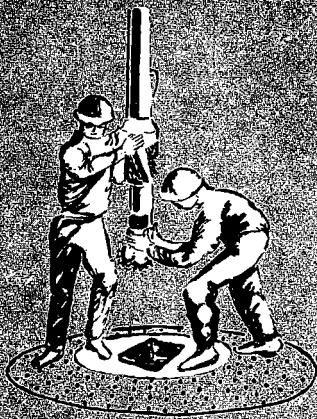


*The*

# MINERAL INDUSTRY OF SOUTH DAKOTA

*in 1960*

by D.H. Mullen, U.S. Bureau of Mines  
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SOUTH DAKOTA Archie Gubbrud, Governor

*State Geological Survey  
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*Vermillion, South Dakota*

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MINERALS REPORT 8

# The Mineral Industry of South Dakota

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, U.S. Department of the Interior, and the South Dakota State Geological Survey.

By D. H. Mullen<sup>1</sup> and Allen F. Agnew<sup>2</sup>



**M**INERAL production in South Dakota in 1960 was valued at \$46.8 million, a 4-percent decline from the record high of \$48.5 million reached in 1959. The drop in total value resulted from lower production and value of some commodities, both metal and nonmetal, that represented major portions of the State's mineral output. Declines were noted in the value of gold, silver, uranium, clays, and sand and gravel, all of which were produced in substantial quantities. There were moderate to substantial gains in other commodities such as beryllium concentrate, cement, feldspar, gypsum, scrap mica, and stone, but these advances were not sufficient to offset the losses in those commodities that were produced in greater quantity.

The total value of the mineral fuels—coal (lignite) and petroleum—more than doubled over 1959. The value of the lignite declined, but represented only a small part of the State total.

Northern States Power Co. began building the Pathfinder nuclear powerplant near Sioux Falls early in the year, and by the end of December it was 42 percent complete. The 62,000-kw. reactor was designed to provide test and operating data on an integral boiling-superheating core with a superheater centrally located within the reactor core. The reactor was scheduled to go critical in June 1962.

Black Hills Power & Light Co. completed a 22,000-kw., \$5.5 million, steam-electric generating plant at Rapid City. The plant was designed to burn 1/4-inch coal in a cyclone furnace and discharge a liquid slag at 2,800° F.

**Employment and Injuries.**—Employment and injuries data in the mineral industry, excluding petroleum, collected by the Bureau of Mines on its annual canvass, are shown on table 2.

**Government Programs.**—Hand-cobbed mica and beryllium concentrate (beryl) were purchased by the Federal Government through the General Services Administration (GSA) purchase depot at Custer. Hand-cobbed mica was processed at the station by a contractor for GSA, and the recovered strategic sheet mica, as well as the beryllium concentrate purchased, was shipped to stockpiles of strategic and defense minerals.

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<sup>2</sup> State geologist, South Dakota Geological Survey, Vermillion, S. Dak.

TABLE 1.—Mineral production in South Dakota<sup>1</sup>

Mineral	1959		1960	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Beryllium concentrate.....short tons, gross weight..	156	\$84	167	\$88
Clays <sup>2</sup> .....thousand short tons..	227	227	202	202
Coal (lignite).....do.....	22	88	20	83
Copper.....short tons.....			1	1
Feldspar.....long tons.....	30,825	196	45,588	292
Gem stones.....	( <sup>3</sup> )	20	( <sup>3</sup> )	20
Gold (recoverable content of ores, etc.)...troy ounces..	577,730	20,221	554,771	19,417
Gypsum.....thousand short tons..	19	78	22	89
Mica: Scrap.....short tons.....	158	5	205	10
Sheet.....pounds.....	38,775	158	30,887	145
Petroleum (crude).....thousand 42-gallon barrels..	151	( <sup>4</sup> )	281	( <sup>4</sup> )
Sand and gravel.....thousand short tons..	17,775	11,058	13,548	9,359
Silver (recoverable content of ores, etc.)...thousand troy ounces..	124	113	108	98
Stone.....thousand short tons..	2,721	7,243	3,149	7,909
Uranium ore.....short tons.....	45,734	606	41,104	586
Value of items that cannot be disclosed: Cement, clays (bentonite), iron ore (1960), lime, lithium minerals, vanadium (1960), and values indicated by footnote 4		9,401		9,376
Total South Dakota <sup>7</sup> .....		48,553		46,780

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

<sup>2</sup> Excludes bentonite; included with "Value of items that cannot be disclosed."

<sup>3</sup> Weight not recorded.

<sup>4</sup> Figure withheld to avoid disclosing individual company confidential data.

<sup>5</sup> Preliminary figure.

