

Developments in Minerals, Mining,
and Energy Resources
in Idaho for 1977

Carl N. Savage
Earl H. Bennett
Maynard M. Miller

Idaho Geological Survey
University of Idaho
Moscow, Idaho 83843

Technical Report 78-1
March 1978

Developments in Minerals, Mining, and Energy Resources in Idaho for 1977

Carl N. Savage
Earl H. Bennett
Maynard M. Miller

Technical Report 78-1
1978

Idaho Geological Survey
University of Idaho
Moscow, Idaho 83844

DEVELOPMENTS IN MINERALS, MINING, AND ENERGY RESOURCES
IN IDAHO FOR 1977

Carl N. Savage
Earl H. Bennett
Maynard M. Miller

Idaho Geological Survey
University of Idaho
Moscow, Idaho 83843

Technical Report 78-1
March 1978

TABLE OF CONTENTS

	Page
INTRODUCTION	1
MINERAL ECONOMICS AND RELATED TOPICS	2
SOME EFFECTS OF NEW MINING LEGISLATION AND REGULATIONS	7
ENERGY RESOURCES	10
Oil and Gas Developments	10
Geothermal Activity	13
Prospects for Coal Mining	15
SELECTED COMMODITY HIGHLIGHTS, 1976-1977	16
Metallic Minerals	16
Gold, Silver, Lead, Zinc, Copper	16
The Coeur d' Alene Mining District	16
Other Districts in Idaho	19
Industrial Rocks and Minerals	25
Phosphate	25
Zeolites	26
Diatomite	27
Bentonite	27
Sand, Gravel, and Stone	27
Garnet	28
Kyanite	28
Barium	29
Other Industrial-Use Mineral Commodities	29

LIST OF TABLES

1. The value of mineral production in Idaho, 1971-1977.
2. Mineral production in Idaho for 1977.

DEVELOPMENTS IN MINERALS, MINING, AND ENERGY RESOURCES
IN IDAHO FOR 1977¹

by

Carl N. Savage²,

Earl H. Bennett³,

and

Maynard M. Miller⁴

INTRODUCTION

At best it is difficult to prepare an annual report too soon after the year is complete and before all data have become available. Some of the following selected details and interpretations, therefore, may be subject to change as the new year progresses. In general, it is clear that trends in mineral, mining, and energy resource development in Idaho during 1977 reflect more chaotic conditions and uncertainty than at any time during the past few years.

The information in this report has been gathered from many sources, with a degree of accuracy ranging from rumor to fact. Sources include

¹The following report has been revised from that presented at the Regional Developments Section, Northwest Mining Convention, Spokane, Washington, in December 1977 by Dr. Maynard M. Miller.

²Associate Chief, Idaho Bureau of Mines and Geology, Moscow, Idaho 83843.

³Supervisor of Geology Section, Idaho Bureau of Mines and Geology, Moscow, Idaho 83843.

⁴Chief, Idaho Bureau of Mines and Geology, Moscow, Idaho 83843.

written and oral communications and published materials. Some details have come from field observations by IBMG staff, from the U. S. Bureau of Mines, from people affiliated with mining companies and industry, from prospectors, from the public, and from the news media. Responses to questionnaires sent to small mining companies provide certain details that the companies have cared to make public. No privileged information has been solicited or used.

The status of oil and gas exploration is supplied principally by Arthur D. Zierold, chief of the Idaho Bureau of Minerals, Department of Lands, Boise. The Bureau of Minerals acts as the Idaho Oil and Gas Conservation Commission. It also handles regulatory duties, including mineral leasing on state lands.

Late news releases of interest to Idaho's mining industry include the following selected items:

Jim Halley, former president of Bunker Hill Company has been appointed vice-president of Special Projects and assistant to the president of Gulf Resources Chemical Corporation, parent company of Bunker Hill. E. Viet Howard, formerly Bunker Hill's vice-president of metallurgy, will take over the job as company president.

MINERAL ECONOMICS AND RELATED TOPICS

For 1976 Idaho's mineral production was valued at more than \$210 million according to final figures released by the U. S. Bureau of Mines (Tables 1 and 2). This total represents a decrease of approximately 10 percent in the state's mineral value below that reported in 1975 and is

the greatest yearly drop recorded in the last six years. Table 1 lists the annual mineral production in Idaho since 1971.

For 1977 the U. S. Bureau of Mines preliminary estimate indicates an approximate 3.5 percent gain over 1976; however, this gain is still 8.6 percent below 1975's gain. The expectation is that 1978 will continue the trend of moderate-to-higher gains in mineral production and value, assuming that international relations are sufficiently stable to permit the international minerals commodity market to self-regulate and stabilize and that no other unforeseen factors restrain production growth.

