THE GEOLOGICAL SURVEY OF WYOMING

Gary B. Glass, State Geologist

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THE GEOLOGICAL SURVEY OF WYOMING

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WYOMING GEO-NOTES

This quarterly newsletter on the geology, mineral resources, and activities of the Geological Survey is available by subscription (four issues for $5.00) or as single copies at $1.50 each.

Wyoming Geo-notes was first published in July, 1977, as a semiannual newsletter for the Geological Survey. It had a very shaky start which ended abruptly with a single issue, designated Volume 1, Number 1. The recent success of our *Quarterly Minerals Update for Wyoming*, however, has been so overwhelming that it now forms the backbone for our rejuvenated *Wyoming Geo-notes*. The newsletter is now published quarterly and has been expanded to include news about Staff and Survey activities.

This and other publications available from: The Geological Survey of Wyoming
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MINERALS UPDATE

OVERVIEW

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

Figures recently released by the Wyoming Department of Revenue show that the assessed value of Wyoming's mineral production decreased about $400 million from 1984 to 1985. Despite the decline, assessed mineral value in 1985 was still a healthy $5.5 billion. More importantly, however, the 1985 valuation precedes the precipitous fall in oil prices of early 1986. Because the value of most of Wyoming's other minerals are also projected to decline in 1986, it is inevitable that the 1986 valuation will be below that of 1985. At this point, it is difficult to predict how much lower it will be, but it will be a substantial decrease.

Second Quarter updates provide little optimism that valuations, revenues, production and employment in the mineral industries will recover in the next quarter or for that matter in 1986. One bright spot is the trona industry which seems to have gained some additional export markets and may boost 1986 production at least back up to pre-1985 levels. Natural gas and coal production may also increase in 1986 although both could fail to register projected gains based on low preliminary First Quarter production figures. Oil production as well as oil prices will be down in 1986, and marginal wells continue to be shut-in or even abandoned. Drilling activity has not been so low since the 1940s.

The only action taken so far this year in regard to the dilemma of the oil industry has been the Federal and State governments' decisions not to terminate leases that are temporarily shut-in due to poor economics brought on by low oil prices. Oil prices are expected to average only $13.55 per barrel in 1986.

Prices could increase if OPEC reaches some accord on setting production quotas or if the Federal Government establishes an import quota. Unfortunately there is little optimism that either of these possibilities will occur in 1986.

Natural gas faces a similar situation as oil. The price is falling, wells are being shut-in and markets are not being found. New drilling for natural gas has all but ground to a halt. The bright spot is the production of carbon dioxide from southwestern Wyoming. This production should begin in late 1986 and grow to about 100 billion cubic feet per year by 1987 or 1988. For comparison, methane production from Wyoming was 597 billion cubic feet in 1985.

The coal industry is for the most part healthy and stable. The exceptions are the Hanna and Sheridan districts where mines have closed or contracts have not been renewed. Statewide, the spot market for coal has tapered off with some spot contracts supplanting previous long term contracts (Glass, 1986). Because of this, spot sales are not in addition to long term contracts but are in essence only making up the differences between high contract demand and trimmed contractual takes. The average price for Wyoming coal will decline further in 1986 as contract prices are renegotiated downward through reopener clauses. A bright note is that railroad competition has lowered transportation costs in many instances, thereby helping make Wyoming coal competitive in a cutthroat market fueled by overcapacity. In at least one instance, however, a major electric power company, supplied by Wyoming, has converted one of its coal-fired units to natural gas. Fortunately, Wyoming's markets do not include many power plants that have this option of switching fuels.

The bottom line is that State revenues are substantially down. Local governments have been forced to trim budgets, have cut back on employees or have

reduced services. Even the State had to reduce its FY 87 budget in anticipation of revenue shortfalls. In the last six months, hundreds of people working in the mineral industry, directly supporting the mineral industry as well as many who provided needed goods and services to these people are now among the unemployed.

Wyoming mineral production forecast to 1991[1].

