The Mineral Industry of Idaho—1977

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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Idaho

UNITED STATES DEPARTMENT OF THE INTERIOR

The Mineral Industry of Idaho

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

By D. W. Lockard[1] and E. H. Bennett[2]

Idaho's mineral production in 1977 was valued at nearly $253 million, an increase of 20% over production in 1976. This increase would have been substantially higher if it had not been for labor problems in the Coeur d'Alene district at the Sunshine mine and the Bunker Hill mine and smelter complex. The strike at the Sunshine lasted for the first quarter of the year, while Bunker Hill was shut down the entire summer.

Twenty mineral commodities were produced statewide; 8 were metallic and 12 were nonmetallic or industrial minerals. Production increased from the 1976 level for five metallic and four nonmetallic minerals, and six metallics and six nonmetallics increased in value.

Phosphate rock was the State's leading mineral commodity in terms of value, followed by silver, lead, and zinc. Metallics accounted for about 55% of the total mineral revenue, and nearly 83% of that metallics revenue came from the Coeur d'Alene mining district in Shoshone County.

Idaho ranked 32nd among the 50 States in mineral production value and was the leader in silver and antimony production. The State ranked second in lead and phosphate production, and ranked fourth in the production of vanadium.

As in previous years, most of Idaho's production came from two separate mining areas: The Coeur d'Alene base metal district in Shoshone County and the phosphate rock region in Bingham and Caribou Counties.

In the metallic-producing sector, the strike at Sunshine Mining Co.'s Sunshine mine, which began in March 1976, ended in March of 1977. Full production resumed in June. Sunshine was also the object of a successful corporate takeover by Great Western United Corp., a Colorado firm controlled by Hunt Brothers of Dallas, Tex. In May, The Bunker Hill Mining Co.'s Bunker Hill mining and smelting complex was shut down by a strike that lasted until September. Full production, with the exception of the mine's upper workings, resumed in November. In addition, environmental problems continued to plague Bunker Hill. The Environmental Protection Agency (EPA) has charged the company with polluting Silver Creek and is still negotiating over proposed standards on lead emissions.

Hecla Mining Co. discovered a mineralized zone more than 2 feet wide while exploring the Day, Independence, and Abot properties, from the Lucky Friday mine. Hecla was attempting to lease the Atlas property, which also adjoins the Lucky Friday.

The new Coeur mine, owned by ASARCO Incorporated, reached full production, and development plans were being formulated

to explore the American Standard property nearby. ASARCO terminated its lease on the Consolidated Silver project. Day Mines Inc.'s Calladay project, which adjoins ASARCO's Galena mine on the east, is still on standby, awaiting a development agreement. Day continued exploration work at its Tamarack property.

Table 1.—Mineral production in Idaho[1]

Mineral	1976 Quantity	1976 Value (thousands)	1977 Quantity	1977 Value (thousands)
Antimony ore and concentrate, antimony content _short tons_	133	$282	446	W
Clays _thousand short tons_	W	W	W	W
Copper (recoverable content of ores, etc.) _short tons_	3,362	4,680	4,052	$5,413
Gem stones	NA	126	NA	100
Gold (recoverable content of ores, etc.) _troy ounces_	2,755	345	12,894	1,912
Lead (recoverable content of ores, etc.) _short tons_	53,636	24,780	47,258	29,016
Sand and gravel[2] _thousand short tons_	6,549	11,504	7,750	15,282
Silver (recoverable content of ores, etc.) thousand troy ounces	11,561	50,292	15,292	70,649
Stone (crushed) _thousand short tons_	3,462	9,122	3,077	8,005
Zinc (recoverable content of ores, etc.) _short tons_	46,586	34,473	30,998	21,327
Combined value of barite, cement (masonry and portland), garnet (abrasive), gypsum, lime, perlite, phosphate rock, pumice, sand and gravel (industrial), stone (dimension), tungsten ore, vanadium, and values indicated by symbol W	XX	74,642	XX	100,966
Total	XX	210,246	XX	252,670
Total 1967 constant dollars	XX	107,919	XX	[p]124,718

[p]Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Excludes industrial sand; value included in "Combined value" figure.