TABLE 1

The value of mineral production in Idaho, 1971-1977

Year	Value	Percentage gain (+) or loss (-)
1971	\$112,280,000	- 6.6
1972	106,206,000	- 5.7
1973	136,081,000	+ 28.1
1974	208,558,000	+ 53.2
1975	253,788,000	+ 12.1
1976	210,246,000*	- 10.0
<u>1977</u>	217,839,000**	+ 3.5

Source: U. S. Bureau of Mines

*Final

**Preliminary estimate

Twenty mineral commodities, including 8 metallic and 11 nonmetallic or industrial rocks and minerals, were produced within the state (Table 2). Silver was the leading mineral commodity in revenue received, followed by phosphate rock, lead, zinc, and copper. The value of

TABLE 2

Mineral production in Idaho for 1977 1/

Mineral	1976		1977 p/	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Antimony ore and concentrate, antimony content short tons--	133	282	495	W
Copper (recoverable content of ores, etc.) short tons--	3,362	4,680	3,800	5,069
Gem stones-----	NA	126	NA	120
Gold (recoverable content of ores, etc.) troy ounces--	2,755	345	12,900	1,912
Lead (recoverable content of ores, etc.) short tons--	53,636	24,780	45,900	28,091
Sand and gravel <u>2/</u> -----thousand short tons--	6,549	11,504	7,000	12,600
Silver (recoverable content of ores, etc.) thousand troy ounces--	11,561	50,292	15,171	69,788
Stone <u>3/</u> -----thousand short tons--	3,462	9,122	3,213	7,992
Zinc (recoverable content of ores, etc.) short tons--	46,586	34,473	31,700	21,810
Value of items that cannot be disclosed: abrasives (natural), barite, cement (Portland and masonry), clays (bentonite, common clay, fire clay, kaolin), gypsum, lime, perlite, phosphate rock, pumice, sand and gravel (industrial), stone (dimension), tungsten, vanadium, and values indicated by symbol W-----	XX	74,642	XX	70,457
TOTAL-----	XX	210,246	XX	217,839

Source: U. S. Bureau of Mines' Annual Preliminary Estimates, 1977.

p/ Preliminary. W withheld to avoid disclosing individual company confidential data.

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

2/ Excludes industrial sand and gravel.

3/ Excludes dimension stone.

metallic minerals accounted for about 64 percent of the state's total mineral output, according to the U. S. Bureau of Mines.

For 1976 the decrease in mineral revenue was caused by a nine-month labor strike at the Sunshine mine near Kellogg. The continuance of the strike at the Sunshine mine through March 1977 and the five-month labor strike from May to October, 1977, at the Bunker Hill mine and smelter in Kellogg has limited production for 1977 as well. The costs of complying with environmental regulations and the failure to meet some of these requirements have had further adverse effects on the state's mineral economy.

Generally lower metal prices have plagued producers throughout the state and country. Full production from the new Coeur mine at Osburn, Shoshone County and from the DeLamar mine, west of Silver City in Owyhee County, has boosted metal supplies. In the future, the value of silver is expected to increase. Lead and zinc, especially zinc, are expected to continue to be somewhat depressed. At least one knowledgeable person close to the silver market expressed the opinion that the price of silver in 1978 has no place to go but up.

Copper, priced at \$.74 a pound in March 1977, by autumn fell to a discouraging low of \$.60 a pound. Copper gained \$.03 a pound in December, but further increases might be slow in 1978. Silver started the year at around \$4.50 an ounce and by the end of November 1977 was \$4.69. Silver has been fluctuating in a pattern similar to gold, which was selling in November for \$157 an ounce and at one point this year reached \$166 an ounce. Almost the entire increase in Idaho's gold production in 1977 may be attributed to the DeLamar silver mine in Owyhee County. Lead has been selling at a steady level near \$.31 a pound all year. In contrast

zinc, which is also subject to international competition, fell from \$.37 a pound early in 1977 to a low of \$.30½ a pound in November.

As reported by the U. S. Department of Energy in October, in the six-month interval between January 1 and July 1, 1977, the average price per pound of uranium oxide increased from \$15 a pound to \$17.20 a pound. This increase has stimulated new exploration in the state.

The phosphate industry in southeastern Idaho reported a decrease in production and revenue because of the falling world demand for phosphate fertilizer. The situation has been disappointing because the upsurge of new production predicted for this year did not materialize. Phosphate production from this important area is expected to increase at only a moderate rate of 2.5 percent a year and will probably serve to satisfy domestic needs only.

The final federal environmental impact statement for the phosphate district was concluded. It approves of increases in phosphate mining, ore processing, new applications for leases, and prospecting permits.

Mineral exploration in Idaho, according to the U. S. Bureau of Mines, approached \$20 million. General exploration is concentrated in Shoshone, Adams, Washington, Elmore, Valley, Owyhee, and Lemhi Counties. Exploration for phosphate rock and natural gas and oil is largely in Bear Lake, Caribou, and Bonneville Counties. The new interest in commercial sources of uranium is greatest in Custer, Blaine, Boundary, and Bonner Counties.

The wages for mineral processing and mining have sunk below earlier estimates primarily because of lower metal prices and labor strikes.

