

The

MINERAL INDUSTRY OF SOUTH DAKOTA

in 1962

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SOUTH DAKOTA Archie Gubbrud, Governor

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MINERALS REPORT 10

The Mineral Industry of South Dakota

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the South Dakota State Geological Survey for collecting information on all minerals except fuels.

By Carl L. Bieniewski¹ and Allen F. Agnew²



MINERAL production in South Dakota was valued at \$45.8 million, an increase of \$1.8 million or 4 percent over that of 1961, thereby reversing the downward trend in total value that started in 1960. The State was again the leading producer of gold and hand-cobbed beryl in the Nation.

Nineteen commodities were produced and sold during the year; the only new commodity produced and sold, compared with those of last year, was lithium minerals. Gold, sand and gravel, cement, and stone accounted for 95 percent of the State total value of mineral output. Production of nonmetals as a group amounted to \$24.4 million or 53 percent of the total; metals, \$20.9 million or 46 percent; and fuels, \$0.4 million or 1 percent. Increases of 10 percent or more in value of production were reported for sand and gravel, lime, and iron ore; decreases of 10 percent or more were reported for mica, vanadium, beryllium concentrate, petroleum, and uranium ore.

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TABLE 1.—Mineral production in South Dakota¹

Mineral	1961		1962	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Beryllium concentrate.....short tons, gross weight.....	238	\$130	144	\$77
Cement.....thousand 376-pound barrels.....	(²)	(²)	2,360	7,596
Clays.....thousand short tons.....	249	249	249	690
Coal (lignite).....do.....	18	75	18	77
Feldspar.....long tons.....	29,354	186	29,697	191
Gem stones.....do.....	18	18	20	20
Gold (recoverable content of ores, etc.).....troy ounces.....	557,855	19,525	577,232	20,203
Gypsum.....thousand short tons.....	22	89	23	93
Iron ore (usable).....thousand long tons, gross weight.....	22	100	34	113
Lead (recoverable content of ores, etc.).....short tons.....	(³)	(³)	3	1
Mica:				
Scrap.....do.....	1,054	32	210	6
Sheet.....pounds.....	18,086	37	2,085	12
Petroleum (crude).....thousand 42-gallon barrels.....	233		170	(²)
Sand and gravel.....thousand short tons.....	11,324	7,336	15,371	9,207
Silver (recoverable content of ores, etc.).....thousand troy ounces.....	127	118	113	123
Stone.....thousand short tons.....	2,806	6,642	2,852	6,533
Uranium ore.....short tons.....	43,588	495	29,452	370
Value of items that cannot be disclosed: Clays (bentonite, 1961), lime, lithium minerals (1962), vanadium, and values indicated by footnote 2.....		\$ 8,975		507
Total.....		\$ 44,007		45,789

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

² Figure withheld to avoid disclosing individual company confidential data.

³ Excludes bentonite; included with "Value of items that cannot be disclosed."

⁴ Weight not recorded.

⁵ Less than 0.5 ton.

⁶ Less than \$500.

⁷ Preliminary figure.

⁸ Revised figure.

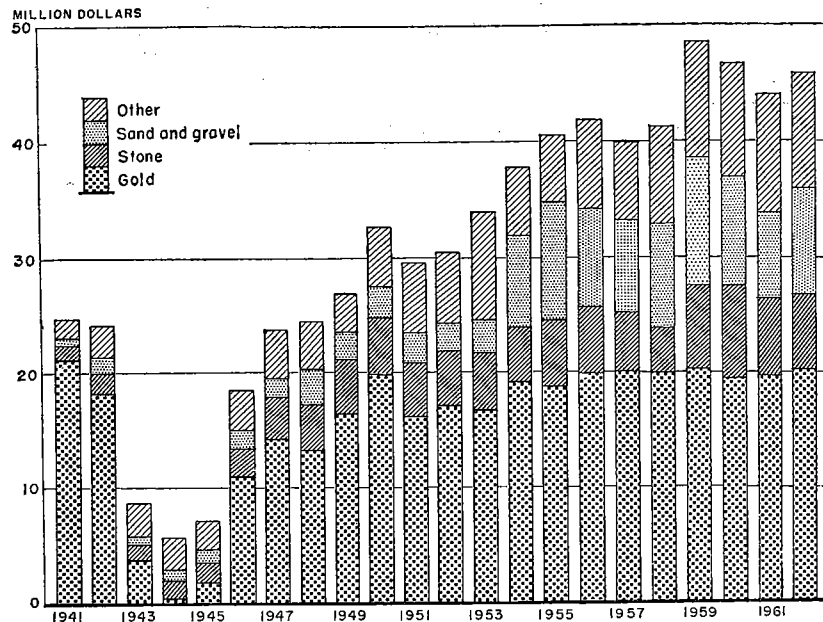


FIGURE 1.—Value of gold, dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1941–62.

Mineral output was reported from 60 of the State's 67 counties. The combined value of mineral production in Lawrence and Pennington Counties was \$31.6 million, or about two-thirds of the total value of the State's mineral output. Grant and Minnehaha Counties each reported production valued at over \$1 million.

Employment and Injuries.—Final data for 1961 and preliminary data for 1962 compiled by the Bureau of Mines for employment and injuries in the South Dakota mineral industries, excluding the petroleum industry, are shown in table 2.

TABLE 2.—Employment and injuries in the mineral industries¹

Industry	Number of operations	Average number of men employed	Total man-hours worked	Injuries		Frequency rate (injuries per million man-hours)
				Fatal	Nonfatal	
1961:						
Metal mines and mills (excluding uranium).....	55	1,831	4,403,145	1	60	13.9
Uranium mines and mills.....	23	104	204,216		10	49.0
Nonmetal mines and mills (other than sand and gravel and stone).....	87	221	321,304	1	5	18.7
Stone quarries and plants.....	74	548	1,057,126		24	22.7
Sand and gravel plants.....	209	1,496	1,960,180		38	19.4
Coal mines.....	2	9	11,964			
Total.....	450	4,209	7,957,935	2	137	17.5
1962:²						
Metal mines and mills (excluding uranium).....	22	1,793	4,359,615	6	55	14.0
Uranium mines and mills.....	20	103	202,062		16	79.1
Nonmetal mines and mills (other than sand and gravel and stone).....	46	227	328,841	1	5	18.2
Stone quarries and plants.....	73	480	1,002,406	1	21	21.9
Sand and gravel plants.....	192	1,208	1,870,171		7	3.7
Coal mines.....	1	8	12,096			
Total.....	354	3,819	7,775,191	8	104	14.4

¹ Excludes employees in the petroleum industry as well as office workers.