<sup>6</sup> Revised figure.

<sup>7</sup> Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

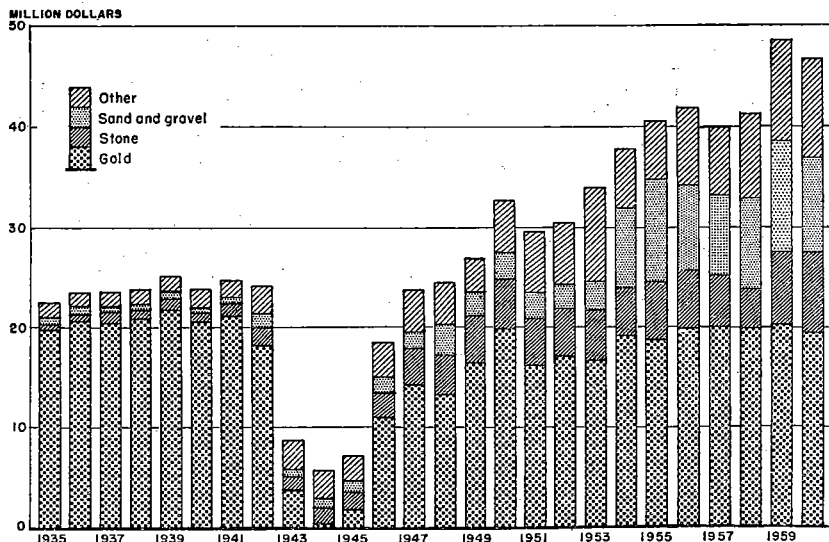


FIGURE 1.—Value of gold, dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1935-60.

TABLE 2.—Employment and injuries in the mineral industries<sup>1</sup> in 1960<sup>2,3</sup>

Industry	Number of operations	Average number of men employed	Total man-hours worked	Injuries		Frequency rate (injuries per million man-hours)
				Fatal	Nonfatal	
Metal mines.....	3	1,741	4,317,543	2	67	16.0
Uranium mines.....	54	269	369,024		21	56.9
Nonmetal mines <sup>4</sup> .....	135	282	356,904	1	5	16.8
Quarries.....	69	576	1,259,835	1	15	12.7
Sand and gravel plants.....	190	1,351	1,893,459	1	9	5.3
Coal mines.....	1	10	16,000			0
Total.....	452	4,259	8,212,765	5	117	15.0

<sup>1</sup> Excludes petroleum industry.

<sup>2</sup> Preliminary figures.

<sup>3</sup> Source: Federal Bureau of Mines data.

<sup>4</sup> Includes beryl.

The Office of Mineral Exploration (OME) approved one contract for the exploration of a deposit for beryl and columbium-tantalum in Custer County.

The Federal Bureau of Mines continued to investigate the recovery of beryllium from low-grade products obtained by beneficiating material from South Dakota pegmatite deposits. The investigations were primarily in the field of solvent extraction after leaching.

## REVIEW BY MINERAL COMMODITIES

### NONMETALS

**Cement.**—Portland and masonry cement shipments from the State-owned plant at Rapid City increased 6 percent in quantity and 11 percent in value over those of 1959. The average price of portland cement in 1960 was \$3.14 a barrel compared with \$3.01 in 1959; the price of masonry cement increased to \$3.89 a barrel from \$3.76.

**Clays.**—Production of bentonite was 48 percent below that of 1959 as known mineable deposits in the State approached exhaustion. Processing plants obtained crude material in greater amounts from deposits in Wyoming. The quantity of miscellaneous clay produced in Butte County for the manufacture of building brick, sewer tile, and heavy clay products and in Pennington County for the manufacture of cement and lightweight aggregates declined 11 percent below that of 1959.

**Feldspar.**—Feldspar production from 64 mines in Custer County and 8 in Pennington County was 48 percent greater than in 1959. Except for one operation, all feldspar was sold to International Minerals & Chemical Corp. (IMC) for grinding at its plant at Custer. The ground product was shipped to consumers throughout the United States, Canada, and Mexico for the manufacture of glass, pottery, enamel, porcelain, and other uses.

**Gem Stones.**—Gem stones and mineral specimens were collected in Custer, Fall River, Lawrence, and Pennington Counties. Most were sold to tourists as souvenirs. Better quality specimens of agate and onyx, and gem varieties of beryl and similar gem minerals were polished by processors.

**Gypsum.**—Gypsum for use as a retarder in portland cement was mined by the South Dakota State Cement Commission from deposits in Pennington County. Production was 16 percent above that of 1959.

**Lime.**—High-calcium limestone for manufacturing quicklime at a plant near Pringle was mined from deposits in Custer County. The entire output of lime was used within the State for metallurgical purposes.