SOME EFFECTS OF NEW MINING LEGISLATION AND REGULATIONS

Several federal and state legislative acts implemented during 1976 have had an immediate impact on mining activity in Idaho. For example, the U. S. Bureau of Land Management (BLM) has started recording some of the first existing claims, as required by the Federal Land Policy and Management Act of 1976 (BLM "Organic Act"). Under this law, owners of existing unpatented mining, mill site, or underground mining claims that were located on or before October 21, 1976, must comply with the new regulations which require owners to file a record of their claims with the BLM within three years of the effective date of the Organic Act. The annual reporting of assessment work is also required. Failure to file automatically constitutes an abandonment of the claim under the new law. This means that considerable paper work will be required when the recording of an estimated 150,000 claims already located in Idaho begins in earnest. It is also probable that many claims will have to be forfeited or abandoned and that a number of small operations will be forfeited because of a lack of awareness of the provisions of this new act.

The BLM has also announced procedures governing the sale of mineral rights to private land owners who hold surface rights. It is possible that such sales will be infrequent, although a limited authority to sell such mineral rights has been granted to the Secretary of the Interior by the BLM "Organic Act."

The U. S. Forest Service (USFS) has initiated the RARE II program, a replacement of RARE I, to investigate the possibility of incorporating roadless areas into the wilderness classification. The USFS has held

public hearings on proposals for roadless areas. In Idaho, 8.2 million acres or more are likely to be evaluated for classification as a result of the RARE II program. John McGuire, chief of the U. S. Forest Service, has publicly stated that much of this acreage will be opened to multiple use; however, considerable portions of this vast area are undoubtedly destined for wilderness classification.

During 1977, considerable public controversy arose over one of the first RARE II proposals on an area surrounding the Gospel Peak-Buffalo Hump highlands east of Grangeville in Idaho County. In mid-1977 a "compromise" between the Grangeville Chamber of Commerce and the representatives of environmental groups released 45,000 acres for immediate timber harvest and multiple use, designated 92,000 acres for study and subsequent classification, and allocated 206,000 acres for national wilderness classification. Senator Frank Church of Idaho mediated the discussions in a series of public meetings.

Some recognition of mineral potential in the area was noted during the public discussions. As a result, although the Wilderness Act of 1964 permits mining and prospecting in proposed wilderness areas until 1983, an amendment added to the Endangered American Wilderness Act by the efforts of Idaho's Senator James McClure extended this deadline to 1988 in the Gospel-Hump RARE II pilot case. There has been an increasing need for information about many potentially mineralized areas like this one scattered over the state. In 1978 the Idaho Bureau of Mines and Geology will open-file the results of its reconnaissance geological and mineral study in the Buffalo Hump area during the summer 1977.

Recent reports indicate that the U. S. Bureau of Land Management is beginning to examine roadless areas under its jurisdiction for potential

classification as Wilderness areas. The 1977 Idaho state legislature passed an amendment to the Idaho Dredge and Placer Mining Protection Act. This amendment withdraws "the St. Joe River and its tributaries" in north Idaho from dredge mining operations. Recognition of the fact, however, that two important commercial garnet dredging operations have long been in operation on two of the St. Joe's tributaries has led to specifically exempting the St. Maries River and its tributaries from these legislative constraints. Also in the news this year are the reports of court injunctions that prohibit dredge mining of garnet sand on Scat and Sherlock Creeks, which are two upper tributaries of the St. Joe River. The controversy over Sherlock Creek has had a particularly long history.

As a further manifestation of regulatory impacts on mining, the federal government has obtained a temporary injunction against Rick Knoblock and Associates for failing to file an operating plan on claims near Grandjean on the South Fork of the Payette River. Because these claims are within the Sawtooth National Recreational Area, this action could result in further litigation to determine whether the regulations of national recreation areas are, in fact, in conflict with existing federal mining laws.

In December 1977, a group of mining men interested in the old Mineral Hill district near Shoup on the Salmon River "activated the district." It was stated that this action was initiated in an attempt to validate and "protect the district" established years ago under an 1872 mining law. This district is a 35 square-mile area around Shoup. According to Robert Milne of Salmon, president of an association

established to "protect the district," the recent BLM Organic Act is a "legal infringement of the rights of owners" (Wallace Miner, December 1, 1977).

ENERGY RESOURCES

OIL AND GAS DEVELOPMENTS

Attempts to locate oil and gas in southeastern Idaho continued with exploratory drilling and seismic operations. The more optimistic expect to discover hydrocarbons in Idaho in the near future. Officials of the Hunt Energy Corporation of Dallas issued a news release in October stating that if permitted to drill in the bed of Bear Lake in southeastern Idaho, success would surely follow.

Most activity has been concentrated on the border regions between northern Utah, southwestern Wyoming, and western Montana, with some activity, especially geophysical exploration, in eastern Idaho in the geologic formations of the "Idaho-Wyoming Overthrust Belt."

In January 1975, the first oil field was discovered in this complex thrust fault zone in Summit County, Utah (approximately 40 miles east of Salt Lake City). Known as the Pineview field, developments here led to over 14 successful wells producing from two formations. Shortly after Pineview, the Ryckman Creek field was discovered 11 miles northeast of Evanstown, Wyoming. Exploratory drilling has now culminated in seven fields under development in Uinta County of Wyoming and Rich and Summit Counties of Utah. Nearest to Idaho is the recent American Quasar discovery approximately 10 miles south of the state line and north of

Randolph, Utah. Initial flow tests from the Dinwoody Formation of Triassic age (at approximately 9,400+ feet in depth) report 20 million cubic feet of gas per day under high pressure. Production also reportedly may be derived from the Phosphoria Formation of Permian age at approximately 10,100 feet below the well head. This well is known as the 20-1 Hogback ridge.

