

# The Mineral Industry of Virginia

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The value of Virginia's nonfuel mineral production was \$264.9 million in 1978 and \$309.8 million in 1979. During these years, Virginia's major nonfuel commodities were, in terms of value, cement, kyanite, lime, sand and gravel, stone, and zinc. Other commodities that contributed to the State's mineral economy included aplite, clay, gypsum, lead, and talc. Also, the State's first vermiculite mine began production in 1979.

**Trends and Developments.**—In the 1970's, stone production accounted for approximately 50% of Virginia's total nonfuel mineral production value. Stone output peaked in 1978 at 50.5 million short tons

and again in 1979 at 51.1 million short tons. As these record production levels were reached, the State's nonfuel mineral production value surpassed the \$300 million mark for the first time.

Virginia became the third State in the Nation to produce crude vermiculite when Virginia Vermiculite, Ltd., began operations in 1979. The open pit operation is located about 20 miles east of Charlottesville in Louisa County. Previously, Montana and South Carolina accounted for all domestic vermiculite production. The material, after extraction, is exfoliated and used mostly by the construction industry.

Table 1.—Nonfuel mineral production in Virginia<sup>1</sup>

Mineral	1977		1978		1979	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays----- thousand short tons..	890	\$1,294	1,043	\$3,266	1,059	\$3,512
Gem stones-----	NA	12	NA	15	NA	15
Lead (recoverable content of ores, etc.) metric tons..	1,999	1,352	1,803	1,339	1,596	1,852
Lime----- thousand short tons..	846	28,767	832	30,578	872	34,985
Sand and gravel <sup>2</sup> ----- do. ....	10,447	24,605	11,430	29,070	11,803	32,268
Stone:						
Crushed----- do. ....	41,707	109,737	50,442	141,601	51,080	165,223
Dimension----- do. ....	10	1,864	10	1,943	9	2,042
Zinc (recoverable content of ores, etc.) metric tons..	12,040	9,131	10,974	7,500	11,406	9,380
Combined value of aplite, cement, gypsum, kyanite, sand and gravel (industrial), silver (1977), talc (soapstone), and vermiculite (1979)-----	XX	39,104	XX	49,585	XX	60,538
Total-----	XX	215,866	XX	264,897	XX	309,765

NA Not available. XX Not applicable.

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

<sup>2</sup>Excludes industrial sand; value included in "Combined value" figure.

Table 2.—Value of nonfuel mineral production in Virginia, by county<sup>1</sup>

(Thousands)

