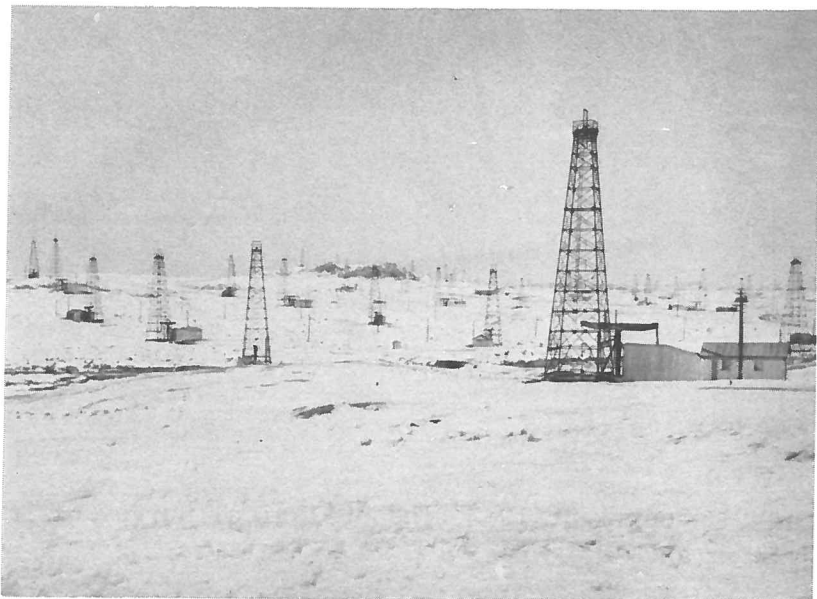


THE GEOLOGICAL SURVEY OF WYOMING

Gary B. Glass, State Geologist

MINERALS OUTLOOK FOR WYOMING

FEBRUARY 1983



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*Front cover photograph: Winter in the Salt
Creek field, Natrona County.*

MINERALS OUTLOOK FOR WYOMING

February 1983

OVERVIEW

by Gary B. Glass, State Geologist, Wyoming Geological Survey

Falling oil prices dominate the petroleum scene. U.S. spot crude prices reportedly were \$26.90-\$28.15/barrel for sweet crude and \$1.00-\$1.75 lower for sour crude in late February (Oil and Gas Journal, volume 81, no. 9, February 28, 1983). Although oil price cuts may not alter Wyoming's oil production in the short term, the cuts are responsible for at least a portion of the downturn in drilling activity. Wyoming's rig count was at a seven year low in February. The current reduction in exploration and development, however, could affect production a few years in the future.

The price cuts are a more immediate concern to Wyoming than the downturn in drilling activity. Reduced crude oil prices mean reduced revenues from both taxes and royalties paid to the State. Couple the falling prices with the gradual decline in production that is forecast for oil, and the effect on revenue is magnified. Until oil prices stabilize, their full effect will remain speculative.

Crude oil prices also can affect Wyoming's gas production. Fuel oil prices are already low enough to compete with higher priced gas, and may edge out part of the market for natural gas. Also, as evidenced by Amoco's March shut in of

150 wells in southern Wyoming, pipeline companies are trying to reduce their contracts for higher priced gas. While renegotiated or cancelled gas contracts may shut in more high priced gas, the resultant production losses could be offset by improved markets for cheaper old gas. Even though these offsetting possibilities may result in no net gain or loss in forecast gas production, production of lower priced gas will again reduce the State's tax and royalty revenues.

Because market conditions for Wyoming coal have apparently not worsened since 1982, this year's production is still forecast at 112 million tons - a 3.7 percent increase over the 108 million tons produced in 1982. Although 1982's production was actually two percent better than predicted in our year-end forecast, that percentage only reflects the inaccuracy of our forecast and does not reflect any real upturn in demand. Similarly, 1982's 5 percent increase in production is still 4 percent less than the increase recorded in 1981.