In December, permission was granted to American Quasar by the Idaho Natural Oil and Gas Conservation Commission to drill exploratory wells in Bingham and Bear Lake Counties. Located on private property, the well in Bingham County is scheduled to penetrate to 17,500 feet below the surface. This would make it the deepest well in the state.

Since the initial discoveries in or adjacent to the overthrust belt, extensive leasing has followed and major geophysical surveys of the region have been conducted to determine potential drilling locations. In 1976, two major exploratory wells were drilled in Idaho. The May Petroleum well in Elk Valley, Caribou County, was drilled to a depth of 3,905 feet into the Nugget Sandstone, but it proved unproductive. In February American Quasar drilled to a depth of 14,330 feet at its Black Mountain prospect in Bonneville County, but this also was nonproductive. Though both wells have been abandoned, the logged data are valuable for determining the nature of rock formations, subsurface structures, and the location of other potential drilling areas. The well logs are particularly useful because so little is known about the deeper zones in this geologically complex region.

Currently there are three drilling ventures in separate areas of southeastern Idaho:

1. Federal 1-8 near Elk Valley in Caribou County is scheduled as a 13,200-foot hole to test the Madison Formation. Location is on a federal lease with surface rights administered by the U. S. Forest Service. May Petroleum Company is the drilling contractor. The well is approximately 2.5 miles north of an earlier, unsuccessful test well. It has been estimated that anticipated drilling problems will boost the cost of drilling at this new location to \$2.8 million. The estimated completion date is February 1, 1978.
2. Jensen 22-1 is approximately 3.5 miles south of Montpelier in Bear Lake County. The drilling is being done by American Quasar Petroleum Company. This site is easily accessible and located on a fee lease basis. The well is scheduled to be drilled to a depth of 10,400 feet. Jensen 22-1 is approximately 27 miles north-northwest of the alleged gas discovery by American Quasar Petroleum Company's well 20-1 on Hogback ridge in Rich County, Utah.
3. Cook 26-1 is approximately 6 miles west of Driggs in Teton County. American Petroleum Company is the operator upon a fee lease. Scheduled depth is to be 10,500 feet. This location is not far from a test well drilled to 12,700 feet by Phillips Petroleum in 1951-53. The Phillips well was commercially nonproductive, but it revealed some favorable signs of petroliferous materials. Cook 26-1 is close to Idaho's principal potential coal commodities in the Horseshoe Creek district. City Service has also been active in this area in the past three years.

All locations under development are the result of intensive exploration and analysis, and these deserve close monitoring of their potential for establishing the first productive oil or gas field in Idaho. Most land holdings in eastern Idaho (private, state and federal) are now under lease or in application for lease. Although no producing gas or petroleum wells are currently operating within the state, by all standards the exploratory wildcat drilling is still small in scope.

GEOHERMAL ACTIVITY

The interest in Idaho's geothermal potential has continued, although some of the enthusiasm of the past several years has waned. The activity in 1977 has been in the Snake River Plain. Early in the year, the U. S. Geological Survey, the Department of Energy (DOE), the U. S. Forest Service, and the Idaho Department of Water Resources signed a joint agreement to investigate the geothermal potential of 19,000 square miles in different sections of the plain. When completed, this investigation will aid in classifying other areas for competitive leasing. It will also assist efforts toward a more effective public land administration and a determination of the extent to which Idaho's geothermal potential is, in fact, a valuable energy resource. More specifically, it will help establish whether appreciable amounts of power can be generated or whether this resource can best be used for space heating. As a coordinated federal-state project this joint agreement appears to have three major objectives: (1) to develop a geological model of the eastern Snake River Plain; (2) to use this model to evaluate the probability of additional major geothermal resources occurring within the study area; and (3) to test by deep drilling the

areas having the greatest potential as a major geothermal resource. Currently, eight areas in Idaho containing about 175,000 acres are classified as Known Geothermal Resources Areas (KGRA).

The DOE has completed three production wells and an experimental injection well in the Raft River geothermal field in Cassia County. Plans for the site include a 10-megawatt power plant to be driven by geothermal energy. In December 1976, the Idaho National Engineering Laboratory (INEL) released a study entitled, *Geothermal R & D Project Report (TREE-1030) for the Period July 1, 1976 to September 30, 1976*. This report was conducted under contract for the former U. S. Energy Research and Development Administration (ERDA now DOE).

Studies have continued in the Boise Front geothermal area. Indications are that the useable aquifer may be larger and more efficient than previously estimated. This year's proposals include such uses as possibly heating homes and parts of downtown Boise, including state government offices.

