Developments in Minerals, Mining, and Energy in Idaho for 1980

Idaho Bureau of Mines and Geology
Idaho Bureau of Minerals
Oil and Gas Conservation Commission
U. S. Bureau of Mines
Idaho Mining Association

This report was originally published in the Idaho Bureau of Mines and Geology's Gem State Geological Review, Spring 1981

Idaho Bureau of Mines and Geology
Department of Lands
Moscow, Idaho 83843

IBMG Reprint 4
August 1981

Developments in Minerals, Mining, and Energy in Idaho for 1980[1]

by

Earl H. Bennett[2], Maynard M. Miller[2], Thomas R. Markland[3], William R. Pitman[4], David W. Lockard[5], and Jack G. Peterson[6]

INTRODUCTION

This report on Idaho's mineral industry and energy resources for 1980 is a cooperative effort among several state and federal agencies and an industrial organization. The Idaho Bureau of Mines and Geology acknowledges the contributions of the Idaho Bureau of Minerals, the Idaho Oil and Gas Conservation Commission, the U. S. Bureau of Mines, and the Idaho Mining Association. Previous open-file reports describing the annual developments in mining and minerals in Idaho are available for the years 1977 through 1979 from IBMG.

MINERAL ECONOMICS

The highest price ever for gold and silver dominated the state's mineral economy throughout 1980. The precious metals started the year with all-time highs of $50.25 an ounce for silver and $850 an ounce for gold. In consequence increased commodity trading and transactions characterized the market as many people rushed to take advantage of the high price. Sales promotions were used by several businesses whereby merchandise could be purchased with silver coin at the current value of silver, with the result that about $1,000 in goods could be bought for $50 in silver coin. The record prices for silver in turn created large price hikes for photographic film and paper and, of course, for other silver products such as sterling ware.

The reason for the high price of silver became readily apparent in late March. Speculation by Nelson Bunker Hunt and W. Herbert Hunt of Dallas, Texas, who were reportedly backed in part by Arab investors, had pushed the price higher and higher. In 1979 the Hunt brothers had figured prominently in the Coeur d'Alene district in a corporate battle for control of the Sunshine Mine.

On March 27, 1980, the commodity brokerage firm of Bache, Halsey, Stuart, and Shields levied a $100 million margin call against the Hunts to cover their silver position on the commodities market. At this time the Hunt brothers owned 4,000 silver futures representing 20 million ounces of silver and had an agreement with Engelhard Minerals and Chemical Corporation to purchase 17.5 million ounces on March 31. Changes in futures trading rules at the Commodities Exchange (Comex) precipitated problems for the Hunts and other speculators. The trouble had worsened on March 26 when the Hunts announced that they and Arab investors would issue silver-backed bonds. This was seen by some observers as evidence that the Hunts needed money to cover their position. In the ensuing turmoil, the price of silver fell from $21.62 an ounce on March 26 to $10.80 an ounce on the 27th, causing repercussions throughout the financial world. On the 27th the Dow-Jones average plunged 25 points but recovered by the end of the day. A loan of $800 million to the Hunts, approved by the Federal Reserve Board, helped avert a total disaster in the silver market, and steps were taken immediately to regulate the commodity market to guard against such problems in the future. The loan stabilized the silver market, and as it turned out the Hunts did not have to liquidate their massive silver holdings. The brothers reportedly still own as much as 200 million ounces of silver used in part as collateral for the loan. As part of the loan agreement, the Hunts will not speculate in the silver market until the loan is paid off. A brief drop in the price of silver in November was rumored to have been caused by the brothers' selling 1,000 futures contracts representing 5 million ounces of silver. After the crash to $20 an ounce, the price of silver stabilized from June until December when it dropped to $15 an ounce.

The record silver prices in 1980 were most beneficial to Idaho's mining industry. Preliminary figures from the U. S. Bureau of Mines (Table 1) estimate Idaho's nonfuel mineral production at $561,298,000, an increase of 28 percent over 1979. Silver accounted for 56 percent of Idaho's nonfuel mineral production. Idaho's yearly mineral production since 1967 is shown in Figure 1. In 1980 Idaho produced 48 percent of the nation's silver, as it had also in 1979.

Other metallic minerals important to Idaho's mining industry exhibited marketing trends similar to 1979. Cobalt maintained a producer price of $25 a pound throughout the year, and the spot price varied between $18 and $23 a pound. Demand for this steel additive lessened during the year. Prices for molybdenum increased from $7.50 a pound early in the year to near $10 at the end; however, spot prices that were very high in 1979 fell below the producer price during 1980. Early in 1980 copper was at $1.18 a pound but rose to $1.32 a pound in February. It declined to $.85 a

[1]This report is based in part on a paper presented in December 1980 at the Regional Developments Session, Northwest Mining Association's Annual Convention, Spokane, Washington.
[2]Idaho Bureau of Mines and Geology, Moscow, Idaho.
[3]Idaho Bureau of Minerals, Boise, Idaho.
[4]Idaho Oil and Gas Conservation Commission, Coeur d'Alene, Idaho.
[5]U. S. Bureau of Mines, Spokane, Washington.
[6]Idaho Mining Association, Boise, Idaho.

pound in December. One factor in this price fluctuation was a major labor strike in the copper industry, thereby decreasing U. S. production. The price of zinc ranged from $.39 a pound early in the year to nearly $.42 a pound near the end. The price of lead began strong at the $.49 to $.50 a pound range in the first quarter of the year but dropped to $.34 in June. It increased to $.45 a pound in September and eased off to $.39 by December.

The high interest in Idaho's mineral wealth is illustrated by over 10,000 new claims that were filed with the U. S. Bureau of Land Management during the year. Gold fever motivated many small prospectors. Over 900 stream alteration permits, which are legally required to operate a small suction dredge, were filed with the Idaho Department of Water Resources.

MINERAL OPERATIONS

METALLIC MINERALS

Coeur d'Alene Mining District

In 1979, the Coeur d'Alene mining district had exceeded the total production of Potosi, Bolivia, to become the largest silver-producing district in the world. Total production from the Bolivian mines is estimated at 910 million ounces of silver. The mines were discovered by the Spanish in 1514 and are now exhausted. By contrast the Coeur d'Alene district began mining in 1884 and since then has produced 922,692,000 ounces of silver, 7.5 million short tons of lead, 3 million short tons of zinc, 15,000 short tons of copper, and 500,000 ounces of gold, for a net total productive value of $3.5 billion by the close of 1979—only 96 years after the initial discovery in the area. The district produces nearly 50 percent of the nation's silver and 85 percent of its antimony (down to 35 percent in 1980 because of the strike at the Sunshine Mine). The mines are still producing with continuing silver values at depth. Large capital investments for new exploration and milling programs during 1980 have insured a vigorous mining industry in the Silver Valley for years to come.

The estimated final cost for new mining projects started in the Coeur d'Alene district in 1980 exceeds $76 million. This includes the sinking of the new "Silver Shaft" and related expenditures by Hecla Mining Company ($27 million), the reopening of the Silver Summit Mine and Polaris Mill by Consolidated Silver, Inc., ($12 million), the sinking of a 5,100-foot shaft and related exploration and development by Callahan Mining Company at the Caladay project ($26.6 million), the sinking of the new No. 12 shaft at the Sunshine Mine ($4.5 million), the deepening of the Crescent Mine shaft by the Bunker Hill Company ($1.6 million), the American Silver project ($3-4 million), the Capital Silver-Newmont project ($600,000), the Vindicator-Colby Mines agreement ($500,000), and the joint venture between Coeur d'Alene, Merger, and Plainview mines, known as the CAMP project ($300,000). In addition to mining projects the Sunshine Mining Company will spend $6 million on a new silver refinery and has spent $1.4 million on a new administration complex. The Bunker Hill Company will spend $1.5 million on increasing the capacity of its silver refinery.

National interest in the high price of silver in early 1980 and the economic

Table 1. Nonfuel Mineral Production in Idaho, 1979-80[1] [Preliminary figures from the U.S. Bureau of Mines]

Mineral	1979 Quantity	1979 Value (thousands)	1980[P] Quantity	1980[P] Value (thousands)
Antimony ore and concentrate, antimony content .... short tons....	W	W	95	W
Clays ..... thousand short tons....	28	$ 263	58	$ 175
Copper (recoverable content of ores, etc.) ..... metric tons....	3,618	7,421	2,887	6,438
Gem stones	NA	60	NA	49
Gold ..... troy ounces....	24,140	7,423	17,056	10,460
Lead (recoverable content of ores, etc.) ..... metric tons....	42,636	49,479	40,378	38,260
Phosphate rock ..... thousand metric tons....	4,880	95,728	5,176	111,562
Sand and gravel ..... thousand short tons....	[2] 7,719	[2] 18,149	7,200	16,600
Silver (recoverable content of ores, etc.) .... thousand troy ounces....	17,144	190,129	14,622	314,380
Stone (crushed) ..... thousand short tons....	2,952	8,787	2,500	8,400
Zinc (recoverable content of ores, etc.) ..... metric tons....	29,660	24,391	29,363	24,371
Combined value of cement (masonry and portland), garnet (abrasive), gypsum, lime, perlite, pumice, sand and gravel (industrial), stone (dimension), vanadium, and items indicated by symbol W	XX	36,055	XX	30,603
Total	XX	$437,885	XX	$561,298

[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.

significance of the Coeur d'Alene district in particular were emphasized when the Silver Valley received national news coverage last fall as a feature on the CBS "60 Minutes" television news program.