**Lithium.**—Spodumene was produced at the Etta mine, and lepidolite and amblygonite were produced at The Bob Ingersoll mine, both near Keystone, and spodumene was produced at the Hunter-Louise mine on the county line between Custer and Pennington Counties. A portion of the amblygonite produced was shipped to Germany.

**Mica.**—Hand-cobbed mica produced from 28 mines in Custer County and 8 mines in Pennington County was 20 percent below that of 1959. Although the quantity mined in 1960 was less than in 1959, the quality and grade of recovered sheet mica was higher; consequently, the total value declined only 8 percent. The entire output was sold to GSA at Custer, where it was processed by a private contractor for the Government. Scrap mica was produced at two mines, one each in Custer and Pennington Counties. The quantity mined was 30 percent greater, and the value was double that of 1959. All scrap mica produced was sold to grinders in Illinois and Minnesota.

TABLE 3.—Production of hand-cobbed mica and yield of sheet mica

Year	Hand-cobbed mica	Total block mica recovered		Stained quality recovered		Good-stained and better quality recovered	
	Pounds	Pounds	Percent of hand cobbed	Pounds	Percent of total block	Pounds	Percent of total block
1956	216,802	12,238	5.64	7,420	60.63	253	2.07
1957	149,163	9,048	6.07	4,828	53.36	255	2.82
1958	257,198	16,681	6.49	9,552	57.26	471	2.82
1959	365,712	38,734	10.59	20,079	51.84	601	1.55
1960	286,043	30,887	10.80	18,662	60.42	461	1.49

**Sand and Gravel.**—The reported production of sand and gravel was 24 percent below that of 1959. State, county, and municipal governments engaged in road construction report production upon completion of construction contracts, and a decline in reported production does not necessarily indicate a decline in activity. Production was reported in 61 of the State's 67 counties; at 84 commercial operations in 35 counties; and at 101 Government-and-contractor operations in 56 counties.

Of the total sand and gravel output, 88 percent was used for paving and roadbuilding, most of which (66 percent) was produced by contractors for governmental agencies. The quantity of sand and gravel that was washed, sized, or otherwise prepared continued to increase; of the total produced in 1960, 75 percent was processed. The value per ton ranged from \$0.439 for unwashed gravel produced by contractors to \$1.012 per ton for washed material produced by commercial operators.

TABLE 4.—Mica sold or used by producers

	1956	1957	1958	1959	1960
Hand-cobbed mica, total: <sup>1</sup> .....pounds	216,802	149,163	257,198	365,712	286,043
Sheet mica: <sup>1</sup>					
Full trimmed:					
Pounds.....	256	45	94	41	-----
Value.....	\$2,010	\$756	\$1,393	\$593	-----
Average per pound.....	\$7.85	\$16.80	\$14.82	\$14.46	-----
From hand-cobbed mica:					
Pounds.....	12,238	9,048	16,678	38,734	30,887
Value.....	\$65,043	\$44,751	\$66,489	\$157,234	\$145,154
Average per pound.....	\$5.31	\$4.95	\$3.99	\$4.06	\$4.70
Total:					
Pounds.....	12,494	9,093	16,772	38,775	30,887
Value.....	\$67,053	\$45,507	\$67,882	\$157,827	\$145,154
Average per pound.....	\$5.37	\$5.00	\$4.05	\$4.07	\$4.70
Scrap mica:					
Short tons.....	1,268	1,626	1,003	158	205
Value.....	\$31,224	\$43,142	\$24,241	\$4,916	\$9,748
Average per ton.....	\$24.62	\$26.53	\$24.17	\$31.11	\$47.55
Total sheet and scrap mica:					
Short tons.....	1,274	1,631	1,011	177	220
Value.....	\$98,277	\$88,649	\$92,123	\$162,743	\$154,902

<sup>1</sup> Sold to the Government through GSA.

Construction of the National System of Interstate and Defense Highways and Federal-aid projects continued at a high rate. During 1960 the Bureau of Public Roads changed its method of reporting progress, and strictly comparable data for 1959 and 1960 were not available. A report<sup>3</sup> of progress on the program showed that between July 1, 1956, and the end of 1960, 59.3 miles of the Interstate System had been completed to full standards, and 56.5 miles had been completed to standards adequate for current traffic. This represented a total of 115.8 miles open to traffic. At the end of the year, 93.7 miles were under construction, and engineering studies and right-of-way acquisition had begun on 185.7 miles. The total designated mileage of the System in South Dakota was 677.6 miles, leaving 282.4 miles yet to be planned and constructed. Under the Federal-aid (ABC) program, 1,138 miles were completed in 1960, and at the end of the year 445.5 miles were under construction.

