to save up to 8 million gallons of fuel oil and 18 million kilowatt-hours of electricity per year. Completion is expected in 1980. IMC also planned a $2.5 million expansion of its Port Sutton terminal on Tampa Bay. Capacity will be increased by 300,000 tons per year.

Mississippi Chemical Corp. continued the permit process to develop a 3-million-ton-per-year mine by the early 1980's. Reserves are estimated at 95 million tons in Hardee County. The company presently receives its phosphate rock primarily from Mobil Oil Corp.

Mobil Oil Corp. planned to develop a new mine in Hardee County to replace its 3-million-ton-per-year Forte Meade Mine, which is approaching exhaustion. Plans are to have the mine in operation by the mid-1980's.

Occidental Petroleum Corp. (Oxy) initiated a $140 million expansion of its chemical facilities adjacent to the Swift Creek Mine. Increased output of phosphoric acid will be required to meet the commitment Oxy has with the U.S.S.R. Oxy also has an agreement with Poland to supply 1 million tons per year of phosphate rock for 20 years. Oxy will purchase 500,000 tons of molten sulfur from Poland over the same period.

Sand and Gravel.—Sand and gravel output increased in 1978, but decreased in 1979. Lake, Polk, and Sarasota Counties were the leading producing counties, accounting for about 60% of the output. Lake, Polk, and Sarasota Counties also accounted for 56% of the value of production.

During 1979, 41 companies operated 54 mines in 21 counties. Transportation was primarily by truck, with the balance shipped by railroad, waterway, and other. The sand and gravel was used mainly for construction purposes, which include con-

Table 4.—Florida: Construction sand and gravel sold or used, by major use category

Use	1977			1978			1979		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	12,344	$22,260	$1.80	11,452	$17,665	$1.54	11,949	$19,200	$1.61
Plaster and gunite sands	NA	NA	NA	W	W	W	239	584	2.44
Concrete products	1,922	4,010	2.09	1,633	3,197	1.96	869	1,765	2.03
Asphaltic concrete	467	1,256	2.69	515	1,420	2.76	868	2,195	2.53
Roadbase and coverings	2,350	3,873	1.65	1,128	1,439	1.28	2,214	2,845	1.28
Fill	1,836	1,903	1.04	5,703	6,175	1.08	4,503	4,556	1.01
Snow and ice control	NA	NA	NA	--	--	--	--	--	--
Other uses	301	515	1.71	296	824	2.78	--	--	--
Total[1] or average	19,220	33,816	1.76	20,730	30,720	1.48	20,642	31,145	1.51

NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Other uses."
[1]Data may not add to totals shown because of independent rounding.

Table 5.—Florida: Sand and gravel sold or used by producers, by use

Use	1977			1978			1979		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Construction:									
Sand	16,869	$29,024	$1.72	19,894	$28,350	$1.43	18,143	$26,843	$1.48
Gravel	2,352	4,793	2.04	833	2,370	2.85	2,500	4,302	1.72
Total[1] or average	19,220	33,816	1.76	20,730	30,720	1.48	20,642	31,145	1.51
Industrial sand	997	5,172	5.19	1,128	6,226	5.52	1,066	8,375	7.86
Grand total[1] or average	20,218	38,989	1.93	21,860	36,950	1.69	21,708	39,520	1.82

[1]Data may not add to totals shown because of independent rounding.

Table 6.—Florida: Crushed stone[1] sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1977		1978		1979[2]	
	Quantity	Value	Quantity	Value	Quantity	Value
Agricultural limestone	1,019	3,529	1,000	3,695	1,131	6,036
Agricultural marl and other soil conditioners	W	W	W	W	52	452
Poultry grit and mineral food	W	W	W	W	490	2,837
Concrete aggregate	r12,889	r33,383	14,246	40,764	14,085	53,980
Bituminous aggregate	4,440	10,190	4,188	11,066	3,498	12,490
Macadam aggregate	578	1,519	721	2,514	W	W
Densegraded roadbase stone	15,409	23,164	18,047	30,341	17,603	37,602
Surface treatment aggregate	2,106	6,101	2,828	8 260	2,885	12,804
Other construction aggregate and roadstone	3,085	7,409	5,645	10,251	13,409	30,858
Riprap and jetty stone	61	291	51	265	58	277
Filter stone	44	W	79	W	55	233
Manufactured fine aggregate (stone sand)	3,093	6,600	4,029	9,376	5,642	19,770
Cement manufacture	2,554	3,173	2,731	3,455	2,344	5,139
Lime manufacture	W	W	W	W	367	1,007
Asphalt filler	—	—	W	W	21	209
Other fillers	W	W	W	W	188	1,222
Fill	2,342	2,722	2,606	3,597	1,580	2,919
Other uses[3]	937	3,357	1,184	5,321	200	632
Total[4]	48,558	101,435	57,354	128,905	63,609	188,467