Although losing some earlier enthusiasm and dropping many early leases because of excessive legal constraints, private industry has still been involved in geothermal exploration on the Snake River Plain and areas to the south. A newscast early in 1977 referred to a statement from the Pacific Energy Company that energy could be produced from geothermal sources in excess of that required to supply all of the city of Idaho Falls in southeastern Idaho. The Sun Energy Development Company has been doing extensive geophysical exploration on geothermal resources around Preston in Franklin County. Geophysical and geologic investigations have also continued in the Sugar City area. It has been proposed that a rebuilt Sugar City (destroyed by the failure of Teton

Dam in eastern Idaho and the subsequent destructive flood) can be heated with geothermal energy. This would be contingent on the reconstruction of the city and on the availability of geothermal resources.

An announcement in October 1977 by the U. S. Department of the Interior that federal regulations may be simplified may encourage further interest and activity in geothermal exploration and development, including the use of this resource for large-scale greenhouse agriculture.

Phillips Petroleum has completed drilling a geothermal well in southwestern Idaho near Weiser in Washington County. Occidental Petroleum is drilling several shallow wells; one of these is on state land in the Island Park area of Fremont County, west of Yellowstone Park.

PROSPECTS FOR COAL MINING

In July at the Idaho Mining Association's meeting in Sun Valley, Spenst Hansen, a geological consultant, reported on the prospects of coal mining in the Horseshoe Creek district near Driggs in Teton County. According to Hansen, a substantial seam of high quality, low-sulfur coal could be developed as an underground mine, assuming that private property constraints and cost analyses are resolved.

SELECTED COMMODITY HIGHLIGHTS, 1976-1977

METALLIC MINERALS

Gold, Silver, Lead, Zinc, Copper

The Coeur d' Alene mining district. The Coeur d' Alene mining district has continued to lead the state in metallic mineral production. In 1976 production was 11,504,000 ounces of silver, 56,136 tons of lead, 48,753 tons of zinc, 2,277 ounces of gold, and 2,350 tons of copper, according to an industry spokesman. Production for 1977 from this district is not separated from total state preliminary estimates in Table 2.

The Sunshine mine, celebrated as the largest domestic silver mine in the U.S., has been in the spotlight in the Coeur d' Alene mining district throughout 1977. A year-long strike at the mine lasted from March 1976 to March 1977 and is primarily responsible for the decrease in the district's production from 13.6 million ounces of silver in 1975 to 11.5 million ounces in 1976. Because this shutdown extended well into 1977, the production figures for 1977 will be adversely affected.

Of national interest is the takeover of the Sunshine mine by Great Western United, a Denver, Colorado, firm controlled by the Hunt Brothers of Dallas, Texas. Nelson Bunker Hunt and Herbert Hunt, who have had a long time interest in silver, visited the Sunshine mine in November 1977.

Production at the Bunker Hill mine, the largest mine in northern Idaho, was adversely affected by a strike that lasted from May 1977 to September 1977. The company's smelter remained open during the strike, however, and was run at about 60 percent capacity by supervisory personnel.

Bunker Hill's loss in production will also reduce the year's total silver production. Of further interest is the newly discovered silver deposits which may extend the life of the Crescent mine that Bunker Hill scheduled to close this year due to ore depletion. New ideas developed by Bunker Hill's exploration staff on the folding and fracturing of the rocks in the mine may prove useful as an exploratory tool throughout the district. A November 1977 field conference in the Coeur d' Alene mining district, cosponsored by the Society of Economic Geologists and the University of Idaho College of Mines and Earth Resources in cooperation with the Idaho Bureau of Mines and Geology, provided a fine opportunity to discuss new developments in the geologic understanding of the region. Twenty-three papers were given at the conference, the proceedings of which may be published by the Idaho Bureau of Mines and Geology.

Environmental problems have continued to plague the Bunker Hill Company. Areas of concern involve an EPA suit charging the company with polluting Silver King Creek, which flows adjacent to Bunker Hill's smelter operations near Kellogg, and the law suits and fines on alleged lead emissions by the company.

On a more positive side, it is interesting to note that the operation of an underground greenhouse inside the Bunker Hill mine continues to produce plant seedlings for Bunker Hill's revegetation program. This project has involved the planting of 18,000 acres between Elizabeth Park and Pinehurst, Idaho. The company has received the Idaho Tree Farmer's Association Forestry award in recognition of the project.

Hecla Mining Company's Star Morning unit and the Lucky Friday mine have continued full operations. Hecla discovered a promising mineralized zone over 2 feet wide while exploring the Day, Independence, and

Abbot Project (DIA) mineralized ground beneath the Old Gold Hunter mine. The DIA property was being explored by a crosscut from the Lucky Friday mine when the discovery occurred.

Late in the year an agreement with Hecla to lease the Atlas mine near Mullan was stalled. Previously the mine had been leased by Noranda, Ltd.

Coeur d' Alene Mine Corporation's new Coeur mine is in full production and should reach its 1977 goal of 2.2 million ounces of silver. The Coeur is said to be the nation's fourth largest silver mine. The mine is leased by ASARCO, Callahan Mining Company, and Day Mines, Inc. Serious negotiations are under way between American Silver, ASARCO, and Coeur d' Alene Mines to plan a program of development for the American Standard adjacent to the new Coeur mine.