Calendar Year	Oil Production[2]	Natural Gas Production[3]	Carbon Dioxide Production[3]	Coal Production[4]	Trona Production[4]	Uranium Production[4]
*1981	122.1	455.4	--	102.8	11.8	4.6
*1982	118.7	465.1	--	107.9	10.1	2.1
*1983	120.9	539.7	--	112.2	10.5	3.0
*1984	127.8	600.1	--	130.7	11.0	1.6
*1985	131.0	597.9	--	140.4	9.4[5]	0.5[5]
1986	125.0	600.0	25.0	142.0	11.3	0.3
1987	123.0	630.0	75.0	144.0	11.4	0.3
1988	120.0	660.0	100.0	146.0	11.5	0.3
1989	118.0	700.0	100.0	148.0	11.5	0.3
1990	116.0	750.0	100.0	149.0	11.7	0.3
1991	114.0	800.0	100.0	150.0	11.9	0.3

*Actual values for comparison, [1] Geological Survey of Wyoming, June, 1986, [2] in millions of barrels, [3] in billions of cubic feet, [4] in millions of tons, [5] estimated.

In addition, the diminished level of oil and gas drilling signals more trouble is ahead. Exploration and drilling is at such a low level that depleted reserves will not be offset by new discoveries. Oil production will continue to decline as older fields are depleted. Even if prices rise, an upturn in activity will be slow in coming. By the mid-1990s, however, growth in energy demand should bring some new coal-fired power plants on line, and Wyoming's large coal mines will be there to compete for these new markets. The natural gas bubble may disappear a little faster

than expected because of conversions of power plants and industrial users to natural gas, and shut-in gas wells could reopen to supply some of that demand. In short, there is some optimism for gains in production of natural gas and coal at least in the long term. The prognosis for gains in oil and bentonite production remain clouded and more pessimistic.

Although much of what is reported in this Second Quarter update is depressing, the State is still a major producer of many mineral resources, and its mineral industry is for the most part capable of rebounding quickly in a better economic climate. Mineral revenues, though declining, are a far cry above their levels in the early 1970s. Belt tightening will help companies weather the bad times, but the long term threat to the domestic oil and gas industry is real and needs immediate serious attention.

Although belt tightening is needed, one must question the wisdom in the almost complete decimation of technical and support staffs by many major petroleum companies. Aside from the personal trama to the laid off employees, these significant cuts in trained manpower are of no small significance in the event of a turnaround because companies will be faced with inadequate staff and personnel to quickly boost exploration and drilling. The domino effect on ancillary businesses, whose clientele have disappeared, only compounds the impact to Wyoming's economy.

Reference cited

Glass, G.B., 1986, Summary of coal contracts: Geological Survey of Wyoming, unpublished xerox report, 63 p.

Production history of selected other mineral commodities[1].

	1980	1981	1982	1983	1984
Ballast[2,3]	1.65	1.72	0.81	0.99	2.43
Bentonite[2]	3.58	4.81	2.35	2.18	3.08
Clay[2]	0.04	0.02	0.02	0.04	0.05
Decorative Stone[2]	0.05	0.05	0.05	0.07	0.08
Dolomite[2]	1.67	0.87	0.61	0.66	0.86
Feldspar[4]	200	25	----	----	----
Gypsum[2]	0.30	0.28	0.26	0.33	0.33
Iron Ore[2]	4.88	4.67	3.28	2.48	----
Limestone[2,5]	0.50	0.72	0.59	0.56	0.65
Sand and Gravel[2]	5.06	5.21	4.74	5.00	4.76
Scoria[2,6]	0.03	0.08	0.08	0.07	0.23
Shale[2]	----	----	----	----	0.02
Sodium Sulfate[4]	----	3,201	3,174	3,194	3,250
Sulfur[2,7]	4.46	4.69	4.85	5.46	5.75

[1]Source: Ad Valorem Tax Division. [2]Millions of short tons. [3]Includes granite, scoria and other rock. [4]Short tons. [5]Includes limestone used for cement rock, sugar beet refiling and other uses. [6]Baked and fused rock, also called clinker. [7]Data from U.S. Bureau of Mines.