² Preliminary figures.

Government Programs.—Domestic mica and beryl purchasing programs of the Federal Government, started in 1952, were terminated in June. During the programs, the General Services Administration (GSA) purchased 2,655 tons of hand-cobbed beryl and 2,225 tons of hand-cobbed mica at its Custer depot. According to records of the Bureau of Mines, 76 percent of the beryl, valued at \$1 million, and 44 percent of the mica, valued at \$0.7 million, came from deposits within the State.

The U.S. Atomic Energy Commission (AEC) and Mines Development, Inc., signed a new contract on March 19 for the purchase of uranium concentrate produced in the company mill at Edgemont. The new contract—retroactive to September 1, 1961—extending through December 31, 1966, replaced an earlier contract which would have expired at the end of March. Under the new agreement, AEC paid \$8.45 per pound for uranium oxide (U₃O₈) purchased before April 1 and \$8.00 per pound for U₃O₈ purchased during the remaining life of the contract. The maximum delivery rate, unless increased by in-

dependent production, was established at 700,000 pounds of U_3O_8 per fiscal year before September 1, 1963, and 650,000 pounds of U_3O_8 per fiscal year thereafter.

The Office of Minerals Exploration (OME) did not enter into any new contracts for mineral exploration in the State, and no OME contracts were in force during the year.

Receipts from bonuses, rentals, and royalties for the year from State mineral land totaled \$170,398. In addition, the State received U.S. Department of the Treasury checks totaling \$91,853 as its share in bonuses, rentals, and royalties from mineral leasing of Federal land within the State.

Superheater difficulties at the Pathfinder atomic powerplant, a cooperative project of AEC and Northern States Power Co., prevented the reactor from reaching criticality this year. The 62,000-kilowatt plant near Sioux Falls was not expected to begin operation until late 1963.

A large part of the output of cement, crushed stone, and sand and gravel was required for construction financed by Federal, State, county, and municipal funds. During 1962, contracts totaling \$34.5 million³ were awarded for highway construction in the State. A 46-percent increase in highway work was planned for 1963. Highlighting the road work completed during 1962 was the addition of 55 miles⁴ of new interstate highways. This addition brought the number of miles open to traffic in this system to 223 miles, or about one-third of the 679 miles designated for the State.

Construction on the Oahe dam project was virtually completed. Dedication services of this dam took place on August 17. Work progressed throughout the year on the Big Bend dam project. The last of the Intercontinental Ballistic Missile sites under construction in the State was nearing completion at yearend.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Cement production statistics for the State are published this year for the first time. The previous method of reporting national cement figures prevented publication of data for South Dakota.

Shipments from the only cement plant, which is the State-owned plant in Rapid City, were less than those of 1961. The drop in shipments was caused partly by the Chicago & North Western Railway Co. strike during the summer, which caused the loss of some cement orders because rail transportation was unavailable. Some heavy-construction projects, such as building of missile sites and dams, were completed or were at a stage that required smaller quantities of cement than those of last year. The cement plant was operated at 88 percent of capacity.

Portland cement sales represented 98 percent and masonry cement 2 percent of the cement shipments, the same as in 1961. Portland

cement sold for \$3.18 per barrel (376 pounds), and masonry cement for \$3.30 per barrel (280 pounds), compared with \$2.91 and \$2.90, respectively, in 1961. Out-of-State shipments of portland and masonry cements were made to Minnesota, Montana, Nebraska, North Dakota, and Wyoming. Small quantities of portland cement were shipped to Ohio and Washington.

The South Dakota Cement Commission postponed establishing a cement distribution center at Wolsey.

Clays.—The quantity and value of clays produced were less than those of 1961. American Colloid Co., the only bentonite producer, mined bentonite west of Belle Fourche. The main uses for this bentonite were as a refractory material in foundries and a rotary drilling mud for oil well drilling. The company did not renew a 5-year lease for mining bentonite on State land west of Belle Fourche; the lease had been acquired March 1, 1957. Only a small quantity of bentonite was mined during the life of the lease.

Miscellaneous clay was produced by Black Hills Clay Products Co. for making brick; by Lightweight Aggregates, Inc., for making lightweight aggregate; and by the South Dakota Cement Commission as raw material for cement.

Feldspar.—There was no appreciable change in the output of crude feldspar. The production came from 49 mines, whereas in 1961, it came from 56 mines. Seven of the mines operated were in Pennington County and 42 in Custer County. Major operators, who produced 1,000 long tons or more, were Royce McRobbie (Albino No. 1 mine), Charles Stiles (Beck), Ray Wineteer & Everett Yanda (St. Louis), International Minerals and Chemical Corp. (IMC) (Shamrock), Fred Tubbs (Tip Top), and Briggs Manufacturing Co. (White Elephant). Output from these six mines accounted for 81 percent of the State total production of feldspar.

Most of the crude feldspar produced was ground at the IMC plant at Custer. The ground feldspar was used by manufacturers of porcelain, pottery, glass, enamel, brick and tile, and insulation in more than 17 States and 2 foreign countries.

Gem Stones.—The value of gem material increased \$2,000 or 11 percent above that of 1961. Agate and rose quartz were the most popular gem materials collected; other gem materials collected were petrified wood, jasper, chert, gypsum, and iron pyrites. Most of the gem material came from Custer and Pennington Counties.

Gypsum.—Gypsum produced at the South Dakota Cement Commission pit near Rapid City was used as a retarder in portland cement. Although the production was 1,000 short tons greater than in 1961, consumption was 7,000 tons less because of the decrease in portland cement production at the cement plant. The balance of the production was stockpiled at the cement plant.