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

(Thousands)

County	1976	1977	Minerals produced in 1977 in order of value
Ada	W	$2,269	Sand and gravel.
Adams	$1,761	1,898	Copper, stone, silver, sand and gravel, gold.
Bannock	W	W	Cement, stone, sand and gravel.
Bear Lake	W	780	Sand and gravel, stone.
Benewah	W	W	Garnet, stone, sand and gravel, clays.
Bingham	W	W	Phosphate rock, sand and gravel.
Blaine	W	W	Barite, silver, lead, zinc, gold, copper.
Boise	1	(2)	Stone.
Bonner	W	W	Sand and gravel, stone, gold, silver, lead.
Bonneville	W	W	Sand and gravel, lime, pumice, stone.
Boundary	37	W	Sand and gravel, stone.
Canyon	W	W	Sand and gravel, lime.
Caribou	43,166	70,768	Phosphate rock, vanadium, stone, sand and gravel.
Cassia	W	W	Sand and gravel, stone.
Clark	W	W	Stone, sand and gravel, clays.
Clearwater	881	412	Stone, sand and gravel.
Custer	2,704	W	Silver, zinc, lead, tungsten, sand and gravel, stone, copper, gold.
Elmore	434	W	Sand and gravel, stone, clays.
Franklin	80	142	Sand and gravel, stone.
Fremont	192	533	Stone.
Gem	897	W	Sand and gravel.
Gooding	462	508	Do.
Idaho	W	1,021	Stone, sand and gravel.
Jefferson	113	422	Stone.
Jerome	W	166	Sand and gravel.
Kootenai	W	W	Sand and gravel, stone.
Latah	W	W	Stone, clays.
Lemhi	W	W	Stone, sand and gravel, gypsum.
Lewis	58	125	Stone.
Lincoln	W	W	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Idaho, by county[1] —Continued

(Thousands)

County	1976	1977	Minerals produced in 1977 in order of value
Madison	403	827	Sand and gravel.
Minidoka	W	W	Lime, sand and gravel.
Nez Perce	W	W	Sand and gravel, stone.
Oneida	W	W	Stone, perlite, pumice.
Owyhee	1	W	Silver, gold.
Payette	500	308	Sand and gravel.
Power	31	W	Stone, sand and gravel.
Shoshone	110,977	W	Silver, lead, zinc, copper, antimony, gold, stone.
Teton	--	287	Sand and gravel.
Twin Falls	W	W	Lime, sand and gravel.
Valley	W	W	Stone, sand and gravel, tungsten.
Washington	W	W	Sand and gravel, stone.
Undistributed[3]	47,552	172,198	
Total[4]	210,246	252,670	

W Withheld to avoid disclosing company proprietary data; included with "Undistributed."
[1]Butte and Camas Counties are not listed because no production was reported.
[2]Less than 1/2 unit.
[3]Includes some stone which cannot be assigned to specific counties, gem stones, and values indicated by symbol W.
[4]Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Idaho business activity

		1976	1977[p]	Change, percent
Employment and labor force, annual average:				
Total civilian labor force	thousands	367.0	390.0	+6.3
Unemployment	do	21.0	23.0	+9.5
Employment (nonagricultural):				
Mining	do	3.3	3.5	+6.1
Manufacturing	do	52.0	53.8	+3.5
Contract construction	do	17.1	19.2	+12.3
Transportation and public utilities	do	17.1	17.9	+4.7
Wholesale and retail trade	do	72.8	76.4	+5.0
Finance, insurance, real estate	do	15.4	16.2	+5.2
Services	do	48.8	51.8	+6.2
Government	do	64.5	66.9	+3.7
Total nonagricultural employment	do	291.0	305.7	+5.1
Personal income:				
Total	millions	$4,729	$5,128	+8.4
Per capita		$5,678	$5,980	+5.3
Construction activity:				
Number of private and public residential units authorized		9,540	12,722	+33.4
Value of nonresidential construction	millions	$80.7	$106.3	+31.7
Value of State road contract awards	do	$46.5	$50.0	+7.5
Shipments of portland and masonry cement to and within the State	thousand short tons	513	512	-.2
Mineral production value:				
Total crude mineral value	millions	$210.2	$252.7	+20.2
Value per capita, resident population		$253	$295	+16.6
Value per square mile		$2,516	$3,024	+20.2

[p]Preliminary.

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

In other developments in the Coeur d'Alene district, the Sidney, Mascot, and Nabob mines were operated under lease by Intermountain Engineers, Inc. The 250-ton Nabob mill was rehabilitated and produced concentrates from the Little Pittsburgh mine. Development work continued at the Goldback claims east of Murray, the Royal Apex property north of Osburn, and the Daybreak mines property adjacent to Callahan Mining Co. holdings.