Most of the increased coal tonnage that is forecast for 1983 simply reflects the initiation of long term contracts signed five or more years ago. The State's 1983 production will probably be 14 percent below contract demand. Excess mine capacity for 1983 is estimated at approximately 87 million tons (Figure 1). The average FOB mine price for Wyoming coal was \$12.57 in 1981. Average coal prices are currently forecast at \$13.20 in 1982 and \$13.86 in 1983 (Figure 2).

In 1983, demand for soda ash (trona), iron ore, limestone, and gypsum should reflect any improvements in the national economy. Bentonite, on

the other hand, is dependent enough on oil and gas drilling activity that significant improvements will probably mirror the status of the petroleum industry. Aggregate (sand, gravel, ballast, clinker, etc.) production will primarily depend on the levels of highway construction and railroad maintenance. Uranium production, however, will remain at low levels, and may even decline further with the closure of the Sweetwater mine. Although further layoffs in the uranium industry are possible, some workers may be recalled as individual producers adjust to their contracts and demand.

Although there will be some exploration for metals and diamonds in Wyoming this year, unless gold and silver prices improve, exploration will fall short of earlier expectations.

OIL AND GAS UPDATE

by Alan VerPloeg, Staff Petroleum Geologist,
Wyoming Geological Survey

The recession and falling oil prices continue to put a damper on drilling in the State. The rig count at the end of February had dropped to its lowest level in seven years, with only 72 rigs running. This represents a 60 percent drop over the past year. Wyoming is not the only western state experiencing such declines as rig activity in Utah, Colorado, Montana, and North Dakota is well below that of a year ago. Even drilling in the Overthrust Belt of western Wyoming has declined. For example, Chevron, which had as many as 40 rigs running a few years ago, has 10 or less

rigs this year. In addition, many petroleum forecasters feel the decline has not bottomed out.

In March, Amoco shut in 150 gas wells in southern Wyoming after Northwest Central Pipeline Company refused to accept the gas because of excessive carbon dioxide content. A spokesman for the pipeline company also noted that the terminated contract would substantially reduce the company's gas costs because cheaper gas was available from Kansas. Various news articles placed the average gas cost from Amoco's wells between \$5.93-\$6.80 an MCF. The 150 wells, which reportedly account for about one-half the gas Northwest Central buys from Wyoming, produce about 17 billion cubic feet of gas. Amoco termed the shut in as temporary, and does not expect to lay off any of the 30 employees at their Wamsutter office.

On a more positive note, officials with Amoco Production indicate that by 1987 the Overthrust Belt "fairway" should contribute up to 180,000 barrels of oil per day and 1.3 billion cubic feet of gas daily. Amoco estimates that the discovered resources in the "fairway" may be as high as 1.7 billion barrels of oil equivalent.

Early in February, Monsanto announced plans to drill a 26,000 feet deep well in the Madden Area of Fremont County (No. 1 Joyce - section 4, T.38N., R.91W.). This well could break the Rocky Mountain depth record of 25,764 feet held by the 1-34 Pacific Creek well, which was drilled by Rainbow Resources in 1978 and 1979. The projected cost for this new Monsanto well is \$26 million. Potential payzones include the Frontier, Muddy, Lakota, Morrison, Sundance, Crow Mountain, Phosphoria, Tensleep, Madison, and Amsden.

COAL UPDATE

by Richard W. Jones, Coal Geologist, Wyoming Geological Survey

Wyoming coal production continues to set new records. Preliminary figures from the State Inspector of Mines indicate that Wyoming's 1982 production was 108 million tons, an increase of five percent over 1981's record production. Wyoming should remain the nation's third largest coal-producing state in 1982, behind Kentucky and West Virginia. For 1982, Wyoming should also maintain its position as the leading state in strip-mined coal production (one-fifth of the nation's surface-mined coal was from Wyoming in 1981). Also, more coal was produced from Federal leases in Wyoming than from any other state (over 60% of Wyoming's 1981 production was from Federal leases). It is probable that Wyoming's 1982 production will again exceed one-eighth of the total coal mined in the United States.

