Developments in Minerals, Mining, and Energy in Idaho for 1983

Idaho Geological Survey
U.S. Bureau of Mines
Idaho Bureau of Minerals
Idaho Oil and Gas Conservation Commission
Idaho Mining Association
DEVELOPMENTS IN MINERALS, MINING, AND ENERGY
IN IDAHO FOR 1983

by

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DEVELOPMENTS IN MINERALS, MINING, AND ENERGY
IN IDAHO FOR 1983

by

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INTRODUCTION

This report on Idaho's mineral industry and energy resources for 1983 is a cooperative effort among several state and federal agencies and an industrial organization. The Idaho Geological Survey acknowledges the contributions of the Idaho Bureau of Minerals, the U.S. Bureau of Mines, the Idaho Oil and Gas Conservation Commission, and the Idaho Mining Association. Numerous individuals in industry and the U.S. Forest Service and Bureau of Land Management have also contributed information. Previous reports from 1977 are available from the Idaho Geological Survey. The locations of towns and cities referenced in this paper are shown on Figure 1.

MINERAL ECONOMICS

Precious metals were the star performers in the domestic minerals industry as the country began to recover from the recession that bottomed in 1982. Throughout the year industry spokesmen intoned cautious optimism about the future of the metal markets. Major economic concerns still

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\textsuperscript{5}Idaho Mining Association, Boise, Idaho 83701.
Figure 1. Location of selected cities and towns in Idaho.
remained at year's end however, with the huge federal deficit looming over the recovery and prolonging fears of high interest rates and a return to galloping inflation. The strong U.S. dollar abroad was also disturbing, as it adversely affected companies with large foreign holdings and hindered sales of U.S. goods abroad.

Another casualty of the recession in Idaho surfaced when Bucyrus-Erie Company, a manufacturer of mining equipment, closed its plant at Pocatello. The closure cost 500 jobs and was a severe economic blow to the Pocatello community. The sprawling plant on 168 acres was purchased in 1974 and had employed up to 1,200 people in the 1970's.

The value of nonfuel mineral production increased from $300 million in 1982 to $434 million in 1983 (Table 1). Almost the entire increase was due to generally improved silver prices during the year. The historical value of the state's mineral production is shown in Figure 2. Nationwide, Idaho ranked sixteenth in the value of nonfuels mineral production in 1983. Idaho's mines produced 50-60 percent of the nation's new silver and 10-15 percent of its phosphate rock. With the successful start-up of Amoco Minerals' Cyprus Thompson Creek project, the state will also soon be a major supplier of molybdenum.

Base metal prices were lower or flat during the year, with the exception of zinc which rose in value due to the major recovery in the U.S. automobile industry. Zinc started the year at almost 38 cents per pound and had risen to 48 cents by year's end. Lead fluctuated around the 20-cent mark until late September when it climbed to 25 cents per pound, reflecting an increased use for car batteries. The copper market continued to be a disaster, with early-year prices starting at 65 cents per pound, rising to 76 cents in May, and then slowly slipping to 60 cents by year's end. U.S. copper producers have sought import protection under the Trade Act of 1964. Massive imports from Chile continue to plague the domestic industry. The subsidies given by foreign governments to their industries also create a major competitive disadvantage for many U.S. industries including mining.

Molybdenum started the year at $2.47 per pound for moly-oxide. At that time AMAX discontinued quoting a producer price. Spot prices were in the $3.50-$4.00 range throughout the rest of the year. Molybdenum
Table 1. Nonfuel mineral production in Idaho, 1982 and 1983, compiled by the U.S. Bureau of Mines.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>1982</th>
<th>1983</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (thousands)</td>
<td>Value (thousands)</td>
</tr>
<tr>
<td>Antimony ore and concentrate, antimony content</td>
<td>294</td>
<td>W</td>
</tr>
<tr>
<td>Clays</td>
<td>8</td>
<td>$101</td>
</tr>
<tr>
<td>Copper (recoverable content of ores, etc.)</td>
<td>3,074</td>
<td>$4,935</td>
</tr>
<tr>
<td>Gem stones (recoverable content of ores, etc.)</td>
<td>NA</td>
<td>75</td>
</tr>
<tr>
<td>Lead (recoverable content of ores, etc.)</td>
<td>W</td>
<td>25,726</td>
</tr>
<tr>
<td>Lime</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>Sand and gravel (construction)</td>
<td>2,340</td>
<td>6,258</td>
</tr>
<tr>
<td>Silver (recoverable content of ores, etc.)</td>
<td>14,830</td>
<td>117,901</td>
</tr>
<tr>
<td>Stone (crushed)</td>
<td>p/ 1,200</td>
<td>p/ 6,000</td>
</tr>
<tr>
<td>Combined value of cement, clays (fire clay and kaolin) (1983), garnet (abrasives), gold, gypsum, perlite, phosphate rock, pumice, sand and gravel (industrial), stone (dimension), tungsten, vanadium, zinc, and values indicated by symbol W</td>
<td>XX</td>
<td>164,810</td>
</tr>
<tr>
<td>Total</td>
<td>XX</td>
<td>p/ 300,078</td>
</tr>
</tbody>
</table>

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

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

2/ Excludes kaolin; value included in "Combined value" figure.

3/ Excludes fire clay; value included in "Combined value" figure.
Figure 2. Value of mineral production in Idaho, 1967-1983.
use was 35 percent below the record year of 1979 (Engineering and Mining Journal, May 1984), reflecting the sluggish steel market. In spite of the poor market conditions, AMAX reopened the Henderson mine, and MolyCorp dedicated the Goat Hill underground mine at Questa, New Mexico. The Cyprus' Thompson Creek molybdenum project may also get a surprising boost from the precious metals market (see later discussion).

The phosphate market began the year with increased exports and slightly better domestic agricultural markets, but overall the industry produced less and received lower prices than in previous years. According to the U.S. Bureau of Mines, prices fell 6 percent to $22.60 per short ton for all domestically mined phosphate rock. In Idaho, the industry was in a break-even mode with hopes that exports would remain favorable. In spite of the flat market, phosphate companies in the state continue to invest heavily in new developments.

Although the silver market was favorable for Idaho miners during the year, prices continued a roller coaster ride in response to the changing economic conditions worldwide. The price for silver peaked on February 11 at $14.30 per ounce, an increase from the $11 range in early January. Fears of drastically lower oil prices, coupled with an oversupply of petroleum throughout the world, drove the price of silver down to the $10.25 range in early March. When the oil market did not collapse, the price of silver climbed to over $13 in May. By year's end rising interest rates—and fears of even higher rates—along with a low domestic inflation rate drove the price down to under $9.00. The sale by Peru of 70 million ounces of silver in October also helped depress the market, as did Portugal's sale of 50 tons of gold to help finance its foreign debt. Furthermore, an over-supply of silver in the U.S. worked to keep prices down, as warehouse inventories rose to over 130 million ounces. Even world crises such as the Iran-Iraq war, the U.S. involvement in Lebanon and Grenada, and the shooting down of a Korean airliner by the Soviet Union failed to initiate an historically expected run-up in precious metals prices. The high U.S. interest rates and the very strong dollar on foreign markets could not be shaken by these events.

Two old problems continued to shadow the silver market: the hoard of over 60 million ounces of silver reportedly held in Delaware by the
Hunt brothers of Dallas, Texas, and the stockpile of 137-million ounces of silver by the federal government. Silver-user groups tried to get the stockpile sold (with hoped-for lower prices) while producers tried to keep it from being sold on the open market. The metal has always been linked to politics, and 1983 proved to be no exception. Idaho's congressional delegation continued a valiant effort to have the stockpile minted into Morgan dollars for circulation as currency.

One wonders what the outcome will be for the two-tiered silver market, with one side representing industrial supply and demand and the other side (and in 1983 the most important) representing a purely speculative market. A problem seldom addressed by either producers or users is what effect the rapidly growing videotape market will have on conventional photography, which currently accounts for almost half of the country's silver consumption.

Gold and silver prices generally go hand in hand, and this held true in 1983. Gold started the year at about $500 per ounce and slipped to the $350 range by year's end. A good example of the fickle nature of the speculative market in precious metals was seen in November, when the news of a major gold theft in London caused the futures markets for both gold and silver to climb sharply higher for a brief period.

MINERAL OPERATIONS

METALLIC MINERALS

Coeur d'Alene Mining District

The Coeur d'Alene mining district continued to lead the United States in silver output, accounting for approximately 60 percent of the country's newly mined silver. The location of active and recently closed mines is shown in Figure 3. The Lucky Friday mine and Sunshine mine ranked first and second respectively in the nation in newly mined silver; the Galena and Coeur mines ranked fourth and fifth. Asarco's Troy project in Montana was third. The over $130 million increase in 1983 in the state's value for nonfuels mineral production was, as noted, the result of improved silver prices. Base metal prices, with the
Figure 3. Location of mines in the Coeur d'Alene district.
exception of zinc, remained depressed and contributed little to the district's higher earnings.

In 1983, the district produced metals valued at $206,623,000, up from $130,214,000 in 1982. Production included 16,132,000 ounces of silver, 29,069 short tons of lead, and 2,143 short tons of zinc. Silver production was the highest since 1978 and zinc production the lowest since 1921. The drop in zinc production is a result of the recent closure of the Bunker Hill and Star-Morning mines. Since mining started in 1884, the historical dollar value of metals produced is $4,444,499,950. Total metal production for the hundred-year period includes 981,324,964 ounces of silver. These production figures were provided by D.C. Springer, Osburn, Idaho.

The production and cost figures for major producing mines as filed with the Shoshone County assessor's office are shown in Table 2. Net profits increased from almost $19 million in 1982 to $82 million in 1983, a welcome boost to the depressed county's tax revenues. Extraction costs increased only slightly, however, reflecting leaner, more efficient operations at all the mines.

The original lode silver and base metal claims in the district were staked in May, 1884, at the Tiger mine near Burke. Next year will be the centennial for lode mining in the Coeur d'Alene. Wallace, at the district's hub, also celebrates its centennial in 1984. The Idaho Geological Survey extends its congratulations and best wishes to the people of Wallace as they enter their second hundred years.

Bunker Limited Partnership. Improved silver prices enabled the Bunker Limited Partnership to open the Crescent mine in October. The mine had been idle for almost two years. On September 12, more than 250 men lined up at the Partnership office to apply for approximately 70 jobs. Over 1,500 would eventually apply, an indication of the area's lingering unemployment problem that started with the closure of the Bunker Hill mining, smelting, and refining complex in 1981 and the loss of 2,100 jobs.