Outside the Coeur d'Alene district, the pouring of a large dore button signified the opening of the new DeLamar mine in Owyhee County. At full production, this open pit mine is expected to produce 2.5 million

ounces of silver and nearly 20,000 ounces of gold annually. The mine is operated by Earth Resources Co. in a joint venture with Canadian Superior Mining (U.S.), Ltd. and Superior Oil Co. Sidney Mining Co. leased its holdings adjacent to the DeLamar mine to ASARCO, but the lease was later dropped. Anglo-Bomarc Mines, Ltd. and Canadian Superior Mining (U.S.), Ltd. carried out an evaluation program on the Hercules property in Adams County. Sun Valley Lead-Silver Mines completed 500 feet of developmental work at its New Hope mine (Blaine County). In Custer County, Exxon Corp. completed exploration drilling at its Empire mine near Mackay. Also, serious consideration was given to reopening the Hoodoo mine (Custer County) on Slate Creek. Canadian Superior Mining continued evaluation of the Stibnite district in Valley County for its gold potential. Shoshone Silver mines continued developmental work in the Lakeview mining district in Bonner County. Noranda Mines, Ltd., has indicated it may seek an option for the Blackbird mine and Iron Creek properties (Lemhi County) owned by Hanna Mining Co.

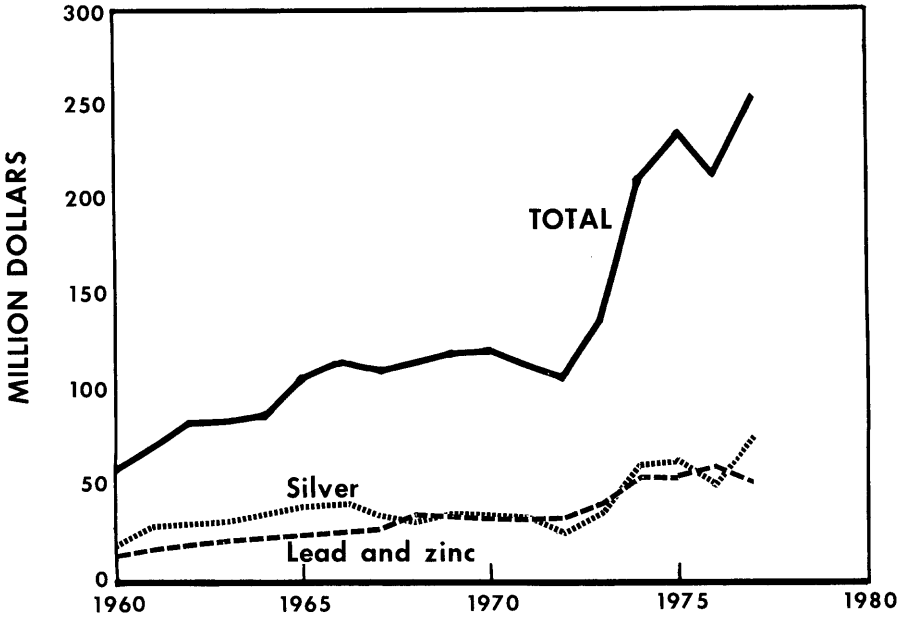

Figure 1.—Value of silver, lead and zinc, and total value of mineral production in Idaho.

Mineral exploration in the State expanded significantly, compared with exploration during 1976. Early estimates of exploration expenditures for all minerals exceeded $20 million. Several companies continued exploration and developmental work on molybdenum properties throughout the State. Bear Creek Mining Co. and Cominco Ltd. have done some developmental work on the molybdenum mineralization on Chilco Mountain in northern Kootenai County; Cominco has been active on its molybdenum property near Napoleon Hill in Lemhi County; and Union Carbide Corp. has done some developmental work on its property next to the Bear Creek-Cominco claims. Developmental work was continued by AMAX on a molybdenum deposit in Boise County near Grimes Pass, on the north side of Boise Basin and south of the South Fork of the Payette River. Also, Cyprus Mines Corp. (Tuscarora Mining Corp.) continued surface and underground drilling, metallurgical testing, and feasibility studies on its molybdenum prop-

erty on Thompson Creek, a tributary of the Salmon River between Challis and Clayton in Custer County.

Rising prices have resulted in intensified exploration for uranium, especially in northern Idaho. Companies active throughout the western panhandle in Boundary and Bonner Counties include Pechiney and Continental Oil Co. A reconnaissance geochemical stream-sediment sampling was done during the fall in the watersheds of Benewah, Latah, Kootenai, and Shoshone Counties. This sampling was conducted by the Geoenergy Co. of Las Vegas under a Department of Energy (DOE) contract in support of the National Uranium Resource Evaluation program.