County	1977	1978	Minerals produced in 1978 in order of value
Accomack	\$163	\$273	Sand and gravel.
Albemarle	W	W	Stone, sand and gravel.
Alleghany	W	W	Stone.
Amherst	W	W	Stone, sand and gravel.
Appomattox	W	W	Stone.
Augusta	W	W	Stone, sand and gravel.
Bedford	W	W	Stone.
Bland	W	W	Do.
Botetourt	W	W	Cement, stone, clays.
Brunswick	W	W	Stone, clays.
Buckingham	W	W	Kyanite, stone.
Campbell	2,830	3,678	Stone, sand and gravel.
Caroline	753	953	Sand and gravel.
Charles City	W	W	Do.
Charlottesville (city)	W	W	Do.
Chesapeake (city)	W	W	Cement, sand and gravel.
Chesterfield	W	W	Sand and gravel, stone, clays.
Clarke	W	W	Stone.
Craig	175	175	Sand and gravel.
Culpeper	W	W	Stone.
Dinwiddie	W	W	Do.
Fairfax	W	W	Stone, sand and gravel.
Fauquier	1,857	W	Stone.
Floyd	W	8	Do.
Franklin	W	W	Stone, soapstone.
Frederick	W	W	Stone, lime.
Giles	W	W	Lime, stone.
Gloucester	36	27	Sand and gravel.
Goochland	3,584	5,753	Stone.
Grayson	W	W	Stone, sand and gravel.
Greensville	W	W	Stone, clays.
Halifax	W	W	Stone, sand and gravel.
Hanover	W	W	Stone, apatite, sand and gravel.
Henrico	10,746	11,990	Sand and gravel, stone.
Henry	1,704	W	Stone, sand and gravel.
Highland	W	W	Stone.
Isle of Wight	W	67	Sand and gravel.
James City	W	W	Do.
King George	W	W	Do.
King William	W	33	Do.
Lancaster	24	44	Do.
Lee	W	W	Stone.
Loudoun	7,656	11,000	Do.
Middlesex	11	W	Sand and gravel.
Montgomery	W	W	Stone, clays.
Nansemond	W	W	Sand and gravel.
Nelson	W	W	Stone, apatite.
New Kent	225	W	Sand and gravel.
Newport News (city)	W	W	Do.
Northampton	W	27	Do.
Northumberland	18	18	Do.
Nottoway	1,651	W	Stone.
Orange	W	W	Clays.
Page	W	W	Stone.
Pittsylvania	W	W	Stone, sand and gravel.
Powhatan	W	W	Stone.
Prince Edward	W	W	Kyanite, stone.
Prince George	W	W	Sand and gravel.
Prince William	W	W	Stone, clays.
Pulaski	W	W	Stone.
Rappahannock	W	W	Do.
Richmond (city)	W	W	Stone, clays.
Roanoke	W	5,031	Do.
Rockbridge	W	W	Do.
Rockingham	W	W	Stone, sand and gravel.
Russell	5,808	6,937	Stone.
Scott	2,091	1,686	Do.
Shenandoah	W	W	Lime, stone.
Smyth	W	W	Stone, clays, sand and gravel.
Southampton	175	175	Sand and gravel.
Spotsylvania	W	W	Stone, sand and gravel.
Stafford	W	W	Sand and gravel, stone.
Suffolk (city)	W	W	Sand and gravel.
Surry	W	W	Do.
Tazewell	W	W	Stone, clays.
Virginia Beach (city)	2,074	2,035	Sand and gravel.
Warren	W	W	Cement, lime, stone, sand and gravel.
Washington	W	W	Stone, gypsum.
Westmoreland	92	89	Sand and gravel.
Wise	W	1,566	Stone.

See footnotes at end of table.

**Table 2.—Value of nonfuel mineral production in Virginia, by county<sup>1</sup>—Continued**  
(Thousands)

County	1977	1978	Minerals produced in 1978 in order of value
Wythe -----	\$15,777	\$14,175	Zinc, stone, lead.
York -----	W	91	Sand and gravel.
Undistributed <sup>2</sup> -----	158,413	199,067	
<b>Total<sup>3</sup> -----</b>	<b>215,866</b>	<b>264,897</b>	

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

<sup>1</sup>The following cities and counties are not listed because no production was reported: Alexandria (city), Amelia, Arlington, Bath, Bedford (city), Bristol (city), Buchanan, Buena Vista (city), Carroll, Charlotte, Clifton Forge (city), Colonial Heights (city), Covington (city), Cumberland, Danville (city), Dickenson, Emporia (city), Essex, Fairfax (city), Falls Church (city), Fluvanna, Franklin (city), Fredericksburg (city), Galax (city), Greene, Hampton (city), Harrisonburg (city), Hopewell (city), King and Queen, Lexington (city), Louisa, Lunenburg, Lynchburg (city), Madison, Martinsville (city), Mathews, Mecklenburg, Norfolk (city), Norton (city), Patrick, Petersburg (city), Portsmouth (city), Radford (city), Richmond, Roanoke (city), Salem (city), South Boston (city), Staunton (city), Sussex, Waynesboro (city), Williamsburg (city), and Winchester (city).

<sup>2</sup>Includes gem stones and values indicated by symbol W.

<sup>3</sup>Data may not add to totals shown because of independent rounding.