Lime.—Output of lime was 14 percent greater than that of 1961. The increase was due to the need for more quicklime by Utah-Idaho Sugar Co. at its Belle Fourche sugar beet mill to process a larger crop of sugar beets. The company produced the quicklime at the plant from limestone purchased from Cole Construction Co. Quicklime also was produced by Black Hills Lime Co. and used for metallurgical purposes.

³ Engineering News-Record. Road Contractors Will Set a Record. V. 170, No. 16, Apr. 18, 1963, pp. 21-24.

⁴ Bureau of Public Roads. Quarterly Report on the Federal-Aid Highway Program, Dec. 31, 1962. Press release BPR 63-10, Feb. 10, 1963.

A new firm, Rapid City Lime Co., announced plans to build a 150-ton-per-day lime plant adjacent to the Pete Lien & Sons limestone quarry at Rapid City. Most of the equipment to be used in the plant was to come from a plant located in Colton, Calif. Pete Lien & Sons, who were to lease the plant after construction, expected to be in production by the fall of 1963.

Lithium.—IMC sold some lithium ore that had been mined and stockpiled from the Hugo Lode mine before 1962. The Tin Mountain mine, operated by Clifford & Chord, was the only other source of lithium ore sold during the year.

Mica.—Output of sheet mica was 88 percent less and of scrap mica 80 percent less than in 1961. There were 8 active mica operations, compared with 21 last year. The considerable decline in production and mining operations partly resulted from the termination of the Government domestic mica purchasing program in June. The mica receiving and processing depot at Custer closed down after 10 years of continual operation. The last sack of sheet mica was handled by the processing contractor, George Campbell, on November 5.

The scrap mica output was sent to grinding plants in California and Illinois. The ground mica was used in manufacturing paint and roofing materials.

TABLE 4.—Mica sold or used by producers

Mica	1958	1959	1960	1961	1962
Hand-cobbed, total: ¹pounds..	257,198	365,712	286,043	83,381	25,680
Sheet:					
Full-trimmed:					
Pounds.....	94	41			
Value.....	\$1,393	\$593			
Average per pound.....	\$14.82	\$14.46			
Punch and washer: ²					
Pounds.....				11,000	
Value.....				\$300	
Average per pound.....				\$.03	
From hand-cobbed: ¹					
Pounds.....	16,678	38,734	30,887	7,086	2,085
Value.....	\$66,489	\$157,234	\$145,154	\$37,040	\$12,060
Average per pound.....	\$3.99	\$4.06	\$4.70	\$5.23	\$5.78
Total:					
Pounds.....	16,772	38,775	30,887	18,086	2,085
Value.....	\$67,882	\$157,827	\$145,154	\$37,340	\$12,060
Average per pound.....	\$4.05	\$4.07	\$4.70	\$2.06	\$5.78
Scrap:					
Short tons.....	1,003	158	205	1,054	210
Value.....	\$24,241	\$4,916	\$9,748	\$32,122	\$5,710
Average per ton.....	\$24.17	\$31.11	\$47.55	\$30.48	\$27.19
Total sheet and scrap:					
Short tons.....	1,011	177	220	1,063	211
Value.....	\$92,123	\$162,743	\$154,902	\$69,462	\$17,770

¹ Sold to the Government through GSA.

² Sold to industry.

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
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
1961.....	83,381	7,086	8.50	4,994	70.48	214	3.02
1962.....	25,680	2,085	8.12	1,597	76.59	22	1.06

Sand and Gravel.—Production of sand and gravel increased 36 percent in quantity and 26 percent in value over that of 1961. The increase was mainly the result of 3.6 million short tons of additional sand and gravel used for paving. Ninety percent of the total output was used for road construction (including road base, surface, and bridges), emphasizing the importance of this market to the sand and gravel industry of the State. Building construction accounted for 5 percent and fill for 4 percent of the total output. The remaining 1 percent was used as railroad ballast, molding sand, blasting sand, and sand for use in the hydrafrac process for recovering oil and gas. Government-and-contractor producers accounted for three-fourths and commercial for one-fourth of the total output in the State.

No sand and gravel production was reported for 9 (Bennett, Edmunds, Hughes, McCook, Shannon, Stanley, Todd, Tripp, and Washaugh) of the 67 counties. Pennington County, the leading producer of sand and gravel, with 1.4 million tons output, was the only county in the State to have an output exceeding 1 million tons. Big Horn Construction Co., Dave Gustafson & Co., Inc., G. H. Lindekugel & Sons, Inc., Tenefos Construction Co., and Weelbarg Bros. each produced between 500,000 and 1 million tons of sand and gravel. The combined output of the five operators was 3.6 million tons, or about one-quarter of the State output. Each of 26 operators, including the 5 above, produced more than 100,000 tons of sand and gravel.

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	1961		1962	
	Quantity	Value	Quantity	Value
Commercial operations:				
Sand:				
Building	502	\$583	527	\$510
Paving	255	220	163	167
Railroad ballast				
Fill	(1)	(1)	11	5
Molding	(1)	(1)	(1)	(1)
Blast	(1)	(1)	(1)	(1)
Oil (hydraulic)	(1)	(1)	(1)	(1)
Other	17	53	18	58
Total	787	863	719	740
Gravel:				
Construction:				
Building	109	160	139	201
Paving	2,961	1,813	2,855	1,677
Railroad ballast	62	59	45	33
Fill	97	49	40	24
Other	20	22	12	8
Miscellaneous	89	74	22	15
Total	3,338	2,177	3,113	1,958
Total sand and gravel	4,125	3,040	3,832	2,698
Government-and-contractor operations:				
Sand:				
Building	125	88		
Paving	594	494	662	509
Fill			10	9
Total	719	582	672	518
Gravel:				
Building			95	85
Paving	6,480	3,714	10,165	5,515
Fill			607	391
Total	6,480	3,714	10,867	5,991
Total sand and gravel	7,199	4,296	11,539	6,509
All operations:				
Sand	1,506	1,445	1,391	1,258
Gravel	9,818	5,891	13,980	7,949
Grand total	11,324	7,336	15,371	9,207

¹ Figure withheld to avoid disclosing individual company confidential data; included with "Other."