A preliminary DOE report on the uranium and thorium content of intrusive rocks in northeastern Washington and northern Idaho has been released by Bendix Field Engineering Corp. Much of Idaho's panhandle has been surveyed for radioactive minerals using an airborne gamma spectrometer and stream-sediment, soil, and rock-sample geochemical techniques. Bendix also released a report on radioactive placers in the Big Meadow Area in Valley and Blaine Counties. Other potential sources of uranium are areas near Hailey and north of Sun Valley in Blaine County. Wyoming Minerals Corp., St. Joe American, Utah International Inc., Lucky Mc, and Exxon are active in these areas. Phillips Petroleum Co. reportedly drilled several holes south of Salmon near Sevenmile Creek.

The Challis volcanics in this area could prove to be the uranium-bearing rock units that are now being sought. Carbonaceous layers and sedimentary interbeds in these volcanics at other locations are known to contain uranium, for example, near the Stanley Basin at the north end of the Sawtooth Mountains.

In the nonmetallic sector, the predicted growth of the State's phosphate industry failed to materialize. As outlined in the final Environmental Impact Statement (EIS) released in October, seven companies had expressed an interest in expanding or starting 16 new mining operations; however, these plans appear to have been postponed because of a sharp drop in sales of elemental phosphorous and phosphate fertilizer.

Double Eagle Petroleum Co. of Casper, Wyo., was investigating zeolite deposits in Owyhee County. Ethel Corp. withdrew its application for patents on kyanite deposits on Woodrat Mountain in Clearwater County. Ethel was also working on claims that cover an anorthsite body in Shoshone County.

In 1977, mineral processing within the State added an estimated $350 million to the value of raw mineral products, a considerable drop from the value added in 1976. The 5-month strike at the Bunker Hill smelter complex was primarily responsible for this reduction.

Of the 9,000 people employed in the State's mineral industry in 1977, an estimated 4,200 were directly involved with mineral extraction, and 4,800 were associated with mineral reduction and processing. Average weekly gross earnings for those employed directly in mining amounted to $332. These mining personnel ranked second in earnings in the State, slightly behind personnel in the construction industry.

No fossil fuels were produced in the State during 1977. At yearend, four exploratory oil and gas wells were in progress; two of these were started in late summer. The exploratory drilling was confined to part of the Willard Overthrust Belt in southeastern Idaho, in Caribou and Bonneville Counties. The outlook is very encouraging for gas production in this area. The Idaho State Land Board approved extensions for oil and gas leases for which the 5-year development clause is due or past due; the extensions were granted to the end of 1978. Since 1903, an estimated 110 dry oil and gas wells have been drilled in the State. Coal exploration and development in Teton County remained at a standstill. An attempt was made to consolidate private coal rights and leases.

Legislation and Government Programs.—Proposed Federal laws, regulations, and land-use classifications caused a great deal of concern in the mineral sector. Revision of the General Mining Law of 1872 is before Congress. The Bureau of Land Management released proposed regulations for hard-rock mining on public lands and regulations pertaining to recordation of mining claims. The hard-rock regulations were not promulgated in final form but the recordation regulations were. Amid controversy, the U.S. Forest Service, which controls 39% of the land in Idaho, initiated new studies of roadless areas (RARE II) for possible inclusion in the national Wilderness System. Public input was solicited at workshops across the State in regard to the 8.2 million acres, or 24% of all Federal lands, that was involved. A special area, the

Gospel Peak-Buffalo Hump region in Idaho County, was the subject of public hearings and was added to H.R. 3454 as an instant wilderness area. A dispute over ambient air standards for smelter discharges is still unresolved between the EPA, the State of Idaho, and The Bunker Hill Co.

The 44th Idaho Legislature, 1st Regular Session, dealt with several significant State issues affecting the mineral sector. A bill was passed to prohibit dredging on the St. Joe River in Shoshone County. The State tax schedule for mine licenses was revised to include phosphate rock and limestone extraction. Some stock issues for small mines are now exempt from securities registration. The Idaho House of Representatives, through House Joint Memorials, petitioned the U.S. Congress to withhold designation of an area in Idaho outside Yellowstone National Park as a critical grizzly bear habitat under the Endangered Species Act. The Idaho House also requested a balanced management objective and rejection of excessive demands for designations of wilderness areas in the Nez Perce National Forest. New legislation was proposed, but remained under committee consideration, that dealt with water quality, water resource management, land use planning, and power plant sitings.

The Bureau of Mines conducted numerous mineral research projects in Idaho. The Spokane Mining Research Center was working on optimum shaft and support design criteria in the Coeur d'Alene district. Field work in the district included stress, deformation, and support-load measurements at the Lucky Friday, Star, Caladay, and Sunshine mines. Preliminary results indicated that deformation around a circular shaft may be less than deformation around a rectangular shaft.