Bunker Hill Company. Low prices for lead and zinc, due to the impact of the recession on the construction and automobile industries, clouded the fiscal picture of the Bunker Hill Company, a subsidiary of Gulf Resources and Chemical Company. The company's electrolytic zinc plant was closed from late June to August with a layoff of 377 hourly employees. The plant shutdown occurred because the company could not obtain concentrates, owing to the closure of several domestic zinc mines. Added to this was the two-week loss in production from the San Vincente Mine in Peru. Early fears of a labor strike at the Bunker Hill Mine during the first part of the year were allayed by a quick settlement, which precluded any loss of production.

Early in the year, the Hunt family of Dallas, Texas, tended an offer of $500 million for all outstanding shares of Gulf Resources and Chemical Corporation. This offer was placed through the Placid Oil Company, a subsidiary owned by the Hunt family. The offer was refused by Gulf Resources, although the Hunts did acquire 11.34 percent of Gulf Resources' stock. It was rumored in midyear that the Bunker Hill complex was for sale at a purported price of $150 million; however, there were no takers.

The Bunker Hill Company expanded further its new silver refinery completed in 1978. The addition of 48 electrolytic cells to the 96 in the original plant increased annual production by 50 percent to 15 million ounces of silver, an amount that is more than 15 percent of the nation's total refined silver. The cost of the expansion is near $1.5 million. The refinery also recovers and refines from 10,000 to 12,000 ounces of gold annually. Gold recovery alone paid for the original cost of the plant within six months.

Bunker Hill began a $1.6 million program to deepen the No. 2 shaft at the Crescent Mine 420 feet below the current level of 4,150 feet in order to gain access to lower levels and for exploration. The company was reported to be drilling on the property of Aberdeen-Idaho Mining Company north of the Crescent Mine. Aberdeen has had an operating agreement with Bunker Hill since 1958.

Legal problems surrounding the Bunker Hill smelter continued through the year. Parents in Kellogg have filed a $20 million suit against the company. The suit alleges that high lead levels were found in blood samples taken from children in 1973 after a fire had damaged emission controls at the smelter. A gag order was imposed by a federal judge in January on all parties involved.

The company denied access to the smelter to inspectors from the Environmental Protection Agency (EPA). Bunker Hill maintains that EPA standards under the Clean Air Act of 1.5 micrograms of lead per cubic meter of air were unattainable in the Silver Valley. The company contends that even with the smelter closed, the lead level would exceed 1.5 micrograms because of blowing dust contaminated by tailings from early-day mining and smelting operations. A judge ordered the company to allow the inspectors into the plant, but this was later appealed.

In August nearly $35,000 in fines against the Bunker Hill Company were dropped by the Occupational Safety and Health Administration (OSHA) because of legal and technical errors in OSHA's health and safety inspections. Another list of violations against Bunker Hill was released by OSHA in September. The company is expected to appeal most of these violations. Most of the citations concern the high lead levels in blood and the cleanup procedures in the smelter. Fines for the alleged violations could reach $82,000 including a $10,000 fine concerning the allegation that Bunker Hill requires women workers in high lead exposure areas to be sterilized because high lead levels can cause fetal abnormalities. The company denied the sterilization charge and noted that women who can have children are not hired for work inside high lead level areas, but are given jobs outside these areas.

A study of lead levels in blood funded by a $125,000 grant from Bunker Hill was completed and released in May by the Bureau of Preventive Medicine in the Idaho Department of Health and Welfare. The study showed that 88 percent of the 452 children tested had blood levels under 40 micrograms (considered normal) compared with 88 percent of 1,000 children tested in 1974 who had blood levels over 40 micrograms. Another study, conducted by the Idaho Air Quality Bureau, showed that lead pollution in air around the smelter was at its lowest in several years but that it is still above the 1.5 micrograms set by the EPA. An independent study for the state revealed that 80 percent of the lead pollution in the Kellogg area is attributable to the smelter and that windborne dust has a relatively minor impact on the pollution problem. The matter is still in the courts.

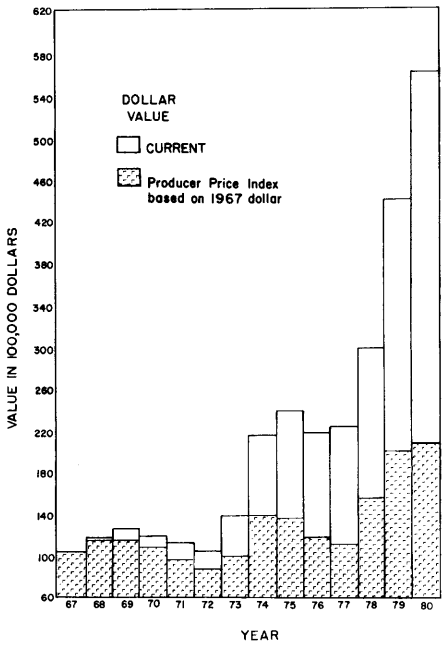


Figure 1. Value of mineral production in Idaho, 1967-1980.

The company completed its sixth year of tree planting on the hills surrounding Kellogg. Over 100,000 seedlings were grown in Bunker Hill's unique underground greenhouse, located 3,000 feet beneath the surface in an abandoned ventilation drift. Seedlings planted this year pushed the total to over one million trees for the six-year program.

Sunshine Mining Company. Production from the Sunshine Mine, the nation's richest silver mine, greatly decreased during 1980 because of an 8½-month strike from March 15 to

November 10. The strike was marred by two bombing incidents, neither of which hurt anyone. The mine was run by supervisory personnel during the strike, and production fell from a normal 300,000 ounces of silver per month to 30,000 ounces for a loss of about 2.7 million ounces for the year. The high prices of silver in the first part of 1980 enabled Sunshine to process 89,000 tons of waste rock that contained only 1 to 2 ounces per ton. The mine was placed on standby after the strike, and the company used this time to make needed repairs to the No. 10 shaft.

Early in the year it was announced that Arab Investors S.A. had purchased 500,000 shares of Sunshine stock, bringing its total to 1.5 million shares or a 26 percent interest in the company.

In a new capital-raising venture, Sunshine Mining Company issued $30 million in silver-backed bonds which can be redeemed for cash or silver bullion. These are the first silver-backed obligations of any kind since the government withdrew silver certificates from circulation in 1962. The bonds pay 8½ percent annual interest and may be redeemed in amounts of $1,000 cash or 50 ounces of silver, whichever is worth more. In another new marketing venture, Sunshine introduced the "Sunshine-80," a one-ounce silver commemorative piece that created an instant demand. The initial issue of 25,000 coins, intended for sale to interested company employees and stockholders, quickly sold out. Sunshine plans to mint an additional 25,000 coins in late 1981. The coins sell for $25 apiece.

The Sunshine Mining Company started building a new silver refinery to be in production by early 1981. The refinery will use a modified nitric-sulfuric acid pressure leach process developed by Sunshine and the U. S. Bureau of Mines. The process should recover as much as 99 percent of the silver in the ore. The refinery is being constructed by Bechtel, Inc., of San Francisco and will be housed in a 100- by 260-foot building near the antimony plant on Big Creek. The refinery will employ 25 people. The company will spend $6 million on the new facility and hopes to amortize the investment in five quarters. The new refinery will make the Sunshine Company totally independent as a silver producer. Concentrates are presently shipped to the ASARCO smelter in Tacoma, Washington.

Sunshine also built a new administration building and executive office on Big Creek. This project cost $1.4 million.

The labor strike slowed down development on the No. 12 shaft that will connect the 3,700- and 4,800-foot levels and provide access to new ground in the west-central part of the Sunshine Unit area. The new shaft should increase Sunshine's annual production from 5.5 million ounces of silver to 6.5 million ounces by 1982 and eventually to 7.5 million ounces. The cost of the shaft is estimated at $4.5 million. It is possible that eventually this shaft will be connected directly to the surface.

Sunshine's suit against Metropolitan Mines over extralateral rights on the Copper Vein continued through the year as did a suit against Silver Surprise over the purchase of Silver Surprise claims by Sunshine for 275,000 shares of Sunshine stock.

In other developments, Sunshine drilled several exploratory holes on the Silver Ore property in Nuckols Gulch. The company's exploration staff was also active in Pearl, a former gold-producing district north and west of Boise. Several diamond drill holes and other exploration were completed on this property in the northern part of the Pearl district.