OIL AND GAS UPDATE

by Rod DeBruin, Petroleum Geologist, Geological Survey of Wyoming

Once again crude oil prices, which began declining late last year, are a major concern for Wyoming as well as other major oil-producing states. Spot prices for crude dropped below $10 a barrel in early April, rose to above $17 in mid-May and declined again to their current $12-$14 range. The posted price for Wyoming crudes presently averages around $13 a barrel.

In Wyoming, the rig count for the first two weeks in June averaged 26 compared to the average of 93 for all of 1985 (see Figures on pages 8 and 9). Well completions in Wyoming for the first five months of 1986 are running about 22 percent below last year (Petroleum Information, Rocky Mountain Region Report, 6-4-86). Nationwide, the rig count dropped below 700 to an all-time low since Hughes Tool Company began keeping records in 1940. In contrast, there were over 4,500 rigs working in the United States late in 1981 when crude oil was selling for over $40 a barrel. It is obvious that at the current drilling pace, this country cannot find enough new oil and gas reserves to replace what we produce. Without significant discoveries of new reserves, U.S. production will continue to drop, and we will become increasingly dependent on foreign imports. During the 1980-1985 period when crude oil prices were relatively high, over 300 new oil and gas fields were discovered in Wyoming. These discoveries, along with significant new discoveries in the 1970's (see Figure and Tables on pages 10 and 11) followed the increase in prices caused by the Arab oil embargo of 1973, and boosted Wyoming's oil production in 1983, 1984 and 1985, reversing its previous decline. Natural gas production also increased during this period and would have increased even more if markets had been available. According to figures from the Wyoming Oil and Gas Conservation Commission, there were 1,685 pro-

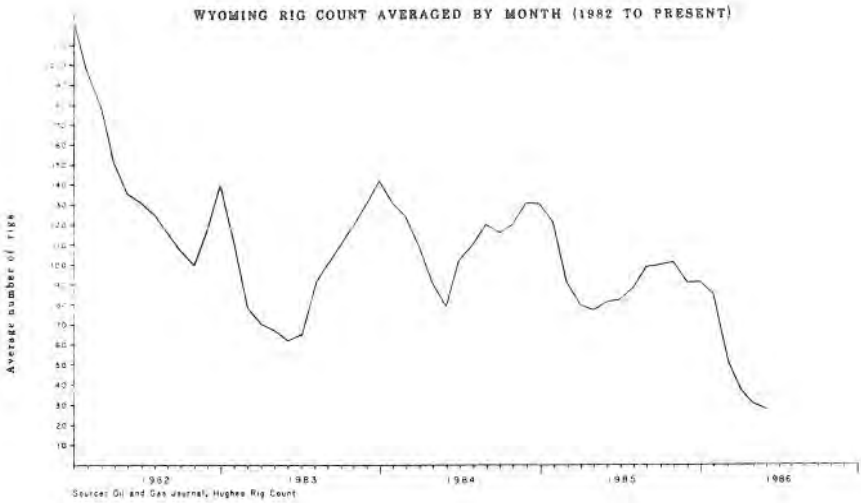
ducing gas wells and 1,271 shut-in gas wells as of September 1985. There was an average of 1,853 producing gas wells and an average of 1,123 shut-in gas wells per month through the first nine months of 1985.