There are now 25 active coal mines in Wyoming: the Powder River Basin gained three more mines in 1982 for a total of 16 mines; the Hanna Basin, which lost two active mines in 1982 and another mine in 1983, now has only 3 active mines, including the only underground mine in the State (Carbon County mine); the Leucite Hills mine, operated by Prospect Point Coal Company, opened in the summer of 1982 and is the third active mine in Sweetwater County; Lincoln County still has two active coal mines; and Hot Springs County has only one active mine. While Campbell County alone accounted for over 75 percent of the State's coal production in

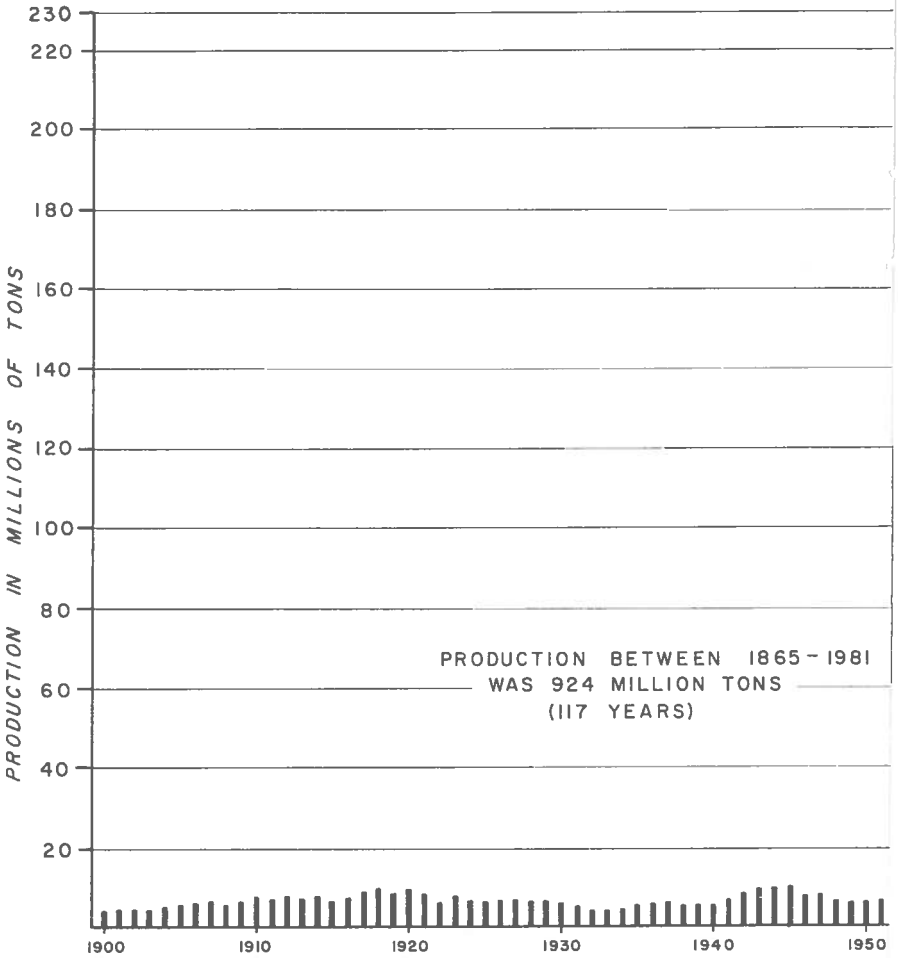
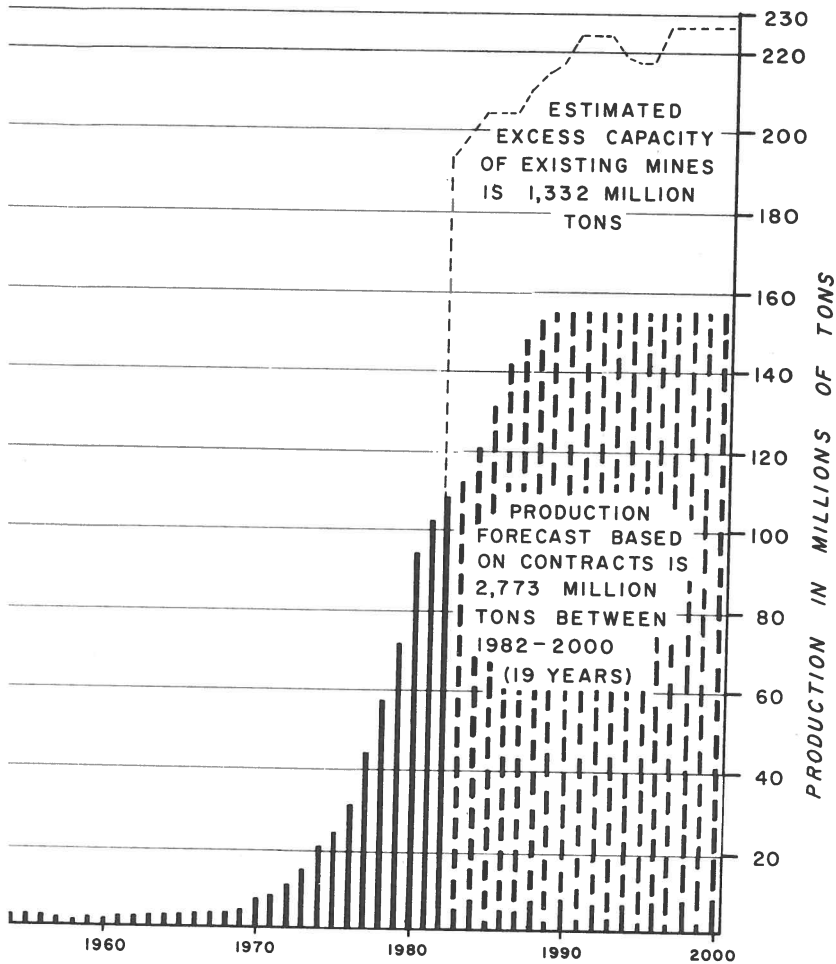
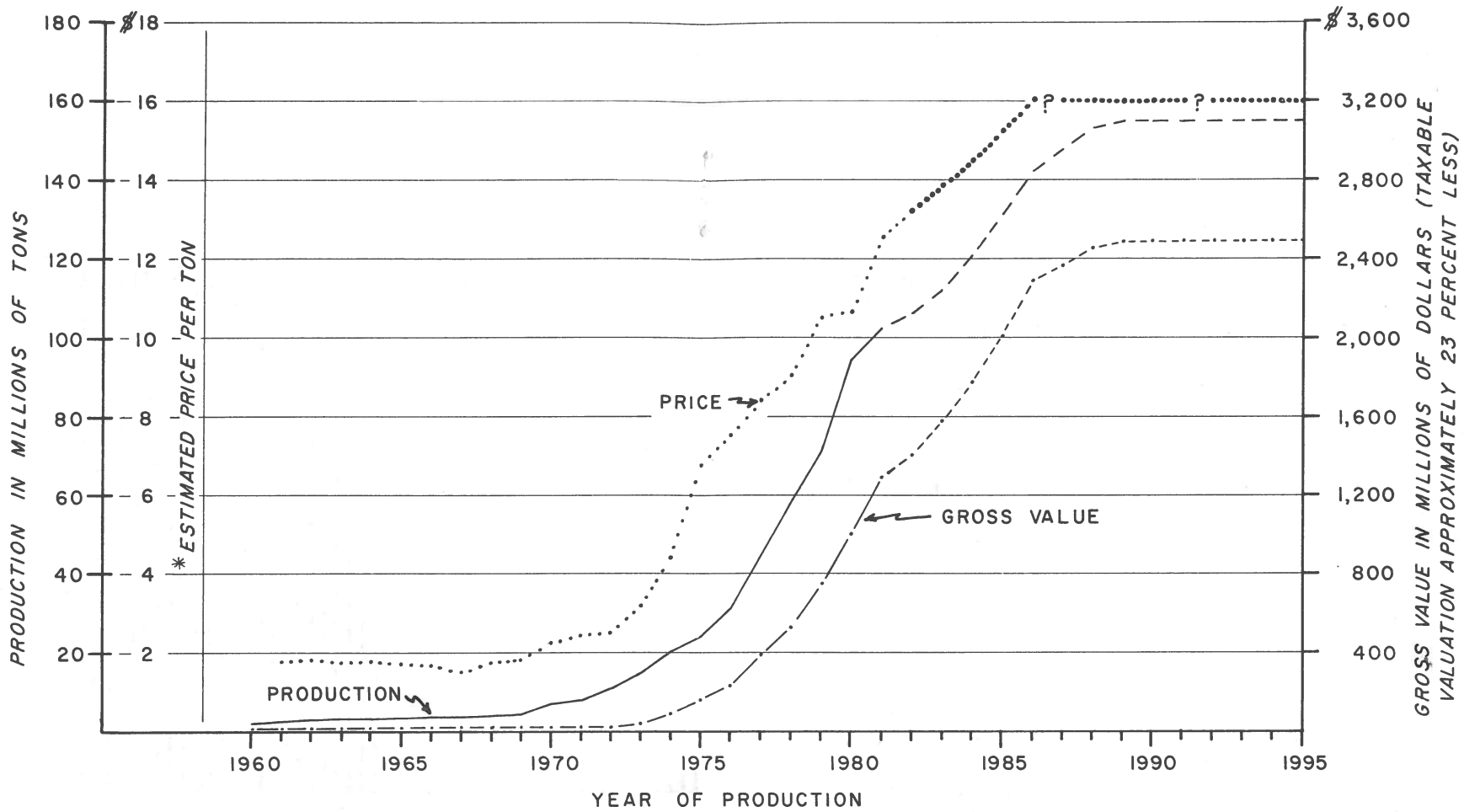