Production continues from the Galena mine, the nation's second largest producer of silver, owned by Callahan Mining Company and operated by ASARCO. ASARCO has terminated its lease on the Consolidated Silver project. Work was suspended on this project back in 1972.

Day Mines is enjoying returns from its interests in the new Coeur mine (25 percent interest) and is active in several other programs in the district. The Caladay project just east of the Galena mine is on standby, awaiting a development agreement. Exploration has continued in Day's Tamarack mine, and some production is expected by the year's end.

Big Creek Apex will benefit from extensive showings of silver mineralization discovered on the 4,000-foot level of the Sunshine mine in the Silver Syndicate fault zone. Royal Apex Silver has announced that several stringers of silver-bearing tetrahedrite and galena have been intercepted on its property north of Mullan.

The assets of Galconda Mining Corp., consisting of 1,100 acres of patented land and 400 acres of unpatented land near the Galconda concentrator between Wallace and Mullan, have been sold to Harry F. Magnuson of Wallace. The deal includes the concentrator and capital stock holdings in other companies. It is one of the largest transactions in recent years involving mining lands and assets in Idaho.

Exploration on several smaller properties within the district continues. The Sidney, Mascot, and Nabob mines have been operated under lease by Intermountain Engineers, Inc. The 250-ton Nabob mill has been rehabilitated and is producing zinc and lead-silver concentrates from a new ore shoot in Mascot's Little Pittsburgh mine. Production is to begin at the Sidney mine.

Silver Scott Mines has entered an agreement with Silver Baron Mining Company for a 20-year lease on the Lost Cabin mine at Murray. Development work continues on the Goldback claims just east of Murray. Silver Crystal mines are continuing development work on the Bear Top property near Murray. Two large mineralized zones are being evaluated on Daybreak Mines Inc. property adjacent to Callahan Mining Company holdings. The zones were discovered when overburden that was to be used as road ballast was removed by the Idaho State Highway Department. Diamond drilling continues on the Gold Creek mines property west of Mullan.

Other districts in Idaho. In general, Idaho has experienced an increasing resurgence of interest in many of its widespread, old and essentially abandoned mining camps and in other known metallogenic provinces. Operations have been conducted by both well-known mining companies or their subsidiaries and by single and multiple independent prospectors.

The first bars of silver bullion produced in southwestern Idaho for many years were poured during April, signifying the opening of Earth Resources Company's DeLamar mine in Owyhee County. The DeLamar mine is now in full production, with an expected annual yield of 2.5 million ounces of silver and 16,500 ounces of gold, according to a year-end report. It has been predicted that this mine will be the nation's second or third largest silver producer and that eventually it will be the largest open-pit silver mine in the world.

DeLamar ore runs 4 to 5 ounces of silver per ton with gold as a by-product. It has been estimated that the mine will be a top producer for at least 20 years. Earth Resources Company operates this new mine as a joint venture with Canadian Superior Mining (U.S.) Ltd. and Superior Oil Company. Total investment to date by the three companies is approximately \$20 million.

Sydney Mining Company entered into a lease agreement with ASARCO to evaluate Sydney's claims adjacent to the Earth Resources' DeLamar mine. Eight rotary drill holes were put down on the property by ASARCO. However, ASARCO later dropped the lease, and Sydney officials will try to interest another company in conducting a more thorough investigation of the property's potential. The claims are located between the eastern boundaries of the DeLamar property to the west and the western edge of the Silver City mining district in Owyhee County.

Anglo Bomarc Mines Ltd. and Canadian Superior Mines (U.S.) Ltd. had planned a \$300,000 drilling program in 1977 on the Hercules silver-lead-zinc property located 30 miles northwest of Cambridge in the Cuddy Mountain area. Near the end of the year, Canadian Superior dropped its option and development plans. Anglo now holds all of the property and

will proceed with development on its own (Northern Miner, December 15, 1977). Silver mineralization was discovered in 1977 in this district through a core-sampling program. Exploration indicates the presence of ore containing 4-8 ounces of silver, 0.5 percent zinc, and some lead. Other companies reportedly active in this district include Homestake, AMEX, American Placer, Cordex, ASARCO, and Exxon.

Clayton Silver mines continues development and ore recovery at its silver mine near Clayton in Custer County. A new offset shaft connecting the 800-foot level to the 1,100-foot level has been completed and further development work has started. For 1977 ore production from this mine reportedly will be approximately 80,000 tons. Reserves, as of December 1976, are reportedly 243,880 tons of ore.

Sun Valley Lead-Silver Mines, Inc., of Ketchum have completed 500 feet of development tunnel in the New Hope mine. This new activity arose because a 45-foot wide mineralized vein system was exposed near the mine during a road-building excavation.

Exploration and development work continues at South Mountain mine in Owyhee County. W. A. Bowes, Inc., is conducting this operation.

Exxon Corporation has completed drilling activities at the Mackay mine in Custer County. No further exploration activities are being considered at this time.

Production of copper and silver continues at the Copper Cliff project in Adams County in the Seven Devils mining district. In 1977, 150,000 tons of ore was recovered from this open-pit mine and processed in a flotation mill.

Superior Mining Company continues work in the district where the old Stibnite mine is located just southeast of Yellow Pine in Valley

County. Commercial quantities of gold, antimony, and tungsten are the principal commodities of interest here.