**Table 3.—Indicators of Virginia business activity**

	1977	1978	1979 <sup>P</sup>	1978-79 percent change
<b>Employment and labor force, annual average:</b>				
Total civilian labor force ----- thousands --	2,363.0	2,443.0	2,477.0	+1.4
Unemployment ----- do -----	126.0	131.0	117.0	-10.7
<b>Employment (nonagricultural):</b>				
Mining <sup>1</sup> ----- do -----	22.0	20.5	24.2	+18.0
Manufacturing ----- do -----	400.8	409.4	413.1	+9
Contract construction ----- do -----	119.0	130.2	135.4	+4.0
Transportation and public utilities ----- do -----	105.9	107.6	114.3	+6.2
Wholesale and retail trade ----- do -----	405.6	423.1	439.9	+2.8
Finance, insurance, real estate ----- do -----	91.7	97.1	103.3	+6.4
Services ----- do -----	331.8	357.9	374.6	+4.7
Government ----- do -----	453.6	482.7	493.6	+2.3
<b>Total nonagricultural employment<sup>1</sup> ----- do -----</b>	<b>1,930.4</b>	<b>2,033.5</b>	<b>2,098.4</b>	<b>+3.2</b>
<b>Personal income:</b>				
Total ----- millions --	\$35,418	\$39,746	\$44,719	+12.5
Per capita ----- do -----	\$6,952	\$7,721	\$8,605	+11.4
<b>Construction activity:</b>				
Number of private and public residential units authorized ----- do -----	54,946	<sup>2</sup> 51,970	45,333	-12.8
Value of nonresidential construction ----- millions --	\$521.3	\$326.1	\$1,032.9	+25.0
Value of State road contract awards ----- do -----	\$294.0	\$360.0	\$243.0	-32.5
Shipments of portland and masonry cement to and within the State thousand short tons --	1,829	2,111	2,164	+2.5
<b>Nonfuel mineral production value:</b>				
Total crude mineral value ----- millions --	\$215.9	\$264.9	\$309.8	+16.9
Value per capita, resident population ----- do -----	\$42	\$51	\$60	+17.6
Value per square mile ----- do -----	\$5,289	\$6,490	\$7,589	+16.9

<sup>P</sup>Preliminary.

<sup>1</sup>Includes bituminous coal, oil, and gas extraction.

<sup>2</sup>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.

**Legislation and Government Programs.**—In 1979, Virginia's General Assembly established a study commission to examine the State's port facilities and recommend improvements. Virginia's port complex includes Hampton Roads, one of the world's finest harbors, where freight traffic annually exceeds 50 million tons, plus three inland river ports. Both foreign and domestic cargoes were handled at Hampton Roads, and approximately 3.75 million tons

of the port's annual freight traffic in 1978 and 1979 was directly or indirectly related to the nonfuel mineral industry. Imports in 1978 and 1979 included manganese, iron ore, ferroalloys, limestone, and other non-metallic minerals. Mineral exports were nonferrous metals and ores, clay, sand and gravel, and crushed stone.

The State Water Control Board, in cooperation with the U.S. Environmental Protection Agency, continued reclamation

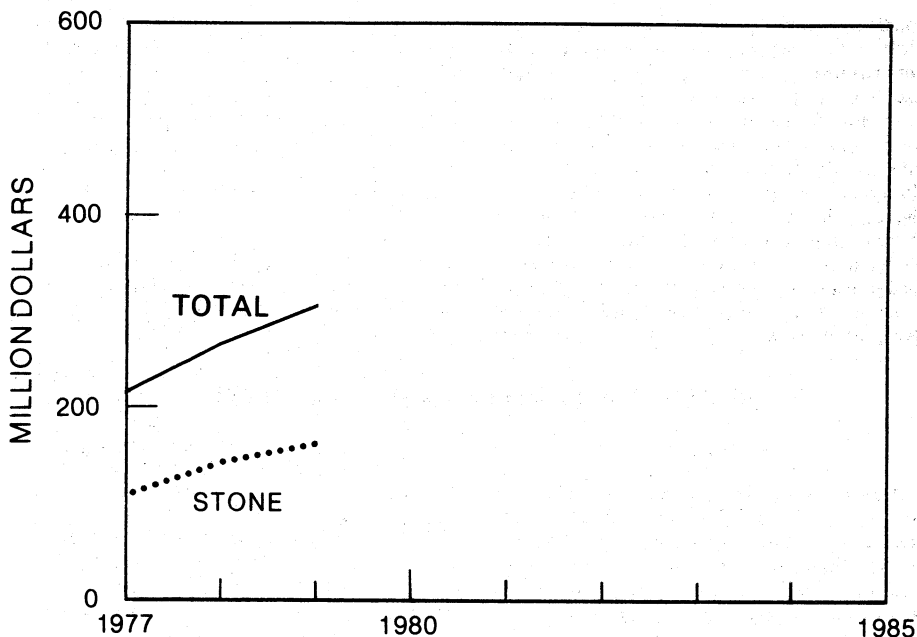


Figure 1.—Value of stone and total value of all nonfuel mineral production in Virginia.

work along Contrary Creek in Louisa County in 1978 and 1979. The project, started in 1976, was aimed at controlling high concentrations of dissolved metals from three inactive pyrite mines. Low rainfall and the general toxicity of the land around the mine sites hampered efforts, but 19.5 acres was reclaimed at two sites near the town of Mineral.