The Partnership announced that the new workforce would be union-free and that the company would stress a "teamwork approach" rather than strict job descriptions. The company has a "gainsharing" (productivity
Table 2. Net production and earnings in 1983 in the Coeur d'Alene mining district, compiled from sworn statements on file with the Shoshone County Assessor.*

<table>
<thead>
<tr>
<th></th>
<th>Tons Extracted</th>
<th>Gross Value</th>
<th>Cost of Extraction</th>
<th>Freight and Treatment</th>
<th>Betterments</th>
<th>Net Profit (Net Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callahan Mining Corporation</td>
<td>195,420</td>
<td>$42,084,079</td>
<td>$13,067,081</td>
<td>$2,166,083</td>
<td>$661,594</td>
<td>$26,189,521</td>
</tr>
<tr>
<td>(Galena mine--Asarco, lessee)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coeur d'Alene Mines Corporation</td>
<td>140,089</td>
<td>28,145,940</td>
<td>7,832,059</td>
<td>1,795,649</td>
<td>165,836</td>
<td>18,352,396</td>
</tr>
<tr>
<td>(Coeur mine--Asarco, lessee)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hecla Mining Company</td>
<td>257,252</td>
<td>62,907,492</td>
<td>25,004,286</td>
<td>6,571,762</td>
<td>3,620,859</td>
<td>27,710,585</td>
</tr>
<tr>
<td>(Lucky Friday mine)</td>
<td>50,458</td>
<td>8,730,552</td>
<td>7,412,005</td>
<td>0</td>
<td>0</td>
<td>1,318,547</td>
</tr>
<tr>
<td>(Consolidated Silver mine)</td>
<td>-0-</td>
<td>-0-</td>
<td>2,632,155</td>
<td>-0-</td>
<td>-0-</td>
<td>(2,632,155)</td>
</tr>
<tr>
<td>Sunshine Mining Company</td>
<td>158,523</td>
<td>35,498,671</td>
<td>21,334,857</td>
<td>1,559,407</td>
<td>1,120,262</td>
<td>11,484,145</td>
</tr>
<tr>
<td>(Sunshine mine)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>801,742</td>
<td>$177,366,734</td>
<td>$77,282,443</td>
<td>$12,092,901</td>
<td>$5,568,351</td>
<td>$82,423,039</td>
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</tbody>
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* Note on "Statement of Net Profit on Mines for Tax Purposes" form: "This statement is not a true statement of "Net Income" because major expenses, including income taxes, depreciation, depletion, insurance, etc., are not allowable deductions and have not been deducted in arriving at net profit...."
pay) plan, a profit-sharing plan, and a matching retirement program.

The first shift of 14 men went underground on October 10. Nine new employees were added to the work force in mid-month. Approximately 600 tons of ore were shipped from the mine in mid-December. The ore will be milled in the Crescent circuit of the Bunker Hill concentrator. At year's end 66 men and women were at work in the mine and 4 at the mill. Concentrate shipments to smelters will start early in 1984.

During the year rumors circulated that the Bunker Hill mine and refining complex might reopen. One rumor early in the year claimed that a study was underway by the Partnership to see if lead concentrates could be found for the lead smelter. Low base metal prices throughout the year dampened any optimism for reopening the two metallurgical facilities. The Partnership is spending about $450,000 per month to maintain the mine and metal refining facilities on standby basis. Such cash drains cannot go on forever. Still, optimism for reopening the Bunker Hill mine remains high.

In June a federal arbitrator absolved the Partnership of union-related liabilities encumbered by the old Bunker Hill Company. The contract between the old company and the United Steelworkers Union expired in August. Union health benefits terminated at this time but pension benefits will continue. Early in the year the Bunker Hill Company name was changed to the Pintlar Corporation, a subsidiary of Gulf Resources and Chemical Corporation (former owner of the Bunker Hill complex). Pintlar is handling the transfer of the complex to the Partnership.

In April a $23-million out-of-court settlement was approved for 37 children of the area whose health was allegedly damaged by lead emissions from the Bunker Hill smelter. The payments will extend over the next 30 years. This suit is similar to another one settled for $9 million in 1982. The settlement by Gulf Resources did not admit liability.


Another chapter in the history of Bunker Hill ended in October with
the death of Charles E. Schwab, president of Bunker Hill from 1960 until Gulf's takeover in 1968. Mr. Schwab was highly regarded in the Silver Valley and is remembered for his attempts to block the Gulf takeover.

_Hecla Mining Company_. The year started on an optimistic note when the Hecla Mining Company announced that a new million-share stock offering would be issued to raise capital to complete the Silver Shaft at the Lucky Friday mine. The sale generated $22 million, which eliminated corporate debt and provided funding to complete the shaft. The company now has 18,740,180 shares outstanding of 30,000,000 authorized common shares.

The vitality of Hecla and its strong capital position make the company an excellent takeover candidate. To help thwart such moves, the company, in June, reincorporated in Delaware where corporate laws make takeovers more difficult. Companies that formerly held large blocks of Hecla stock had substantially reduced their holdings by year's end. Sunshine, who at one time owned 3 percent of Hecla's shares, reduced holdings to 50,000 shares and Amax, who held 9.1 percent, reduced control to 4 percent.

The most significant event during the year was the completion of the $39 million Silver Shaft to a depth of 6,205 feet on April 27, 1983. The shaft greatly improved mine production, which rose from 3,840,000 ounces of silver in 1982 to 5,077,182 ounces in 1983, making the mine the largest silver producer in the United States. The mine also yielded 27,969 tons of lead. Tonnage increased over 20 percent from 211,000 tons in 1982 to 257,000 tons in 1983. Daily tonnage increased from 725 tons to over 1,000 tons per day. The increased tonnage exceeds mill capacity, and five days of mining now feeds a seven-day milling schedule. It is estimated that 90 percent of the mine production will eventually be handled through the new shaft. Over 300 people are employed in the mining operation and another 13 in the mill.

The shaft was dedicated in August and about 550 employees, families, and guests made the trip down the shaft to the 4900 level. The project, started in 1980, was completed 40 weeks ahead of schedule by J.S. Redpath Corporation, the contractor. Development on the 4900 and 5100 levels began in midyear, and the first ore was hoisted through the shaft on
October 10.

One of the most exciting aspects of the new shaft is the deep exploration potential it provides the company. Plans also include continued exploration of the DIA (Day, Independence, and Abot) project north of the Lucky Friday. Hecla previously spent $1.7 million on this program in an earlier effort that ended in 1978.

Work continued at the $11 million Consolidated Silver Corporation venture at the Silver Summit mine. The shaft was completed to a depth of 5,524 feet and plans for 10,000 feet of drifting and 20,000 feet of diamond drilling were underway. This work started at the 5400 level. Hecla is the operator and a 64 percent owner of the exploration venture; Sunshine has a 23.9 percent interest, and Coeur d'Alene Mines Corporation a 12.1 percent interest.

More than 1,200 feet of drifting was completed at the Atlas mine south of the Lucky Friday. Exploratory drilling of the Boulder Creek vein system is planned for 1984. The work is being done under a $1.3-million exploration agreement signed in 1982 with the Atlas Mining Company.

Hecla profited from its 35½ percent interest in the Sunshine Unit Area, 12½ percent interest in the Calena mine, and 5 percent share in the Coeur mine. The Knob Hill mine in Republic, Washington, continued production, although the company announced that ore reserves were almost exhausted and that the mine would probably be closed in 1984. The Sherman mine in Leadville, Colorado, was reopened in February, and production at 120 tons per day was resumed in June.

Hecla signed an agreement with Texagsulf, Inc., whereby Hecla became the operator of joint venture properties under the name of the Cripple Creek and Victor Gold Mining Company at Cripple Creek, Colorado. Work during 1983 was centered at the Ajax mine. Hecla is entitled to 32 percent of profits, Texagsulf to 32 percent, and Golden Cycle Gold Corporation, the third partner, to 36 percent.

In March, Hecla signed a 10-year agreement with the Silver Snowshoe Company to explore eight patented claims northeast of the Lucky Friday mine. The claims could be explored from the Silver Shaft.

Hecla supported an aggressive exploration program throughout the
year. Work continued at the Florence Queen mine at Niehart, Montana, while another project at Hughesville, Montana, was abandoned. Exploration expenditures for all projects was $3.9 million, up from $2.5 million in 1982.

In June Hecla entered merger negotiations with Ranchers Exploration and Development Corporation of Albuquerque, New Mexico. Talks broke off after the tragic death of Ranchers' chairman, Maxie Anderson, in a ballooning accident in West Germany. The merger would have given Hecla control of the Escalante silver mine in Utah and other Ranchers holdings. Sunshine Mining Company was also interested in Ranchers.

The U.S. Department of Labor granted benefits in June to about 200 former employees of the Star-Morning mine under the federal Trade Readjustment Act. Benefits under the act provide help in finding new work and retraining for new skills to those workers who have lost their jobs to foreign competition. The Labor department had refused an earlier request but that decision was successfully appealed by Hecla. The Star was permanently closed by the company in 1982 because of low metal prices and high production costs.

The solid price for silver throughout the year, coupled with increased production, earned the company a net income of $26.7 million, up from $5 million in 1982. Total silver production from all sources increased to 6.8 million ounces, up from 5.2 million the previous year. Improved income enabled the company in December to cancel wage holdbacks initiated in June, 1982. Non-union employees were compensated for lost wages with interest. The success of the company was highlighted when Hecla was listed in mid-September for options trading on the American Stock Exchange. Also sharing in the company's good fortune were pupils in a fourth grade class in Adamstown, Pennsylvania, who received a lot of press coverage as their jointly-held single share of Hecla stock rose from $12 to $25. Hecla ended 1983 with only $865,000 in long-term debt and with assets of $121 million. The company maintains a $50 million bank credit agreement.

Sunshine Mining Company. Better silver prices in 1983 enabled the Sunshine Mining Company to reopen the Sunshine mine, closed during the second half of 1982 due to the poor silver market. The mine achieved full production by late February. Employment at the mine was up to 564
people by March 1. At year's end the company had mined 212,062 tons of ore, yielding a record 4,481,434 ounces of silver, 1,169,073 pounds of antimony, and 1,495,256 pounds of copper. This was an impressive increase over the 6-month production prior to closure in 1982 of 2,352,586 ounces of silver from 104,824 tons of ore. The Sunshine mine ranked second in silver production nationwide behind the Lucky Friday mine. Improved production enabled the company to reduce its cost per ounce to $7.50, the lowest level in several years. The mine employs 413 workers and the mill 18. Sunshine finished the year with a net gain of almost $5.5 million, compared with a $22.5-million loss in 1982.

In January the company offered 1.1 million new shares of stock to raise funds for capital projects, such as finishing the new silver refinery and reopening the Sunshine mine. Sale of the stock raised about $14.7 million. About $8 million was used to finance the reopening of the Sunshine mine. Another 1.2 million shares were sold in July, netting approximately $17.6 million. In February the company sold $30 million in 8 percent, silver-indexed bonds due in February 1995. Part of these proceeds were used to pay off bank loans related to last year's mine closure.

Development work in the Sunshine mine included 5,972 feet of drifting, 878 feet of raises, and 16,614 feet of diamond drilling. A connection between the No. 10 and No. 12 shafts on the 4600 level was completed, and an operating station was cut at the 4400 level.