Shoshone Silver Mines has conducted further development work of the underground workings in the Lakeview mining district on the southeast side of Pend Oreille Lake in Bonner County. Silver and a possible by-product, antimony, are the commodities of interest. Reportedly, ore was being milled at the site throughout the summer.

The U. S. Forest Service has conducted a program of regional geochemical studies and some geological reconnaissance work within the areas designated as RARE II lands in the northern part of the state, in the St. Joe River area, and in the Gospel Peak-Buffalo Hump region. The data gathered will supposedly be used for land-use planning in these areas.

Also, some development work reportedly has been done at the Old Big Elk mine on Bald Mountain in the St. Joe mining district near Adair by Idaho Copper and Gold Mines, Inc. Some development work has been carried out at the Tahoma mine near the Middle Fork of the Boise River in Elmore County. Noranda is reportedly interested in the Blackbird mine (cobalt-copper) and Iron Creek properties southwest of Salmon in Lemhi County. The properties belong to Hanna Mining Company. Anaconda has been said to be conducting exploration in this same district.

The Hoodoo mine on Slate Creek, Custer County, has been idle for some months; however, the latest reports indicate that serious consideration is being given to starting production again.

Dredge mining for placer gold has continued to be popular throughout Idaho through the efforts of many weekend prospectors. Small operations are conducted in the Elk City area and in many of the other

old placer mining camps of the state. Such information is incomplete; these operations are common but probably not lucrative. Other gold dredging operations include the Virginia City Gold Mines placer on Moose Creek, a tributary to the Selway River.

Small placer gold operations have continued on Kelly Creek and on China Bar in the Lochsa River as well as at numerous other places around the state; but again, these probably are not too profitable.

Molybdenum exploration has included the following: Bear Creek and Cominco have done some development work on the molybdenum mineralization on Chilco Mountain in northern Kootenai County. Last year this was informally reported as a "major discovery"; however, this has not been verified. Union Carbide has done some development work on its property next to the Bear Creek-Cominco claims. AMAX continues development work on a molybdenum deposit near Grimes Pass on the north side of Boise Basin and south of the South Fork of Payette River in Boise County. Cominco has been active on its molybdenum property near Napoleon Hill, Lemhi County. Cyprus Mines Corp. (Tuscarora Mining Corp.) continues surface and underground drilling plus metallurgical testing and feasibility studies on its molybdenum property on Thompson Creek, a tributary to the Salmon River between Challis and Clayton.

Although rumors have circulated that several mining companies are looking for commercial tungsten ore in Idaho, only two development projects have actually been reported. These include several thousand tons of tungsten ore presumably blocked out at the Salmon River Scheelite property in Custer County. Painted Desert Uranium Oil Company has supposedly started to explore and develop a tungsten property on Elk Mountain in Kootenai County.

Rising prices have intensified exploration for uranium, especially in northern Idaho. Companies active throughout the western panhandle in Boundary and Bonner Counties include Pechiney and Conoco. Current exploration involves a search for "uranium porphyries," located in intrusive rocks similar to those found in the Mt. Spokane area of Washington. Research and exploration have also been intense for potential "sedimentary" uranium deposits in Tertiary and older sediments containing carbonaceous material. Wide-interval geochemical stream-sediment sampling has been done this fall in the watersheds of Benewah, Latah, Kootenai, and Shoshone Counties by the Geoenergy Company of Las Vegas under a Department of Energy (DOE) contract.

A preliminary report under a DOE contract 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 the panhandle of Idaho has been surveyed for radioactive minerals with an airborne gamma spectrometer and with stream sediment, soil and rock sample geochemical techniques. Again much of this work has been performed under DOE contracts.

Other areas of interest as potential sources of uranium are near Hailey and north of Sun Valley. Wyoming Minerals Corp., St. Joe American, Utah Int., Lucky Mc, and Exxon are reportedly active in these areas. Rock outcrops in the Hailey gold belt and in what appears to be the Phi Kappa Formation (?), have also interested uranium exploration geologists.

Phillips Petroleum is reported to have drilled several holes south of Salmon near Sevenmile Creek. The Challis Volcanics, located in this district, could be the object for this exploration. Carbonaceous layers

occurring within sedimentary interbeds are known to contain uranium, for example, near the Stanley Basin at the north end of the Sawtooth Mountains.

Bendix Field Engineering Corp. has released a report entitled *Provenance of Radioactive Placers, Big Meadow Area, Valley and Blaine Counties, Idaho*. This is a review of earlier literature and reinterprets the possible bedrock origin of radioactive minerals, columbium, tantalum, and other heavy minerals found in the Bear Valley placer deposit. This deposit was dredge-mined by the Porter Brothers of Boise in the 1950's. When government subsidies expired, however, columbium and tantalum, the principal commodities, could no longer compete with foreign import prices. Former exploration suggests that these placer deposits still contain a sizeable reserve of mineral commodities.