The Federal Office of Coastal Zone Management terminated support of Virginia's Coastal Resources Management Program in 1979. By law, the Federal Government allocates 80% of the funds for a State's coastal resources planning and management, provided the State develops a program that meets Federal guidelines. Although Virginia's program met the required Federal guidelines, it was not approved by the General Assembly. Opponents within the State believed that it would have restricted industrial development, including mineral extraction, in coastal areas.

In 1978 and 1979, the Virginia Department of Conservation and Development's Division of Mineral Resources continued mineral resource evaluations, as well as

geologic and topographic mapping programs. Geologic maps of nine quadrangles were published. Work began on a study of the geology and mineral resources of two quadrangles in the central Piedmont Province, under an agreement with the Piedmont Planning District Commission.

The Federal Bureau of Mines and the U.S. Geological Survey (USGS), in accordance with provisions of the Wilderness Act, conduct mineral surveys of lands considered for addition to the National Wilderness Preservation System. Results of mineral surveys are published by the USGS in a bulletin series. A report on the mineral resources of the Mill Creek, Mountain Lake, and Peter Mountain wilderness study areas was released as USGS Open File Report 78-1076 in 1978. The report listed iron ores and common building stone as possible prospects for mineral development, but neither appeared commercially attractive under then-current market conditions.

The Forest Service of the U.S. Department of Agriculture instituted the Roadless Area Review and Evaluation (RARE II) program in 1977. The program identified

roadless and undeveloped land areas in the National Forest System to determine their general use for wilderness or other multiple use designation resource development. In 1978, the Forest Service identified 16 areas in Jefferson National Forest, 7 of which, totaling 29,553 acres, were recommended to Congress for addition to the Wilderness System. Of the 15 areas identified in George Washington National Forest, 5, totaling 33,025 acres, were nominated for wilderness designation. Congressional action on the 12 areas was expected in 1980. Once an area is designated as wilderness by Congress, vir-

tually all activities that could alter the natural character of the land are prohibited.

Virginia's Division of Mined Land Reclamation received a \$203,000 grant in 1979 from the U.S. Office of Surface Mining. The funds were to be used to inventory the State's abandoned mine lands as a first step towards reclamation. The Division's Minerals Other Than Coal Section reported that in the 1978-79 period, the State's clay, sand and gravel, and stone mining operations disturbed 2,068 acres, and only 334 were reclaimed.

## REVIEW BY NONFUEL MINERAL COMMODITIES

### NONMETALS

**Aplite.**—Virginia was the only State to produce apelite in 1978 and 1979. The Feldspar Corp., Hanover County, and International Minerals and Chemical Corp., Nelson County, mined apelite by open pit methods. After onsite processing, apelite was used primarily in the manufacture of glass. In 1978, Owens-Illinois, Inc., began construction of a glass container plant in James City that was being designed to use apelite, along with other materials, to make throwaway bottles. The plant was scheduled to begin production in early 1980 with an estimated annual output of 500 million glass containers.

**Cement.**—Lone Star Cement, Inc., Botetourt County, and Riverton Corp., Warren County, produced cement in the State in 1978 and 1979. One of the Nation's largest operators, Lone Star Cement, Inc., produced both portland and masonry cement at its Botetourt plant, which has an annual capacity of over 1 million tons. The company also operated cement manufacturing plants in the city of Chesapeake. Riverton Corp. produced only masonry cement.

**Clays.**—In 1978 and 1979, clay was produced by 8 companies in 11 counties and 1 city. Leading counties, in decreasing order of production tonnage, were Botetourt, Smyth, Orange, and Brunswick. During this period, nine plants used clay in brick production. A 10th brick plant was under development in 1979, with capacity estimated at 35 million brick annually. About 90% of the clay produced in Virginia was used in the manufacture of face and common brick. The manufacture of lightweight aggregate for use in concrete block and

structural concrete accounted for the remainder.