Pillar destressing in advance of mining is being studied at the Star mine as a possible means for preventing rock bursts. The degree of destressing is being measured, and stope closure, stresses, and loads are being monitored throughout the process of mining the stope. A test level was driven through a destressed zone, and few ground control problems were encountered. Limited studies on electrokinetic dewatering and consolidation of underground fill were conducted at mines in the Coeur d'Alene district.

The Bureau's Western Field Operation Center in Spokane conducted mineral studies on the Fort Hall Indian Reservation and the following proposed wilderness areas in the State: Hells Canyon, Salmo-Priest, and the Snake River Wild and Scenic River. The Center also reviewed land use planning documents and environmental impact statements.

The Metallurgical Research Centers at Reno, Nev., Salt Lake City, Utah, and Albany, Oreg., continued research on Idaho mineral resources. Heap leaching techniques of gold-silver rock from Valley, Boise, and Owyhee Counties were tested at Reno and Salt Lake City. The Center in Albany pioneered various recovery experiments on by-product commodities associated with phosphate rock from Bingham, Caribou, and Bear Lake Counties.

The Idaho Bureau of Mines and Geology (IBMG) concentrated its efforts during 1977 on field mapping and reconnaissance geochemical studies. Ongoing programs included the mapping and sampling of the Trinity Mountain area of Elmore County (in cooperation with DOE) and the geologic study of Owyhee County (in cooperation with the U.S. Geological Survey).

IBMG initiated a mineral evaluation program to provide reconnaissance mineral data for the Gospel Peak-Buffalo Hump area in Idaho County. New publications included the final report on the Blackbird Mountain-Panther Creek area in Lemhi County (IBMG Pamphlet 167).

A Bureau of Mines-funded grant was given to the University of Idaho to examine the occurrence of leakage from tailings ponds and methods for leakage control. The Bunker Hill tailings ponds were used to determine the amount and location of seepage and the nature of contaminants in the water.

Employment.—Employment in the mineral extraction sector of the State's mineral industry increased slightly in 1977 from that of 1976; the averages for the number of men working and man-hours worked increased less than 1%. Total fatal injuries for the year exceeded the 1976 total by 1, and there were 67 more nonfatal accidents than there were in 1976. Of the four fatal accidents, one occurred in an underground metal mine, and the other three were associated with ore mills. Nondisabling injuries totaled 109 and their frequency rate was 15.85 per million man-hours.

Table 4.—Idaho: Mine employment and injury experience[1]

Year and industry	Average employees working daily	Employee-hours worked (thousands)	Number of disabling injuries reported		Frequency (injury rates per million employee-hours)	
			Fatal	Nonfatal	Fatal	Nonfatal
1976:						
Metal	2,507	4,430	2	142	0.45	32.05
Nonmetal	962	1,836	1	24	0.54	13.07
Sand and gravel	356	255	--	1	--	3.92
Stone	319	289	--	1	--	--
Total	4,144	6,811	3	168	0.44	24.66
1977:						
Metal	2,327	4,383	4	213	0.91	48.60
Nonmetal	982	1,801	--	17	--	9.44
Sand and gravel	518	371	--	2	--	5.40
Stone	358	320	--	3	--	9.37
Total	4,185	6,875	4	235	0.58	34.18

[1]All figures final.

Source: Mine Safety and Health Administration, U.S. Department of Labor.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Antimony production more than tripled from 133 short tons in 1976 to 446 short tons in 1977. The value of antimony produced also showed a substantial increase. The increased production resulted from the resumption of operations at the Sunshine mine after a lengthy strike that had affected production during much of the previous year. Idaho ranked first in the Nation in antimony production; it produced 73% of the total U.S. output.

Cadmium.—Idaho's output of cadmium came entirely from The Bunker Hill Co.'s zinc processing plant in Shoshone County. Compared with data from 1976, output decreased 63% and value decreased 55%. These decreases can be attributed to the labor strike that curtailed operations for nearly 5 months during 1977.

Cobalt.—No cobalt was produced in the State, but exploration continued in Lemhi County. Hanna leased the Blackbird mine to Noranda Mines, Ltd., of Toronto, Canada. A new publication released by IBMG indicates other areas in Lemhi County that may have potential for mineralization of cobalt, copper, or both.

Copper.—Production of copper from 18 mines increased 21%, but value rose only 16%. Much of the increased production came from the Sunshine mine, which resumed operations in March after the strike. Three mines produced over $1 million worth of copper. The Coeur d'Alene district produced 76% of the State's copper, and much of the remainder came from the Copper Cliff mine in Adams County.

Gold.—Gold production increased dramatically to 12,894 ounces. Nearly all of this increase came from Earth Resources' DeLamar mine (Owyhee County). Gold production from the base metal deposits in the Coeur d'Alene district remained nearly constant. No gold placer production was recorded for the year.