The company started reclamation on a 15-acre abandoned tailings pond at an estimated cost of $150,000. This will be the first large tailings pond recovered in the Silver Valley. Sunshine also gave a $15,000 grant to the College of Mines and Earth Resources at the University of Idaho to initiate a Tertiary Research Center for Paleontological Study aimed at a comprehensive geological investigation of the extensive Miocene fossil site near Clarkia. Part of this grant is allocated for publishing a detailed monograph on the fossil site. The Sunshine Company also completed the first volume of its new company magazine, "The Drifter."

Consolidated Silver Corporation. Consolidated Silver Corporation announced a joint lease venture with Hecla Mining Company, Coeur d'Alene Mines Corporation, Silver Dollar Mining Company, and Sunshine Mining Company for reopening the Silver Summit mine and mill near Osburn. These four companies own 82 percent of Consolidated Silver Corporation's common stock. Other substantial shareholders in the remaining stock include Merger Mines Corporation and Plainview Mining Company. The lessees will get 65 percent of the profits divided as follows: Hecla, 64 percent; Coeur d'Alene Mines, 12.1 percent; Silver Dollar Mining Company, 12.1 percent; and Sunshine Mining Company, 11.8 percent. The remaining 35 percent of the profits will go to the Consolidated Silver Corporation. Hecla will be the operator of the property.

The project includes sinking the Silver Summit main shaft from a depth of 4,590 feet to 5,524 feet. This will allow exploration for the extent of the Silver Summit and Chester Veins. Refitting and repairing are completed on the mill, and production has started, eventually to reach 100 tons per day. The mill will process ore from known reserves of 67,000 tons of ore, averaging 20 ounces of silver and .5 percent copper per ton. The mill will employ 60 people when in full production. The estimated cost of the overall project is $12 million. Hecla geologists believe this project to be the most promising venture in the Coeur d'Alene district.

Coeur d'Alene Mines Corporation. Coeur d'Alene Mines Corporation enjoyed an excellent year from its 40 percent share of ore sold from the Coeur Mine, which is the fourth largest silver producer in the district and is operated by ASARCO. The company entered into an exploration program with Royal Apex Silver, Inc., and increased its holdings in Royal Apex stock to 20 percent of the outstanding shares. Exploration continued on the CAMP property (Coeur d'Alene Mines, Merger Mines, Plainview Mining) adjacent to the Coeur property, and work started on the 2,000-foot Chilcott tunnel project. The company also has a 12.1 percent operating interest in the Consolidated Silver project.

Callahan Mining Corporation. Callahan Mining Corporation owns the Galena

Mine and receives 50 percent of the mine's profits. The Galena was the top silver-producing mine in the district in 1980 and is operated by ASARCO. Callahan also has a 5 percent interest in the Coeur Mine. A three for two stock split was announced by Callahan in April.

The company plans to spend $26.6 million for intensive exploration on its Caladay property. The company will finance the venture on its own. The 825-acre property is jointly owned with Day Mines (18.5 percent) and ASARCO (8.2 percent). A major part of the new effort involves sinking a 5,100-foot shaft at the end of the 5,000-foot Caladay tunnel. The tunnel, along with an underground hoist room, was completed in 1969-71. The shaft will be located 2,200 feet east of the Galena-Caladay boundary line, on strike with the rich ore veins of the Galena Mine. In June, a $9 million contract was awarded to the Wallace Diamond Drilling Company of Osburn for sinking the shaft. This will involve a three-compartment timbered shaft, and it will take 4½ years to complete. It is planned to diamond drill and develop mining levels as the shaft sinking proceeds. Another contract for $1 million was awarded to the Dix Corporation of Spokane, Washington, for installing a double-drum, 2,700-horsepower Nordberg hoist and related equipment in the underground hoist room.

Hecla Mining Company. Hecla had an excellent year in 1980 following a good year in 1979. Record profits enabled the company to clear the last of a $96 million write off from 1978 on the Lakeshore Mine in Arizona.

In February AMAX, Inc., announced the purchase of Rosario Resources, Inc. Rosario owned 19.94 percent of Hecla's outstanding stock, and this stock is now owned by AMAX.

Hecla currently operates the Lucky Friday Mine and the Star-Morning Unit area (owned 30 percent by Hecla and 70 percent by the Bunker Hill Company) and owns 33.25 percent of production from the Sunshine Unit area. Hecla may yet profit from the Granduc Mine in British Columbia (Hecla owns 35.4 percent of this property) that was written off in 1977. The mine was placed in production by Esso Resources, Ltd., of Canada during the year. The turnabout in Hecla's fortunes has allowed the company to begin several major new projects in the Coeur d'Alene mining district.

In February, the company awarded a contract to J. S. Redpath Corporation of Tempe, Arizona, to construct a 7,700-foot mine shaft at the Lucky Friday Mine near Mullan. The project will cost $27 million. The "Silver Shaft" will take five years to develop and will be the deepest shaft in the world outside South Africa. The shaft will be 18 feet in diameter and concrete-lined (1 foot thick). This will be the first and only circular concrete shaft in the district. The structure contains four compartments, two for main hoisting, one for material hoisting and man hoisting, and one service compartment. The headframe that dominates the view of the Lucky Friday Mine stands 140 feet high, contains 280 tons of steel, and is topped with two 12-foot diameter sheave wheels. The main hoist is to be a double-drum, double-clutched 3,000 horsepower Nordberg unit. The capacity of the hoist will be 125 tons per hour off the 7,500-foot level using 10-ton skips. The shaft sinking has been advancing at 7½ feet a day. About 60 men are working on the project. It is currently planned to reach the 5,500-foot level by late 1983, with production starting from the first mining level at 5,300 feet in 1985. The new facility should increase production from the Lucky Friday Mine by 35 percent to 1,000 tons per day and provide access to deeper levels in the mine. A new central compressor building has also been built, and it is planned to construct new dry rooms adjacent to the shaft.

Hecla was awarded $424,000 in a legal dispute with the Bunker Hill Company. The litigation concerned the purchase of ore concentrates from the Star-Morning Mine. The company was sued at year's end by Atlas Mining Company. The suit concerns extralateral rights on property near the Lucky Friday Mine.

Late in the year the Lucky Friday Mine was evacuated due to a small fire that broke out 200 feet below the shaft collar. There were no injuries and production was resumed the next day.

Day Mines, Inc. Day Mines, Inc., continued to profit from its 25 percent participation in the Galena Mine and its 5 percent operating interest in the Coeur Mine. Late in the year the company announced a three for two stock split.

Ore was mined from Day's Hunter Ranch property adjoining the Lucky Friday Mine operated by Hecla. Day receives 50 percent of the Hunter Ranch production. Hecla's new "Silver Shaft" should increase production from the Hunter Ranch area by 1986. The DIA (Day, Independence, Abot) project was explored further during the year. Day has a 47.7 percent interest in the DIA project. The company continued drilling on the Hornsilver property located 2 miles south of Wallace and east of the Caladay project. The drilling is planned to extend from a collar elevation of 3,000 feet to below sea level. The project will use new techniques of directional drilling control to go this deep.

Other Coeur d'Alene Mining Operations

American Silver Mining Company and Coeur d'Alene Mines ended years of litigation and negotiation when an agreement was signed to explore and develop American Silver's ground in the Silver Belt. Coeur d'Alene Mines' property adjoins American Silver's land on three sides, and past problems have concerned extralateral rights on American Silver's land. The agreement was worked out by ASARCO, who will undertake exploration and development in the area. Exploration will start from the 3,400-foot level of the Coeur Mine at a cost of $3 to 4 million. The program calls for 3,000 feet of drifting and many thousands of feet of diamond drilling.

A long litigation between *Silver Syndicate, Inc.*, and Sunshine Mining Company was settled in September. The out-of-court settlement will give Syndicate 50 percent of the profits from ores mined by Sunshine in the Rambo area. The settlement ends 6½ years of court action. In a related case, Hecla Mining Company will not have to pay damages to Silver Syndicate for allegedly interfering with a 1944 Sunshine-Syndicate mining agreement.

Discussions continued throughout the year between Sunshine Mining Company and *Silver Surprise.* Three years ago Sun-

shine was ordered by a Washington state judge to settle a claim by Silver Surprise over the ore mined on Surprise property located south of the Jewell Tunnel. This case is another in a long line of extralateral rights litigation concerning the Sunshine Unit area and surrounding claims.

A similar suit is still pending between *Metropolitan Mines* and Sunshine Mines over the silver-bearing Copper Vein. The suit concerns extralateral rights on the vein, and Sunshine must now establish that the apex, or outcrop, of the vein is on its land.

The revenue of the *Silver Dollar Mining Company* (with a 9.61 percent interest in the Sunshine Unit area) was adversely affected financially by the Sunshine strike. The company also owns a 12.1 percent operating interest in the Consolidated Silver project. In addition to the operating interest, the company owns a 9.5 percent interest in Consolidated Silver's outstanding capital stock.