Production of sand and gravel in excess of 500,000 tons was recorded in six counties: Brown (1,092,400), Brookings (658,500), Minnehaha (613,800), Day (599,400), Clark (574,400), and Lincoln (516,700). Leading commercial producers included Mannerud Construction Co., Hallett Construction Co., See Nel Construction Co., and Concrete Materials Co.

**Stone.**—Dimension granite was produced at 11 quarries in Grant County for architectural and monumental use. Of the total output, 62 percent was finished at plants at Cold Spring, Delano, Saint Cloud, and Sauk Centre, Minn. Crushed limestone, of which 61 percent was used in road construction and as a concrete aggregate, was produced in four counties. A substantial quantity was mined in Pennington County for the manufacture of cement. Other uses of limestone included riprap, railroad ballast, the manufacture of quicklime, and

<sup>3</sup> Bureau of Public Roads, Quarterly Report on the Federal-Aid Highway Program, Dec. 31, 1960; Press release BPR 61-6, Feb. 22, 1961.

**TABLE 5.—Sand and gravel sold or used by producers, by classes of operations and uses**

(Thousand short tons and thousand dollars)

Class of operation and use	1959		1960	
	Quantity	Value	Quantity	Value
<b>Commercial operations:</b>				
<b>Construction sand:</b>				
Building.....	478	\$529	572	\$689
Paving.....	377	351	212	195
Railroad ballast.....	45	24	( <sup>1</sup> )	( <sup>1</sup> )
Fill.....	22	11	9	12
Other.....	20	8	71	78
<b>Industrial sand:</b>				
Molding.....	1	5	4	16
Oil (hydraulic).....			3	21
<b>Total sand.....</b>	<b>943</b>	<b>928</b>	<b>871</b>	<b>1,011</b>
<b>Construction gravel:</b>				
Building.....	294	282	96	120
Paving.....	4,010	2,678	1,581	947
Railroad ballast.....	52	34	176	126
Fill.....	46	16	34	12
Other.....	( <sup>2</sup> )	( <sup>2</sup> )	123	94
<b>Miscellaneous gravel.....</b>	<b>36</b>	<b>11</b>	<b>418</b>	<b>217</b>
<b>Total gravel.....</b>	<b>4,438</b>	<b>3,021</b>	<b>2,428</b>	<b>1,516</b>
<b>Total sand and gravel.....</b>	<b>5,381</b>	<b>3,949</b>	<b>3,299</b>	<b>2,527</b>
<b>Government-and-contractor operations:</b>				
<b>Sand:</b>				
Building.....			2	1
Paving.....	445	300	520	343
<b>Total sand.....</b>	<b>445</b>	<b>300</b>	<b>522</b>	<b>344</b>
<b>Gravel:</b>				
Building.....	399	349	132	138
Paving.....	11,550	6,460	9,595	6,350
<b>Total gravel.....</b>	<b>11,949</b>	<b>6,809</b>	<b>9,727</b>	<b>6,488</b>
<b>Total sand and gravel.....</b>	<b>12,394</b>	<b>7,109</b>	<b>10,249</b>	<b>6,832</b>
<b>All operations:</b>				
Sand.....	1,388	1,228	1,393	1,355
Gravel.....	16,387	9,830	12,155	8,004
<b>Grand total.....</b>	<b>17,775</b>	<b>11,058</b>	<b>13,548</b>	<b>9,359</b>

<sup>1</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Other."<sup>2</sup> Less than 1,000 short tons.

sugar refining. Crushed sandstone from quarries in Hanson and Minnehaha Counties was used for road construction, as a refractory stone, in foundries, for filters, for railroad ballast, and in the manufacture of ferrosilicon. Crushed miscellaneous stone, used entirely for road construction, was produced by commercial operators in 2 counties and by contractors in 47 counties. Total stone production in 1960 was 16 percent greater than in 1959.

## METALS

**Beryllium.**—Beryllium concentrate (beryl) production from 71 mines in Custer and Pennington Counties was 7 percent above that of 1959. The greater portion (71 percent) was from Pennington County. The major output was sold to the GSA purchase depot

at Custer for the national stockpile and the remainder to Gladys Wells of Custer for resale to consumers. Production from individual mines ranged from a few pounds to 35 tons.

**Copper.**—Copper ore was shipped from a dump at the Maloney Blue Lead mine in Pennington County. The ore also contained an ounce of gold and a small quantity of silver. This was the first recorded production of copper in the State since 1944 when copper was recovered from a lead concentrate produced from claims operated by the Belle Eldridge Gold Mines, Inc., in Lawrence County.