In May, Sunshine announced it would sell silver directly to the public, in keeping with its long term corporate plan to become a vertically integrated, independent silver mining, refining, and marketing firm. Silver in 1-ounce rounds and in 10-, 100-, and 1,000-ounce bars is sold through the Sunshine Bullion Company. The bullion is minted by Tentex, Inc., in Chino, California. Sunshine's mark-up on silver is among the lowest in the country, and sales have been excellent. The company sold approximately 1,066,000 ounces during 1983. Also marketed at year's end were 10,000 proof sets of Sunshine medallions. Each set contains 7 ounces of silver.

In June, a commemorative medallion was released by Sunshine as a community service. Profits from the sale of the medallions go to the
Wallace and Kellogg Chambers of Commerce, the Coeur d'Alene District Mining Museum, and the Sierra Silver Mine tour. The medallions are provided to the organizations at company cost.

In July, a 3-year contract extension was signed by the company and the United Steelworkers of America, Local 5089. A company proposal had been rejected by the union earlier.

A $10.5 million contract was awarded in December to Weyher/Livsey Constructors, Inc., a wholly owned subsidiary of Dravo Corporation, for the completion of the company's $18 million silver refinery on Big Creek. The plant will be a hydrometallurgical facility that is environmentally clean. The refining plant will use a chemical leaching and electrowinning process to produce high purity .999+ fine silver from tetrahedrite, the main ore mineral in the Sunshine mine. The refinery is currently processing ore from the 16 to 1 mine in Nevada. In August the fine gold circuit was completed, and by year's end 25,619 ounces of gold and 947,110 ounces of silver had been refined.

During May, approximately 8,000 acres of promising mineralized land were acquired in the Tintic district in Utah when Sunshine purchased the H.M.C. Mining Company for $800,000 in cash and $1.3 million in liabilities. Included in the company assets was the Trixie mine that Sunshine is currently evaluating. Initial ore shipments from the Trixie were made to the Kennecott smelter at Garfield, Utah, in December. Sunshine continued its exploration and predevelopment program at the Burgin mine, also in the Tintic district, that was leased in 1980. In October, the company obtained a lease on an additional 2,335 acres adjacent to the Burgin mine from the Chief Consolidated Mining Company and Central Standard Consolidated. The company now has holdings of 12,751 acres in this area.

Sunshine deviated slightly from its total commitment to silver in October when the company joined several other investors, spearheaded by Mesa Petroleum's chairman, T. Boone Pickens, Jr., in an attempt to gain control of Gulf Oil, Inc. The investors' group purchased 21.7 million shares of Gulf at an average price of $45 per share. In March 1984, Gulf announced that it had accepted a $13.4 billion offer ($80 per share) from Standard Oil of California in the largest corporate takeover
in history. The investors' group stands to make about $760 million from its shares. Sunshine invested approximately $70 million in the venture, and its share of the profit should be approximately $45 million.

Work started in Mullan on a 2,000-foot drill hole to explore approximately 400 acres held by Allied Silver-Lead Company. The company is unique in that shares are held by property owners and the city of Mullan; both have signed over the mineral rights to their property to Allied. Boyle Brothers started the work in September, but turned the job over to Ponderosa Drilling when a heavier drill rig was needed. The project is looking for extensions of the Lucky Friday vein system beneath the town. Two more holes are planned for next year. Each hole will cost approximately $120,000.

An 18-year-old dispute with Silver Surprise Mining, Inc., was settled in February. Silver Surprise received $2 million plus interest as part of the settlement. sunshine retained the right under a 1946 agreement to a half interest in the Surprise property and has exclusive rights to operate and mine the Surprise claims adjacent to the Sunshine mine.

A legal dispute, started in 1979 between Metropolitan Mines Corporation and Sunshine, continued late in the year. The argument is over the ownership of the Copper vein in Metropolitan ground, claimed by Sunshine under extralateral rights. Metropolitan disputes this claim.

Sunshine has been working for the past 2 years at the Bellevue mine in Sierra County, California. The mine is an underground placer gold mine. The Bellevue tunnel has been opened 5,000 feet, and the company was deciding on the project's future at year's end.

Full production continued from the 16 to 1 mine at Silver Peak, Nevada. The 1983 production was 902,321 ounces of silver and 7,037 ounces of gold from 196,999 tons of ore. The mine went into production in April 1982.

A slide show was sponsored by the company for the Coeur d'Alene District Mining Museum. The 18-minute presentation gives visitors to the valley a summary of how mining is done and some background on the district's history. The show is given at the museum at half-hour intervals and has been a popular attraction with both tourists and local residents.
Callahan Mining Corporation. During 1983 the Callahan Mining Corporation received revenues of $11,729,000 from its 50-percent share of the Galena mine and 4.8-percent share of the Coeur mine profits. The Galena mine is the company's main income source. Callahan continued to fund all projects from internal cash flow.

A major part of the company's exploration program is the Caladay project, located east of the Galena mine at the southeast end of the silver belt. Hecla Mining Company (12%) and Asarco, Inc. (5%), are partners in the venture. Callahan spent $4.8 million on the Caladay during 1983 and plans to spend an additional $5 million in 1984. The following summary of events is taken from the company's 1983 annual report (see also Figure 4):

Callahan's major silver exploration project (82.3 percent owned) continued ahead of schedule with a consequent saving in costs to date. Shaft depth reached 4,578 feet at the end of 1983 with 4,437 feet of timber installed. Shaft stations were excavated at the 4000 and 4300 levels and work commenced on the 4600 level by year-end. Diamond drilling at both the 3000 and 4300 levels confirmed favorable geological structures; sporadic mineralization was also encountered in and near the shaft though not in commercial quantities. [The shaft sinking is being done by Faussett International of Wallace, Idaho. Forty men are employed at the operation.]

Arrangements were made during the third quarter with Asarco Incorporated to interconnect the Caladay and Galena properties and provide an escapeway at the 4900 level. This work will include some 2,300 feet of drifting in the Caladay property and 900 feet of drifting in Galena ground, an increase of 1,600 feet of drifting over that originally planned for this level. If cost savings continue to be realized, all of this work and 1,500 feet of drifting on another level should be accomplished within the $28.6 million total originally budgeted.

Although the Caladay shaft and both the 4000 and 4800 stations should be completed this year, two years of exploration drifting and diamond drilling remain to be accomplished under the current program. Total expenditures through the end of 1983 were $17.6 million.

In addition to the Caladay project, Callahan started development of the Ropes Gold mine in Michigan. Capital outlay for this project was $1.3 million. The company spent $2.4 million on other exploration projects for precious metals. They plan to spend $8 million on exploration for precious metals in 1984, including the $5 million at the Caladay.

Callahan also controls the Flexaust Company, a manufacturer of plastic
Figure 4. Generalized sketch of the Galena and Caladay underground workings. Shaft completion and levels planned for excavation through Caladay in 1984-85 are shown in dashed lines. (From Callahan Mining Company's annual report for 1983.)
products, and has a 49.9-percent interest in K.R.M. Petroleum.

Coeur d'Alene Mines Corporation. Profits from the Coeur mine boosted the Coeur d'Alene Mines Corporation's net income by more than 83 percent over 1982. The mine, operated by Asarco, has the lowest costs in the district and is the company's main source of income. Reserve figures for the Coeur mine increased substantially, to almost 1.3 million tons averaging 19.6 ounces of silver. These reserves ensure at least 8½ years of future production at present mining rates. The company also maintains a 12.1-percent interest in the Consolidated Silver project and a 35-percent share in the American Silver exploration venture.

Highlighting the year was the announcement on April 8 that Coeur d'Alene Mines would become the operator of the Thunder Mountain Gold property in Valley County in rugged central Idaho. Exploration of this area, centered on the Sunnyside mine, has been underway for several years, first by Superior Mining and more recently by Phillips Petroleum. Results from these previous efforts were encouraging. The agreement between Coeur d'Alene Mines and Phillips gave the company a 60-percent interest in Phillips' lease, with Phillips retaining a 10-percent interest and a buy back option for an equal interest if production starts. Thunder Mountain Gold holds a 30-percent net profit interest in the venture.

The project covers 14 patented and 449 unpatented claims. Coeur d'Alene Mines controlled 8,800 acres in the area at year's end. In August, a new issue of one million shares of Coeur d'Alene Mines' stock was offered to raise operating capital for the estimated $15 million for a mill, $2.3 million for roads and ancillary facilities, and $1.5 million for development and feasibility studies. This was the first public offering of the company's stock and raised about $18.3 million.

Approximately $2.3 million was expended in 1983 for predevelopment work and exploration at Thunder Mountain. Ore tonnage increased by 25 percent to 2 million tons averaging 0.10 ounce of gold per ton. During the year, 182 reverse circulation holes were drilled totalling almost 27,000 feet. Plans for 1984 include preparing the mine, mill, and support facilities for operation. The company hopes to start production in 1985 at the rate of 25,000 ounces of gold per year from the open-pit mine. The project will employ around one hundred people and will be a
welcome addition to Valley County's employment picture.

Coeur Explorations, Inc., continued work at the Royal Apex Silver, Capitol Silver, and Highland Aurora projects at the west end of the Coeur d'Alene district. The program included completing 3,185 feet of diamond drilling (636 feet at Capitol Silver) and 204 feet of trackless tunnel in the Harlow tunnel at Royal Apex. Geologic studies also continued at the CAMP project to explore the Polaris fault between the Silver Summit and the Coeur d'Alene mines.

Preliminary work was underway at the Rochester silver-gold property near Rochester, Nevada, about 115 miles northeast of Reno. The company purchased Asarco's lease on the Rochester for $10 million in late 1982. The Rochester property is owned by Royal Apex Silver. Coeur d'Alene Mines owns 49.8 percent of Royal Apex, giving the company a 92-percent interest in the Rochester project.

Northern Idaho silver went to Boise early in the year when Coeur d'Alene Mines presented a set of eighteen silver candlesticks to the state of Idaho for use at official functions in the Governor's mansion. The candlesticks are replicas of an eighteenth century design and were made from a 1,000-ounce ingot of silver from the Coeur mine.

Asarco Incorporated. Asarco Incorporated, the operator of the Galena and Coeur mines, had another excellent year, with good production from both mines. Perhaps the most significant event for the company in Idaho was the signing of a new labor contract with the United Steelworkers Union effective January 1, 1984. The 3-year contract contains essentially the same terms as the old contract. This new contract extends to 18 years the labor harmony at the Galena mine.