**Table 4.—Virginia: Clays sold or used by producers**

(Thousand short tons and thousand dollars)

Year	Quantity	Value
1975 -----	819	1,152
1976 -----	862	1,210
1977 -----	890	1,294
1978 -----	1,043	3,266
1979 -----	1,059	3,512

**Gypsum.**—United States Gypsum Co., Virginia's only producer of crude gypsum in 1978 and 1979, continued underground mining operations at the Plasterco mine in Washington County. Gypsum was processed at the company's mill in Plasterco for use in gypsum wallboard, portland cement, and as agricultural gypsum. The company also operated a mill in Norfolk to process material imported from Nova Scotia, Canada.

**Kyanite.**—Virginia led the Nation in kyanite production in 1978 and again in 1979. Kyanite Mining Corp. operated one surface mine at Willis Mountain, Buckingham County, and another at Baker Mountain, Prince Edward County. Most of the ore was processed at plants near the mine sites and converted to synthetic mullite by calcination. The finished product was marketed in bulk or in bags. The major use of kyanite was in the manufacture of brick for rotary kilns and furnaces.

**Lime.**—In terms of value, lime was among the State's leading nonfuel commodities in 1978 and 1979. Lime was produced by six companies with operations in Frederick, Giles, Shenandoah, and Warren Counties. Consumption was mainly by the

paper and pulp and steel industries.

**Mica.**—Two plants in the Newport News area processed imported mica. Asheville Mica Co. operated a fabricating plant, and the Mica Co. of Canada, Inc., operated a plate-mica plant.

**Perlite.**—Johns-Manville Sales Corp., Shenandoah County, imported crude perlite from New Mexico. The product was expanded and used in the manufacture of roof insulation board.

**Sand and Gravel.**—In the 1970's, Virginia's sand and gravel industry contributed about 13% of the State's total nonfuel mineral value. Production in 1979 was by 84 companies at 90 locations. Of the State's 90 operations, 75 produced less than 200,000 tons each. Of those operations with greater output, eight produced between 200,000 and 500,000 tons; five produced between 500,000

and 900,000 tons; and two produced between 1 million and 1.5 million tons together. The 15 operations accounted for about 75% of the State total. Of the State's 42 counties that produce sand and gravel, Henrico led with an annual output of about 3.6 million short tons.

Most of the State's sand and gravel was used by the construction industry in concrete aggregate and concrete products. Industrial sand was produced by J. C. Jones Sand Co., Inc., Virginia Beach, for use in casting applications and as a traction medium.

Efforts continued to reclaim lands affected by sand and gravel extraction. Operations in 1978 disturbed 487 acres, and 79 acres were reclaimed; in 1979, 442 acres were disturbed, and 120 acres were reclaimed.

Table 5.—Virginia: Lime sold or used by producers, by use

Use	1977		1978		1979	
	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)
Steel, BOF	359,000	\$12,168	281,500	\$10,358	273,635	\$10,960
Paper and pulp	128,500	4,354	201,400	7,409	207,135	8,297
Water purification	110,100	3,730	86,400	3,180	94,107	3,769
Acid mine water	W	W	38,649	1,422	69,967	2,802
Steel, electric	54,970	1,863	58,200	2,146	57,665	2,310
Steel, open-hearth	52,590	1,782	W	W	51,084	2,046
Mason's lime	43,430	1,742	40,400	1,433	W	W
Sewage treatment	48,120	1,631	26,900	990	25,648	1,027
Agriculture	7,250	274	5,930	248	6,169	247
Other uses <sup>1</sup>	41,770	1,221	92,500	3,392	86,783	3,477
Total <sup>2</sup>	845,700	28,767	831,900	30,578	872,193	34,935

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

<sup>1</sup>Includes construction lime (1979), fertilizer (1978-79), finishing lime (1977), food and food byproducts (1978-79), glass, other chemical and industrial uses, other construction uses (1978), other metallurgical uses, petroleum refining (1978-79), soil stabilization, sugar refining, tanning, wire drawing (1978), and uses indicated by symbol W.

<sup>2</sup>Data may not add to totals shown because of independent rounding.