**Gold and Silver.**—Production of gold and silver declined 4 and 13 percent, respectively, below that of 1959. Virtually all production was from the Homestake mine at Lead in Lawrence County. Although more ore was mined and milled than in 1959, the grade was slightly lower.

**TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, in terms of recoverable metals<sup>1</sup>**

Year	Mines producing		Material sold or treated <sup>2</sup> (thousand short tons)	Gold (lode and placer)		Silver (lode and placer)		Total value (thousands)
	Lode	Placer		Troy ounces	Value (thousands)	Troy ounces (thousands)	Value (thousands)	
1951-55 (average).....	4	1	1,447	509,386	\$17,829	143	\$130	<sup>3</sup> \$17,963
1956.....	2		1,743	568,523	19,898	136	123	20,021
1957.....	2		1,779	568,130	19,885	135	122	20,007
1958.....	3		1,824	570,830	19,979	153	138	20,117
1959.....	2		1,778	577,730	20,221	124	113	20,334
1960.....	2		1,767	554,771	19,417	108	98	<sup>4</sup> 19,515
1876-1960.....			( <sup>5</sup> )	28,250,907	770,379	11,518	8,557	<sup>6</sup> 779,101

<sup>1</sup> Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes retreated, and ore or old tailings shipped directly to smelters during the calendar year indicated.<sup>2</sup> Does not include gravel washed.<sup>3</sup> Includes 14 short tons of lead valued at \$3,956.<sup>4</sup> Includes 1 ton of copper valued at \$642.<sup>5</sup> Data not available.<sup>6</sup> Includes 107 short tons of copper valued at \$37,108, 497 tons of lead valued at \$71,752, and 265 tons of zinc valued at \$56,406.

**Iron Ore.**—Iron ore was mined from the Iron Hill mine in Pennington County for use as an additive in the manufacture of cement.

**Uranium.**—Production of uranium ore was 10 percent below that of 1959; however, the number of operations increased from 36 to 48. The greatest production continued to be from Fall River County; Custer County ranked second. A small quantity of uranium ore was mined from the Fort Union formation in Harding County. The entire output was processed at the Edgemont plant operated by Mines Development, Inc. The average grade of the ore mined was 0.19 percent (3.8 pounds per ton) uranium oxide.

**Vanadium.**—During 1960 a vanadium-recovery circuit was added to the Edgemont uranium mill. The quantity of contained vanadium in the uranium ores from South Dakota and Wyoming was relatively small but was sufficient to warrant recovery. The unit began operating in November.

## MINERAL FUELS

**Coal (Lignite).**—Production of coal (lignite) was 9 percent below that of 1959. The entire output came from the Dewey County Coal Co. operation of a strip mine on the Hellcreek seam. Other mines, producing less than 1,000 tons during the year, were operated in Dewey, Corson, and Perkins Counties.

**Petroleum.**—Petroleum production was 281,000 barrels, an increase of 86 percent over 1959 all from the Buffalo field in Harding County. The State geologist reported that 19 wells in the Harding field were producing at the close of the year. Thirteen wells, eight exploratory and five development, were completed during the year; three were producers.

## REVIEW BY COUNTIES

**Butte.**—American Colloid Co. produced bentonite and operated its processing plant at Belle Fourche. The processed product was used in rotary drilling mud, in foundries and steel plants, for filters, and in other miscellaneous products. Eastern Clay Products Department, International Minerals & Chemical Corp. (IMC), operated a bentonite mill at Belle Fourche and processed crude material from deposits in Wyoming. Miscellaneous clay for the manufacture of building brick, draitile, and other clay products was produced by Black Hills Clay Products Co.

Crushed stone and sand and gravel for road construction and repairs were produced by contractors for the State department of highways and the Butte County Highway Department. The county ranked fifth in the value of mineral production.

**Custer.**—Beryllium concentrate (beryl), feldspar, and hand-cobbed and scrap mica from numerous pegmatite deposits represented 67 percent of the value of all minerals produced in the county. Beryl was recovered from 41 mines, feldspar from 64, and mica from 29. Major producers of beryl were Double R Mines at the Smith Dike, Bland Mining & Milling Co. at 5 mines, and J. D. Long at 12 mines.

IMC was the leading producer of feldspar and operated the Shamrock and White Elephant mines. Abingdon Potteries, Inc., produced feldspar at its mines and shipped the crude material to its grinding plant at Abingdon, Ill. All other feldspar produced was sold to IMC for grinding at its plant at Custer. Scrap mica was produced at the Old Mike mine. Hand-cobbed mica was sold to the GSA purchase depot at Custer. Major producers included York Minerals, at six mines; Merical Exploration Co., at the Red Fawn; Homestead Mining Co., at the GC Dike; and Marvin Kenoyer, at the Lillian Fraction.