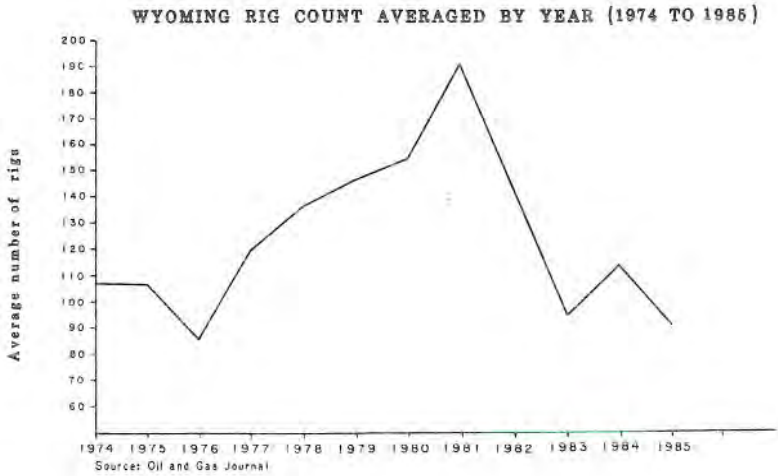
In another setback for Wyoming's oil and gas industry, Chevron officials recently announced the closing of their Casper offices. The closing will affect 150 people in land, exploration and production offices and should be completed later this year.

In a related development, Marathon Oil has announced more layoffs, but company officials have not said how many of Wyoming's 700 Marathon employees will be affected. This will be the second Marathon layoff this year.

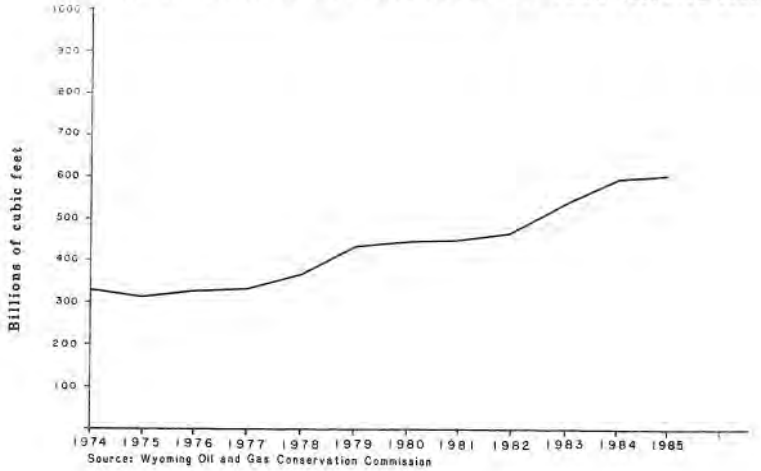
Low crude prices have forced Amoco Production Company to close over two-thirds of Fourbear Field near Meeteetse. The 14°API crude was selling for only $5 a barrel. Amoco has shut-in over 60 wells in the Bighorn Basin until prices increase.

The director of the Wyoming Revenue Department's Ad Valorem Tax Division believes the severance tax for hydrogen sulfide and carbon dioxide may be settled by the Wyoming Supreme Court. Amoco and Chevron maintain that hydrogen sulfide should be taxed at a two percent rate rather than a six percent rate since it is not a hydrocarbon. Amoco is also challenging the department's position that carbon dioxide production should also be taxed at a six percent rate.

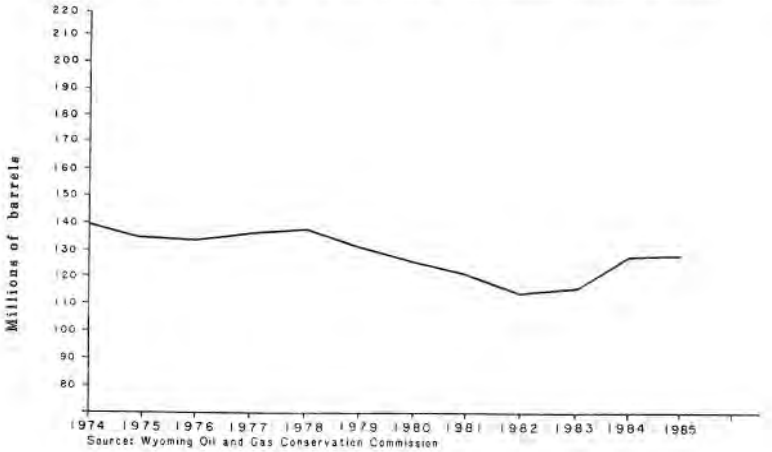

WYOMING RIG COUNT AVERAGED BY MONTH (1982 TO PRESENT)
Average number of rigs
1982
1983
1984
1985
1986
Source: Oil and Gas Journal, Hughes Rig Count