The Galena mine, owned by Callahan Mining Corporation and operated by Asarco, maintained steady production. The Galena was the fourth major producing silver mine in the United States, following the Lucky Friday mine, the Sunshine mine, and Asarco's Troy mine in Montana. In 1983, 195,420 tons of ore were mined from the Galena yielding 3,821,000 ounces of silver for an average of 20.2 ounces per ton. The previous year, 201,877 tons of ore produced 3,801,000 ounces of silver. Reserve figures provide for 6 years of production at current mining rates. The mine employs 226 men and the mill 15. Production costs at both the Galena and Coeur increased slightly over previous years.
In the Galena mine, the No. 3 shaft was sunk 132 feet to 6 depth of 5,301 feet. A main shaft pocket was prepared at the 5200 level, and a new ball mill was installed in the Galena concentrator.

The Coeur mine, owned by Coeur d'Alene Mines Corporation, also continued with steady production. The Coeur ranked fifth among domestic silver mines, following the Galena. Tonnage mined increased to 140,089 tons from 134,863 tons in 1982. Silver production increased to 2,582,000 ounces from 2,481,000 ounces in the previous year and grade was steady at 18.78 ounces per ton versus 18.2 ounces per ton in 1982. Development work on the 400 and 483 veins maintained a 6-year reserve figure at current mining rates. The Coeur mine employs 130 people and the mill 11.

Exploration continued at the American Silver project that was started in mid-1980 and placed on standby in June 1982. The $3.5 million project explores the American Silver ground west from the 3400 level of the Coeur mine. In 1983, 347 feet of new drift was completed, for a total of 3,434 feet since the project started. The Wire Silver vein is one of the main targets of interest and it should be reached in 1984. Partners in the project include Coeur d'Alene Mines Corporation, Callahan Mining Corporation, and Hecla Mining Company.

Other Coeur d'Alene Mining Operations

Anaconda Minerals Company, a division of Atlantic Richfield Company, continued exploration of nearly 25,000 acres in the east end of the district extending from Wallace, Idaho, into Montana. The area lies between the Placer Creek and Osburn faults and includes land owned by 17 small mining companies. Early in the year, a diamond drill hole was started on one of the claim blocks under option from Silver Crest Mines, Inc. In August, diamond drilling and geologic studies were started at the Beacon Light mine. A soil and rock sampling program was conducted over other parts of the area.

The Bunker Chance Mining Company changed its name to the Silver Corporation of America. The company owns four dormant claims near Wardner. The company also purchased 35 percent of the stock of Lake Gulch Silver Mines, Inc., that has claims north of the Sunshine-Crescent area.
Pacific Coast Mines, Inc., a subsidiary of U.S. Borax, completed assessment work on 197 claims held by the Burke Mining Company in the Snowstorm-National copper belt. Pacific completed two holes on the property in 1982. No new holes were drilled in 1983.

Rehabilitation of the Canyon Silver mine on Canyon Creek started in April. The portal was cleared and the mine dewatered. The eight-man crew at the mine hopes to reach ore left on the 600 level and then explore for higher grade ore on the 800 level.

The Evolution tunnel was opened by the Evolution Mining Company, which owns 68 claims south of the Galena mine. The company plans to explore for mineralization in the favorable Revett Formation about 1,000 feet beneath the tunnel level.

Wallace Diamond Mining and Wallace Diamond Drilling were renamed Fausett Mines Services and Fausett Diamond Drilling, both under Fausett International. The company has the shaft-sinking contract for the Caladay project and will develop the Ropes Gold mine in Michigan for Callahan Mining Corporation. Fausett is also the principal contractor for Teck, Inc., at the Rock Creek project.

A 2-year exploration and drilling program was announced by Silverton Mines, Inc., on the company's 15 claims in the Placer Center district. The property has been idle for many years.

Noranda Exploration, a subsidiary of Noranda Mines, Ltd., began work on 4 patented and 103 un patented claims owned by Idaho-Montana Silver, Inc., under an exploration agreement. The claims are located northeast of Mullan on the Idaho-Montana border. This property was last active 15 years ago.

Cominco American, Inc., continued its program on Pine Creek in the Prichard Formation. Efforts centered on the Hypotheek mine. Several diamond drill holes also were completed at the Nabob mine. Cominco has a large land position on Pine Creek and has been exploring the area for several years reportedly for mineralization similar to its huge Sullivan mine at Kimberly, British Columbia, in Prichard-equivalent rocks.

Exploration started on two claims held by St. Elmo Silver Mines Corporation. The claims are in the Coeur project area, the site of the Coeur mine.
Rumors flew when it was announced that a silver vein had been discovered in the Galena mine that continued south into claims held by the Sterling Mining Company. The vein, on the 4900 level of the Galena, is actually 200 feet north of the Sterling claim line.

The Beacon Light Mining Company leased the Hultner property owned by Sundance Mining and Development Company of Kellogg. The approximately 100-acre tract is 2 miles east of Wallace adjacent to the Golconda mine. Sundance also owns the Wake-Up Jim gold mine, 1 mile southwest of Murray, that has had some development over the past few years. The company also plans to explore the Vendetta Chief Gold mine near Murray. Two tunnels were opened at the mine, and an environmental impact statement for a new road was approved by the U.S. Forest Service.

Teck Resources, Inc., a subsidiary of Teck Corporation of Vancouver, British Columbia, rehabilitated the 4800-foot-long Rock Creek tunnel on the Gem State and Rock Creek claims. Geologic and geophysical studies were completed in anticipation of diamond drilling in 1984. The tunnel was originally driven by Hecla Mining Company in 1948. The project is being financed by S.O. Resources and Patmar Resources Corporation. Teck believes that vein structures on the property will improve at depth when the favorable Revett-St. Regis horizon is reached by the drilling program.

A newly formed company, Titan Resources, Inc., leased the Alice group of 17 claims located 2 miles north of Wallace. The company plans to conduct geologic studies at the property next year.

Mines Management, Inc., opened a new office in Spokane. The company finished the first phase of an exploration program on the Copper Camp property near Prichard. Initial work was started on the Janstan claims, a stratiform silver-copper prospect on the Idaho-Montana border.

Silver Scott Mines, Inc., planned to ship 1,200 tons of silver-bearing ore stockpiled at the Lost Cabin mine near Murray. Silver Scott has been trying to interest a larger company in the property for several years.

A new gold rush started early in the year when the Murray area was "rediscovered" as a gold district. This time the interest was in lode deposits rather than in placer gold. Several companies believe that some of the lode mines in the area are stratiform gold deposits in the
Prichard Formation. Pictures in IBMG Pamphlet 47, written in 1938 by Philip Shenon, support this idea.

The Golden Dream mine, owned by Idaho Goldfields and under lease to Intermountain Minerals Engineers, Inc., (IME) shipped some ore during the year, although the mine is still in the exploration stage. IME completed 860 feet of drilling at the mine located 6 miles northeast of Murray. By September, 624 tons of ore had been milled at the Nabob concentrator on Pine Creek. The concentrator is leased by IME from the Nabob Silver-Lead Company. The ore yielded 12 to 16 tons of concentrates averaging 5 ounces of gold and 8 ounces of silver to the ton.

Cominco American entered a joint exploration venture with the Trans-Atlantic Pacific Company to look at 33 patented claims of Golden Chest, Inc., at the Golden Chest mine. Cominco is interested in the underground workings of the old mine. Placer mining also started at the property, averaging 126 yards a day from a pilot mill.

Cominco signed an agreement with Viking Resources that staked 109 claims adjacent to the Golden Chest. Other companies besides Cominco that reportedly were active in Idaho's latest gold rush were Exxon Minerals and Asarco.


In other Coeur d'Alene activity, the Sierra Silver mine continued to mine silver of a different sort as it became one of the top tourist attractions in northern Idaho. Over 15,000 visitors toured the mine that is operated by the Wallace Chamber of Commerce and the Coeur d'Alene District Mining Museum. The mine was used until recently by the Wallace High School for its mining class in vocational education.

The Selkirk Alliance, a group of 15 northern Idaho artists, presented a show at the Coeur d'Alene District Mining Museum in Wallace. The theme was of course mining, and exhibits ranged from paintings and sculptures to photographs. The outstanding show also displayed pieces by Ken Lonn, a guest artist and well-known miner-sculptor from the district.
Other Mining Operations in the State

Mining operations in other parts of the state made a significant contribution to the value of mineral production. For the locations of mining operations in the following discussion, the reader should refer to Figure 5.

The giant Cyprus Thompson Creek molybdenum project, located west of Challis in east-central Idaho, started production in late November. The mine is owned and operated by Amoac Minerals, Inc., a subsidiary of Standard Oil of Indiana. The newly completed mill operated at year's end at about 75 percent capacity producing 40 tons per day of MoS₂ concentrates. When in full production, the mill will handle about 25,000 tons of ore per day. Production will run initially from 9 to 11 million pounds of concentrate per year and by 1990 increase to 18-22 million pounds.

Approximately 110 million tons of overburden have been moved since preproduction stripping started in 1981. When mined out in over 20 years, the open pit will be over 1 mile across and 2,350 feet deep on the high wall. Estimated reserves at the mine are 200 million tons grading 0.18 percent MoS₂.

Ore from the pit is crushed in a gyratory crusher and then transported via a 7,500-foot-long conveyor belt to the concentrating mill. The concentrates may be shipped to the railhead at Mackay or Arco; however, Union Pacific is abandoning the Mackay to Arco line. Ore concentrates may be trucked to the Burlington Northern Railhead at Darby, Montana. Concentrates will be sent to several domestic and foreign refineries for further processing.

The mine and mill currently employ about 500 people and will have an annual payroll of $9 million when in full operation. Preproduction costs for the project are estimated at nearly $375 million.

A possible bonus for the mine was the discovery that the orebody contains other metals besides molybdenum. A study was underway at year's end to see if extraction of low-grade gold and silver from the concentrates would be economical. The precious metal content is small, but the 25,000-ton-per-day production is huge when compared, for example, with mills in the Coeur d'Alene district that operate at 500 to 900 tons
Figure 5. Location of some active mining operations and districts in Idaho.
Custer County residents approved a plan that will allow Amoco to finance pollution control projects with tax-exempt and low interest bonds. The company may issue up to $30 million worth of the new bonds. A similar measure in 1981 authorized the sale of $15 million in exempt bonds, but only $10 million were sold. Part of this money financed two $1.5 million sediment control ponds. The bonds must be used for pollution control projects.

About 200 of the 262 new homes built in Challis to house the mine's workforce were vacant during the year. The company noted that it was somewhat overzealous in its plans to provide decent housing for its workers, and that consultants had overestimated the number of living units that the mining operation would need.

The October 28 earthquake that rocked the Pacific Northwest was centered at Chilly Buttes about 28 miles from the mine. There was very little damage to any of the mine's facilities, which was fortunate considering the 7.3 magnitude of the shake.