Lead.—In lead production, Idaho ranked

Table 5.—Idaho: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing (lode)[1]	Material sold or treated (short tons)	Gold		Silver	
			Troy ounces	Value	Troy ounces	Value
1975, total	29	1,935,363	2,529	$408,405	13,868,133	$61,297,147
1976, total	29	1,959,630	2,755	345,258	11,561,421	50,292,184
1977:						
Adams	1	150,000	5	742	58,282	269,263
Blaine	4	623	11	1,631	5,034	23,258
Custer	7	88,665	37	5,487	135,358	625,355
Shoshone	11	1,442,176	2,646	392,428	14,273,142	65,941,915
Undistributed[2]	2	396,236	10,195	1,512,020	820,148	3,789,084
Total	25	2,077,700	12,894	1,912,308	15,291,964	70,648,875

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1975, total	3,192	$4,099,129	50,395	$21,669,903	40,926	$31,922,354	$119,396,938
1976, total	3,362	4,680,235	53,636	24,779,910	46,586	34,473,313	114,570,900
1977:							
Adams	923	1,233,153	--	--	--	--	1,503,158
Blaine	(3)	468	18	11,269	10	6,939	43,565
Custer	24	31,408	469	287,832	620	426,672	1,376,754
Shoshone	3,105	4,148,376	46,771	28,717,148	30,368	20,892,918	120,092,785
Undistributed[2]	--	--	(3)	142	--	--	5,301,246
Total	4,052	5,413,405	47,258	29,016,391	30,998	21,326,529	128,317,508

[1]Operations at old mill or miscellaneous cleanups not counted as producing mines.
[2]Includes Bonner and Owyhee Counties combined to avoid disclosing company proprietary data.
[3]Less than 1/2 unit.

Table 6.—Idaho: Mine production of gold, silver, copper, lead, and zinc in 1977, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines[1]	Material sold or treated (thousand short tons)	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Gold, gold-silver, silver[2]	10	968	11,354	11,063	2,616	758	350
Copper	1	150	5	58	923	--	--
Lead, zinc[2]	7	196	1,101	2,603	305	18,620	2,682
Lead-zinc	9	764	434	1,568	208	27,879	27,966
Total lode material	25	2,078	12,894	15,292	4,052	[3]47,258	30,998

[1]Detail will not add to total because some mines produce more than one class of material.
[2]Combined to avoid disclosing company proprietary data.
[3]Data may not add to totals shown because of independent rounding.

Table 7.—Idaho: Mine production of gold, silver, copper, lead, and zinc in 1977, by type of material processed and method of recovery, in terms of recoverable metal

Type of material processed and method of recovery	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates	2,705	14,454	4,052	46,980	30,894
Direct smelting of ore and cyanidation[1]	10,189	838	(2)	278	104
Total	12,894	15,292	4,052	47,258	30,998

[1]Combined to avoid disclosing company proprietary data.
[2]Less than 1/2 unit.

second in the Nation, producing more than 47,000 short tons, or nearly 8% of the Nation's newly mined metal. Twenty-two mines accounted for this production; 11 operations in the Coeur d'Alenes produced 99% of the State's output. Production declined 12%, but value increased 17%. The loss of production was attributed to the 5-month strike at the Bunker Hill operation. Outside the Coeur d'Alenes, only the Clayton Silver mine (Custer County), had notable lead production.

Silver.—Production of silver rose 32%, despite labor difficulties in the Coeur d'Alene district. Both the Sunshine and Bunker Hill mines experienced strikes, but production returned to normal levels at yearend. Eleven mines in the district produced 93% of the State's total production; the Sunshine, Galena, Lucky Friday, and Coeur mines produced over 2 million ounces each.

Silver was also mined in Owyhee, Custer, and Adams Counties. The DeLamar mine (Owyhee County) was the only significant producer outside the Coeur d'Alene district.

Idaho ranked first in domestic silver production, accounting for 40% of the U.S. total. At the national level, Idaho's silver mines ranked according to production as follows: (1) Sunshine, (2) Galena, (4) Lucky Friday, (5) Coeur, (12) DeLamar, (13) Bunker Hill, and (14) Star.

Tungsten.—Two mining operations, in Custer and Valley Counties, reported tungsten production for the year. Value received was nearly 7 times more than that of 1976. The quantity produced increased 400%. Exploration for tungsten continued in two other central Idaho counties.

Vanadium.—Production and value of contained vanadium fell about 16% for the year. Vanadium is a byproduct of ferrophosphorus slag from phosphate processing operations in southeastern Idaho. Nearly 63% of the State's ferrophosphorus slag was treated at Kerr-McGee Corp.'s plant at Soda Springs, and the remainder was shipped to Union Carbide's Hot Springs, Ark., facility. Idaho ranked fourth in the Nation in vanadium production.