WYOMING RIG COUNT AVERAGED BY YEAR (1974 TO 1985)
Average number of rigs
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985
Source: Oil and Gas Journal

WYOMING NATURAL GAS PRODUCTION BY YEAR (1974 TO 1985)



WYOMING OIL PRODUCTION BY YEAR (1974 TO 1985)



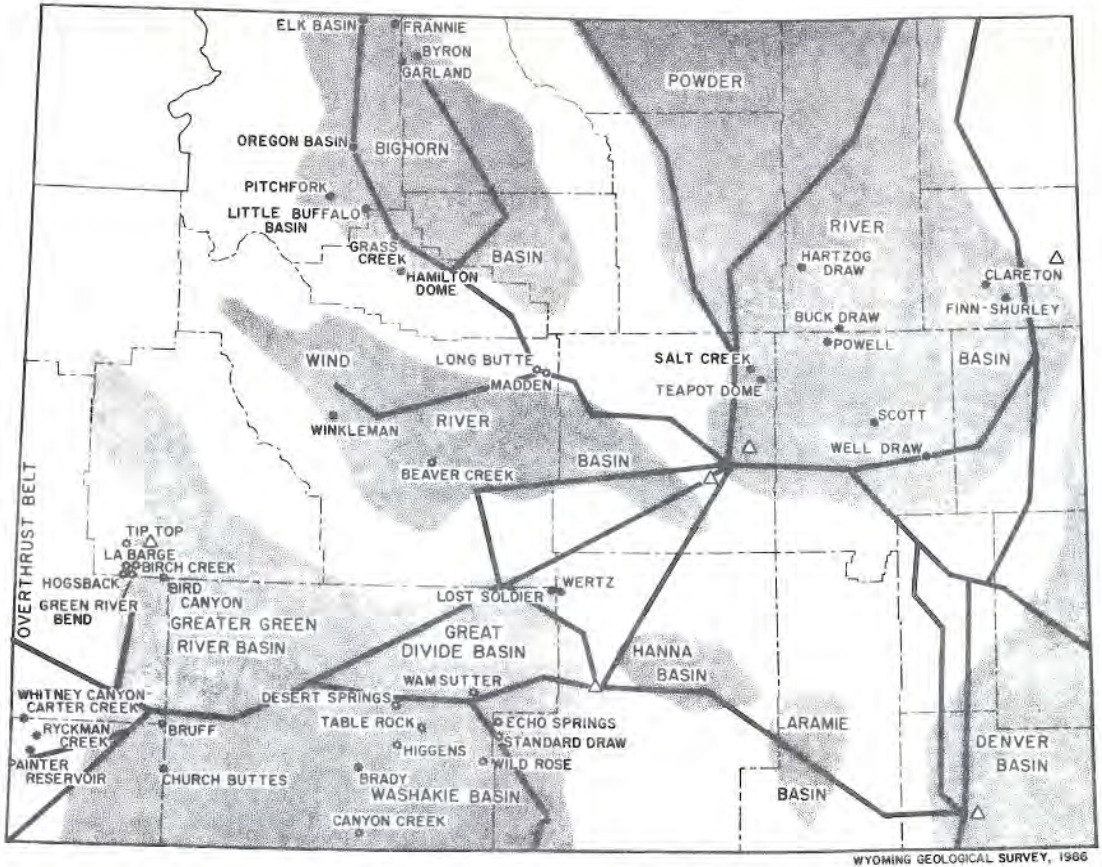
TOP 25 OIL FIELDS IN WYOMING BASED ON 1984 PRODUCTION[1]