The first year of full production from Superior Oil Company's heap-leach operation at Stibnite in Valley County was completed in 1983, with 480,000 tons of ore mined yielding 29,000 ounces of gold. The mine operated from May to November, when it shut down for the winter. The five leach pads at the mine measure 250 by 325 feet apiece, and each holds approximately 30,000 tons of ore. Activated charcoal is used to reclaim gold from the pregnant cyanide leach solution. About 2,000 to 3,000 tons of ore is removed daily from the West End open-pit mine, owned 25 percent by TRV Minerals Corporation of Vancouver, British Columbia. Western Construction from Boise is the mining contractor at the site. The operation employs about one hundred people in mining operations and 45 men at the mill. Estimated reserves at the mine are 1.8 million tons of ore, averaging 0.085 ounce of gold per ton.

The Delamar Silver mine, operated by Mapco Minerals Corporation, maintained full production throughout the year. The company moved 5.2 million tons of ore and waste and milled 846,000 tons of ore. Production was 1.5 million ounces of silver and 28,800 ounces of gold. The operation employs 67 people in mining and 65 at the closed circuit, vat-leach
cyanide system mill. Ore was mined from the Sommercamp and Glen Silver open pits. The Sommercamp pit will be phased out in 1984. The mine has a 20-year ore reserve and is one of the lowest cost gold-silver mines in the country. Superior Oil maintains a 47.4 percent interest in the venture.

*Clayton Silver Mines* resumed production in December 1982, after being closed from June 30 to December 20 due to low metal prices. During the shutdown a new 250-ton-per-day ball mill and an auxiliary powerline were installed. The mine operated at about 220 tons per day, with a work force of 35 men and a 6-day work week. Clayton is one of the oldest operating mines in the state, and the present company was incorporated in 1930. The mine established a new production record of 16,676 tons during the first quarter, and production averaged 254 tons per day during the first 6 months of the year.

The October 28 earthquake that was centered at Chilly Buttes, about 25 miles from the Clayton mine, literally washed away hopes for the mine having a record year. The major phenomenon of the earthquake was the effect it had on ground water. The Clayton mine has always been a wet mine, but the quake triggered a massive increase in the water flow underground. Prior to the quake, about 1,000 gallons of water per minute was being pumped from the 1100 level, the deepest level in the mine. The flow rate is estimated to have doubled due to the quake. Mine personnel were forced to abandon the mine shortly after the major shock as the water was rising at the rate of 1.5 feet per minute. By November 3 the mine was flooded to the 975-foot level.

The mine remained closed at year’s end as new, more powerful pumps were installed to handle the tremendous water flow. Although flooding was a serious problem, the earthquake caused no damage to the surface plant. However, a large boulder, dislodged from the steep slope behind the mine site, narrowly missed the mine’s power substation. If the substation had been knocked out, the flooding would have been much worse. Fortunately, there were no injuries as most of the miners were off for the day in celebration of the opening of elk season. The Clayton silver mine employs 30 men and the mill 10. While open in 1983, the mine produced 52,800 tons of ore yielding 177,500 ounces of silver, as
compared with a yield of 55,900 ounces in 1982. Improvements at the mine during the year included a new 1,000-kilowatt diesel generator and a larger compressor.

Bear Creek Mining Company, a subsidiary of Kennecott Corporation, will evaluate 100 claims held in the Targhee National Forest in 1984. The company plans a 3-year drilling program on the claims that are in the Camas Creek area northeast of Dubois.

Cash Industries in Sun Valley shipped ore from the Champagne mine in the Lava Creek district to its 350-ton-per-day custom mill at Ketchum. The mill was converted from a barite processing plant to a flotation plant late last year. Ore was also shipped to Ketchum from the Bayhorse mine in Baker County, Oregon. Cash evaluated mines held under option in the Vienna district north of Ketchum. The company experienced financial problems late in the year and ceased all operations.

Circa Incorporated announced a joint venture with Chan Mining Company of Los Angeles to operate a 80-ton-per-day mill at Mountain Home and the Blackstone mine located 42 miles north of the city. Ore stockpiled at the mine was sent to the mill late last year for testing, and the mining of the copper-, silver-, and gold-bearing ore was underway by the end of 1983. The ore grades about 0.08 percent copper and 15 ounces of silver per ton. The mill was being upgraded to 200 tons per day in December, and a 500-ton-per-day leach circuit should be on line by early 1984. At the end of the year, 5 men were working at the mine and 16 at the mill.

There was considerable activity in the Elk City-Dixie area. Drilling programs were conducted at the War Eagle mine (Award Resources) and at the Robinson Dike mine near Dixie. Both properties will have programs next year, and a heap-leach operation is planned for the Robinson Dike mine. Centennial Minerals Ltd., drilled and evaluated a large claim block centered on the Frisco pit near Orogrande. Agar, Barretta, and Ellis, an exploration group with Nugold Enterprises Corporation, worked at the Erickson Reef gold property north of Elk City. BEMA has a large land holding near the Erickson Reef. Gray Eagle Resources evaluated the Alberta, Hercules, and Pasadena claims near Ditch Creek. The Big Buffalo Mining Company operated a pilot mill at the Big Buffalo mine in the
Buffalo-Hump district.

Resources Engineering and Development Company completed construction of a cyanide heap-leach project near Elk City to process dump material from the Buster mine. The plant is close to Big Elk Creek that serves as the water supply for Elk City's 200 residents. Some citizens voiced concerns about possible cyanide leaks into the water system.

Geodome Resources (formerly Geodome Petroleum) assumed control of the Sunbeam mining operation above Jordan Creek in Custer County. Funding for the project was obtained by a $1.6 million public offering in April. A pilot heap-leach operation at the mine site had problems last year with a minor cyanide spill. Geodome will probably use a vat-leach process or an agglomeration heap-leach system and plans to operate at about 3,000 tons per day. Since 1968, almost $3.5 million has been expended on the property, and about 72,000 feet of drilling has been done to evaluate the deposit. Reserves at the Sunbeam mine are estimated at 8.3 million tons, grading 0.051 ounce of gold per ton.

U.S. Antimony Corporation mined gold and silver ore and processed dump material from several mines in the Yankee Fork district. A 300-ton-per-day mill and vat-leach plant are located at Preacher’s Cove. Dump material was processed from the Charles Dickens mine, and ore was mined from Mt. Estes and other small properties in the area. Ten men were employed in mining operations and five more at the mill.

Other operations in the Yankee Fork area included Excell Minerals, drilling the Lucky-Custer mine, and M and S Mining at the Black mine. M and S plans to ship some ore next year.

Gold Cache, Inc., obtained a lease from Bagdad-Chase, Inc., on the Golden Anchor mine on 39 patented and unpatented claims adjacent to the Kimberly mine (also under lease to Gold Cache). The gold mines are in the Marshall Lakes district east and south of Riggins. The Golden Anchor produced 30,052 ounces of gold and 120,000 ounces of silver from 1932 to 1942, when it was closed by the War Production Board at the beginning of World War II. In August, Gold Resources, Inc., entered a joint venture agreement with Gold Cache, Inc., and as a result Gold Resources' geologists began evaluating the Kimberly and Golden Anchor mines. Gold Resources plans to process old tailings from earlier mining
and to block out ore reserves in the Golden Anchor above the 200 level. A heap-leach operation is reportedly planned for 1984.

The Iron Mask Mining Company raised $500,000 through a 4.9-million-share stock sale to explore the Iron Mask mine in the Talache district, 9 miles east of Sandpoint. The mine has operated intermittently since 1957. About 0.4 ton of ore was high graded from the mine from 1978 to 1981. Plans call for exploration and diamond drilling centered on the No. 2 level of the mine.

St. Joe American strengthened its land holdings and began exploring for precious metals near Grangeville. This area has had some gold production in the past from several small mines.

Gold Fields Mining Corporation drilled 20 holes at the Consolidated mine near Weiser, looking for hot spring-related gold and mercury deposits. Results were reportedly disappointing. Freeport Minerals and Homestake Mining drilled several holes at the Almaden mine for similar deposits. The Almaden mine has had substantial mercury production in the past.

Tenneco Minerals drilled six holes at the Parker Mountain property in Lemhi County. Tenneco took over the prospect from Dennison Mines (U.S.), Inc., early in the year. Four holes were drilled at the Williams mine and two on Parker Ridge, for a total depth of about 6,000 feet. The company was looking for gold mineralization in silicified and brecciated rhyolite. Preliminary results were reportedly discouraging. Tenneco will stay active in the area with an exploration program planned for next year at Red Mountain and in the Silver Creek area.

The Mio-Oro Mining Company hopes for some production from claims held in the Caribou Mountain district in Bonneville County. Three men spent most of the field season developing a mine site for precious metals.

Anglo-Bomarco Mines conducted a feasibility study for mining the Hercules silver property 6 miles southeast of Brownlee Dam in Washington County. Grande Trunk Resources has earned a 20-percent interest in the property, having spent $1 million on exploration, and can earn a 50-percent interest by spending $5 million more. Open-pit production from the Adit and Fishpond zones may start in 1984, and it is possible that the flat-lying Belmont zone could be mined underground using room and pillar methods.
Silver King Mines, Inc., purchased the remaining two-thirds interest in the Iron Dyke mine and a 100-percent interest in the Red Ledge mine from Texasgulf Corporation. Silver King has been a partner with Texasgulf in the Iron Dyke since 1978, and ore from the mine was shipped to Silver King’s mill at Cuprum. During 1980 and 1981, 36,000 tons of copper and gold ore was shipped from the Iron Dyke to Cuprum. The Iron Dyke is in Oregon just across the Snake River, and the Red Ledge is on the Idaho side of the river. Silver King’s Copper Cliff mill and mine at Cuprum were closed in 1981 due to low metal prices. The closure forced suspension of mining at the Iron Dyke. The company plans to resume production from the Iron Dyke in 1984.

Titan Resources, Inc., acquired a 70-percent interest from Evergreen Minerals, Inc., in 38 unpatented gold claims in central Idaho in the Orogrande district. Evergreen Minerals retained a 30-percent interest. The claims have three workings: the Goldmaster, Gold Bug, and Utopia mines. The Gold Bug, once a gold producer in the 1890’s, has a 210-foot shaft and a 710-foot adit.

Copper Lake Exploration, Ltd., and Arivaca Silver Mines, Ltd., (known collectively as the Golden Reef Joint Venture) announced in November the startup of operations at the Dewey mine in the Thunder Mountain district east of Yellowpine. Mining will begin at 250 tons per day and build to 900 tons per day. A 20,000-ton stockpile at the mine averaged 0.10 ounce of gold per ton. Reserves at the site of the first area planned for open-pit mining are 1.7 million tons, averaging 0.07 ounce of gold per ton. Sixty drill holes have been put down to establish more reserves.

The mine has had a history of environmental problems. In 1981 a settling pond burst and caused mud to flow into Mule Creek, a tributary of Monumental Creek. More environmental damage occurred in 1983 when sludge was bulldozed into another creek. The state sued the operators and obtained a $25,000 settlement. In June the state shut down the mine. The mine operators agreed to pay damages and to provide better environmental controls and monitors at the site. This was the largest fine ever levied against a mining operation by the state. The present operators believe these past problems have been solved.
The mine is unique in Idaho—and perhaps in the rest of the world—because the gold occurs in coal seams in volcanioclastic sediments. In places, coalified tree trunks have native gold crystals in the growth rings. This mineralization is a good example of gold being complexed by organic material or carbon.