Figure 1. Historical Wyoming Coal Production with Forecast to 2000.



WYOMING GEOLOGICAL SURVEY
 FEBRUARY 1, 1983



* ASSUMES THE PRICE PER TON IS 1.25X THE ASSESSED VALUE PER TON

WYOMING GEOLOGICAL SURVEY
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Figure 2. Wyoming Coal Production, Price, and Gross Dollar Value to 1995.

1982, collectively, the coal mines in Wyoming's Powder River Basin produced more than 80 percent of the State's coal. With the addition of Wyoming's 1982 coal production, the State's cumulative production has exceeded one billion tons. The one billionth ton, which represents the total coal produced in Wyoming since mining began in the 1860's, was mined in September of 1982.

Federal coal activities still continue: plans for the second round of Federal coal leasing are now underway in both the Green River-Hams Fork and the Powder River coal production regions. In the Wyoming portions of these production regions, a total of 21 companies have expressed an interest in leasing more than 6.5 billion tons of coal under 368,000 acres. Thirty-one federal lease tracts containing nearly 8 billion tons of coal have been delineated. Following the ranking and selection of tracts and the completion of Environmental Impact Statements, the next Federal lease sales are scheduled for the summer of 1984. In another leasing-related Federal action, the U.S. Department of Interior banned all railroad company subsidiaries from acquiring any future federal coal leases. The ban was initiated late last year in response to an internal legal opinion that modified Interior's interpretation of Section 2 (c) of the Mineral Leasing Act of 1920. The change reverses a six-year-old policy that was at odds with the Justice Department's interpretation of Section 2 (c). While the National Coal Association had strongly supported the Justice Department's interpretation and had urged Interior to change its views to agree with Justice, the railroad companies had been advocating the repeal of Section 2 (c).