Table 6.—Virginia: 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	3,984	\$10,806	\$2.71	5,310	\$14,183	\$2.67	4,738	\$14,671	\$3.10
Plaster and gunite sands	NA	NA	NA	167	487	2.91	125	501	4.02
Concrete products	1,918	5,680	2.96	1,549	5,370	3.47	1,632	6,118	3.75
Asphaltic concrete	1,997	3,521	1.76	771	1,595	2.07	676	1,745	2.58
Roadbase and coverings	790	2,055	2.60	1,531	4,083	2.67	1,402	4,205	3.00
Fill	1,409	1,755	1.25	1,479	1,965	1.33	2,423	3,003	1.24
Snow and ice control	NA	NA	NA	66	137	2.07	66	133	2.09
Other uses	349	788	2.26	553	1,252	2.27	741	1,886	2.54
Total <sup>1</sup> or average	10,447	24,605	2.36	11,430	29,070	2.54	11,803	32,268	2.73

NA Not available.

<sup>1</sup>Data may not add to totals shown because of independent rounding.

Table 7.—Virginia: Sand and gravel sold or used by producers, by use

Use	1977			1978			1979		
	Quantity (thous- and short tons)	Value (thou- sands)	Value per ton	Quantity (thous- and short tons)	Value (thou- sands)	Value per ton	Quantity (thous- and short tons)	Value (thou- sands)	Value per ton
Construction:									
Sand -----	6,772	14,167	\$2.09	7,752	17,518	\$2.26	8,091	18,638	\$2.30
Gravel -----	3,675	10,438	2.84	3,675	11,555	3.14	3,712	13,629	3.67
Total or average -----	10,447	24,605	2.36	11,430	29,070	2.54	11,803	32,268	2.73
Industrial sand -----	W	W	3.37	W	W	5.24	W	W	6.71
Grand total or average --	W	W	2.36	W	W	2.56	W	W	2.75

W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Data do not add to total shown because of independent rounding.

**Stone.**—In terms of value and quantity, stone was Virginia's leading nonfuel mineral commodity throughout the 1970's. Nationally, the State ranked sixth in total stone production and fifth in the value of stone production in 1978 and maintained the same position in 1979. During this period, granite, limestone, marl, sandstone, traprock, and slate were extracted at 130 quarries. Output at each of 16 quarries exceeded 900,000 short tons and accounted for 39% of the total State production. Leading counties, in decreasing order of production tonnage, were Loudoun, Goochland,

Fairfax, Dinwiddie, and Wythe.

About 99% of the stone produced in Virginia was marketed as crushed stone. The construction industry remained the State's primary consumer, utilizing crushed stone as roadbase and concrete aggregate. Crushed limestone production averaged about 24 million short tons annually in 1978 and 1979, and most of it was used in construction. High-calcium limestone was used in the manufacture of lime and cement and as a raw material in the steel, glass, and chemical industries.

Table 8.—Virginia: Crushed stone<sup>1</sup> sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1977		1978		1979	
	Quantity	Value	Quantity	Value	Quantity	Value
Agricultural limestone -----	1,660	6,880	1,620	7,612	1,710	8,361
Agricultural marl and other soil conditioners -----	6	13	4	8	W	10
Concrete aggregate -----	<sup>1</sup> 4,786	<sup>1</sup> 12,437	4,163	11,896	4,339	14,033
Bituminous aggregate -----	5,270	14,171	4,913	13,720	4,818	16,818
Macadam aggregate -----	531	1,237	428	1,065	438	1,309
Dense-graded roadbase stone -----	16,036	39,013	20,806	54,978	19,647	61,581
Surface treatment aggregate -----	2,116	5,789	4,086	12,192	3,417	11,968
Other construction aggregate and roadstone -----	5,689	13,937	7,346	19,159	9,078	27,219
Riprap and jetty stone -----	208	677	271	1,004	298	1,225
Railroad ballast -----	288	664	458	1,183	442	1,285
Filter stone -----	W	W	97	269	472	984
Manufactured fine aggregate (stone sand) -----	574	1,882	914	3,421	1,229	4,222
Cement manufacture -----	1,584	2,979	1,609	2,588	1,649	2,752
Lime manufacture -----	1,566	2,977	1,723	4,042	1,607	3,918
Flux stone -----	207	435	222	488	201	504
Mine dusting -----	442	1,656	440	1,784	331	2,079
Other fillers or extenders -----	168	963	150	921	139	963
Other uses <sup>2</sup> -----	575	4,026	1,191	5,270	1,265	5,993
Total <sup>3</sup> -----	41,707	109,737	50,442	141,601	51,080	165,223

<sup>1</sup>Revised. W Withheld to avoid disclosing company proprietary data; included with "Other uses."