TABLE 6.—Sand and gravel production in 1962, by counties
(Thousand short tons and thousand dollars)

County	Quantity	Value	County	Quantity	Value
Aurora	75	\$32	Jackson	122	\$68
Beadle	154	77	Jerauld	28	14
Bon Homme	279	116	Jones	15	8
Brookings	520	290	Kingsbury	577	289
Brown	421	265	Lake	180	114
Brule	95	47	Lawrence	248	138
Buffalo	140	61	Lincoln	262	178
Butte	238	158	Lyman	153	77
Campbell	(1)	(1)	McPherson	186	72
Charles Mix	303	157	Marshall	440	278
Clark	374	195	Meade	850	424
Clay	61	32	Mellette	83	43
Codington	474	346	Miner	(1)	(1)
Corson	225	171	Minnehaha	932	612
Custer	231	118	Moody	276	149
Davison	171	99	Pennington	1,397	939
Day	254	130	Perkins	309	171
Deuel	216	100	Potter	59	30
Dewey	88	24	Roberts	466	267
Douglas	103	63	Sanborn	14	9
Fall River	147	111	Spink	378	231
Faulk	310	182	Sully	61	13
Grant	26	13	Turner	494	344
Gregory	158	123	Union	89	45
Haakon	126	126	Walworth	146	116
Hamlin	71	65	Yankton	146	77
Hand	129	64	Ziebach	148	76
Hanson	61	31	Undistributed	1,393	1,032
Harding	147	74			
Hutchinson	189	77			
Hyde	73	46			
			Total	15,371	9,207

¹ Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Stone.—Production of stone was virtually the same as that of 1961. Granite, limestone, quartzite, and slate were the definite types of stone produced. Miscellaneous stone not identified as to type was produced in 27 counties. Fifty-nine percent of the total stone production was used in concrete and as road material; 21 percent in cement; 11 percent as riprap; 6 percent as railroad ballast; and the remaining 3 percent as filler, refractory material, dimension stone, and raw material for producing lime. Fifty-eight stone operations, five more than those of last year, were active in the State. Concrete Materials Co., Hills Materials Co., L. G. Everist, Inc., Pete Lien & Sons, South Dakota Cement Commission, and Spencer Quarries, Inc., accounted for 89 percent of the output of stone.

Although the quantity of dimension granite quarried was only about 15,000 short tons, the value (\$2.4 million) was appreciable, being 37 percent of the value of all the stone produced during 1962. From quarries in Grant County, six companies produced dimension granite in rough and dressed blocks for use as building stone and monuments. Quantity and value of dimension granite were each 14 percent below those of 1961. Dimension limestone, the first of such production since 1957, was used for rough building stone and rubble.

TABLE 7.—Stone sold or used by producers, by kinds

Year	Granite		Limestone		Sandstone ¹	
	Short tons	Value	Short tons	Value	Short tons	Value
1958.....	18,696	\$2,097,262	878,500	\$1,232,400	424,400	\$692,000
1959.....	18,568	3,065,502	1,599,521	2,331,485	914,800	1,687,900
1960.....	17,915	3,002,488	1,578,618	2,501,216	1,081,524	1,855,179
1961.....	26,476	2,823,441	1,378,062	1,939,293	984,512	1,493,464
1962.....	25,923	2,442,181	1,572,300	2,184,374	1,119,655	1,779,639
	Other stone		Total			
	Short tons	Value	Short tons	Value		
1958.....	73,600	\$73,600	1,395,196	\$4,096,262		
1959.....	187,696	187,696	2,720,585	7,242,583		
1960.....	520,945	550,469	3,149,002	7,909,352		
1961.....	417,391	385,953	2,806,441	6,642,151		
1962.....	2 134,056	2 126,373	2,851,934	6,532,567		

¹ Includes quartz and quartzite.² Includes slate.

TABLE 8.—Stone sold or used by producers, by uses

Use	1961		1962	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough construction and rubble..... short tons.....	(1)	(1)	(1)	(1)
Rough architectural..... cubic feet.....	(1)	(1)	(1)	(1)
Dressed architectural..... do.....	(1)	(1)	(1)	(1)
Rough monumental..... do.....	(1)	(1)	(1)	(1)
Dressed monumental..... do.....	2 145,194	\$2,380,436	3 122,572	\$1,644,297
Flagging..... do.....	(1)	(1)	(1)	(1)
Other..... do.....	4 75,897	427,653	5 93,295	800,634
Total (approximate, in short tons).....	17,908	2,808,089	18,457	2,444,931
Crushed and broken stone:				
Riprap..... short tons.....	365,771	418,089	313,753	404,891
Railroad ballast..... do.....	(1)	(1)	183,280	234,302
Concrete and roadstone..... do.....	1,673,894	2,306,037	1,693,440	2,479,787
Cement..... do.....	575,191	862,787	593,557	890,335
Other..... do.....	6 173,677	6 247,149	7 49,447	7 78,321
Total..... do.....	2,788,533	3,834,062	2,833,477	4,087,636
Total stone (approximate, in short tons).....	2,806,441	6,642,151	2,851,934	6,532,567

¹ Figure withheld to avoid disclosing individual company confidential data; included with "Other."² Approximately 11,761 short tons.³ Approximately 9,926 short tons.⁴ Approximately 6,147 short tons.⁵ Approximately 8,531 short tons.⁶ Includes stone used in lime, refractory, filler, roofing and decorative gravel, filter blanket, and railroad ballast.⁷ Includes stone used in filler, lime, and refractory.

METALS

Beryllium.—Termination of the Government beryl purchasing program in June adversely affected the output of beryl; production decreased 94 tons or 40 percent below that of 1961. No favorable market existed after June. Beryl was produced at only 27 mines compared with 65 in 1961.

Although production was far below that of 1961, the State still retained its position as the leading producer of hand-cobbed beryl in the Nation. The State output of beryl averaged 10.84 percent beryllium oxide (BeO).