_First Eagle Corporation_ announced a stock offering, for Idaho citizens only, to finance development at the Monte Cristo mine above Loon Creek in Custer County. The company hopes to raise $100,000 to build a small pilot mill and proceed with evaluating the old mining property.

An impressive gold-bearing chalcopyrite vein, in places measuring as much as 15 inches wide, was discovered at the Lost Packer mine located between Pinyon Peak and Loon Creek. The mine is owned by James Ivers and has been in an exploration phase for several years. The Lost Packer was the largest gold mine in this area and had major production in the early 1900's. Similar veins in the mine carried as much as 5 ounces of gold per ton. The new discovery may be a faulted offset of one of the early mined veins.

A high-grade silver showing was accidentally uncovered at the Minnie Moore mine near Bellevue in midyear. Carl Johnston purchased the mine in 1978 for $250,000. Mr. Johnston had hired a contractor to break up rock in the mine area for riprap to line river banks. The vein was discovered while holes were being drilled for blasting. _Exxon Minerals_ obtained an interest in the property soon after the discovery. Exxon earlier obtained a 10-year lease and option to buy the Queen Bess Silver mine 2 miles northwest of Bellevue. The mine, owned by TASA, a Twin Falls trading investment company, is on 28 unpatented and 1 patented claim. Exxon also controls the Snoose mine in this same area.

A classic conflict involving surface rights versus mineral rights developed at year's end when Exxon obtained state and federal mineral rights on 1,800 acres covering the site of the planned Hailey Hot Springs resort. The surface rights are owned by the _Togarmee Land and Cattle Company_ who wants to develop the resort area. Negotiations by both parties were underway at year's end to settle the problem amicably. Exxon now has a substantial interest in the Hailey area, with 900 mining
claims on federal land and state mineral leases on 6,700 acres, for a total of nearly 25,000 acres. Exxon is reportedly interested in stratiform/magmatothermal deposits. The Wood River district was a past producer of silver and lead and perhaps soon will produce precious metals again.

Elsewhere in the Hailey area, a 165-foot drift was driven on a new structure at the Croesus mine, and more work is planned for next season. Getty Oil reportedly will drill at the Triumph mine next year. Bear Creek drilled the property several years ago. The Atlantis Mining Company operated a pilot mill in Colorado Gulch. The mill processes arsenopyrite that is mined from the Magdalena and Barbara properties. Some work was done on the Queen Extension above the Minnie Moore mine, and a mineralized area averaging 25 ounces of silver per ton was reportedly blocked out.

Near Idaho City, the Comeback mine was active, as was a new mine on Moores Creek operated by Don Gilles. There was some activity at the Valley Chief mine located near the headwaters of the North Fork of the Boise River near Graham.

There was little activity at the Riggins operation of Key Milling Company of San Francisco. The vat cyanide mill has a capacity of 100 tons per day.

Noranda Mining, Inc., wrote-down part of its investment at the Blackbird mine in 1983. There was little activity at the mine or at the townsite of Cobalt.

The Yankee Machine Company continued exploration at the Talache mine in Atlanta. A new 6- to 8-inch-wide vein that runs 2-3 ounces of gold and 150-200 ounces of silver per ton is being developed in a new working close to the old Talache mine workings.

A small pilot mill was working on the North Fork of the Boise River near Atlanta. Ore is shipped to the mill from a stockpile at the Washington mine near Idaho City.

Full operations were underway by June at Shoshone Silver Mining Company's mill and mines in the Lakeview district in Bonner County. Oxidized ore from open pits at the Weber mine and the Keep-Cool mine (leased from Sunshine Mining Company and Lakeview Consolidated Silver Mines, Inc.) was processed at a carbon-in-pulp leaching plant. By October, the company had sold 10,757 ounces of silver to Sunshine for refining. The mill site is currently under patent application.

Merger Mines was reportedly driving a drift at Cedar Mountain near Chilco Mountain. The Chilco Mountain area was explored several years ago as a tungsten-molybdenum prospect.

Democrat Resources drilled 20 holes as part of an exploration program at the Democrat mine near Leadore. Further exploration is planned for next year.

Big Turtle Mines, Inc., evaluated holdings in Owyhee County near Castle Creek. The company also did preliminary work at the Treasure Vault mine near Hailey. Four vein systems have been delineated that may have potential for open-pit mining.

Several small operators worked in the Warren area. Active mines included the Silver Eagle at the head of Pony Gulch and the Red Demon, a cinnabar prospect in Ruby Meadows.

In the Little Smoky district, a leach pad was being constructed near Carriagetown. Several other mines in the area reportedly had limited activity.

The following companies who responded to the 1983 questionnaire sent out by the then Idaho Bureau of Mines and Geology reported activity but no actual production.

<table>
<thead>
<tr>
<th>Company/Owner</th>
<th>Mine</th>
<th>County</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powell Mining</td>
<td>Lloraine mine</td>
<td>Idaho</td>
<td>6</td>
</tr>
<tr>
<td>Mi-Oro Mining Co.</td>
<td>(Caribou Mtn. area)</td>
<td>Bonneville</td>
<td>3</td>
</tr>
<tr>
<td>Stanley Johnson</td>
<td>Red Leaf mine</td>
<td>Blaine</td>
<td>3</td>
</tr>
<tr>
<td>Fisher Int., Inc.</td>
<td>Carbonate</td>
<td>Custer</td>
<td>3</td>
</tr>
<tr>
<td>Lyman Andrews</td>
<td>King-Queen mine</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td>Bruno Krause</td>
<td>Ozark Extension</td>
<td>Idaho</td>
<td>2</td>
</tr>
<tr>
<td>Howard Russell</td>
<td>Scorpion Group</td>
<td>Blaine</td>
<td>exploration</td>
</tr>
<tr>
<td>Sun Valley Lead-Silver Mines</td>
<td>New Hope mine</td>
<td>Blaine</td>
<td>&quot;</td>
</tr>
<tr>
<td>Company/Owner</td>
<td>Mine</td>
<td>County</td>
<td>Personnel</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Diamond Hill Mng.</td>
<td>Comeback mine</td>
<td>Boise</td>
<td>&quot;</td>
</tr>
<tr>
<td>Floyd Johnson</td>
<td>Blue Ridge-Buckskin</td>
<td>Boise</td>
<td>&quot;</td>
</tr>
<tr>
<td>Boyd Wilmoth</td>
<td>Princess Blue Ribbon</td>
<td>Camas</td>
<td>&quot;</td>
</tr>
<tr>
<td>Carl Beyer</td>
<td>Cardon mines</td>
<td>Clearwater</td>
<td>&quot;</td>
</tr>
<tr>
<td>James Yount</td>
<td>Easy Does It</td>
<td>Clearwater</td>
<td>&quot;</td>
</tr>
<tr>
<td>West Mont Oil</td>
<td>Pearl Silver</td>
<td>Gem</td>
<td>&quot;</td>
</tr>
<tr>
<td>Felix Mining Co.</td>
<td>Friday Group</td>
<td>Gem</td>
<td>&quot;</td>
</tr>
<tr>
<td>Silver Strand Mng.</td>
<td>Silver Strand</td>
<td>Kootenai</td>
<td>&quot;</td>
</tr>
<tr>
<td>Iron Mtn. Mng.</td>
<td>Iron Mtn. mine</td>
<td>Washington</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

Placer Gold Operations

A novel plan to open a stretch of placer ground near Eagle Creek on both sides of the lower Salmon River was promoted by two men in midyear. The entrepreneurs wanted to rent out parts of the placer claims to individuals at $10 per day. Because this area of the Salmon is withdrawn by the state from mineral entry, no mechanized dredges or other machinery can be used for gold mining. Only gold pans, rockers, or other hand methods are permitted. The project collapsed when it was discovered that a state lease would have to be obtained on the claims and that a moratorium on any new leases was in effect on this part of the river.

Secesh Mines, Inc., was still in the development stage of getting its operation in Warren Meadows underway. A 16-inch suction dredge was rehabilitated and tested at the end of the season. This is the largest suction dredge in the state.

The following list includes the larger commercial placer operations as reported by the Idaho Bureau of Minerals.

<table>
<thead>
<tr>
<th>Operation</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinglefoot Mining</td>
<td>Boise</td>
</tr>
<tr>
<td>Carl Beyer</td>
<td>Clearwater</td>
</tr>
<tr>
<td>International Oro-Fino Placer, Inc.</td>
<td>Clearwater</td>
</tr>
<tr>
<td>Black Sand Mining Co.</td>
<td>Idaho</td>
</tr>
<tr>
<td>Desperation Exploration Mining Co.</td>
<td>Idaho</td>
</tr>
<tr>
<td>Walter Lindsay</td>
<td>Idaho</td>
</tr>
<tr>
<td>Manning/Stanford</td>
<td>Idaho</td>
</tr>
<tr>
<td>Maxwell Placers &amp; Idaho Mining &amp; Devel. Co.</td>
<td>Idaho</td>
</tr>
<tr>
<td>Mining Specialties &amp; Equip., Inc.</td>
<td>Idaho</td>
</tr>
<tr>
<td>Mustang Mining Co., Inc.</td>
<td>Idaho</td>
</tr>
<tr>
<td>Rick Willard</td>
<td>Lemhi</td>
</tr>
<tr>
<td>Leesburg Land &amp; Mining, Inc.</td>
<td>Lemhi</td>
</tr>
<tr>
<td>Orogrande, Inc.</td>
<td>Lemhi</td>
</tr>
<tr>
<td>Salmon City Gold, Inc. (Kirtley Cr.)</td>
<td>Lemhi</td>
</tr>
</tbody>
</table>
Operation
Salmon City Gold, Inc. (Sagehen)
Delbert Kohtz
C. Richard Nordstrom
Mi-Oro

County
Lemhi
Owyhee
Shoshone
Twin Falls

There are hundreds of recreational placer operations in Idaho. The Idaho Department of Water Resources issued 650 "one-stop" permits during 1983. A permit is needed to operate small, hobby-type dredges.

NONMETALLIC MINERALS

Phosphate

The "other half" of Idaho's mining industry is in southeast Idaho (Figure 6) and produces about 10 to 15 percent of the nation's phosphate. Phosphate is a major ingredient in agricultural fertilizers, and elemental phosphorus has a wide variety of uses in cleansing agents, industrial applications, and food products. The operating companies produce three primary products: elemental phosphorus (Monsanto, FMC, and Stauffer), phosphoric acid, and fertilizer (Simplot and Beker). All of the phosphate mines are open-pit operations in the Phosphoria Formation. The industry recovered somewhat in 1983 from the recession, and most plants returned to full production. This was an improvement over 1982, when everyone cut back and in general had a poor year. Exports are a major factor for the industry, and these were up during 1983.