	Name	Year discovered	1984 Production (Barrels)	Cumulative Production through 1984 (Barrels)
1	Oregon Basin	1912	9,128,974	350,441,072
2	Painter Reservoir	1977	8,015,754	30,285,153
3	Salt Creek	1889	5,752,998	604,510,984
4	Little Buffalo Basin	1914	4,154,349	105,599,231
5	Hartzog Draw	1976	3,481,875	41,255,775
6	Brady	1973	3,408,996	43,234,727
7	Lost Soldier	1916	3,264,869	199,747,595
8	Hamilton Dome	1918	3,233,840	217,970,782
9	Elk Basin	1915	3,172,638	419,953,135
10	Garland	1906	2,949,119	151,928,971
11	Buck Draw	1974	2,850,933	3,695,982
12	Powell	1954	2,743,398	7,983,072
13	Wertz	1921	2,601,158	88,233,273
14	Grass Creek	1914	2,522,303	175,137,554
15	Byron	1918	2,317,513	114,470,737
16	Frannie	1928	1,781,946	106,437,957
17	Winkleman	1917	1,619,309	81,508,491
18	Scott	1979	1,514,309	7,524,470
19	Clareton	1950	1,102,370	3,284,127
20	Teapot Dome Naval Reserve	1922	1,082,693	15,818,048
21	Ryckman Creek	1976	1,066,862	12,408,231
22	Whitney Canyon - Carter Creek	1978	1,055,402	2,048,119
23	Finn-Shurley	1965	1,044,698	5,208,391
24	Well Draw	1973	1,015,314	23,995,637
25	Pitchfork	1930	976,095	28,383,894
	TOTAL		71,857,715	2,841,065,408

TOP 25 GAS FIELDS IN WYOMING BASED ON 1984 PRODUCTION[1]

	Name	Year discovered	1984 Production (MCF)	Cumulative Production through 1984 (MCF)
1	Whitney Canyon-Carter Creek	1978	101,988,688	194,675,086
2	Painter Reservoir	1977	65,541,811	200,492,638
3	Table Rock	1946	29,054,470	384,260,489
4	Brady	1973	22,307,987	195,376,091
5	Echo Springs	1976	17,288,542	81,283,608
6	Ryckman Creek	1976	15,058,433	50,675,828
7	Madden	1969	14,118,774	208,779,147
8	Powell	1954	11,483,547	30,432,441
9	Standard Draw	1979	10,909,054	48,835,454
10	Bruff	1974	10,251,534	67,880,645
11	Beaver Creek	1938	9,748,982	525,639,100
12	Desert Springs	1958	9,638,080	231,697,536
13	Wild Rose	1975	9,560,001	45,221,841
14	LaBarge	1925	8,684,454	196,135,433
15	Church Buttes	1956	6,819,249	328,381,873
16	Tip Top	1928	6,762,125	309,313,249
17	Long Butte	1982	6,575,864	22,388,332
18	Green River Bend	1958	6,505,105	161,970,241
19	Birch Creek	1957	6,483,301	147,938,972
20	Buck Draw	1974	5,953,236	7,564,293
21	Hogsback	1955	5,848,083	291,916,581
22	Bird Canyon	1971	5,618,941	21,650,677
23	Wamsutter	1958	5,484,034	62,104,491
24	Higgens	1969	5,461,325	56,553,570
25	Canyon Creek	1941	4,870,694	228,506,874
	TOTAL		402,016,314	4,099,674,490

[1] Data from Wyoming Oil and Gas Conservation Commission reports.



WYOMING GEOLOGICAL SURVEY, 1986

GENERALIZED OIL AND GAS INDEX MAP OF WYOMING

On a more optimistic note, final 1985 production figures from the Wyoming Oil and Gas Conservation Commission show that the State produced nearly 131 million barrels of oil and 597.9 billion cubic feet of natural gas. Production for 1984 was 127.8 million barrels of oil and 600.1 billion cubic feet of gas.

Since the last issue of Geo-notes, the U.S. Bureau of Land Management held two lease sales. The April sale drew high bids of $1,795,890 for 29,938 acres. There were bids on 116 of the 189 parcels offered with an average bid of $59.99 per acre. Bass Enterprises' high bid of $1,881.88 per acre was for a 40-acre lease in the Powder River Basin about one mile east of Dakota oil and gas production in Ross Field.