Big Creek Apex declared a dividend for the year but also lost financially as a result of the Sunshine strike. Big Creek receives a portion of the production from the Snowstorm area that is mined by Sunshine. Completion of the new No. 12 shaft by Sunshine will allow development of the Apex and Snowstorm areas below the 4,000-foot level. It was proposed to merge Big Creek Apex with Sunshine Consolidated and adjoining property. Sunshine Consolidated owns 70 percent of the outstanding stock of Big Creek. After the merger Sunshine Consolidated will be the surviving company. Both companies have a 50-50 operating agreement with the Sunshine Mining Company.

Diamond drilling and other exploration were conducted by Newmont Exploration, Ltd., of New York on claims located north of Wallace and Silverton and owned by *Capital Silver Mines, Inc.* Capital has over 300 contiguous claims in the area. Newmont's agreement with Capital calls for an exploration expenditure of $600,000 over 4 years, starting in 1981.

Vindicator Silver-Lead Mines reached an agreement with Colby Mines of Vancouver, Canada, to explore the Vindicator property on a 50-50 working arrangement. Colby will spend $500,000 over a 2-year period in exploration of Vindicator's holdings.

A shakeup in management occurred in the *Atlas Mining Company*, which owns property south of the Lucky Friday Mine near Mullan. Several top corporate officers were removed after Atlas lost $2.4 million on the silver futures market last March. Hecla Mining Company sought to buy an 80 percent interest in Atlas and an unspecified interest in Banner-Idaho Mines, which was also having trouble with silver futures trading. Hecla has since withdrawn the offer.

Merger Mines participated in the CAMP project where Coeur d'Alene Mines will spend $300,000 on exploration during the next 6 years. Merger will receive 17.2 percent of net profits from this venture. The company also has an interest in the new Consolidated Silver project. Work continued during the year at the Beartop Mine in the Murray district. These claims are leased to Silver Crystal Mines by Merger Mines on a 50-50 basis. Some ore was shipped during the year from this property.

Sundance Mining and Development Company has leased the old Vendetta Chief Mine to Hicks and Associates of Canada. The mine is located 4½ miles north of the Star Mine. Ore was stockpiled from a new No. 2 portal, and 300 feet of new drift was completed. The ore averages .20 ounce of gold per ton.

Beacon Light Mining Company conducted a surface diamond-drilling program on holdings of 76 claims east of Murray. Drilling was planned on several "hot spots" indicated in a geochemical soil survey conducted several years ago.

Cominco Resources reportedly signed leases for property on Pine Creek, including Lookout Mountain and the New Era Mining and Signal Gold and Silver projects. Outside of extensive exploration in the Pine Creek area, Cominco's plans have not been made public.

ASARCO is apparently interested in an area near Sidney Mine and Page Mine on Pine Creek. The Nabob concentrator on Pine Creek continued its custom milling program during the year and processed some ore from the Little Pittsburg Mine.

Idaho Gold Fields completed a soil-sampling program over the Gold Dream Mine above Butte Gulch near Murray. The property consists of six unpatented claims with three open portals. Gold assays of the Renown Vein, discovered in a newly opened portal, were encouraging. The company also did some preliminary work on its gold property adjacent to the McKinley Mine, 2 miles north of Lucile Bar and 12 miles west of Florence in west-central Idaho.

Magna Mining Company resumed work on the Magna-Princeton property east of the Lucky Friday Mine. This property has been promising since several high-grade silver veins were discovered in the Magna adit. Several major mining companies have reportedly expressed an interest in this property. The Magna adit portal, damaged three years ago during a winter storm, was reopened and further surface exploration continued during the year.

Silver Star Mines, Inc., started diamond drilling at its property in Nine Mile Gulch, which adjoins the Dayrock Mine. The drilling was conducted from within the main Silver Star adit, 1,500 feet underground.

The Mountain Goat Mill, also known as the Rex Mill, operated during the year. Ore was obtained from stockpiles at the Goldback Mines owned, as is the mill, by *Silver Baron Mining Company*. A proxy fight for control of Silver Baron was underway during the latter part of the year.

Consolidating twenty claims at the Jack Waite Mine near Murray resulted in the formation of a new company called the *Silver Creek Mining Company*. Plans for the new company are presently unknown.

Beacon Light drilled two exploratory holes on its property east of Mullan (a corner of the property is in Montana). Another company is reportedly interested in the project.

The *Silver Beaver Mining Company* was drilling on its property 8 miles north of Mullan.

St. Elmo Silver Mines, whose property is surrounded by the holdings of Coeur d'Alene Mines, is reported to have discovered silver ore in a vein 2 to 3 feet wide. Exploration on the property is being done by C. M. Silver Mines.

A new closed-circuit cyanide mill was constructed at Eagle this summer. The mill owners plan to custom process ores from mines in the Murray district.

Other Mining Operations in the State

Noranda Mining, Inc., announced early in 1980 that the Blackbird Mine would reopen. The mine, located about 30 miles west of Salmon, is a past producer of cobalt and copper and the only readily-available major source of cobalt in the nation. The company started work on an Environmental Impact Statement in September. Noranda is spending more than $1 million a month to get the mine into production. Preproduction costs for reopening the mine are estimated at $150 million. The company has tentative plans for building a cobalt refinery in the western United States at a cost of $50 million. Idaho is one of the possible sites for this refinery.

The refurbished mill at the Blackbird Mine site is expected to be operating at 300 tons a day for tests by year's end. It is planned to expand this capacity to 2,000 tons a day by 1984. The mine will produce about 20 percent of the current domestic need for cobalt. Noranda has a minimum of 12 years of ore reserves at the 2,000-ton-per-day production schedule. Ore grade averages 0.6 percent cobalt and 1.6 percent copper per ton on defined reserves of 4 million tons. A recommended site for the new tailings impoundment is in upper Blackbird Creek valley, upstream from the existing plant site. Waste water from the impoundment site will be recycled.

It is planned to utilize underground mining methods and probably construct a new shaft to access the lower levels of the mine. Currently 165 persons are working on the project. This is expected to increase to 400 to 600 when full production is reached. Most employees will reside in Salmon, although some will live at Cobalt. The new operation will increase the population of the area by about 2,000 people.

A major part of Noranda's plans concerns solving the environmental problems in the Blackbird Mine area. A program to clean up the area around the mine has already greatly improved the appearance of the region that was neglected by previous mining operations. The company completed a 400 gallon-per-minute water treatment facility (at a cost of $1 million) for processing mine drainage and waste water from mining operations. Completion of the treatment plant will enable Noranda to de-water the two lower levels of the mine for further development and exploration. The company will operate a bio-monitoring program to insure environmental quality. Reclamation plans have been announced that are to be completed upon termination of the life of the mine. The concern for the environment was emphasized when Noranda offered to provide funds to hire a new conservation inspector for the Idaho Department of Fish and Game. It is anticipated that the extra man will be needed as the local population rapidly grows owing to the mining effort.

A new microwave relay system will provide modern communications for the mine. A major requirement is upgrading the current available electrical power supply.

Exploration and development of other areas with high copper-cobalt potential north and west of the Blackbird Mine is possible even though these areas are part of the River of No Return Wilderness Area. This area that has potential for other cobalt deposits strategically important to the country was designated by Congress as a special management area (see new legislation and regulations affecting mining in Idaho).

Cyprus Mining Corporation, recently acquired by Amoco (Standard Oil of Indiana), plans to open what will be the largest surface mining operation in the state's history. All properties being developed by Cyprus will carry the Cyprus name. Cyprus plans to start an open pit mine at the Thompson Creek molybdenum deposit approximately 40 miles southwest of Challis and 7 miles north of the Salmon River. Preproduction stripping is to begin in January 1981 and the building of a mill in April. Mining will start in 1983. The mine, when completed, will be over 1 mile across and 1,600 feet deep on the high wall, with an average pit depth of about 500 feet. The plan calls for the mining of 20,000 to 25,000 tons a day for a total of 17-20 million pounds of molybdenum annually. This amounts to approximately 19 percent of the world's molybdenum production for 1980. The orebody averages .18 percent MoS_2. The minimum lifetime of the mine is 20 years with reserves of about 200 million tons. A tailings embankment will be constructed, eventually to be 600 feet high. Approximately 300 to 900 feet of overburden is to be removed during the open pit operation, and it is proposed to use five 25-yard electrically operated shovels, twenty-four 170-ton trucks, and four 12¼-inch blast hole drills to mine the ore. The stripping ratio will be 3.7:1. Most of the stripping will be done during the first 15 years with a total bulk removal of 180,000 tons a day.

The U. S. Forest Service approved an Environmental Impact Statement for the project in December. Cyprus expects to bring in about 600 people on private contracts to work on site preparation and construction. The project, which includes the mine, mill, tailings impoundment, roads, and a construction camp, is estimated to cost $350 million.

In 1983 Cyprus will employ about 550 people in mining and related jobs for an annual payroll of $14-16 million. This will have an overall population impact of approximately 2,400 people on the Challis area. The total impact is expected to significantly raise the population of Custer County, currently at 3,854 people. The company plans to build 109 new homes near Challis to house part of the work force.