Hough & Judson again produced over 100,000 pounds of beryl from a single property (the Hugo Lode), an accomplishment reported only twice previously in the history of beryl mining within the State. Peerless mine (two operators—Northwest Beryllium Co. and Newlon & Cordes), Tin Mountain (Walter S. Clifford), Beecher No. 1 (Arthur H. Lyndoe), and Etta (Walter S. Clifford) each produced between 10,000 and 100,000 pounds. Fourteen mines had production between 1,000 and 10,000 pounds, and 8 had less than 1,000 pounds.

Gold and Silver.—Production of gold accounted for 44 percent of the total value of minerals. Output increased 19,377 ounces or 3 percent over that of 1961. Silver production decreased 14,000 ounces or 11 percent below that of 1961. The price of silver increased during 1962, and as a result the value of the recovered silver was \$5,000 or 4 percent greater than that of last year.

The Homestake Mining Co. mine at Lead continued to be the Nation's largest gold producer; again the output was sufficient to make South Dakota the leading gold-producing State. The 1.87 million short tons of ore milled established a new high in production, surpassing the previous company record set last year by 88,000 tons. The value of the recovered gold and silver per ton of ore was \$10.85 or \$0.15 less than that of 1961. However, because more ore was mined and the price of silver increased, value of the bullion was about \$681,000 more than that of last year. This value, \$20.3 million, was an alltime high for the mine; the previous high was \$20.1 million in 1959.

Some gold and silver was recovered from lead ore mined at the Silver Queen property of Hage Bros., Inc.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc, in terms of recoverable metals¹

Year	Mines producing		Material sold or treated (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)	
1953-57 (average).....	2	-----	1,654	548,590	\$19,201	143	\$129	² \$19,330
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	³ 19,515
1961.....	2	-----	1,781	557,855	19,525	127	118	⁴ 19,643
1962.....	2	-----	1,869	577,232	20,203	113	123	⁵ 20,326
1876-1962.....	(6)	(6)	(6)	29,385,994	810,107	11,758	8,798	⁷ 819,070

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore or old tailings shipped directly to smelters during the calendar year indicated.² Includes 10 short tons of lead valued at \$2,620 in 1953.³ Includes 1 ton of copper valued at \$642.⁴ Includes less than 0.5 ton of lead valued at \$52.⁵ Includes 3 tons of lead valued at \$552.⁶ Data not available.⁷ Includes 107 short tons of copper valued at \$37,108, 500 tons of lead valued at \$72,356, and 265 tons of zinc valued at \$56,406.

Iron Ore.—Pete Lien & Sons mined iron ore from the Dungey Bog and Painter pits located in the Rochford district. The South Dakota Cement Commission purchased the output and placed it in a stockpile at the cement plant for use in making certain types of cement. The 1962 purchases completed the plant iron-ore stockpile program in effect since 1960.

A positive magnetic anomaly was found in the southeast corner of the State by the South Dakota State Geological Survey magnetometer crew. The anomaly, known as the Willowdale magnetic high, was in the same general area as the Spink anomaly discovered in 1961. The State Geological Survey planned to put down a core hole on the newly discovered anomaly in the spring of 1963. The unaltered rock of the core obtained from a hole on the Spink anomaly assayed 14.5 percent ferric oxide (Fe_2O_3) and 6.8 percent titanium dioxide (TiO_2), and the altered rock assayed 13.6 percent Fe_2O_3 and 3.6 percent TiO_2 . The unaltered rock contained magnetite and the altered rock hematite.

Lead.—The Silver Queen mine, operated by Hage Bros., Inc., was again the only source of lead production in the State. The ore was shipped to the American Smelting and Refining Co. lead smelter at East Helena, Mont.

Uranium Ore.—Although the number of uranium operations increased from 27 to 29, production of uranium ore was 32 percent less than that of 1961. The average grade of the ore shipped was 0.18 percent uranium oxide (U_3O_8), 0.01 percent higher than that of 1961. Walter Wilk shipped a small quantity of ore from a mine in Pennington County, a mine that had been inactive since 1957. Other shippers were F. J. & F. Albright, Bettenhausen & Wheeler, Black Hills Uranium Co., Earl Boner, Roy E. Chord, Chord Uranium Co., Ray Fay, Walter L. McKenna, Wayne Sundstrom, and Susquehanna-Western, Inc.

The outlook for mining and treating the uranium-bearing lignite in the Cave Hills and Slim Buttes areas dimmed considerably when International Resources Corp. announced in January that it had abandoned plans to build a uranium processing mill to handle the material. Kermac Nuclear Fuels Corp. and Susquehanna-Western, Inc., later became interested in this material. In the fall, Kermac mined material from deposits in the Cave Hills area and stockpiled it on a property near Riley Pass in the same area. Starting in September, Susquehanna-Western purchased uranium-bearing lignite mined by independent producers from deposits in the Cave Hills and Slim Buttes areas. The purchased lignite was stockpiled next to the company buying station at Buffalo. Both companies planned to burn the lignite and ship the ash to a uranium mill for processing. Production of the uranium-bearing lignite was not to be reported until it was accepted at a uranium mill.

Vanadium.—Production of vanadium oxide (V_2O_5) was one-half that of 1961. The decrease was attributed to a lower V_2O_5 content in the uranium ores shipped and a reduction in the quantity of vanadium-bearing uranium ores shipped. The ores averaged 0.123 percent V_2O_5 , whereas last year, they averaged 0.153 percent V_2O_5 . The V_2O_5 was recovered from the ores treated at Mines Development, Inc., uranium mill at Edgemont.

MINERAL FUELS

Coal (Lignite).—Output of coal (lignite) was the same as that of 1961; however, because of a price increase of 10 cents per ton, the value was 3 percent greater. The reported production, excluding mines producing less than 1,000 short tons, came from the strip mine operated by Dewey County Coal Co. near Firesteel in Dewey County.

Petroleum.—Petroleum (crude) production continued to decline; the output was 63,000 barrels (27 percent) less than that of 1961. Nineteen wells, the same as in 1961, were active in the Buffalo field. The one well active in 1961 in the Barker Dome field did not produce in 1962.