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Other uses."
[1]1977-78 data include limestone, shell, and marl.
[2]Crushed limestone only.
[3]Includes stone used for railroad and glass manufacture, unspecified uses, and uses indicated by symbol W.
[4]Data may not add to totals shown because of independent rounding.

crete aggregate and fill, with the balance going into industrial uses.

Staurolite.—Staurolite was recovered as a byproduct of ilmenite production at the Highland and Trail Ridge plants of E. I. du Pont de Nemours & Co., Clay County. Production decreased in 1978, but increased substantially in 1979. Staurolite was mainly used in sandblasting, and minor amounts, in cement. Florida is the only State with a record production of staurolite.

Stone.—Florida ranked third in the Nation in crushed stone production, which included crushed limestone, dolomite, and oyster shell.

Stone was produced by 75 companies at 105 quarries in 21 counties. The three leading producing counties were Broward, Dade, and Hernando, which supplied nearly 70% of the State's total tonnage and value. Fifteen companies produced over 1 million tons each from 33 quarries, and accounted for 71% of the production and 75% of the value.

Crushed stone was transported mainly by truck, followed by railroad, and other. Crushed stone was used for dense-graded roadbase, concrete and bituminous aggregate, and for cement manufacture. Two companies processed oyster shell for roadbed material.

Sulfur.—Florida ranked fifth in the Nation in the recovery of sulfur from petroleum. Recovered sulfur from Exxon's desulfurization plants in Santa Rosa County increased slightly in 1978, but decreased in 1979. The value of byproduct sulfur is not included in the State's mineral production value.

Vermiculite.—Exfoliated vermiculite was produced by two operators at four plants in Broward, Duval, and Hillsborough Counties from crude ore shipped into the State. Main uses were for lightweight concrete aggregate, horticulture, and insulation. The value is not included in the State's mineral value.

METALS

Rare-Earth Minerals.—Humphrey's Mining Co., Nassau County, and Titanium Enterprises, Clay County, produced monazite concentrate as a coproduct from their heavy minerals operation. The dredging and wet milling portions of the Titanium Enterprise's heavy mineral sand operation at Green Cove Springs were shut down in mid-1978 because of economic conditions, mainly the depressed price for zircon. Production of zircon, staurolite, and monazite continued from the company's dry mill tailings. Tailings are sufficient for another 2 years production at current rates. At yearend, the operation was for sale. Although the zircon price was low, the demand for monazite was firm.

Titanium.—Titanium Enterprises and E. I. du Pont de Nemours & Co., Clay County, and Humphrey's Mining Co., Nassau County, produced titanium concentrate. Humphrey's Mining Co.'s operation closed in 1979 owing to depleted reserves.

Zircon Concentrate.—Production and value of zircon concentrates from E. I. du Pont de Nemours & Co. and Titanium Enterprises, both in Clay County, decreased in 1978. Florida was the only producer of zircon concentrate.