Partially to alleviate the socio-economic impact on Custer County, Cyprus has proposed to prepay property taxes so that local government can prepare for the expected population increase in the area. This was approved by the Idaho legislature in 1980.

Earth Resources Company operated the DeLamar open-pit silver mine, exceeding plant design for the second year. The mill, designed to process 1,700 tons a day, operated at 2,060 tons a day. Approximately 750,000 tons of ore was processed from September 1979 to September 1980, averaging 2.5 to 3.0 ounces of silver and .02 to .04 ounce of gold per ton. Total production was 1.66 million ounces of silver and 18,000 ounces of gold. Increased metal prices extended reserves and the life of the mine to more than 20 years.

Other companies active in Owyhee County include *Dennison Mines* (Canada) and *Freeport Minerals*. Dennison plans to evaluate the Lost Packer Mine on Cougar Creek (a tributary to Loon Creek) in Custer County. Some work was done on the nearby Iron Cap property by a small company, but no ore was shipped. Freeport Minerals has reportedly staked a large claim block near Twin Peaks, north of the DeLamar townsite.

AMAX continued drilling and exploration at the CUMO molybdenum prospect at Grimes Creek. The company also continued a limited drilling program on Big Southern Butte, a rhyolite dome in the Snake River Plain.

A Hailey-based company is reprocessing dumps from the Minnie Moore Mine near Hailey. Another company is reprocessing the dumps from the Independence Mine, and a mining operation is reportedly underway near Carrietown.

The *Silver Strand Mine* in the Lakeview district shipped 6,000 to 7,000 tons of ore to the ASARCO smelter in Tacoma in 1979, but due to the copper strike in 1980, which idled the smelter, the mine stockpiled ore at Athol, Idaho. The company wanted to ship 300 tons of gold and silver ore monthly and is considering building a small, closed, cyanide vat leach mill to process the ore.

Some ore was stockpiled at the *Tungsten Jim* property on Thompson Creek. The ore is reportedly quite rich and runs 6 percent tungsten.

Myko, Inc., continued shipments of ore from the Phi Kappa Mine, located east of Sun Valley, to its mill at Mackay. The company also plans to ship ore to the mill from the Silver King Mine on Beaver Creek in the Vienna district.

The *Greyhound Mine*, located north of the Seafoam Ranger Station, was being further developed during the year. Some ore was processed in a new mill completed on the property in 1979.

A limited diamond-drilling program was carried out near the *Mountain King Mine* on Sheep Mountain, east of the Seafoam guard station. The drilling was done to find extensions of the Mountain King orebody.

Bullion Lode Silver Mining Company announced that its claims east of Riggins would be developed and explored by Monogram Development, Ltd., of Vancouver, B.C. Two 200-foot drill holes reportedly intercepted veins averaging 5 ounces of silver per ton.

Shoshone Silver Mining Company milled 600 tons of ore from an open pit at the Weber Mine and the Keep Cool Mine in the Lakeview mining district, Bonner County. The company has operating agreements with Lakeview Consolidated Silver Mines, Inc., on property in the area. Shoshone has reopened the Idaho Lakeview Mine and will complete 700 feet of new tunnel this year. The company mill is centrally located to several properties in the district.

Silver Butte Mining Company reported that two veins of low-grade silver were found early in the year on its property south of Sandpoint. A 300-foot tunnel was completed during the year to intercept the vein at depth. The company also diamond drilled new anomalies on claims at the west end of Lake Pend Oreille.

The U. S. Forest Service churn drilled placer bars located between the Spruce Tree Campground and Scat Creek Bar on the St. Joe River. The drilling was designed to determine the value of placer claims on this stretch of the St. Joe River now classified as part of the Wild and Scenic River System. The federal government is required to buy such mining claims as noted in the the Wild and Scenic Rivers Act, so the drilling is to evaluate the potential of these claims.

Silver King Mines, Inc., continued its copper-silver mining operation at the Copper Cliff open-pit mine at Cuprum in Adams County. The company operates a mill at Cuprum that processes ore from the Copper Cliff Mine and from the Iron Dyke Mine located across the Snake River in Oregon and operated by Silver King Mines and Texas Gulf. In September Silver King was considering a merger with a major German industrial company. The deal would give the German company a 30 to 35 percent interest in Silver King Mines.

Prudential Mining and Exploration Company of Clearfield, Utah, has an interest in several properties near Dollarhide Summit (Carrietown area) in the Little Smokey mining district west of Ketchum.

Abella Resources conducted a large diamond-drilling program on its Little Falls molybdenum prospect on the South Fork of the Payette River. This property has been in the exploration and development stage for the past three years. The company has expended approximately $3 million on the project so far.

Monica Mines continued a drilling and testing program in the Pearl district northwest of Boise near Horseshoe Bend. The Red Warrior and Leviathan vein systems are being actively explored. Either Monica or the Sunshine Mining Company has agreements on most of the old claims in this area. The Pearl district produced gold in the early 1900's. Monica Mines was also active at the Golden Gate Tungsten Mine near Yellow Pine in Valley County. Approximately 8,000 tons of tungsten ore was stockpiled during the summer.

The old Dewey Mine in the Thunder Mountain district started limited production this fall. The venture is known as the *Golden Reef Joint Venture*, and some excellent native gold has reportedly been mined. The mill at the site consists of a rod and ball mill that feeds a series of Reichert cones. Material from the cone separater then goes through a series of Whiffley tables where the free gold is recovered.

Anaconda erected a large drilling rig on its claims west of Red Mountain in the

Pioneer-Tango Creek area of central Idaho. The drill was flown in by helicopter and assembled at the site. The company is evaluating a molybdenum deposit on this property.

Clayton Silver Mines enjoyed an excellent year in 1980 as it did in 1979. The completion of the No. 2 shaft project in 1979 increased ore reserves from 100,000 tons to 410,000 tons. The mine, located north of Clayton, has been in continuous operation for many years. Development of ore reserves was completed on the 1,000-foot level of the mine during 1980. The 800- and 1,100-foot levels were opened by the No. 2 shaft project.

Canadian Superior Mining (U.S.), Ltd., did no further testing on its cyanide heap-leach gold operation at Stibnite. The company is waiting for the draft Environmental Impact Statement due in December 1980 so that it can continue mining operations. The company estimates that it has put close to $10 million on this project. Canadian Superior did reopen the Sunnyside Mine (owned by Thunder Mountain Gold) in the Thunder Mountain mining district east of Stibnite and did some diamond drilling and development on this property.

Exaggerated press releases in midyear stated that *Anglo-Bomarc* had plans to open the largest open-pit silver mine in the world at its Hercules property near Grade Creek, approximately 6 miles southeast of Brownlee Dam in Washington County and 20 miles west of Cambridge. Anglo-Bomarc has in fact an agreement with a West German drilling fund represented in part by TRV Minerals, Inc. (Twin Rivers Development), of Vancouver, B.C. The company drilled sixteen holes this year to delineate the size of the orebody. Some encouraging intercepts were made. Under the agreement between Anglo-Bomarc and TRV Minerals, Ltd., $1 million in funding will be committed to the property this year and another $4 million over the next few years. The arrangement gives TRV a 51 percent share of the property.

Conjecture Mines, in an operating agreement with the privately owned company Minerals Management, Inc., evaluated the silver-lead potential of the long-dormant Conjecture Mine in the Lakeview district in Bonner County.

Painted Desert and Uranium Company entered into an agreement with Union Carbide concerning the Elk Mountain tungsten property near Beauty Bay on Lake Coeur d'Alene.

Sidney Mining Company completed a diamond drill hole on its holdings near DeLamar in Owyhee County. Sidney has been actively exploring this area for several years.

U.S. Antimony Corporation, the largest antimony producer in the United States, is operating a 100-ton-per-day gold mill in Preachers Cove on the Yankee Fork of the Salmon River. The mill is processing dumps from the Charles Dickens Mine and mines operated by U. S. Antimony on Estes Mountain. The company is known as the Yankee Fork Silver and Gold Company.

Inspiration Development Company (a subsidiary of Inspiration Copper Company, Arizona) continued exploring and developing the old Bayhorse, Pacific, and Ramshorn mines in the Bayhorse mining district south and west of Challis. A lease option was obtained on the Keystone Mine in this area. The company also continued with exploratory diamond drilling at the Ima Mine near Patterson, a major tungsten producer in the past. Inspiration is considering the mine as a molybdenum prospect. The company also continued work at the Salmon River Copper Mine (copper and cobalt) west of Shoup on the main Salmon River.

Brenda Mines (a subsidiary of Noranda) continued developing its Spring Creek molybdenum prospect. Two adits have been driven on the property and numerous diamond drill holes have been completed in the past three years.

Cominco drilled several holes on its molybdenum property on Napolean Ridge north of Salmon.