In 1983 legislative action, the Wyoming Legislature sent a bill to Governor Herschler that authorized a reduction in the severance tax paid on coal mined underground. This bill reduces the current 10.5 percent tax to 7.25 percent. The bill, which may cost the State \$1 million a year in lost tax revenues, was designed as an incentive for additional underground coal mining. Proponents of the bill also hoped the tax break might make Wyoming's underground coal more competitive in the Pacific Rim coal market.

Other industry news includes the sale of Cities Service's (Citco's) Dry Fork coal property, north of Gillette, to Phillips Petroleum, and the sale of Energy Development Company (owned by Iowa Public Service Company) to Arch Mineral Corporation. This latter sale prompted the layoff of another 60 miners when Energy Development's strip mining contractor, Resource Exploration and Mining, Inc., closed its mine in the first quarter of 1982.

URANIUM AND NONFUEL MINERALS UPDATE

by Ray E. Harris, Uranium and Industrial Minerals Geologist, Wyoming Geological Survey

In January, Union Oil Company announced that it will close its Sweetwater mine and mill later this year, and lay off 211 employees. This is the eighth uranium mine closure since mid-1979. Union's action results from an announced five-year delay in the construction of two midwestern nuclear power plants. Union has fuel contracts with both plants. With the closure, there are now eleven producing

uranium mines in Wyoming. Union noted that they are only suspending operations until the plants are finished or the market improves.

Rocky Mountain Energy (RME) closed its Casper uranium exploration office in January, causing the layoff of 12 employees and the transfer of 15 other employees to RME's headquarters in Broomfield, Colorado. This closure will not affect operations at their Bear Creek uranium mine and mill in Converse County.

The market price of uranium has increased almost 25% from a low of \$17.25 per pound of uranium oxide in 1982 to the present \$21.50 per pound in late February. The price, however, is not expected to show a rapid increase this year. This recent increase may reflect a reduction in mill site stockpiles as well as adjustments due to mine closures and declining uranium production during 1982.

Declining soda ash production from trona deposits near Green River, which was evident in late 1982, is apparently continuing into 1983. FMC Corporation laid off 25 employees in January. Their trona operation (the world's largest) now employs about 100 fewer people than the 720 employees who worked in their mine and soda ash plant in 1981.

The bentonite industry in Wyoming is also feeling the effects of the declining demand for bentonite for oil and gas well drilling, foundry castings, and taconite (iron ore) pelletizing. Wyo-Ben laid off a number of people at their main office in Billings, Montana, and output from their bentonite mines in Wyoming is down. Other bentonite producers have experienced a decline in orders for processed bentonite.

Rallying from a decline that began in May 1981, gypsum sales increased in the latter part of 1982 and in the first two months of 1983. Sales of refined gypsum are already 4 percent above December 1981. This rally reflects an increase in housing starts and the resultant growing demand for wallboard, first noted in October 1982.

Story Stone Company's attempt to open a limestone quarry near Story was denied by the U.S. Department of the Interior. The company is appealing the ruling.

BASE, PRECIOUS, AND FERROUS METALS AND DIAMOND UPDATE

by W. Dan Hausel, Deputy Director, Wyoming Geological Survey

Until the end of February, base and precious metal prices had been on the upswing. In early March, however, gold dropped \$100 an ounce, and silver dropped \$4 an ounce. These large drops in precious metal prices are attributed to panicky selling following the decline in worldwide petroleum prices. Prediction of future metal prices is very difficult in the present unstable market.