Zinc.—Zinc suffered a substantial decline in both production and value during the year; production dropped 34%, and value dropped 38%. Eleven mines in the Coeur d'Alene district produced 98% of the State's zinc; the only major producer outside the district was the Clayton Silver mine (Custer County).

The strike at the Bunker Hill mine and smelter was the primary factor responsible for the State's lower production for 1977. Hecla's Star mine surpassed the Bunker Hill mine as the State's leading zinc producer for the year.

Idaho ranked sixth in the Nation in zinc produced.

NONMETALS

Abrasives (Natural).—Idaho's 1977 production of garnet, a natural abrasive, fell 18%, compared with production for 1976; value fell 13%. Two operators in Benewah County, Emerald Creek Garnet Milling Co. and Idaho Garnet Abrasive Co., accounted for the State's total production. These two operations accounted for nearly 8% of the Nation's output of natural abrasives.

Barite.—Rocky Mountain Refractories was the State's only barite producer in 1977. Output from its Deer Park mine (Blaine County) remained constant, but the value received increased 17% over that of 1976.

Cement.—Production of cement by Idaho Portland Cement Co. in Bannock County, the State's only producer, increased 5%, and the value increased more than 26%. Stocks on hand at yearend were lower than in 1976. Numerous cement manufacturers made inquiries within the State regarding the location and extent of limestone deposits that could be used for cement.

Clays.—Clays production in 1977 remained steady, compared with production in 1976, but the value decreased by 53%. More than 50% of the total clay produced was from Benewah County; the remainder came from Clark, Elmore, and Latah Counties. Bentonite and fire clay accounted for less than 27% of the total clay production. Kaolin production was not significant for the year.

Fluorspar.—No fluorspar production was reported in 1977. Domestic Power Development Co. of Idaho Falls finished reconstruction of a mill near Challis in Custer County. The drilling of two additional fluorspar deposits in Custer County was completed.

Gem Stones.—The value of gem stones produced in Idaho was estimated to be $100,000, down 21% from the previous year's value. Opals (Clark County), star garnets (Benewah County), and fire opals and jasper (Owyhee County) were the most sought-after gems.

Gypsum.—Production of gypsum from the Lidy Hot Springs deposit in Lemhi County decreased 48%. Value received also

fell considerably. Lidy was the State's only gypsum operation.

Lime.—Production of lime fell 3%, but value rose 28%. Utah-Idaho Sugar Co. and Amalgamated Sugar Co. accounted for the State's total production. Minidoka County was the source of 36% of the State's total lime output, and the remainder came from Bonneville, Canyon, and Twin Falls Counties. The entire output was used for sugar beet processing.

Perlite.—Oneida Perlite Corp. in Oneida County continued to be the State's only producer of perlite. Crude perlite production remained about the same as that in 1976, but value received was up 50%. Nearly half the crude production was used to make expanded perlite, which had increased substantially in value since the previous year. Firewall insulation was the largest use of expanded perlite. During the year, Oneida Perlite Corp. applied for a mineral patent on its perlite mining claims.

Phosphate Rock.—Total marketable production of phosphate rock decreased 7%, but its value increased 51%. Five mines operated during the year, one in Bingham County and four in Caribou County. J. R. Simplot Co.'s Gay mine (Bingham County) was the State's largest phosphate producer. Phosphate ore usage was evenly split between elemental phosphorus and wet-process phosphoric acid.

The final EIS on Idaho phosphate was released during the year; however, the moratorium on leasing was not lifted.

Alumet's phosphate project continued in abeyance; only some detailed exploration work was completed.

Pumice.—Pumiceous material production increased 5%, but total value dropped 9%. Three operations were active during the year: Amcor, Inc., and Producers Pumice in Bonneville County, and Hess Pumice Products in Oneida County. Amcor is the largest pumice producer in the State. All production from Bonneville County was used in concrete aggregate; pumice from Oneida County was used for various abrasives and a concrete admixture.

Sand and Gravel.—Sand and gravel production and value increased 18% and 33%, respectively, for the year. A total of 95 quarries were active during the year. Ada, Canyon, and Bonneville Counties each produced over 1 million tons, and Bear Lake County produced over 500 thousand tons. Five companies produced nearly 34% of the State's total output.