<sup>2</sup>Includes limestone, granite, marl, marble (1977), sandstone, shell (1977), traprock, other stone, and slate.

<sup>3</sup>Includes stone used in poultry grit and mineral food, ferrosilicon (1978-79), asphalt filler, glass manufacture, roofing granules (1979), terrazzo and exposed aggregate (1977), slate floor (1977-78), lightweight aggregate, sulfur dioxide (1979), unspecified uses, and uses indicated by symbol W.

<sup>4</sup>Data may not add to totals shown because of independent rounding.

Limestone, granite, sandstone, and slate were quarried for dimension stone at nine sites located primarily in central Virginia. Slate was the principal type of dimension stone quarried and was used for roofing material.

**Sulfur.**—Hydrogen sulfide gas was converted to elemental sulfur by the Amoco Oil Co. at its Yorktown refinery in York County. The hydrogen sulfide gas was burned, with approximately 33% of the hydrogen sulfide oxidizing to sulfur dioxide. (These two gases react to produce elemental sulfur.)

**Talc.**—Blue Ridge Talc Co., Inc., Franklin County, produced small quantities of talc from intermittent surface mining operations. The material was processed at a nearby plant and marketed for use in refractories.

**Vermiculite.**—Virginia Vermiculite, Ltd., in Louisa County, began limited production in 1979. The vermiculite was extracted by open pit mining and processed at a nearby mill. Coarse grades of expanded vermiculite are used for loosefill insulation in homes

and other structures; finer grades are used in numerous agricultural and chemical applications.

## METALS

**Ferroalloys.**—Chemstone Corp. produced ferrovanadium at its Strasburg plant in Shenandoah County for use as a toughening ingredient in steelmaking.

**Iron Oxide Pigments.**—Virginia was one of four States in the country that produced crude iron oxide pigments in 1978 and 1979. Hoover Color Corp., the State's only producer, recovered brown iron oxides from a surface mining operation in Pulaski County. The company used the material to produce natural — and mixtures of natural and synthetic — iron oxide pigments. Blue Ridge Talc Co., Inc., which operated a processing plant in Henry County, purchased crude iron oxide to produce mixtures of natural and synthetic pigments. Iron oxide pigments were used in printing inks, paint manufacturing, and as coloring agents in other products.

Table 9.—Virginia: Mine production of recoverable lead and zinc

Year	Lead		Zinc	
	Quantity (metric tons)	Value <sup>1</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
1975	2,316	\$1,097	13,754	\$11,818
1976	1,767	899	10,205	8,319
1977	1,999	1,352	12,040	9,131
1978	1,803	1,339	10,974	7,500
1979	1,596	1,852	11,406	9,380

<sup>1</sup>U.S. producers' prices.

<sup>2</sup>Prime western and high grade.

**Lead and Zinc.**—The State's only production of lead and zinc was from Wythe County, where one company operated an underground mine. The mine was the State's only active metal mine in 1978 and 1979. All haulage was by rail to an underground crusher. The crushed ore was hoisted to the surface, where it was processed in a flotation mill. Mill output included concentrates of zinc and lead sulfides and finely ground dolomitic limestone.

**Lithium.**—Foote Mineral Co., Scott County, processed lithium carbonate mined in

North Carolina and Nevada to produce lithium hydroxide. The product was used in the manufacture of multipurpose grease. Foote began processing operations in Virginia in 1953 and is one of the major lithium producers in the United States.

**Manganese.**—Union Carbide Corp.'s Battery Products Div. near Newport News operated a processing plant for imported manganese. The product was used primarily in the manufacture of batteries.

<sup>1</sup>State mineral specialist, Bureau of Mines, Pittsburgh, Pa.