Exploration for gold and silver mineralization will probably not increase unless the prices of gold (presently above \$400 an ounce) and silver (above \$10 an ounce) recover before summer. Base metal exploration, on the other hand, will probably not increase because base metal prices

are still somewhat depressed. Quotes on U.S. copper prices are as high as 84¢/pound (about 11¢ higher than last year), zinc is up to 40¢/pound (about 4¢ higher than February), and lead prices have fluctuated in recent months (in early March, lead sold for 22¢/pound).

At least some gold exploration activities in Wyoming's Archean greenstone belts and in the Black Hills region should continue in 1983. If the market recovers, silver exploration may occur in the Overthrust Belt of Wyoming. Any exploration for base metals will probably occur in the Sierra Madre and the Hartville Uplift. Massive sulfide deposits have been reported in both of these regions (massive sulfide deposits generally contain varying concentrations of copper, zinc, lead, and trace gold and silver) (Hausel, 1982b). It is unlikely that the Absarokas will receive much attention because most of the porphyry copper-molybdenum deposits lie within wilderness areas (these deposits not only contain significant amounts of copper and molybdenum, but also sizable resources of zinc, lead, silver, gold, and, presumably, titanium).

During the first quarter of 1983, mining activities at U.S. Steel's Atlantic City iron ore mine near South Pass were suspended because of a malfunction in the mill's primary crusher. More than 400 employees have been temporarily laid off until the crusher is repaired. Mine officials don't expect a lengthy closure.

Continued diamond exploration is expected in Colorado and Wyoming. The Geological Survey of Wyoming announced that their joint venture with the Remote Sensing Group of the University of Wyoming's Department of Geology and Geophysics

would continue for at least another year. The two groups are investigating the application of remote sensing techniques to exploration for diamond-bearing kimberlite. Funding for the venture is provided by a NASA grant.

Early this year, the Geological Survey of Wyoming extracted two micro-diamonds (less than 1 mm in diameter) from less than 25 pounds of kimberlite collected from the Sloan 5 (Evelyn) pipe in the Colorado-Wyoming State Line District. With this discovery, there are now thirteen proven diamond-bearing kimberlites in the district.

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WYOMING COAL PRODUCTION FORECAST TO 1990

Calendar Year	Production forecast (millions of tons): minimum, and best guess		Maximum, and best guess	Increase per year	Estimated contracted production (millions of tons)	Below contracts
*1981	-	-	102.7	9%	110	7%
*1982	-	-	108.0	5%	120	10%
1983	117	112	112.0	4%	130	14%
1984	125	120	121.0	8%	138	12%
1985	134	129	131.0	8%	142	8%
1986	142	134	142.0	8%	148	4%
1987	156	140	148.0	4%	153	4%
1988	161	145	153.0	3%	159	4%
1989	162	148	155.0	1%	159	2%
1990	161	149	155.0	0%	159	3%

*These are actual values for comparison.

WYOMING OIL AND GAS PRODUCTION FORECAST TO 1988

Calendar Year	Natural Gas Production (billions of cubic feet)	Oil Production (millions of barrels)
*1980	450.6	126.4
*1981	455.4	122.1
1982	500.0	119.0
1983	567.0	116.0
1984	647.0	112.0
1985	667.0	108.0
1986	693.0	106.0
1987	740.0	105.5
1988	780.0	105.0

*These are actual values for comparison.

WYOMING URANIUM PRODUCTION FORECAST TO 1987

Calendar Year	Gross Uranium Production (millions of tons)
*1980	5.4
*1981	4.6
1982	2.7
1983	2.6
1984	2.6
1985	2.8
1986	3.3
1987	3.3

*These are actual values for comparison.

WYOMING TRONA PRODUCTION FORECAST TO 1987

Calendar Year	Gross Trona Production (millions of tons)
*1980	12.2
*1981	11.8
1982	11.0
1983	11.0
1984	12.0
1985	13.0
1986	14.0
1987	15.0

*These are actual values for comparison.

All these estimates were made in September, 1982.