The 11 exploratory wells drilled during the year were dry holes—4 in Custer, 3 in Fall River, and 1 each in Butte, Brule, Pennington, and Tripp Counties. Total footage of the 11 wells was 28,110 feet. The depths drilled varied from 1,803 feet to 3,420 feet. One well in Fall River County, redrilled and deepened to a depth of 2,545 feet, also was a dry hole.

Early in November, Zapata Petroleum Corp. (a Texas firm) purchased the Shell Oil Co. holdings in the Buffalo field area. The holdings included 13 producing wells and leases on approximately 18,000 acres, plus production equipment such as pumps and storage tanks.

On October 15, Wyco Pipe Line Co. started constructing a 189-mile, \$4.5 million pipeline about 3 miles south of Edgemont. One pipeline crew headed westward toward an existing pipeline southwest of Douglas, Wyo.; another crew proceeded northwest toward Rapid City. When completed the pipeline was to carry petroleum products from three Casper, Wyo., oil refineries to the terminal under construction at Rapid City. The pipeline and terminal were to be completed by the end of February 1963.

REVIEW BY COUNTIES

Mineral production was reported from all but 7 of the 67 counties in the State. Bennett, Edmunds, Hughes, Shannon, Stanley, Todd, and Tripp Counties had no mineral production. Forty counties had increases, 25 had decreases, and 2 had no changes in value of mineral production, compared with 1961 figures. The changes were due mostly to increases or decreases in value of sand and gravel output. Only those counties with larger values or with significant changes in mineral production are discussed below; see table 10 for additional details.

Butte.—Mineral production increased \$76,700 or 12 percent in value over that of 1961. Clays, sand and gravel, lime, and stone were produced as in 1961; only clays decreased in production. The clay producers were American Colloid Co. (bentonite) and Black Hills Clay Products Co. (miscellaneous clay). At its plant at Belle Fourche, American Colloid Co. processed bentonite mined in South Dakota and Wyoming. At its Belle Fourche plant, IMC processed bentonite from Wyoming only.

TABLE 10.—Value of mineral production in South Dakota, by counties¹

County	1961	1962 ²	Minerals produced in 1962 in order of value
Aurora.....	\$32,345	\$32,100	Sand and gravel.
Beadle.....	76,380	81,290	Sand and gravel, stone.
Bon Homme.....	110,200	115,600	Sand and gravel.
Brookings.....	377,463	289,700	Do.
Brown.....	207,300	272,107	Sand and gravel, stone.
Brule.....	62,709	47,402	Sand and gravel, gem stones.
Buffalo.....	28,700	62,940	Sand and gravel, stone.
Butte.....	648,557	725,209	Clays, sand and gravel, lime, stone.
Campbell.....	31,700	170,347	Sand and gravel, stone.
Charles Mix.....	139,038	164,778	Sand and gravel, stone, gem stones.
Clark.....	77,877	196,831	Sand and gravel, stone.
Clay.....	38,800	31,500	Sand and gravel.
Codington.....	276,402	346,400	Do.
Corson.....	(3)	171,677	Sand and gravel, stone.
Custer.....	4 734,266	702,307	Uranium ore, feldspar, sand and gravel, lime, vanadium, beryllium concentrate, stone, mica (sheet), gem stones, lithium minerals.
Davison.....	176,298	98,900	Sand and gravel.
Day.....	71,861	129,900	Do.
Deuel.....	11,066	100,300	Do.
Dewey.....	95,047	101,510	Coal, sand and gravel.
Douglas.....	141,683	63,300	Sand and gravel.
Edmunds.....	76,776		
Fall River.....	4 365,924	282,286	Sand and gravel, uranium ore, stone, vanadium.
Faulk.....	103,000	184,019	Sand and gravel, stone.
Grant.....	2,865,574	2,437,093	Stone, sand and gravel.
Gregory.....	100,853	127,908	Sand and gravel, stone.
Haakon.....	71,100	126,300	Sand and gravel.
Hamlin.....	14,028	67,431	Sand and gravel, stone.
Hand.....	56,900	64,400	Sand and gravel.
Hanson.....	(3)	617,228	Stone, sand and gravel.
Harding.....	4 574,884	(3)	Petroleum, sand and gravel.
Hughes.....	256,793		
Hutchinson.....	73,291	80,207	Sand and gravel, stone.
Hyde.....	25,200	48,840	Do.
Jackson.....		68,966	Do.
Jerauld.....	65,580	14,000	Sand and gravel.
Jones.....	14,500	7,500	Do.
Kingsbury.....	74,876	292,237	Sand and gravel, stone.
Lake.....	117,800	114,200	Sand and gravel.
Lawrence.....	19,747,169	20,574,158	Gold, sand and gravel, silver, stone, lead, gem stones.
Lincoln.....	634,190	177,600	Sand and gravel.
Lyman.....	22,709	76,600	Do.
Marshall.....	39,562	277,700	Do.
McCook.....	84,715	1,250	Stone.
McPherson.....	32,400	73,547	Sand and gravel, stone.
Meade.....	165,665	455,455	Do.
Mellette.....	4,500	43,100	Sand and gravel.
Miner.....	41,100	159,079	Sand and gravel, stone.
Minnehaha.....	1,922,908	1,807,880	Stone, sand and gravel.
Moody.....	153,732	149,200	Sand and gravel.
Pennington.....	11,014,262	11,016,445	Cement, stone, sand and gravel, clays, iron ore, gypsum, beryllium concentrate, feldspar, mica (scrap), gem stones, lithium minerals, uranium ore, mica (sheet).
Perkins.....	35,964	174,821	Sand and gravel, stone, gem stones.
Potter.....		29,700	Sand and gravel.
Roberts.....	80,200	269,851	Sand and gravel, stone.
Sanborn.....	1,900	9,300	Sand and gravel.
Shannon.....	14,850		
Spink.....	79,015	258,186	Sand and gravel, stone.
Stanley.....	34,900		
Sully.....	47,600	12,600	Sand and gravel.
Tripp.....	86,509		
Turner.....	188,400	344,100	Sand and gravel.
Union.....	418,200	44,600	Do.
Walworth.....	69,300	116,500	Do.
Washabaugh.....		866	Stone.
Yankton.....	56,800	77,300	Sand and gravel.
Ziebach.....	30,401	75,500	Do.
Undistributed ³	4 800,734	1,127,035	
Total.....	4 44,607,000	45,789,000	

¹ Bennett and Todd are not listed because no production was reported.