Table 10.—Principal producers

Commodity and company	Address	Type of activity	County
<b>Aplite (crude):</b>			
The Feldspar Corp -----	Route 1, Box 23 Montpelier, VA 23192	Quarry and plant	Hanover.
International Minerals & Chemical Corp.	Box 38 Piney River, VA 22964	---do---	Nelson.
<b>Cement:</b>			
Lone Star Cement, Inc. <sup>1</sup> -----	Box 27 Cloverdale, VA 24077	---do---	Botetourt.
Lone Star Cement, Inc. -----	Box 5128 Chesapeake, VA 23320	Plant -----	Chesapeake (city).
Riverton Corp. <sup>2</sup> -----	Chesapeake, VA 23320 Riverton, VA 22651	Quarry and plant	Warren.
<b>Clay and shale:</b>			
Brick and Tile Corp -----	Box 45 Lawrenceville, VA 23868	Pits and plant ---	Brunswick and Greensville.
General Shale Products Corp -----	Box 3547 Johnson City, TN 37601	---do---	Rockbridge, Smyth, Tazewell.
Web-lite Corp -----	Box 12887 Roanoke, VA 24029	---do---	Botetourt.
Webster Brick Co., Inc. -----	---do---	---do---	Botetourt and Orange.
<b>Ferroalloys:</b>			
Chemstone Corp. <sup>3</sup> -----	Box 189 Strasburg, VA 22657	Plant -----	Shenandoah.
<b>Gypsum:</b>			
United States Gypsum Co. -----	Box 4686 Norfolk, VA 23523	---do---	Norfolk (city).
Do -----	Route 1 Saltville, VA 24370	Mine and plant ---	Washington.
<b>Iron oxide pigments (crude):</b>			
Hoover Color Corp -----	Box 218 Hiwassee, VA 24347	---do---	Pulaski.
<b>Kyanite:</b>			
Kyanite Mining Corp -----	Dillwyn, VA 23936	---do---	Buckingham and Prince Edward.
<b>Lime:</b>			
Chemstone Corp. <sup>4</sup> -----	Box 71 Strasburg, VA 22657	Plant -----	Shenandoah.
W. S. Frey Co., Inc -----	Box 65 Clearbrook, VA 22657	---do---	Frederick.
The Flintkote Stone Products Co ---	Box 8 Stephens City, VA 22655	---do---	Do.
National Gypsum Co. -----	Star Route 635 Ripplemead, VA 24150	---do---	Giles.
Virginia Lime Co -----	Star Route Ripplemead, VA 24150	---do---	Do.
<b>Perlite, expanded:</b>			
Johns-Manville Sales Corp -----	Box 442 Woodstock, VA 22644	---do---	Shenandoah.
<b>Sand and gravel:</b>			
Fredericksburg Sand and Gravel Co ---	Box 650 Culpeper, VA 22701	Pits -----	Stafford.
Lone Star Industries, Inc -----	Box 34527 Richmond, VA 23229	Pits and plant ---	Charles City, Chesterfield, Henrico, Prince George.
Sadler Materials Corp -----	Box 5607 Virginia Beach, VA 23455	Pits -----	Prince George and Henrico.
Solite Corp -----	Box 883 Fredericksburg, VA 22401	---do---	King George.
West Sand and Gravel Co., Inc -----	Box 6008 Richmond, VA 23222	---do---	Henrico.
E. V. Williams Co., Inc -----	Box 938 Norfolk, VA 23501	---do---	Virginia Beach (city).
<b>Stone:</b>			
Chantilly Crushed Stone, Inc -----	Box 112 Chantilly, VA 22021	Quarries -----	Loudoun.
Culpeper Stone Co., Inc -----	Box 650 Culpeper, VA 22701	---do---	Culpeper.
Lone Star Industries, Inc -----	977 Norfolk Square Norfolk, VA 23501	---do---	Brunswick, Chesterfield, Dinwiddie.
Luck Quarries, Inc -----	Box 4682 Richmond, VA 23229	---do---	Albemarle, Augusta, Fairfax, Goochland, Halifax, Mecklenburg, Pittsylvania, Prince William, Rockingham, Washington.

See footnotes at end of table.

Table 10.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
Stone —Continued			
Vulcan Materials Co., Midsouth Div -	Drawer 920 Bristol, VA 24200	Quarries -----	Bristol.
Talc:			
Blue Ridge Talc Co., Inc. <sup>5</sup> -----	Box 39 Henry, VA 24102	Quarry and plant	Franklin.

<sup>1</sup>Also sand and gravel and stone.<sup>2</sup>Masonry cement only; also produces limestone and lime.<sup>3</sup>Also lime.<sup>4</sup>Also ferroalloys.<sup>5</sup>Also finished oxide pigments.