Sunbeam Mining Corporation was active on its property at the Sunbeam Mine on Jordan Creek, a tributary of the Yankee Fork of the Salmon River. The company is actively testing the feasibility of a heap-leach cyanide operation on low-grade gold ores in the area. This year the company developed three leach pads for testing and installed a building to house the gold recovery equipment. The plant uses a zinc-cyanide extraction process. Each of the three pads will test a different type of operation. One pad will be for the mine-run ore. The second pad will test ore crushed to one-half inch. The third pad will test ore crushed to one-half inch that has previously been run through a trommel to separate the coarse gold. If results are satisfactory, it is planned to start leaching a production pad next year.

Cal-Ida Mines is reportedly drilling a copper prospect located 40 miles southeast of Salmon on McDivett Creek in Lemhi County.

A small mill south of Riggins has been placed into operation for the custom milling of ores from the Red Demon Mine in Florence and from several small mines (Ida Bell, Berg, Minarcha) north of DeLamar in Owyhee County. The mill is a closed cyanide vat system.

The *Banner Mining Company* (a joint venture between the Silver Chief Mining Company and National Resources, Ltd., of Dallas, Texas) continued development of the Banner Mine northeast of Idaho City. The major effort this year was to reopen the 3,500-foot, Long Tunnel, driven in the 1890's. Approximately 3,000 feet had been reopened when operations ceased for the winter. The company has expended over $1 million on the project thus far and hopes to ship ore next year. The mine employed 50 men last summer.

The *Missouri Mine* was in operation near Pioneerville. A mill was built and operating this year. Some ore was shipped. The mine employs eight men and has approximately 700 feet of new workings.

The *Princess Blue Ribbon Mine* south of Dollarhide Summit was reportedly operating last summer.

The *Willy Jack Mining Company*, in association with Bear Creek Mining Company, test drilled tungsten deposits in Wildhorse Canyon east of Sun Valley. The company has reportedly dropped this venture.

Numerous placer operations were underway throughout the state in response to the high price of gold. The largest operation was Goldfinger Mining Company's Phifer Creek Placer on the Middle Fork of the Boise River. The trommel used can process 1,000 to 1,200 yards of gravel a day. Other significant placer operations were developed on the Yankee Fork of the Salmon River, on the main Salmon River north of Riggins, on Newsome Creek near Elk City, and in the Murray area in northern Idaho.

NONMETALLIC MINERALS

The phosphate industry in southeast Idaho produces approximately 10 percent of the nation's phosphate.

J. R. Simplot is developing the new Smoky Canyon Mine, a 2,000,000-ton-per year operation scheduled to start in 1984. Preproduction costs are estimated at $20 million. Construction at the mine site will begin in 1982. The mine will use a 25-mile slurry pipeline to transport phosphate ore. The lease acreage covers 2,520 acres. Around 100 new employees will be hired at the Smoky Canyon facility. The mine has over 30 years of identified reserves. Simplot continued work on the Woodall Mountain Mine, a patented property adjoining a federal lease.

Due to a rate increase, the cost of electric power for the phosphate fertilizer plant of *Freeport Minerals Company* at Pocatello was raised from $14 million in 1979 to an estimated $23 million in 1980. The plant consumes about 15 percent of the power generated by the Idaho Power Company.

Idaho Portland Cement at Inkom had a good year despite the slowdown in the construction industry. The company is the only cement producer in the state. Plans have been made to expand its Idaho operation. Lime for the cement is mined right next to the Inkom plant.

Oneida Perlite had an excellent year because of its strength in industrial work, although its residential building business was reduced. The company is building a new filler plant and plans to install five new furnaces for producing expanded perlite for the ceramic insulation market. They also are going into the precast panel construction business for building industrial firewall panels.

Cash Industries in Ketchum operated a 100-ton-per-day barite-processing mill on Warm Springs Road. The barite is processed from ore stockpiled at the Deer Creek site near Clarendon Hot Springs. The company plans to start an underground barite mining operation on claims near the Deer Creek Mine next year and has five to seven years of reserves blocked out. Barite is used in drilling-mud in Idaho, Utah, and Canada.

N. L. Baroid (a division of National Lead) owns the Old Soldier and Bonnie May claims that cover the Deer Creek Mine. The company plans to build a plant in the Bellevue area to process barite. The plant should be completed by 1985.

Barite was also mined this year from the Hoodoo Mine (a former zinc producer) on Slate Creek near Clayton. The barite is in a 25-foot-wide vein. Approximately 4,200 tons of the material was shipped to Missoula for use in drilling-mud.

Occidental Petroleum has a large claim block near Sheaville in Owyhee County. The company plans to build a mill next year to process zeolites.

The *Double Eagle Petroleum Company* from Casper, Wyoming, shipped some zeolites from its open-pit operation near Oreana.

Rocky Mountain Energy started driving an adit at the Little Boulder Creek property near the headwaters of Summit Creek and Trail Creek east of Sun Valley. The company is exploring for uranium.

Hess Pumice Products had a good year because of its industrial abrasives market. The abrasives are used for finishing glass, metal, wood, and plastics. Pumice is used as an abrasive in soaps, erasers, tumbling media, and finishing compounds. As with other construction-related industries this part of the year's business was poor. The company plans to relocate in the next five years. Pumice is mined at the Wright Creek Mine, 22 miles northwest of Malad. Reserves are estimated at 8 million tons of crude pumice. The mine is an open-pit operation, with 5 to 40 feet of overburden stripped prior to mining. Hess Pumice is a main source of pumice for lightweight aggregate in concrete and blocks. The insulating properties of pumice make it useful for fill in concrete building blocks, and its porosity and water-holding ability make it useful as a soil conditioner.

Pumice Products of Boise, Idaho, underwent a business decline, because all its pumice product is used as an aggregate by the construction industry.

A. P. Green had a slow year because of the falloff of the construction industry. The Troy-based company makes fire brick that is used extensively by the lumber and paper industry in the Pacific Northwest. The company mines refractory clay from pits near Helmer.

Emerald Creek Garnet, Inc., operates a garnet placer on Carpenter and Emerald Creek near Fernwood that is one of the largest in the country. The company has an average production of 13,000 tons of finished product per year and is also the largest dredge-mining operation in the state. In 1979 the company purchased the Idaho Garnet Abrasive Company, owned by Sunshine Mining Company. Much of the ground dredged by Sunshine is being reclaimed by the new operators. The company employs 27 people. Garnet is used as an abrasive in sandblasting and as a filtration medium.

OIL AND GAS

The Overthrust Belt continues to be one of the most successful areas for oil and gas exploration in the United States. The large fields found in southwestern Wyoming and northeastern Utah are yielding hydrocarbon reserves that are approaching in magnitude 30 percent of the reserves of the Prudhoe Bay field in the North Slope of Alaska. The Overthrust Belt continues into southeast Idaho and this part of the state has a high potential for oil and gas reserves.

Seven drilling permits were issued during 1980, but only five wells were drilled. The two permits not drilled are

held by Amoco. Amoco plans on drilling these wells in 1981. The history of oil and gas drilling in Idaho is summarized in Table 2. A summary of the wells drilled during 1980 is shown in Table 3.

In addition to the new starts, Supron Energy reentered the Bevens No. 1 well in NW¼NE¼, Sec. 33, T. 5 N., R. 44 E. Efforts to complete the well as a gas producer failed, and the well was plugged and abandoned.

Company seismic crews in southeast Idaho were very active during 1980. Quite often it was difficult to obtain a motel room in Montpelier because of the numerous geophysical crews based there. Much of the seismic data involves new transects over old areas. The new data should be an improvement over the old, and better results are expected to be obtained in future drilling.

Table 2. Historical Summary of Oil and Gas Drilling in Idaho

Area	Pre-1963 Well/Footage	1963-1975 (13-Year Period)	1976-1980 (5-Year Period)	Total
Eastern Idaho	21	5	23	49
	81,849*	32,466	196,724	311,039
Southwest Idaho	36	5	1	42
	69,921	41,231	14,006	125,158
Other	8	5	—	13
	14,308	25,761	—	40,069
Wells Drilled	65	15	24	104
Footage Drilled	166,078	99,458	210,730	476,266
Average Depth	2,555	6,631	8,780	4,580

*Represents total footage figure for the number immediately above in each case.

NEW LEGISLATION AND REGULATIONS AFFECTING MINING

The bill creating the River of No Return Wilderness was approved by the Congress of the United States and signed by President Carter during the year. The act creates a 2.2 million-acre wilderness in central Idaho, the largest federal wilderness area outside Alaska. Special management was approved for 39,000 acres of the area that has a high possibility of containing cobalt mineralization similar to deposits at the Blackbird Mine just outside of the wilderness area. A further survey for this strategic mineral in the area will be conducted under the direction of the Department of Defense, and newly discovered deposits have the potential for being mined. If no deposits are found, then this area will be managed as wilderness.

The U. S. Bureau of Land Management (BLM) identified 1.6 million acres in 61 areas within Idaho for wilderness study out of a total 11.9 million acres under bureau jurisdiction in the state. The BLM also recommended designating 720,000 acres in southwest Idaho for an expanded Birds of Prey Conservation Area. The present refuge of 26,714 acres was set aside in 1971.