² Value of petroleum is preliminary.

³ Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

⁴ Revised figure.

⁵ Includes production of some sand and gravel and gem stones that cannot be assigned to specific counties and values indicated by footnote 3

Value of sand and gravel production was \$158,000 or twice that of 1961. Harold Dodd, Cole Building Supply Co., and J. B. Connors were commercial sand and gravel operators. The Butte County Highway Department produced sand and gravel for road repairs. Contractors for the State department of highways produced sand and gravel and crushed stone for road construction. Utah-Idaho Sugar Co. produced lime (quicklime) at its Belle Fourche sugar beet factory.

Custer.—The value of mineral production decreased \$32,000, or 4 percent; increases in outputs of sand and gravel, gem stones, lithium minerals, and feldspar over those of 1961 almost offset the decreases in production of beryl, mica, stone, lime, petroleum, uranium ore, and vanadium. Sand and gravel output showed the greatest increase in value, from \$45,400 in 1961 to \$118,000 in 1962. The county was the State's leading source of beryl, gem stones, feldspar, mica, uranium ore, and vanadium.

Lithium ore was produced at the Tin Mountain mine operated by Clifford & Chord. Although only 44 operations were active, compared with 53 in 1961, feldspar production increased about 500 tons. The Shamrock mine of IMC was the leading source of feldspar. The Albino No. 1 (operated by Royce McRobbie), White Elephant (Briggs Manufacturing Co.), Tip Top (Fred Tubbs), St. Louis (Wineteer & Yanda), and Beck (Charles Stiles) were the only other mines which individually produced over 1,000 long tons of feldspar. Twelve operations each produced between 100 and 1,000 long tons of feldspar, and 26 operations each had an output of less than 100 tons. IMC operated its ground feldspar plant at Custer throughout the year. One-third of the State's total value of gem stones was attributed to the county; rose quartz, agate, jasper, and chalcedony were the gem materials collected.

Beryl output was one-half that of 1961 and mica was one-eighth, mainly the result of the termination of the Federal Government buying program for these two commodities in June. Beryl was obtained from only 20 operations compared with 55 in 1961. Beryl production, 76,343 pounds, averaging 11.12 percent beryllium oxide (BeO) was valued at \$20,691. Walter S. Clifford and Arthur H. Lyndoe, each having an output of over 10,000 pounds, produced the most beryl. Twelve operations each produced between 1,000 and 10,000 pounds of beryl and 6 operations less than 1,000 pounds.

Six operations were the only sources of mica production, compared with 17 in 1961. Mica producers were Homestead Mining Co. with two operations and Tom Druyvestine, Lester Sander, Duncan & Shull, and Bernie Van Der Vorste each having one operation. Stone production consisted of limestone mined by Black Hills Lime Co.; quicklime was produced from the limestone. No petroleum output was reported because the only oil well, Helms No. 1 Coffing, did not produce. Oil well exploration was resumed; however, the four wells drilled were dry holes.

Although nine operations were active compared with four in 1961, uranium ore production was less than that of last year. Walter L. McKenna, Bettenhausen & Wheeler, Wayne Sundstrom, Black Hills Uranium Co., and Susquehanna-Western, Inc., produced uranium

ore. The drop in uranium ore production was the cause of the decrease in byproduct vanadium output.

Fall River.—The \$84,000 or 23-percent decline in value of mineral production below that of 1961 resulted from decreases in output of gem stones, uranium ore, and vanadium. Output of sand and gravel and of stone were more than in 1961. Flyte Sand and Gravel Co., Oral Sand Co., and Fall River Gravel & Sand Co. were commercial sand and gravel operators. The South Dakota Department of Highways accounted for the balance of the sand and gravel production, mainly used on its road-construction projects. No gem stones were reported collected. Production of uranium ore decreased considerably below that of 1961 and adversely affected the output of byproduct vanadium. The 19 active uranium operations, 4 fewer than last year, were worked by Black Hills Uranium Co., Chord Uranium Co., Earl Boner, Walter L. McKenna, F. J. & F. Albright, Roy E. Chord, and Ray Fay. Three exploratory oil wells drilled were unsuccessful.

Grant.—The county was one of four that had mineral production valued at over \$1 million. Because of the granite industry, the county was the leading State producer of stone in terms of value. However, the value of stone production decreased \$386,000 or 14 percent below that of 1961. The decrease in value of production of sand and gravel, the only other mineral commodity, plus the decrease in stone, resulted in a \$428,000 or 15-percent drop in value of mineral production for the county below that of 1961. Cold Springs Granite Co.; Dakota Granite Co.; Delano Granite Works, Inc.; North Star Granite Corp.; Robert Hunter Granite Co. Inc., and Steiner-Rausch Granite Co., Inc., quarried granite. As in past years, some of the rough granite blocks were shipped to Minnesota for finishing. Sand and gravel production dropped from 102,200 short tons in 1961 to 25,500 tons in 1962 because of a decrease in road construction. Walter Lindberg sold some sand and gravel from his pit. The remainder was produced by a contractor for the South Dakota Department of Highways.

Harding.—All the petroleum production in the State came from this county. The 19 oil wells active last year also pumped oil this year; production, however, was 61,500 barrels (27 percent) less than that of 1961. No oil well exploration drilling was reported during the year, whereas in previous years there had been some activity. The one exploratory well reported uncompleted last year was reported as unsuccessful. Shell Oil Co. sold its holdings in the county, including 13 active oil wells, to Zapata Petroleum Corp. about November 1.

Output of sand and gravel, which was 122,000 tons or 5 times more than in 1961, was used on road construction projects of the State department of highways.