High-calcium limestone was mined for manufacturing quicklime at a plant near Pringle. Crushed stone and sand and gravel were produced by contractors for the State department of highways for road construction. Gem stones and mineral specimens were produced and collected by Allen's Minerals and Mining, Scott's Rose Quartz Co., and others for sale to tourists as souvenirs. Uranium ore was produced at the Lucky Bud Nos. 1 and 2 mines by Bettenhausen & Wheeler, Susquehanna Western, Inc., and Triangle Enterprises, Inc., and processed at the uranium mill at Edgemont.

TABLE 7.—Value of mineral production in South Dakota, by counties

County	1959	1960 <sup>1</sup>	Minerals produced in 1960 in order of value
Aurora.....	\$52,400	\$208,190	Sand and gravel, stone.
Beadle.....	260,919	146,552	Do.
Bennett.....	42,600	(?)	Sand and gravel.
Bon Homme.....	145,200	217,400	Do.
Brookings.....	486,400	391,483	Sand and gravel, stone.
Brown.....	783,348	658,902	Do.
Brule.....	37,472	99,196	Do.
Buffalo.....	49,900	73,210	Do.
Butte.....	2,359,203	1,297,862	Clays, sand and gravel, stone.
Campbell.....	39,319	(?)	Sand and gravel.
Charles Mix.....	184,236	348,800	Do.
Clark.....	299,806	454,200	Do.
Clay.....	50,027	34,900	Do.
Codington.....	404,795	471,061	Sand and gravel, stone.
Corson.....	179,200	39,534	Do.
Custer.....	702,902	3 685,214	Feldspar, mica (sheet), uranium ore, lime, beryllium concentrate, sand and gravel, stone, gem stones, mica (scrap).
Davison.....	129,584	127,942	Sand and gravel, stone.
Day.....	280,946	378,900	Sand and gravel.
Deuel.....	45,685	91,100	Do.
Dewey.....	87,712	167,584	Coal, sand and gravel, stone.
Douglas.....	124,700	289,000	Sand and gravel.
Edmunds.....	38,600	42,000	Do.
Fall River.....	572,042	3 642,825	Uranium ore, sand and gravel, stone, gem stones.
Faulk.....	175,844	121,100	Sand and gravel.
Grant.....	3,077,096	3,004,488	Stone, sand and gravel.
Gregory.....	121,905	242,322	Sand and gravel, stone.
Haakon.....	70,536	169,777	Do.
Hamlin.....	45,400	7,959	Do.
Hand.....	28,197	22,277	Do.
Hanson.....	377,534	500,152	Stone, sand and gravel.
Harding.....	(?)	3 800,346	Petroleum, sand and gravel, uranium ore.
Hughes.....	481,400	420,990	Stone, sand and gravel.
Hutchinson.....	55,950	148,800	Sand and gravel.
Hyde.....	209,800	2,549	Stone.
Jackson.....	61,818	46,625	Sand and gravel, stone.
Jerauld.....	107,200	51,900	Sand and gravel.
Jones.....		5,390	Stone.
Kingsbury.....	131,714	110,202	Sand and gravel, stone.
Lake.....	584,075	285,120	Do.
Lawrence.....	20,477,494	19,609,878	Gold, silver, stone, sand and gravel, gem stones.
Lincoln.....	179,118	355,940	Sand and gravel, stone.
Lyman.....	153,800	66,573	Do.
Marshall.....	146,000	258,115	Do.
McCook.....	10,800	39,285	Do.
McPherson.....	146,000	163,000	Sand and gravel.
Meade.....	76,500	156,151	Sand and gravel, stone.
Mellette.....	20,000	78,343	Do.
Miner.....	76,400	54,181	Do.
Minnehaha.....	1,816,926	1,842,250	Stone, sand and gravel.
Moody.....	113,500	180,064	Sand and gravel, stone.
Pennington.....	10,531,492	10,555,075	Cement, stone, sand and gravel, clays, gypsum, beryllium concentrate, iron ore, feldspar, mica (scrap), mica (sheet), gem stones, copper, gold, silver.
Perkins.....	92,500	21,818	Sand and gravel, stone.
Potter.....	119,844	7,939	Do.
Roberts.....	256,520	242,063	Do.
Sanborn.....	6,884		
Shannon.....	49,500	10,144	Stone.
Spink.....	135,806	144,370	Sand and gravel, stone.
Stanley.....	334,800	131,345	Do.
Sully.....	35,800	22,400	Sand and gravel.
Todd.....	27,203	4,544	Stone.
Tripp.....	4,324	31,118	Sand and gravel, stone.
Turner.....	28,700	228,115	Do.
Union.....	262,083	236,653	Do.
Walworth.....	159,621	134,424	Do.
Washabaugh.....	150		
Yankton.....	128,800	164,800	Sand and gravel.
Ziebach.....	6,900	12,375	Sand and gravel, stone.
Undistributed <sup>4</sup> .....	1,215,280	118,454	
Total <sup>6</sup> .....	5 48,553,000	46,780,000	

<sup>1</sup> Value of petroleum is preliminary.