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Table 7.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Florida Mining & Materials Corp	Box 23965 Tampa, FL 33622	Plant	Hernando.
General Portland, Inc	4400 Republic National Bank Tower, Box 324 Dallas, TX 75221	Plants	Dade and Hillsborough.
Lone Star Florida, Inc	Box 2035 PVS Hialeah, FL 33012	Plant	Dade.
Rinker Portland Cement Corp	Drawer K West Palm Beach, FL 33402	do	Do.
Clays:			
Engelhard Minerals & Chemicals Corp.	Menlo Park Edison, NJ 08817	Open pit mines	Gadsden.
Mid-Florida Mining	Box 68-F Lowell, FL 32663	do	Marion.
Pennsylvania Glass Sand Corp	Berkeley Springs, WV 35411	do	Gadsden.
Gypsum (calcined):			
Jim Walter Corp	Box 135 Jacksonville, FL 32226	Plant	Duval.
National Gypsum Co	4100 First Intl. Bldg. Dallas, TX 75270	do	Hillsborough.
United States Gypsum Co	101 South Wacker Dr. Chicago, IL 60606	do	Duval.
Lime:			
Chemical Lime, Inc	Box 250 Ocala, FL 32670	do	Hernando.
Dixie Lime & Stone Co.[1]	Drawer 217 Ocala, FL 32670	do	Sumter.
Magnesium compounds:			
Basic Magnesia, Inc.[2]	Box 160 Port St. Joe, FL 32456	do	Gulf.
Peat:			
F. E. Stearns Peat	Route 1, Box 542D Dover, FL 33527	Bog	Hillsborough.
Superior Peat & Soil	Box 2688 Sebring, FL 33870	Bog	Highlands.
Perlite (expanded):			
Airlite Processing Corp. of Florida.	Route 2, Box 740 Vero Beach, FL 32960	Plant	Indian River.
Armstrong Cork Co	Box 1991 Pensacola, FL 32589	do	Escambia.
Chemrock Corp	End of Osage Street Nashville, TN 37208	do	Duval.
W. R. Grace & Co.[3]	62 Whittemore Ave. Cambridge, MA 02140	do	Broward.
Phosphate rock:			
Agrico Chemical Co	Box 3166 Tulsa, OK 74101	Open pit mines and plants.	Polk.
Borden, Inc	Box 790 Plant City, FL 33566	Open pit mine and plant.	Hillsborough and Polk.
Brewster Phosphates	Bradley, FL 33835	do	Do.
C. F. Industries	Box 790 Plant City, FL 33566	do	Hardee.
Estech General Chemical Corp	Box 208 Bartow, FL 33830	Open pit mines	Polk.
Gardinier, Inc	Box 3269 Tampa, FL 33601	Open pit mine and plant.	Do.
International Minerals & Chemical Corp.	Box 867 Bartow, FL 33830	Open pit mines	Do.
Mobil Oil Corp.[4]	Box 311 Nichols, FL 33863	do	Do.
Occidental Petroleum Corp	White Springs, FL 32096	Open pit mine	Hamilton.
U.S.S. Agri-Chemicals, Inc	Box 867 Ft. Meade, FL 33841	do	Polk.
W. R. Grace & Co	Box 471 Bartow, FL 33830	Open pit mine and plant.	Do.
Sand and gravel:			
Florida Rock Industries, Inc., Shands & Baker.	744 Riverside Ave. Jacksonville, FL 32201	Pits	Clay, Dade, Glades, Lake.
General Development Corp	1111 South Bayshore Dr. Miami, FL 33131	do	Brevard, Charlotte, Sarasota, St. Lucie.
E. R. Jahna Industries, Inc., Ortona Sand Co. Div.	First & East Tillman Lake Wales, FL 33853	do	Glades, Lake, Polk.
Standard Sand & Silica Co	Box 35 Davenport, FL 33837	do	Dade, Polk, Marion, Lake.
Staurolite:			
E. I. du Pont de Nemours & Co	DuPont Bldg. D-10084 Wilmington, DE 19898	Mines and plants	Clay.

See footnotes at end of table.

Table 7.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
Stone:			
Florida Crushed Stone Co	Box 317 Leesburg, FL 32748	Quarries	Hernando and Sumter.
Florida Rock Industries, Inc.[5]	Box 427 Brooksville, FL 33512	do	Collier, Lee, Sumter, Suwannee.
Lone Star Florida, Inc	Box 2601 PVS Hialeah, FL 33012	Quarry	Dade.
Southeastern Materials, Inc	Box 2634 Miami, FL 33012	Quarries	Do.
Vulcan Materials Co	Box 660097 Miami Springs, FL 33166	do	Broward and Dade.
Titanium concentrates:			
E. I. du Pont de Nemours & Co	DuPont Bldg. D-10084 Wilmington, DE 19898	Mines and plants	Clay.
Titanium Enterprises[6]	Green Cove Springs, FL 32043	Mine and plant	Do.

[1]Also stone.
[2]Also lime.
[3]Also phosphate rock and exfoliated vermiculite.
[4]Also elemental phosphorus.
[5]Also sand and gravel.
[6]Also zircon concentrate and rare-earth oxides and thorium oxide in monazite concentrate.