After a lapse of a few years, mining of uranium-bearing lignite began in the fall, when Kermac Nuclear Fuels Corp. and Susquehanna-Western, Inc., announced their interest in acquiring this lignite for uranium recovery. Susquehanna-Western, Inc., set up a buying station at Buffalo in September and purchased uranium-bearing lignite produced by operators in the Cave Hills and Slim Buttes areas; this lignite was stockpiled at the buying station. Kermac Nuclear Fuels Corp. mined and stockpiled uranium-bearing lignite from its properties near Riley Pass in the Cave Hills area.

Lawrence.—The county retained its leading position in value of mineral production and established a new record for a South Dakota county total, surpassing its previous high of 1958 by \$96,664. All commodities produced in the county, except gem stones, showed increases in value of production. Gold output accounted for 98 percent of the total value of mineral production.

Virtually all the gold and silver produced was mined by Homestake Mining Co. Homestake operated its mine and amalgamation-cyanidation mill at Lead the entire year. According to the company's annual report to stockholders, metallurgical recovery was 97.39 percent compared with 97.28 percent in 1961. Total direct operating costs increased 29 cents per ton, but general costs were 10 cents per ton less. Facilities for mining below the 4,850-foot level were completed in April, and the ore-haulage system on this level was placed in operation in September. Eight hundred tons per day was to be mined from stopes below this level beginning in early 1963. Sinking of the No. 4 winze from the 6,200- to the 6,800-foot level began in July and had reached 6,547 feet below the surface at yearend. Extension of the winze would make available for development another 600 feet of the principal ore zones and permit further testing of structures to the west, where indications of ore continued to be encouraging.

TABLE 11.—Homestake mine ore milled, receipts, and dividends ¹

Year	Ore milled (thousand short tons)	Receipts for bullion product		Dividends (thousands)
		Total (thousands)	Per ton	
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
1961.....	1,781	19,590	11.00	4,030
1962.....	1,869	20,271	10.85	3,242

¹ From 1876 to 1962, inclusive, this mine yielded bullion and concentrates that brought a net return of \$737.9 million and paid \$218.1 million in dividends.

Source: Homestake Mining Co. annual report to stockholders.

All the lead produced in the State and the balance of gold and silver came from Hage Bros., Inc., Silver Queen mine located southeast of Lead. Sand and gravel, which rose in output from 37,100 tons in 1961 to 248,000 tons, was produced by the Lawrence County Highway Department for road maintenance and by contractors of the State department of highways for road construction. Crushed limestone was produced for road construction and for making lime. Crushed granite was produced by a contractor for the City of Lead for aggregate in making bituminous pavement. Jasper was the only gem material reported collected.

Minnehaha.—The county was among the four in the State which had mineral production worth over \$1 million. The total value was about \$100,000 (5 percent) below that of 1961, because output of the two commodities (stone and sand and gravel) produced in the county dropped slightly below that of 1961. Two-thirds of the value was derived from stone production and one-third from sand and gravel

production. Only one other county, Pennington, had greater output of sand and gravel and of stone. Three operators—Concrete Materials Co., L. G. Everist, Inc., and Hector Construction Co.—accounted for the stone production. Commercial sand and gravel producers were Concrete Materials Co., Steve R. Oberg Construction Co., and Eagle Sand and Gravel Co. Contractors produced sand and gravel for road-construction projects of the Federal Bureau of Public Roads and the State department of highways.

Pennington.—Only one county, Lawrence, had a larger value of mineral production than Pennington. Irrespective of individual changes in values of output for commodities produced, the total value was almost exactly the same as that of last year. The 12 commodities produced gave the county the distinction of having the most diversified mineral production. The county was the leading sand and gravel producer and the only one in the State having a stone output of over 1 million tons. The stone output in Grant County, however, had a higher value per ton, and Grant surpassed Pennington in value of stone production. The entire State production of cement, gypsum, and iron ore was from this county.

The one-third drop in beryl production was caused by the termination in June of the Federal Government domestic beryl purchasing program. Only 9 operations produced beryl compared with 27 last year. The Hugo Lode mine operated by Hough & Judson was the largest beryl producer in the State and the only one to exceed the 100,000-pound mark for beryl production. Two operators each had production between 10,000 and 100,000 pounds of beryl, three between 1,000 and 10,000 pounds, and three less than 1,000 pounds. Mica production was adversely affected by the termination in June of the Federal Government domestic mica buying program. Mica production came from two mines: Hough & Judson produced scrap mica from the Hugo mine, and Northwest Beryllium Co. produced sheet and scrap mica from the Peerless mine, which the company acquired early in 1962 from Peerless Minerals, Inc. Although seven operations were active, compared with six in 1961, output of feldspar was 197 long tons (13 percent) below that of the last year. None of the operations yielded over 1,000 tons. Robert Stilen with three operations and Elfred Hazeltine, Hough & Judson, Keystone Chemical Co., and Carl Salmen with one operation each produced feldspar. Production of lithium minerals was reported; however, the ore sold by IMC had been mined by Hough & Judson from the Hugo Lode in 1961.

The South Dakota Cement Commission produced limestone, gypsum, clay, and sand and gravel for its cement plant at Rapid City. The cement plant was operated throughout the year, but production was curtailed at times because of a railroad strike. Lightweight Aggregates, Inc., was the only other clay producer in the county. Pete Lien & Sons produced the total output of iron ore from the Dungey Bog and Painter pits near Rochford. Five commercial and three non-commercial producers reported sand and gravel production. About 98 percent of the 1.4 million tons of sand and gravel reported as production in the county was used for road construction. Black Hills Silica Sand Corp. produced some silica sand from its operation west of Hill

City; most of the output was used in the oil hydrafracing process of recovering oil and gas. Stone production increased 161,000 tons or 12 percent above that of 1961. Seven operators accounted for the total output of stone, which was mostly crushed limestone. One operator produced some dimension limestone.

Uranium ore production (shipments) was again attributed to the county after a lapse of 5 years as Walter Wilk produced a small quantity of ore from the Rube No. 1 mine. One exploratory oil well drilled in the fall was a dry hole; the last previous well was drilled in 1957.