<sup>2</sup> Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

<sup>3</sup> Excludes vanadium.

<sup>4</sup> Includes production of lithium minerals, vanadium (1960), some sand and gravel and gem stones that cannot be assigned to specific counties and values indicated by footnote 2.

<sup>5</sup> Revised figure.

<sup>6</sup> Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

The Office of Mineral Exploration (OME) approved a contract with Lithium Corp. of America, Inc., for exploration of the Black Diamond pegmatite deposit for beryl and columbite-tantalite by drilling. Total amount of the contract was \$26,640, with Government participation limited to 50 percent.

**Fall River.**—Three-fourths of all uranium ore produced in the State came from 43 operations in Fall River County. Major producers included Walter L. McKenna, at five operations; Black Hills Uranium Co., at nine; and Chord Uranium Co., at seven. The entire production was processed at the Mines Development, Inc., mill at Edgemont. Improvements were made at the mill, and a circuit was added to recover vanadium oxide contained in uranium ores from South Dakota and Wyoming. Seventy-five percent of the ore processed at the mill was from Wyoming deposits.

Crushed stone and sand and gravel were produced for road construction by contractors for the State department of highways. Building and paving sand and gravel was produced at five locations. Leading producers were Oral Sand Co., Rounds Construction Co., and Flyte Rock Products Co.

**Grant.**—Mahogany-brown and deep-red granites of Grant County were produced at 11 quarries near Milbank and Big Stone City by 7 companies. One-half of the stone quarried was finished at plants in Minnesota. The color and texture of the granite makes it particularly desirable for building facings, interior decoration, and monuments; the finished stone was widely marketed.

**Harding.**—Petroleum production, entirely from wells in the Buffalo field in Harding County, was 86 percent greater than in 1959. At yearend 19 wells from the Red River formation were producing. According to data from the State geologist, 13 wells (8 exploratory, 5 development) were completed during the year; 3 were producing. Drilling totaled 87,878 feet. Sand and gravel was produced by contractors for the State department of highways for road construction. Uranium ore was produced at the Lonesome Pete claims and shipped to the processing plant at Edgemont.

**Lawrence.**—Homestake Mining Co. operated the Homestake mine and 4,800-ton-per-day amalgamation-cyanidation plant at Lead and continued to be the Nation's leading gold producer. The quantity of ore mined and milled was nearly 1.77 million tons, the highest in 83 years of operation. However, the recoverable value of gold and silver in the ore was only \$11.02 a ton, a decrease of \$0.50 from 1959, and the total value of bullion recovered was 4 percent below that of the previous year. The percentage recovery was 97.21 percent, the same as in 1959. Productivity increased from 3.41 tons per man shift in 1959 to 3.58 tons in 1960. No new blocks were added to the ore reserve; however, 92 percent of the ore mined in 1960 was offset by production from specific blocks in excess of the amounts previously estimated, and further development above the 5,000 level removed the discount formerly applied to reserves that had not been sufficiently delineated. Development between the 5,000 and 6,200 levels continued. The ore-bearing structures revealed, although smaller and less continuous, were comparable in grade and mineralogy to the ore bodies above the 5,000 level. Reserves below the 5,000 level were not to be

estimated until continuity between widely spaced exposures and more definite data concerning the grade were determined, according to the company. On the basis of available information, it appeared that a reserve of at least 2.5 million tons below the 5,000 level eventually would be established. The program was continued to provide adequate ventilation and to control high rock temperatures below the 4,800 level. Stripping of the Oro Hondo shaft began and was expected to be completed by mid-1961. This would complete the ventilation program and permit extensive development of the deep block at a greater rate. Plans were developed to mine ore in the deep block concurrently with the ore above the 5,000 level. A program to mine and mill 800 tons per day from the deep levels was begun. It would require skip hoisting below the 4,850 level, the addition of another grinding unit, and other minor changes in the mill. This program was to increase daily milling capacity to 5,600 tons.