The June sale drew high bids of $1,332,216 for 24,512 acres. There were bids on 75 of the 86 parcels offered. Coastal Oil and Gas with two partners made the high bid of $437.50 per acre for a 480-acre tract in the Powder River Basin about one mile from Dakota oil and gas production in Ogalalla Hills Field. The average bid was $54.35 per acre.

The Wyoming Board of Land Commissioners' March lease sale drew $77,402 in high bids on 112 of 199 parcels offered. There were bids on 44,504 acres with an average bid of $17.38 per acre. Nora Pickrel of Moorcroft made the high bid of $370 per acre for a 480-acre lease in the Powder River Basin. The lease is within a half mile of Minnelusa oil production at Rabbit Ears Field.

The May State sale drew high bids of $354,941. Only 70 of the 200 parcels received bids. Bids were for 27,543 acres, and the average bid was $12.89 per acre. The top bid of the sale was $140 per acre for a 640-acre tract near Minnelusa oil production in Adon East Field in the Powder River Basin. Maurice Brown of Casper made the high bid. For a comparison with past sales, see the table on page 13.

WYOMING FEDERAL AND STATE COMPETITIVE OIL AND GAS LEASE SALES

BLM SALES 1984

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
February	$ 7,262,056	21	21	2,304	2,304	$3,151.31	$21,239.34
March	615,088	28	28	4,015	4,015	153.20	500.00
April	330,798	29	29	3,977	3,977	83.17	412.51
May	1,571,896	77	75	14,565	14,470	108.63	1,300.00
August	12,465,683	162	162	30,110	30,110	414.00	13,333.33
October	2,521,434	115	115	19,852	19,852	127.01	3,852.00
December	4,761,794	123	123	29,202	29,202	163.07	5,751.50
TOTAL	$29,528,749	555	553	104,025	103,930	$ 284.12	$21,239.34

1985

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
February	$ 3,547,273	117	115	34,948	34,028	$ 104.24	$ 1,700.00
April	2,025,793	133	128	25,497	24,056	84.21	2,609.53
June	1,963,897	140	137	40,304	38,904	50.48	2,577.15
August	2,854,821	190	146	75,094	56,906	50.17	1,732.14
October	1,876,105	208	105	81,611	32,052	58.53	1,108.77
December	1,467,265	211	144	73,723	46,908	31.28	1,167.23
TOTAL	$13,735,154	999	772	331,177	232,854	$ 58.99	$ 2,609.53

1986

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
February	$ 1,992,326	211	154	58,507	38,809	$ 51.34	$ 680.00
April	1,795,890	189	116	54,136	29,938	59.99	1,881.88
June	1,332,216	86	75	27,137	24,512	54.35	437.50

STATE SALES 1984

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
January	$ 2,316,714	200	165	118,285	92,785	$ 23.97	$ 502.04
March	2,173,851	200	166	85,993	66,781	31.49	524.00
May	1,527,903	200	162	87,469	67,579	32.49	390.00
July	2,028,880	200	181	86,387	73,849	26.46	2,100.00
September	1,379,138	200	141	87,095	53,066	24.99	1,020.00
November	739,766	200	135	82,363	51,640	13.33	280.00
TOTAL	$10,166,252	1,200	950	547,592	405,700	$ 25.05	$2,100.00

1985

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
January	$ 757,214	200	86	80,019	27,520	$ 26.51	$1,700.00
March	2,077,478	300	172	137,321	69,781	29.77	1,600.00
May	936,374	199	117	73,625	35,273	26.55	350.00
July	636,350	200	113	83,491	43,630	14.59	280.00
September	989,069	200	126	95,052	60,356	16.39	325.00
November	494,739	200	109	70,144	41,399	11.95	320.00
TOTAL	$ 5,891,224	1,299	723	539,652	277,959	$ 21.19	$1,700.00

1986

Month	Total Revenue	Number of parcels offered	Number of parcels sold	Total acres	Acres sold	Average price per acre sold	High price per acre
January	$ 630,069	200	123	83,064	49,783	$ 12.66	$ 320.00
March	773,492	199	112	77,237	44,504	17.38	370.00
May	354,941	200	70	74,128	27,543	12.89	140.00

Sources: Wyoming Department of Public Lands, Petroleum Information Corporation - Rocky Mountain Region Report and U.S. Bureau of Land Management.