INDUSTRIAL ROCKS AND MINERALS

Phosphate

The predicted upward surge in Idaho's phosphate industry in southeastern Idaho has failed to materialize. Seven companies had previously expressed an interest in expanding or starting 16 new mining operations in the region. During the year most of these plans appear to have been postponed. Declining prices and dwindling sales of elemental phosphorous and phosphate fertilizer have slowed expansion in this industry. There are currently five operating surface mines in the area that account for about 11 percent of the production of phosphate in the U.S. Most of this is consumed domestically. As the Florida and Carolina deposits are mined out toward the end of the century, the phosphate industry in Idaho may produce more. It is of interest that two or more new discoveries of

potentially commercial phosphate deposits in the U.S. were reported in the summer of 1977 (e.g., at several sites in Charleston County, South Carolina).

Informed observers predict a gradual upward trend in the phosphate market and production of ore in the next few years. The increase may approximate 2.5 to 3 percent annually.

Zeolites

Double Eagle Petroleum Company of Casper, Wyoming, has staked numerous claims over bedded zeolites just southwest of the town of Oreana in Owyhee County. These zeolites appear to have developed by alteration of volcanic materials. They occur in massive ash layers that are commonly intercalated within sediments of Tertiary age. Clinoptilolite and mordenite are the main zeolites of interest.

The zeolite bed appears to be 20 feet thick and occurs just below an oolitic limestone bed close to the contact between the Glens Ferry and the Chalk Hills Formations. Reports indicate that over 1,000 acres of a "good quality" zeolite and 600 acres of "high quality" zeolitic material are available. It is believed that three million tons can be developed by surface mining. Another 10 million tons, if produced, will require underground mining. A large block of zeolite claims is also reported to have been staked on the Idaho-Oregon border in western Owyhee County.

These new discoveries may be significant to Idaho's economy because of the potential industrial use of zeolites as molecular sieves and traps. Zeolites are capable of capturing industrial gaseous and liquid

environmental pollutants. Should the techniques be refined sufficiently, this could turn the zeolitic deposits into a premium mineral commodity.

Diatomite

Some interest has been shown in diatomite beds (another filtering and sundry use commodity) in Owyhee County by Grefco, Inc., of California. In the past, known diatomite deposits in this state have proven either too small or impure for industrial development.

Bentonite

The Ben-Jel bentonite mine near Oreana has been reactivated and may produce bentonite for industrial use. The reserves and quality of this bentonite are not well known. Past production has been sporadic.

Sand, Gravel, and Stone

Over 200 commercial and 370 noncommercial gravel pits are in operation. Over 80 stone quarries are in operation according to the U. S. Bureau of Mines. It is quite likely that the actual value of these commodities is greater than reported.

Under pressure from environmentalists the Idaho Department of Transportation dropped plans to develop a gravel dredging operation on the Middle Fork of the Clearwater River. Instead, the department is now using gravel from a dry bar near Kooskia, outside of the designated Wild and Scenic River area.

A small operation in the Clarkia area produces attractive quartzite flagstones (Belt Supergroup rocks) for ornamental and building use, reflecting the increasing demand for Idaho rock types by the building

industry. There is widespread interest among architects in natural and fabricated stone products.

Garnet

Two placer garnet operations in Emerald Creek and Carpenter Creek in Benewah County, have continued to be very active. Garnet is used primarily as an abrasive, although it is also a premium commodity as a filtering media in tertiary stage sewage treatment. This filtering use should increase because of the widespread activities designed to clean up the effluents entering surface water systems.

An application to the U. S. Forest Service by Leo Hurley and Associates of Texas for a dredge permit to recover garnet and possibly a minor amount of gold by-product from an area near Scat Creek on the upper St. Joe River was rejected. A Montana syndicate, which has been the focus of litigation on federal versus state mining law over many years, has been issued a temporary injunction on its garnet dredge-mining on Sherlock Creek, also a tributary of the upper St. Joe. Since 1971, the Montana firm has mined about 15 acres along the stream near the Idaho-Montana border.

Kyanite

Ethyl Corp. of Louisiana withdrew its application for patents on its kyanite deposits in the Woodrat Mountain area near Syringa, just north of U. S. Highway 12 along the Clearwater River. The company continues to hold leases in the area. Kyanite traditionally has been used as a refractory. It is believed that Ethyl's plan to produce aluminum or aluminum silicon from kyanite is not economically feasible

at the present time. The high cost of energy and possible power shortages are a major deterrent to such a plan. Rumors that possible environmental problems pose further restraints have been denied by members of the environmental impact study team that has recently completed studies in the area of planned open pit mining of kyanite ore.

It is interesting to note that Ethyl Corp. has performed some work on at least 24 claims located in the center of an anorthosite body of an unknown number of cubic miles in dimension. This body of rock is south of the St. Joe Valley in Shoshone County. Anorthosite, like kyanite, contains aluminum, with the percentage of aluminum greater in anorthosite.

Barium

Some development work has been done by the Muldoon Barium Company on a property in Muldoon Canyon north of Carey. No barium production has been reported elsewhere in the state.

Other Industrial-Use Mineral Commodities

The production of pumice, cement, other building stones, gemstones, clay, and so forth is about the same as in 1976. It is likely that the value of these commodities may slowly increase in the years ahead.