The plan announced a few years ago by Chevron Corporation (Standard Oil Company of California) to build a $250 million phosphate fertilizer plant near Rock Springs, Wyoming, continues to concern Idaho operators. Chevron plans to increase annual production at its phosphate mine at Vernal, Utah, from 1/2 to 3/4 million tons when the new plant is built. Chevron purchased the Vernal mine and associated facilities in 1981 from Stauffer Chemical for $130 million. The company plans to build a 95-mile-long pipeline to transport slurried ore from the Vernal mine to Rock Springs.

The J.R. Simplot Company neared completion of the new Smoky Canyon mine near the Idaho-Wyoming border, 25 miles east of Soda Springs. The 27-mile-long, 8-inch-diameter pipeline that will transport slurried
Figure 6. Location of active phosphate mines and plants in southeast Idaho.
phosphate ore from the mine to Simplot's Conda plant was nearly finished at year's end, as was also most of the work on the new mill and mine. The mine and mill should be operating in June, 1984, and will employ 80 to 100 people. The mine will replace the Conda mine that is almost worked out. About 40 to 50 people will continue working at the Conda mill after the new mine is opened. At full production, Smoky Canyon will supply 2 million tons of phosphate ore a year for at least 30 years. Preproduction costs for the facility are estimated at $40 million. Phosphate ore from Conda will continue to be shipped to Simplot's acid plant at Pocatello, and calcined phosphate ore to the company's Sim-Cal Chemical Company in California.

In spite of the cautious market, Simplot announced a major $50 million expansion for the Pocatello plant. Plans call for building a new 2,000-ton-per-day sulfuric acid plant. Sulfuric acid is mixed with the ground phosphate ore to make phosphoric acid. The new construction will also include a 650-ton-per-day phosphoric acid plant, and a superphosphoric acid production plant. Work started in December on a new $4 million covered storage area at Pocatello for ore from the Smoky Canyon mine. The Pocatello plant employs about 550 people. This investment illustrates Simplot's faith in the future of its phosphate operations and the need to modernize to ensure continued success in this highly competitive business.

A $1 million investment in converting from natural gas to coal at Simplot's Conda plant saved the company nearly $100,000 per month in fuel costs. The low-sulphur coal is shipped from Utah and Wyoming.

Beker Industries closed its ammonia plant early in the year due to the difficulty in obtaining a cheap supply of natural gas. The gas is used to produce ammonia, an ingredient used to add nitrogen to fertilizer products. The closure entailed laying off about 20 employees. Beker continued full operations at the Charles F. White acid plant at Conda. The plant manufactures about 300,000 tons of phosphoric acid per year.

Beker and Western Cooperative Fertilizer, Inc., of Canada formed the Conda Partnership in 1978. The Canadian company obtained a half interest in Beker's phosphate reserves for $65 million. The partnership mines phosphate from the Maybe Canyon mine. Washington Construction
Company is the mining contractor for the company. Half of the calcined ore goes to Western's plants at Medicine Hat and Calgary, and the other half goes to Beker for use in its acid plant. The Partnership employs about 150 people, and Beker's plant employs almost 250 workers. In September 1982, the Partnership opened a new mine on the Champ lease in Dry Valley, 5 miles south of the Maybe Canyon mine. Production continued throughout 1983 from both mines.

Monsanto operates an elemental phosphorus plant near Soda Springs and mines phosphate ore for the plant from the Henry mine. The company employs nearly 400 people at the Soda Springs operations. Uncertain power supplies from Idaho Power Company continue to be a problem for the company, as it may lose part of the electricity needed to operate its furnaces in 1986.

Kerr-McGee's plant, across the road from Monsanto, extracts vanadium from ferrophosphorus slag, a waste product of the elemental phosphorus operation. The extraction plant normally employs about 50 people, but was forced to lay off 19 workers during the year due to the extremely depressed steel market which uses vanadium as a steel additive. This was the first layoff in the plant's history.

Stauffer Chemical Company's Wooley Valley mine closed in 1982 and remained closed during 1983, but will reopen next year. Prior to the closure the mine produced ore for the company's elemental phosphorus plant at Silver Bow, Montana, near Butte. At one time the mine employed over 70 workers.

FMC Corporation operates the largest elemental phosphorus plant in the world at Pocatello. Favorable electrical power rates and adequate power supply enabled the plant to maintain full production during 1983. The uncertainty of electrical power supplies has been a problem for FMC over the past several years. The plant uses about 15 percent of Idaho Power's electricity. Ore for plant feed is mined from the Gay mine on the Fort Hall Indian Reservation; the mine is leased by FMC and Simplot and operated by Simplot. The mine annually provides up to 2 million tons of ore for FMC's plant and 300,000 tons for Simplot's acid plant. FMC plans to continue investing capital to upgrade and modernize the Pocatello plant. The company employs about 600 people in Pocatello.
Alumet (a joint venture between Earth Science, Inc., National Steel Corporation, and the Southwire Company) mined about 70,000 tons of phosphate rock from the Lanes Creek mine. Three people staff Alumet's office at Soda Springs.

Other Industrial Rocks and Minerals

Other mining companies in Idaho produced a variety of industrial rocks and minerals. For the locations of mining operations in the following discussion, the reader should refer to Figure 7.

The Idaho Portland Cement Company at Inkom remained the state's only cement manufacturer. The company was purchased by the Ash Grove Cement Company of Kansas for $42 million and will operate as a subsidiary of Ash Grove. During 1983, 205,000 tons of limestone, used to make cement, was mined from a quarry located behind the plant. The quarry employed 6 people and the plant 69.

The Morning Glory mine near Dubois in Clark County produced approximately 6,000 tons of limestone for E.J. Wilson and Sons. The small operation employs three people in mining and two at the mill. Most of the limestone is used as an animal feed additive.

A.P. Green Refractories Company (a subsidiary of U.S. Gypsum Company) used 4,000 tons of clay from pits mined on state leases near Helmer to produce fire brick at its plant in Troy. A contract signed in 1982 with Reynolds Aluminum in Portland, Oregon, proved to be the main outlet for the company's product in 1983. It is hoped that other aluminum producers will soon use this high-quality fire brick. The plant employs 14 men, and 5 people work at the clay pits.

The nation's leading producer of garnet is the Emerald Creek Garnet Milling Company at Fernwood. The garnet is placered from Emerald and Carpenter Creeks. The company is also the state's largest placer operation. It produced 13,760 tons of finished garnet product during 1983. The garnet is used as an industrial abrasive and as a filtering medium. Fourteen men are employed in the placer operations and eight more work in the processing plant.

Hess Pumice continued to grow during the year as they captured more of the United States' pumice market. The company mines extremely pure
Figure 7. Location of some active industrial rock and mineral mines and plants in Idaho.
pumice from a unique deposit at the Wrights Creek mine, 20 miles north of Malad in Oneida County. A new processing plant is planned, and construction should start soon at an industrial park site near Malad. Hess produced 16,500 tons of finished product and employed 15 people at the mill and 5 at the mine. The pumice is used as an abrasive and has many applications, ranging from making pencil erasers to polishing television screens and printed circuit boards for high-tech industries.

Amcor, Inc. produced pumice for concrete aggregate at their plant in Idaho Falls. The company mines pumice from a pit at the Fan claim. Producing Pumice, also in Idaho Falls, mined pumice for aggregate from the Rock Hollow mine.

Barite production was at a standstill due to the decrease in oil drilling activity throughout the country. N.L. Baroid did assessment work only at the Bonnie Barite mine near Hailey, as did Chromalloy at the Cavity claim located 25 miles south of Pocatello.

Spencer Opal Mines welcomed rock hounds who dig for precious opal at the mine in Clark County. The company employs two people at the mine to handle the traffic at the popular collecting area.

Oneida Perlite Corporation shipped perlite from its mine next to the Wrights Creek mine north of Malad. The company is involved in all aspects of the expanded perlite business, and employs four people at the mine and five in the plant. The perlite is used as a fireproofing material, a light-weight aggregate, and a filtering medium. A press for making specialty panels for decoration and insulation was installed during the year. The company markets industrial pumice under the trade name Vulcan.

An old quarry was reopened in midyear at Table Rock, a wellknown landmark near Boise. Hans and Gerhard Borbonus plan to sell sandstone slabs from the quarry for landscaping. The quarry was first used in 1892, and several homes in Boise are built from sandstone blocks from the site.

A relatively new mining industry in Idaho gained international sales and a widely broadened domestic market during the year. The state’s fledgling decorative building-stone industry is centered at Oakley. Five companies currently quarry the decorative quartzite:
Northern Stone, Ernie Ray Hale Quarries, Star Stone Company, Oakley Valley Stone, and Idaho Quartzite Corporation. Three types of rough quartzite products are sold: thin "slate" slabs, 1 inch thick or less; patio stone; and building stone in brick-sized pieces. In addition, two companies West Pac Stone and Idaho Quartzite, cut the stone into tiles. The quartzite comes in different natural colors, and the companies have exacting standards to ensure conformity for construction requirements. Sales of the attractive quartzite are increasing. One of the companies, Idaho Quartzite, mined over 1,000 tons of quartzite in 1983 and employed four people in mining operations and three more at its mill. The company also released an attractive color brochure showing the uses of quartzite and detailing the engineering properties of the stone.

Mountain Machinery and Supply Company continued to build grinding and crushing equipment at its plant near Hayden Lake. A custom portable crushing plant was designed and built during the year specifically for small mining applications.

Marble Shop, Inc., completed an 18-month contract to provide 600,000 square feet of travertine facing stone for the new Southwest Bell Company's building complex in Dallas, Texas. This was the company's largest contract to date. The travertine quarrying and finishing operation started in 1967 and was purchased 3 years ago by Marble Shop, Inc., of Knoxville, Tennessee. The Idaho plant is the largest travertine operation in the United States. The company obtains the stone from a pit at Fall Creek about 40 miles east of Idaho Falls. In 1983, approximately 140,000 cubic feet of travertine was quarried. The material is shipped nationwide as a facing and decorative stone and is also used for floor and wall tile. The travertine is 99.4 percent pure calcium carbonate, and a new market that may eclipse the decorative stone end of the business has developed in finely crushed, high purity carbonate which has many industrial uses. The company also sells crushed stone for landscaping and aggregate. The plant at Idaho Falls employs 75 people, and 10 more work at the quarry.

Unimin Corporation purchased 10 silica plants, including the operation at Emmett, from Martin Marietta. Unimin is now the number-one industrial sand producer in the United States, with 16 plants nationwide. Most of
the silica from the Emmett plant is used in manufacturing glass containers and other glass products. The company employs 11 people at Emmett and is studying the potential for expanding markets and improving the facility.

Several tons of variscite were mined from the Turquoise Mountain claims in Fremont County. The mine also is open on a fee basis for rock hounds.