The BLM adopted regulations that restrict oil exploration and leasing in areas that are under study for wilderness potential. This has affected large parts of

Table 3. Exploratory Oil and Gas Wells in Progress in Idaho for 1980

Operator, Location	Well Name	Location	Depth (Ft.)	Status
Ladd Petroleum, Denver, Colorado	Bennington No. 3-24	SE¼SW¼, Sec. 3, T. 12 S., R. 43 E.	13,530	Plugged and abandoned, dry hole
Cities Service, Denver, Colorado	Rigby "A" Williams No. 1	SW¼SE¼, Sec. 29, T. 13 S., R. 46 E.	11,025	Plugged and abandoned, dry hole
American Quasar Petroleum, Dallas, Texas	North Eden Federal No. 21-11	NW¼NW¼, Sec. 21 T. 16 S., R. 45 E.	9,391	Plugged and abandoned, dry hole
American Quasar Petroleum, Dallas, Texas	North Rabbit Creek Federal No. 6-21	NE¼NW¼, Sec. 6, T. 16 S., R. 46 E.	11,603	Plugged and abandoned, dry hole
Phillips Petroleum Co., Cutbank, Montana	Stoor "A" No. 1	NW¼SE¼, Sec. 29, T. 5 S., R. 44 E.	15,109	Plugged and abandoned, dry hole
Amoco Production Co., Denver, Colorado	Bald Mountain Federal No. 1	NE¼NE¼, Sec. 5, T. 4 S., R. 45 E.	—	To be drilled in 1981
Amoco Production Co., Denver, Colorado	Bald Mountain Federal No. 2	NW¼NE¼, Sec. 6, T. 4 S., R. 45 E.	—	To be drilled in 1981

the Overthrust Belt, an interstate area with potential oil and gas production. Regarding the adjoining areas of Wyoming, a Wyoming judge overturned similar restrictions late in the year. This has had little effect, however, in Idaho, as only about 500 acres in the Overthrust Belt of the state is designated for wilderness study.

The BLM adopted regulations that are designed to protect land from certain mining activities. The new regulations have been under study for four years and pertain to locatable minerals. The regulations cover three tiers of activity. (1) Miners who significantly disturb 5 acres of land or less per year must notify BLM 15 days in advance of working and describe their operation and location. They must also pledge to reclaim the land to BLM standards after work ceases. No bond is required for these smaller operations. (2) Miners who disturb more than 5 acres per year must follow more stringent guidelines. (3) Miners who prospect without any significant surface disturbance are not affected. Copies of the new regulations are available from the BLM offices in Coeur d'Alene and Boise.

The second session of the 45th Idaho legislature saw record activity with the introduction in early 1980 of twenty pieces of proposed legislation affecting mining. A combination of events, including the Sagebrush Rebellion, the One Percent Tax Initiative, and the higher prices for silver, focused attention on mining and resulted in an increase in legislation which could directly impact the mining industry. Proposed actions during 1980 ranged from state acquisition of federal mineral rights through extensive discussion of the Sagebrush Rebellion to major increases in the state mine license tax.

Several bills were adopted that were introduced by the mining industry. One of these assures renewal of state mineral leases; another allows prepayment of property tax on large new businesses (for example, allowing Cyprus Mining Company to prepay its property tax to Custer County for alleviating the socio-economic impact of development at the Thompson Creek Molybdenum Mine); and another bill clarifies water quality regulations. Another new law allows gas station owners who sell gasohol to get a refund from the state for each gallon sold. Bills that would have duplicated federal regulations on hazardous waste were not passed. The legislature also failed to create a new state Department of Energy that would have replaced the Office of Energy that is now operating on federal funds. As the legislature drew to a close, paramount concern continued to focus on Sagebrush Rebellion legislation which, as drafted, failed to provide any protection regarding grandfather rights for existing mining claims or mineral leases under current federal law. The legislation also failed to provide protection against the possibility of making duplicate payments to both state and federal governments until the final determination of ownership is made by the U. S. Supreme Court.

The Sagebrush Rebellion is a movement by many western states to gain ownership and jurisdiction of public lands within their boundaries. The movement gained popularity by a recent Nevada statute giving the state of Nevada title to all BLM land in the state. The Nevada bill was based on an Alabama case settled by the Supreme Court in 1845 that turned over federal land to that state. Nevada's statute has not been tested in federal court. Idaho's Sagebrush Rebellion hinged on an Idaho Senate resolution for a constitutional revision which failed. After heated debate, the remaining Sagebrush bills were held in committee when the legislature adjourned. Supporters of the rebellion were buoyed by conservative gains made during the 1980 fall election.

The Idaho Department of Lands released the final regulations governing dredge and placer mining operations in the state. An application for a permit must be filed, if the dredge operator will move more than 2 cubic yards of material per hour, or if a suction dredge with an intake larger than 8 inches is used. Copies of the regulations may be obtained from the Bureau of Minerals, Department of Lands, Statehouse, Boise, Idaho 83720. The department also released for public comment the proposed regulations governing the issuance of oil and gas leases on state land. Copies of these may also be obtained from the Idaho Department of Lands office in Boise.

The high price of gold stimulated a dramatic increase in the number of people interested in placer mining. Approximately 900 stream alteration permits (required of all dredge operators, no matter how small their operation) were filed with the Idaho Department of Water Resources. The department completed the state regulations concerning mine tailings ponds. Tailings ponds with banks or dams 30 feet or less in height and with a storage capacity of less than 50 acre feet of water are exempt from the new regulations that require the posting of a bond to guarantee that larger dams, once abandoned, are left in a safe and maintenance-free condition. The regulations apply only to ponds constructed after 1978. Copies of these rules may be obtained from the Idaho Department of Water Resources, Statehouse, Boise, Idaho 83720.

The state continued to wrestle with problems of radioactive waste disposal. The Governor's office recommends three disposal methods for low-level wastes that are currently pumped underground at the Idaho National Engineering Laboratories (INEL) on the Snake River Plain. Last year the state became concerned about contamination in the Snake River aquifer, the largest in the state, by these low-level wastes from INEL that were being pumped underground. None of the three proposed methods will require pumping contaminated water underground. In a related matter, Idaho and the other states now have responsibility for developing a plan to deal with the disposal of low-level nuclear wastes. Governor Evans noted that if a waste disposal site is located in Idaho, the area around Grand View might be considered as a site, because the impermeable clay in this area is appropriate for waste containment.

In November the Environmental Protection Agency placed into effect regulations regarding hazardous waste disposal as required by the Solid Waste Disposal Act and the Resource Conservation and Recovery Act of 1976 (RCRA). The regulations are designed to provide permanent waste monitoring. Idaho companies immediately affected include Hewlett-Packard of Boise, Zilog of Nampa, Sim-Chem of Mountain Home, and Wescon,

Inc., of Grand View. The Bunker Hill Company of Kellogg and Omark Industries in Lewiston may also be affected.

The Pacific Northwest Power Bill became law in December. This law transforms the Bonneville Power Administration into a broker for all electric power generated in Oregon, Washington, Idaho, and Montana.

A Supreme Court decision upheld a previous ruling that the United Steel Workers of America could be sued for negligence by the widows of some of the 91 miners who died in the tragic 1972 fire at the Sunshine Mine. The suit alleges that the union failed to inspect the mine and develop adequate safety programs for its members. The suit is for $3 million.

OTHER DEVELOPMENTS

On May 18, 1980, the Pacific Northwest underwent a cataclysmic geologic event when Mount St. Helens, a volcano in the Cascade mountain chain in southwest Washington, erupted. The resulting ash cloud, borne by the prevailing west to east jet stream, by midafternoon had turned day to night throughout northern Idaho. The ash fallout was extensive in northern Idaho, exceeding 3 inches near St. Maries. All of the eight north Idaho counties were designated as a disaster area. The Idaho National Guard was mobilized to help with the mammoth clean-up effort. The possible ill effects of the ash on crops, livestock, and human health caused great concern. The Idaho Bureau of Mines and Geology continued to provide analyses of the ash to citizens and the press to assuage public fears. Although the ash was proven to be chemically inert, nontoxic, and nonacidic, people were urged to don masks to keep from breathing the ash. The engines of many vehicles were damaged by the abrasive ash particles. The cost for the clean-up of northern Idaho was approximately $2 million.

In June, a 236-foot long crack was detected in the 717-foot high concrete Dworshak Dam above Ahsahka. The leak of 7,700 gallons per minute concerned officials from the state and the Army Corps of Engineers. A solution consisted in lowering a plastic sheet over the crack on the upwater side of the dam to seal the leak. Prior to emplacement of the sheet, 70 diamond drill holes were bored to intercept the crack and to relieve pressure, allowing the crack to seal itself. Both operations were partially successful and the flow was cut in half. Further repair work, including a patch made up of a mixture of sawdust, cement, and volcanic ash, is planned for early 1981. The repair bill will exceed $1 million. The structure dams the North Fork of the Clearwater River near Orofino, forming a lake that is now 53 miles long.