Stone.—Crushed stone for flux stone, roadstone, riprap, and other uses was produced by 19 companies at 67 quarries. Output fell 11% to 3.08 million tons valued at $8 million. Leading producers were the U.S. Forest Service, the State Department of Transportation, and Idaho Portland Cement Co. Bannock County production exceeded 500,000 tons, while each of the following counties produced more than 200,000 tons in 1977: Caribou, Fremont, Idaho, Latah, and Oneida.

Idaho Travertine Corp. quarried dimension marble for rough blocks, rough construction stone, and rubble from quarries in Clark and Bonneville Counties. Dimension stone was less than 1% of the State's total stone output.

[1]State Liaison Officer, Bureau of Mines, Boise, Idaho.
[2]Supervisory geologist, Idaho Bureau of Mines and Geology, Moscow, Idaho.

Table 8.—Idaho: Construction and industrial sand and gravel sold or used by producers, in 1977

	Quantity (thousand short tons)	Value (thousands)	Value per ton
Construction:			
Sand	1,926	$3,887	$2.02
Gravel	5,824	11,395	1.96
Total or average	7,750	15,282	1.97
Industrial:			
Sand	W	W	W
Gravel	W	W	W

W Withheld to avoid disclosing company proprietary data.

Table 9.—Idaho: Construction sand and gravel sold or used in 1977, by major use category

	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	2,208	$5,309	$2.40
Concrete products	172	466	2.71
Asphaltic concrete	1,156	3,015	2.61
Roadbase and coverings	3,224	5,265	1.63
Fill	940	1,140	1.21
Other uses	49	89	1.80
Total[1] or average	7,750	15,282	1.97

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

Table 10.—Principal producers

Commodity and company	Address	Type of activity	County
METALS			
Antimony:			
Sunshine Mining Co	Kellogg, ID 83837	Mine and plant	Shoshone.
Copper:			
ASARCO Incorporated	Wallace, ID 83873	Mine and mill	Do.
Silver King Mines, Inc	1204 Deseret Bldg. Salt Lake City, UT 84111	do	Adams.
Gold:			
Earth Resources Co	Box 52 Jordan Valley, OR 97910	do	Owyhee.
Hecla Mining Co	Wallace, ID 83873	do	Shoshone.
Lead:			
The Bunker Hill Co	Kellogg, ID 83837	Mine and plant	Do.
Hecla Mining Co	Wallace, ID 83873	Mine and mill	Do.
Silver:			
ASARCO Incorporated	do	Mine and mill	Do.
Sunshine Mining Co	Kellogg, ID 83837	Mine and plant	Do.
Tungsten:			
R. M. Barrett	Continental Bank Bldg. Salt Lake City, UT 84101	Underground mine	Custer.
Vanadium:			
Kerr-McGee Corp	Soda Springs, ID 83276	Mine	Caribou.
Zinc:			
The Bunker Hill Co	Kellogg, ID 83837	Mine and plant	Shoshone.
Hecla Mining Co	Wallace, ID 83873	Mine and mill	Do.
NONMETALS			
Abrasives:			
Emerald Creek Garnet Milling Co	Fernwood, ID 83830	Mine and plant	Benewah.
Idaho Garnet Abrasive Co	Kellogg, ID 83837	do	Do.
Barite:			
Rocky Mountain Refractories	Hailey, ID 83333	Pit	Blaine.
Cement:			
Idaho Portland Cement Co	Inkom, ID 83245	Plant	Bannock.
Clays:			
A. P. Green Refractories Co	Box 158 Troy, ID 83871	Pit and plant	Latah.
Interpace Co	Ione, CA 95640	do	Benewah.
Gypsum:			
E. J. Wilson & Sons	Dubois, ID 83423	Pit	Lemhi.
Lime:			
Amalgamated Sugar Co	First Security Bank Ogden, UT 84401	Plants	Canyon, Minidoka, Twin Falls.
Utah Idaho Sugar Co	Box 1855 Idaho Falls, ID 83410	Plant	Bonneville.
Perlite:			
Oneida Perlite Corp	Malad City, ID 83252	Pit and plant	Oneida.
Phosphate rock:			
Beker Industries	Box 37 Conda, ID 83230	Pit	Caribou.
J. R. Simplot Co	Pocatello, ID 83201	Mine	Bingham.

Table 10.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
NONMETALS —Continued			
Pumice:			
Amcor, Inc	Box 1141 Idaho Falls, ID 83401	Pit	Bonneville.
Producers Pumice	Ammon, ID 83401	Mine	Do.
Sand and gravel:			
Idaho Concrete Pipe Co	222 Caldwell Blvd. Nampa, ID 83651	Pit	Various.
MONROC	Box 1221 Idaho Falls, ID 83401	Pit	Do.
Stone:			
Deatley Corp	Box 648 Lewiston, ID 83501	Quarry	Bonner.

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