TABLE 8.—Homestake mine ore milled, receipts, and dividends<sup>1</sup>

Year	Ore milled (thousand short tons)	Receipts for bullion product		Dividends (thousands)
		Total (thousands)	Per ton	
1956.....	1,628	\$19,354	\$11.89	\$4,019
1957.....	1,660	19,479	11.74	4,019
1958.....	1,725	19,611	11.37	4,019
1959.....	1,746	20,120	11.52	4,019
1960.....	1,767	19,465	11.02	4,021

<sup>1</sup> From 1876 to 1960, inclusive, this mine yielded bullion and concentrates that brought a net return of of \$698.0 million and paid \$210.9 million in dividends.

Cole Construction Co. produced crushed limestone for road construction and railroad ballast, and for use in sugar refining. Crushed miscellaneous stone and sand and gravel were produced for road construction by contractors for the State department of highways, and the Lawrence County Highway Department produced sand and gravel for road repairs.

**Pennington.**—The county ranked second in the value of mineral production, and its mines, quarries, and mills produced a variety of minerals and mineral products. Beryllium concentrate (beryl) was produced at 30 mines. Major production was from the Peerless lode operated by Thomas M. Edson, Peerless Minerals, Inc., and Bland Mining & Milling Co.; the Hugo lode operated by Walter Hough; the Sackett Fraction lode operated by C. L. Myler; the White Cap operated by McCarty-Pullen Mines, Bland Mining & Milling Co., Northwest Defense Minerals, and C. O. Patterson; and the Ingersoll operated by Bland Mining & Milling Co. Northwest Defense Minerals installed new equipment in the Holy Terror mill at Keystone (previously operated as a cyanide mill for gold and silver ores and for the recovery of spodumene concentrate) for the recovery of beryl concentrate. Crude ore was to come from the dump at the White Cap pegmatite mine. The daily capacity of the mill was to be 100 tons, and the beryl was to be recovered by a flotation process developed at the Federal Bureau of Mines Research Laboratory at Rapid City.

Trial runs were made, but no production was reported. Hand-cobbed mica was recovered at eight mines and sold to GSA at Custer for processing. Principal producers were McCarty-Pullen Mines at the White Cap and R. W. Meiners at the Cobb. Scrap mica was produced at the Peerless lode by Thomas M. Edson. Crude feldspar was produced at eight mines and sold to IMC for grinding at its plant at Custer. Principal producers were Walter Hough at the Hugo and High Climb mines, McCarty-Pullen Mines at the White Cap, and Alfred V. Hazeltine at the Hesnard lode. The Etta mine near Keystone, operated by Maywood Chemical Co., was closed early in the year after being operated almost continuously since 1898. Unconfirmed reports indicated the mine had been sold to Clifford and Corde, operators of pegmatite mines in Custer and Pennington Counties. A shipment of copper ore was made from dump material at the Maloney Blue Lead mine. This was the first recorded production of copper in South Dakota since 1944.

Shipments of portland and masonry cements from the State-owned cement plant at Rapid City operated by the South Dakota State Cement Commission were 6 percent above those of 1959. The Commission produced the limestone, shale, gypsum, and sand used by the plant at deposits near Rapid City. Iron ore, also used at the plant as an additive, was produced by a contractor at the Iron Hill mine near Nemo. Bentonite clay was obtained from a bentonite processing mill at Belle Fourche. Cement clinker was used as a base in the manufacture of masonry cement. Shipments were made to consumers in South Dakota, North Dakota, Wyoming, Montana, Nebraska, Minnesota, Iowa, and Colorado. Miscellaneous clay, in addition to that used for cement, was produced from deposits near Rapid City for the manufacture of lightweight aggregate. Gem stones and mineral specimens were produced and collected by Scott's Rose Quartz Co., Allen's Minerals and Mining, and individuals, largely for sale to tourists as souvenirs. The better qualities of agate and gem varieties of beryl and similar minerals were polished.

Sand and gravel and crushed miscellaneous stone were produced by contractors for the State department of highways and for the Pennington County Highway Department for road construction and repairs. Building and paving sand and gravel was produced by four operators. Molding sand and oil sand (hydrafrac) was produced by the Black Hills Silica Sand Corp. Crushed limestone for riprap, road construction, concrete aggregate, and railroad ballast was produced by Hills Materials Co., L. G. Everist, Inc., Pete Lien & Sons, and The South Dakota Cement Plant. A general improvement program extending for 7 years was completed at the quarry and preparation plant of Pete Lien & Sons. The program consisted of a modern crushing, screening, and preparation plant in addition to replacement of the quarry equipment. The plant produced a complete range of sized- and blended-rock products for concrete aggregate, ready-mixed concrete, and base courses for highways and military construction. Because the production rate of 250 tons per hour was below design capacity, and shipments could be made at the rate of 500 tons per hour, plans were made to increase capacity of the plant to 500 tons per hour.