Consumers' Coop in Weiser sold 5,800 tons of gypsum in 1983. The Hansen Building Company crushes the gypsum and hauls it to Weiser from the Iron Mountain gypsum mine in Washington County. The Coop sells the gypsum for agricultural use.

OIL AND GAS

Oil and gas exploration in Idaho remained slow throughout 1983 as the world oil glut continued. Wells completed, underway, or permitted during the year are shown in Table 3. Drilling activity continued to center in the southeast part of the state.

Although wells were drilled in the south, a great deal of interest was shown in northern Idaho and Montana. Arco's wildcat well, the No. 1 Paul Gibb, was spudded late in the year. The well is in northwest Montana, about 32 miles west of Kalispell. The hole may go to 18,000 feet, and will test the Fairview anticline that overlies the Whitefish thrust sheet. The well should penetrate Precambrian rocks of the Belt Supergroup, go through the thrust fault, and end up in a thick section of Paleozoic and Mesozoic rocks—if seismic interpretations are correct. Marathon Oil is a partner in the venture. If successful, the well could open up western Montana and northern Idaho as a major oil province. The wildcat well is classified as a stratigraphic test, and little information is available about progress at the site. At least 50 companies have leases in this part of Montana; Genex may spud a well in 1984. The leasing boom extended into favorable areas of northern Idaho, over 1.5 million acres of federal land were under lease application. The Idaho Department of Lands held a lease auction of 73,000 acres of state land in northern Idaho because of the recent activity and interest.
Table 3. Exploratory oil and gas wells in Idaho for 1983.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Well Name</th>
<th>Location</th>
<th>Total Depth (Feet)</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Amoco Production Company</td>
<td>Milford Federal 19-1</td>
<td>NW SW 4 sec. 19, T. 15 N., R. 27 E.</td>
<td>9,886</td>
<td>plugged and abandoned</td>
</tr>
<tr>
<td>R and T Exploration</td>
<td>Joe Elliot No. 1</td>
<td>SE NE 4 sec. 34, T. 5 S., R. 8 E.</td>
<td>--</td>
<td>suspended</td>
</tr>
<tr>
<td>Sundance Hunter</td>
<td>Linning 1-30</td>
<td>NW SW 4 sec. 30, T. 5 N., R. 3 W.</td>
<td>3,555</td>
<td>plugged and abandoned</td>
</tr>
<tr>
<td>Sohio</td>
<td>Bishoff Canyon 30-A</td>
<td>NE NE 4 sec. 30, T. 11 S., R. 46 E.</td>
<td>15,272</td>
<td>plugged and abandoned</td>
</tr>
<tr>
<td>Sohio</td>
<td>Sweetwater 5-13</td>
<td>SW SW 4 sec. 5, T. 16 S., R. 46 E.</td>
<td>11,617</td>
<td>plugged and abandoned</td>
</tr>
<tr>
<td>Amoco Production Company</td>
<td>Bald Mountain Federal No. 1</td>
<td>NE NE 4 sec. 5, T. 4 S., R. 45 E.</td>
<td>9,080</td>
<td>plugged and abandoned</td>
</tr>
<tr>
<td>Sun</td>
<td>Tincup Mountain Federal No. 1</td>
<td>NW SE 4 sec. 6, T. 5 S., R. 45 E.</td>
<td>--</td>
<td>permit</td>
</tr>
<tr>
<td>Hughes Group</td>
<td>Nicholson No. 1</td>
<td>NW NW 4 sec. 31, T. 15 S., R. 24 E.</td>
<td>(surface case)</td>
<td>drilling</td>
</tr>
</tbody>
</table>

-- Data not available.
OTHER DEVELOPMENTS

At 8:06am (MDT) on October 28, 1983, Idaho was rocked by the biggest earthquake in the state's history—and the largest in the United States in 24 years. The epicenter was near Chilly Buttes, about 10 miles northwest of Mackay. The initial shock registered 7.3 on the Richter scale and was followed by hundreds of smaller aftershocks. Fortunately, the area affected most severely by the quake is sparsely populated. Yet tragically, two Challis school children—Travis Frank, age 6, and Tara Leaton, age 7—were killed by blocks falling from a building front. The children were the only fatalities from the quake.

A new fault scarp over 20 miles long with a maximum displacement of about 15 feet extended along the west side of the Lost River Range, centered at the foot of Mt. Borah, the highest peak in the state. Estimates are that the valley floor went down an average of 10 feet relative to the mountains.

Next to the spectacular fault scarp, the ground-water system showed the most effect from the quake: the Clayton mine was flooded; waterspouts and sandboils formed near Chilly Buttes; a new temporary lake-sized body of water formed at Thousand Springs; and hot springs south of Challis on the Will Ingram Ranch dried up. Within several days the hot springs resumed flowing at a higher rate than before the quake, and the high water flow at Chilly Buttes stopped.

The area was designated as a disaster area by President Reagan, and total damage to the eastern side of the state was estimated at $12.5 million. Damage was extensive to several older buildings in Mackay (population 541) and Challis (population 758). In both towns, 11 businesses and 39 homes had major damage, and 200 homes had minor to major damage. Structures hit hardest included the Challis Junior High School, the Arco Junior High School, and the State School for the Deaf and Blind at Gooding. In spite of these examples, most observers were surprised at the minor amount of destruction caused by the shock. Much of the area is mountainous, but few rock slides or other mass earth movements resulted from this major quake.

Damage at the Idaho National Engineering Laboratory was minimal,
although nuclear reactors were shut down automatically by the initial shock. There was also little damage at the giant Cyprus' Thompson Creek molybdenum project, located just west of Challis.

The discovery that asbestos was used as insulation for pipes in the Sagle Elementary School at Sandpoint sparked a statewide inspection and cleanup for asbestos hazards in public buildings. Certain asbestiform minerals are known or suspected carcinogens, and older types of insulating materials may contain these substances. The Sandpoint school was closed for two days in November while pipes were rewrapped and sealed. A few days after the school reopened, Sorenson Elementary School in Coeur d'Alene announced that it was cleaning up a similar asbestos hazard. The University of Idaho and other state institutions initiated the same type of cleanup programs later in the year.

In August, a flash flood swept through the site of the hazardous waste dump operated by EnviroSafe Services Incorporated at an abandoned missile site near Grand View in Owyhee County. This prompted an investigation of the site by state agencies and the federal Environmental Protection Agency to see if liquid wastes had been improperly handled. The company was fined $150,000 for illegally burying liquid wastes, and all shipments of liquid waste to the site were stopped. The EPA announced that there was no evidence of any immediate danger to public health at the 117-acre site. State officials and local citizens were concerned about the problem, and new laws regulating the handling of hazardous waste in the state are sure to be a topic when the 1984 legislature convenes.

The EPA announced that four hazardous waste sites in Idaho were eligible for federally assisted cleanup using the Superfund established by the government for this purpose. The sites are the Bunker Hill smelter complex at Kellogg; Arrcom Corporation, an oil recycling operation at Rathdrum; Union Pacific Railroad's sludge pond at Pocatello; and Pacific Recycling's waste operation, also at Pocatello. The Pocatello sites caused alarm in March when PCB's were found leaking from electrical capacitors stored at the recycling yard. The EPA declared an emergency at the site and sent an Emergency Response Team to oversee cleanup operations.

Another area of concern to state officials is a 37-acre tract near
Lowman that contains 200,000 tons of low-level radioactive minerals. The minerals are left over from a blacksand processing plant that was active from 1955 to 1960. There are 107 sites in the state that have been listed by the EPA as having a potential problem involving hazardous wastes, but the extent of the hazard, if any, at these sites is unknown.

An 18-year-old lawsuit over claims on state land that were flooded by Dworshak Reservoir was settled in September. The owners were seeking more than $8 million in damages from the state, claiming that they were denied the right to develop a kyanite deposit under lease from the state when the reservoir was filled. The state signed these lands over to the Army Corp of Engineers in a land exchange that included 700 acres of the kyanite lease. Kyanite is an aluminum silicate that is used to manufacture high temperature refractories such as oven-proof cookware. The Second District Court ruled that the state was not liable for the alleged damages, overturning an earlier court decision.

A complicated legal case involving 320 acres in Section 16 near the Bunker Hill and Sunshine mines was settled, at least as far as the State Land Board was concerned, when it was decided to lease the potentially valuable property to the highest bidder. Several claimants who had previously tried to lease the disputed ground will probably appeal the decision in court.

The Small Miner's Advisory Committee suggested changes in the state's Dredge and Placer Mining Act to the Idaho Land Board in November. The areas of the changes included bonding requirements, inspection fees, enforcement, and judicial review under Idaho law. The suggestions will be incorporated in new legislation expected in 1984.

The Idaho Conservation League asked the State Land Board to implement tougher mining laws, to beef up inspection requirements, and to hire more inspectors for the Bureau of Minerals to monitor mining operations around the state. A moratorium on any new dredge and placer mines was requested by the Department of Lands, noting that the single state inspector could not handle current operations, let alone any new ones. The Land Board dismissed this request. The need for more inspectors will be addressed by the coming legislature.

Major personnel changes occurred in the Department of Lands during
1983. Jack E. Gillette, assistant director, retired in midyear after 31 years of state service in the department. Later, Gordon C. Trombley, director of the department, announced his retirement, also with 31 years of service. Trombley was appointed head of the new Department of Lands when the state was reorganized in 1974. Both men will be remembered as efficient administrators, and both were highly respected and well liked.

The Idaho Department of Fish and Game completed a 5-year study on the impact of phosphate mining on big game in southeast Idaho. The study was in cooperation with the federal Bureau of Land Management, the U.S. Forest Service, and the U.S. Fish and Wildlife Service. Financial support for the study was provided by the phosphate industry, including FMC, J.R. Simplot, Monsanto, and the Conda Partnership. Spokesmen said the report, due to be released next year, is very favorable towards the industry and will be invaluable in planning future mining operations.

The Raft River geothermal plant near Malta in southern Idaho was sold by the federal government to Hydra-Co Enterprises, a subsidiary of Niagara Mohawk Power Company of New York. Geo-Energy, Inc., a Boise firm, is a partner. The plant was built by the Department of Energy to see if 300-degree geothermal water could be used to generate electricity. The government spent approximately $40 million on the experimental plant, including $14 million on buildings and preparation of the geothermal well field. The reported selling price was $750,000.

The federal Bureau of Land Management's new minerals program was established early in the year. The Minerals Management Service was merged with BLM in late 1982. Bill R. LaVelle was appointed State Director for Mineral Management, and several other new staff members joined the organization. The new office is responsible for overseeing minerals management on all BLM-administered lands in the state.

The Idaho Bureau of Mines and Geology drafted legislation that would change its enabling act, established by state law in 1919. The legislation calls for the name of the organization to be changed to the Idaho Geological Survey and for the agency to be removed from the Department of Lands and established as a special program at the University of Idaho. The new statute will be considered by the 1984 legislature.