The new "Gold Rush" in 1980 prompted the University of Idaho College of Mines and Earth Resources to offer a short course entitled "The Design, Economics, Mining and Metallurgy of Small-Scale Gold and Silver Operations." The course was an instant success, and demand required that it be offered four more times during the year with plans for several more offerings in 1981.

Three geoscientists from the People's Republic of China arrived at the University of Idaho to study for one year. They are at the university as part of a graduate student exchange program with China. Their stay is being financially supported in part by the Idaho mining industry.

A major research project to study the Coeur d'Alene mining district is underway at the University of Idaho. The College of Mines and Earth Resources succeeded in developing a $827,000 federal grant, which in cooperation with the U. S. Geological Survey, will fund a four-year research program that will help industry in finding new ore reserves.

The College of Mines and Earth Resources completed the enclosure and equipping of a new mining and geological engineering rock mechanics laboratory. The project was funded by donations of about $250,000 from the mining industry.

The Sunshine Mining Company donated $15,000 to the College of Mines and Earth Resources to establish a Tertiary Research Center for Paleontological Study. The Center plans to publish an extensive volume on the Clarkia fossil site that has been under intensive study by University of Idaho scientists for several years. The site is well-known for its plant, insect, and fish fossils of Miocene age that are remarkably well-preserved.

J. R. Simplot contributed $1 million to the Center for the Fine and Performing Arts at Boise State University. The center will be named for the late Harry Morrison of the Morrison-Knudsen Company.

The first of three geothermal wells that will eventually heat the State Capitol Building was drilled in 1980. This project costing $800,000 is under the direction of the Idaho Division of Public Works.

Legal problems continued to snarl plans for the Northern Tier Pipeline approved by President Carter in 1979. Because the pipeline will carry oil from Port Angeles, Washington, to Clearbrook, Minnesota, the plans have been under criticism by many conservation organizations for the past several years. Public hearings on the pipeline were held during 1980.

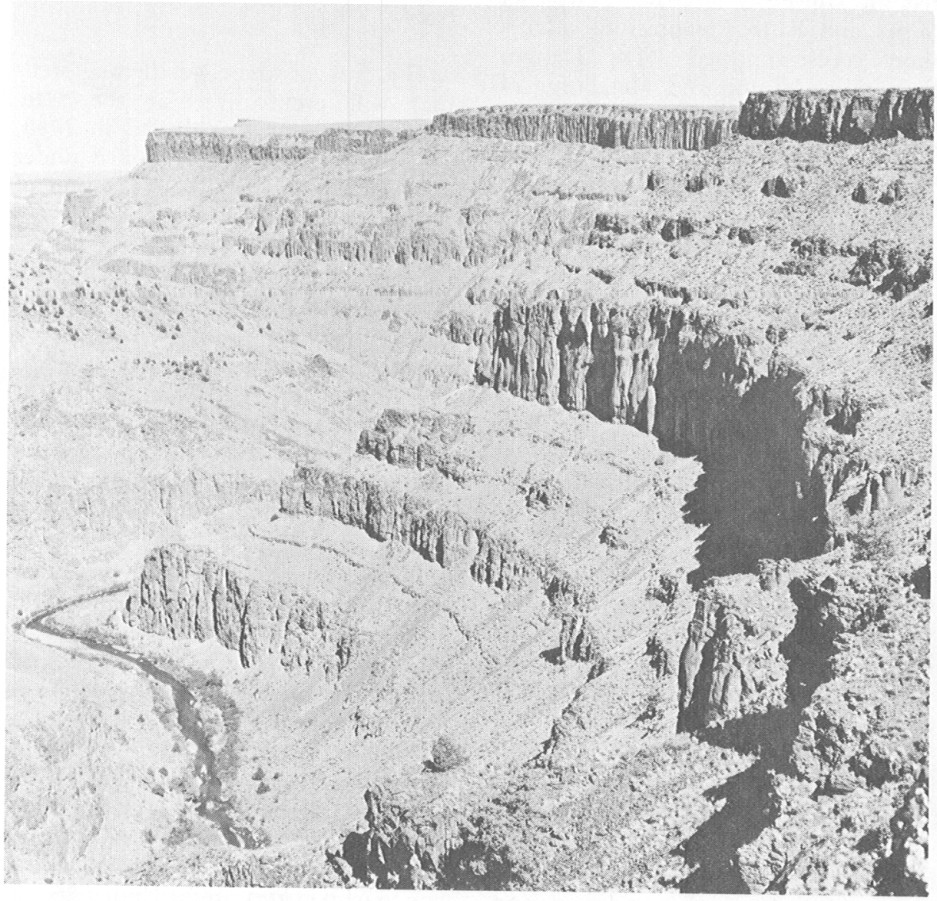
Work did start on the Idaho portion of the Alaska Highway Pipeline that will eventually bring Alaska natural gas to the lower forty-eight states. Ground preparation for the 42-inch pipeline is expected to move ahead at a rate of a mile a day. The initial 160-mile segment of the pipeline crossing Idaho, Washington, and Oregon is scheduled for completion in 1981, at which time natural gas from Alberta will flow through the line to market areas in the United States.

Volcanic Center

(continued from page 1)

meters, considerably larger than any volcano that might be associated with them. Much of their structural subsidence takes place along arcuate or circular boundary fractures up through which magma has erupted. Their shape results essentially from the collapse of the magma chamber roof when part or all of the molten mass under the surface is expelled. The critical structural evidence ascertaining that subsidence occurred in the Bruneau-Jarbidge eruptive center has been found by Bonnichsen at localities in the canyons on the Jarbidge and Bruneau Rivers and Sheep Creek.

The volcanism during the evolution, collapse, and subsequent filling of the Bruneau-Jarbidge eruptive center is similar to that which occurred later in the Island Park caldera of eastern Idaho and in the Yellowstone National Park area. Most of the volcanism, both in volume and probably in length of time, consists of the extrusion of rhyolite (a volcanic rock very similar to granite and characterized by a high content of silica, sodium, and potassium and low amounts of iron, magnesium, and phosphorous). The rhyolite was formed by a partial melting of portions of the earth's lower crust beneath the region. The voluminous rhyolite eruptions were followed by a number of relatively small basalt eruptions, very much like those that occurred throughout much of Idaho's Snake River Plain. The upward ascent of basalt magma probably was guided by the locations of earlier fractures that had formed during the preceding rhyolite eruptions and evolution of the caldera complex. Thus, the localization of the basalt vents in arcs suggests where the major ring fracture systems of the caldera complex are buried.



Looking north along Blackrock escarpment which forms the east wall of Bruneau Canyon for the first few kilometers north of the Nevada border. Each weather resistant layer exposed in this escarpment is a different cooling unit, or ignimbrite layer, within the Cougar Point tuff. Each was formed from a series of immense eruptions closely enough spaced in time to yield—after spreading out as hot pyroclastic flows and then cooling—a single layer of dense rhyolite. Deposits of stream and lake sediments and unconsolidated volcanic ash occur between the weather resistant ignimbrite layers. *IBMG photo.*

At least seventeen separate major rhyolite eruptions associated with the development of the Bruneau-Jarbidge eruptive center have been documented. Others probably occurred, but details of their existence have not been resolved because they are covered by overlying rocks. The first nine major eruptive cycles produced ignimbrite layers. This type of rhyolite is formed by pyroclastic flows laid down by extremely hot (incandescent) avalanches of volcanic ash, pumice fragments, and hot gasses. In an eruption like this, hot magma is explosively ejected from large fissures to form vertical eruption columns extending many kilometers into the atmosphere. Such columns would be similar to those produced by atomic explosions and by last year's major Mount St. Helens eruption. The gravitational collapse of a column provides the energy and velocity necessary for the hot ash to spread along the ground many tens of kilometers from its source. The hot ash and pumice fragments from such eruptions were still hot enough after they had spread laterally to weld together into dense layers of rhyolite.

This explosive phase of the volcanic activity from the Bruneau-Jarbidge caldera produced a series of welded rhyolite pyroclastic flows, known as the Cougar Point tuff. Each of the Cougar Point tuff units, or ignimbrite layers, was probably the result of several explosive pyroclastic eruptions in rapid enough succession so that they cooled together to form one layer of rhyolite. Accompanying the eruptions and the pyroclastic ash flows was the eruption of huge volumes of airborne volcanic ash. Many layers of this ash, some of which are tens of meters thick, occur in the vicinity and to the east of the Bruneau-Jarbidge eruptive center. Large amounts of volcanic ash deposited from the atmosphere occur between the layers, attesting to additional, probably small, eruptions between the major events that formed the Cougar Point tuff. Each ignimbrite layer is thought to represent the eruption of the upper part of a separate rhyolite magma chamber. Mineralogical, chemical, and chronological studies of the individual ignimbrite sheets reveal that they were erupted from a succession of large magma chambers which had formed beneath the area from time to time.

(continued on page 19)