During the first half of 1986, the Powder River Basin continues to be the most active area in terms of wildcat and development drilling. Most of the acreage for lease in that basin has drawn bids during the six sales this year and the per-acre bids are usually higher there than for leases in other parts of the State.

One of the best discoveries in the Powder River Basin was the Bass Enterprises' 12-13 Moore Ranch well in northwestern Converse County. The well tested 3.9 million cubic feet of gas and 1,055 barrels of oil per day from the Dakota.

One area outside the Powder River Basin that has seen significant recent activity is the southern end of the Moxa Arch. Sun Exploration and Production recently tested two offset wells to the last year's Luckey Ditch discovery well. The 2-A Luckey Ditch-Federal flowed 1,020 barrels of oil and 2.5 million cubic feet of gas per day from the Dakota. The 3-A Luckey Ditch-Federal flowed 907 barrels of oil and 2 million cubic feet of gas per day, also from the Dakota. These two wells establish production to the southeast and southwest of the discovery well, completed last year, and which is currently producing ten million cubic feet of gas and 1,400 barrels of condensate per day from the Dakota (Petroleum Information, Rocky Mountain Region Report, 4-22-86). Anadarko Petroleum recently tested their 1-A Whiskey Springs-Federal well, two miles northeast of the Luckey Ditch discovery well, at 10.3 million cubic feet of gas and 1,185 barrels of condensate per day from the Dakota. All these wells are in southeastern Uinta County in T.12N., R.114W.

Chevron's 31-33C Cabin Creek well, about 25 miles southeast of Jackson, tested 720,000 cubic feet of gas and 48 barrels of condensate per day from the Madison Limestone. This Overthrust Belt discovery is nearly 100 miles north of the nearest comparable Madison production in the Whitney Canyon-Carter Creek Field.

Work on field facilities at Amoco's enhanced oil recovery project for Wertz Field near Bairoil has started. Construction of the carbon dioxide processing plant was scheduled to begin June 8th and injection of carbon dioxide into the Madison Formation should begin this fall.

In a related item, Richard Ewing, Director of the University of Wyoming's Enhanced Oil Recovery Institute told oil industry members that an additional 400 to 500 million barrels could be produced in Wyoming by using enhanced oil recovery techniques. This estimate is only about one-third of what was estimated recoverable at last year's symposium, but it still represents about four years of annual oil production for Wyoming. The second annual symposium was held in Casper, May 15-16 with representation from the University of Wyoming, the oil industry and government.

The U.S. Bureau of Land Management (BLM) is allowing operators of uneconomical wells to suspend production without losing their Federal leases. Companies can apply for a one-year production suspension. The State has also done the same.

In another BLM action, the agency wants to revoke an oil and gas lease issued to Exxon. BLM officials claim the issuance of the lease violates an agreement with the Forest Service. The lease is along the Buffalo Fork River between Togwotee Pass and the Moran Junction entrance to Grand Teton National Park. Exxon has appealed the action and has asked for extensions on other leases in the area.

The Industrial Siting Council has approved changes in permits held by Exxon for work on its LaBarge Project. The council approved changes which decrease its jurisdiction over the impact of drilling activity and which emphasizes the role of the Wyoming Department of Environmental Quality in monitoring emissions from Exxon's gas processing facilities.

At the April hearing of the Wyoming Oil and Gas Conservation Commission, two rules which had been proposed, were withdrawn. The withdrawn rules pertained to the deletion of rectangular spacing patterns and proposed production curtailment schedules for exception wells. In the June hearings, the Commission raised its mill levy to 0.2 mil (from 0.1 mil) because of declining revenues related to low oil prices.

URANIUM AND INDUSTRIAL MINERALS UPDATE

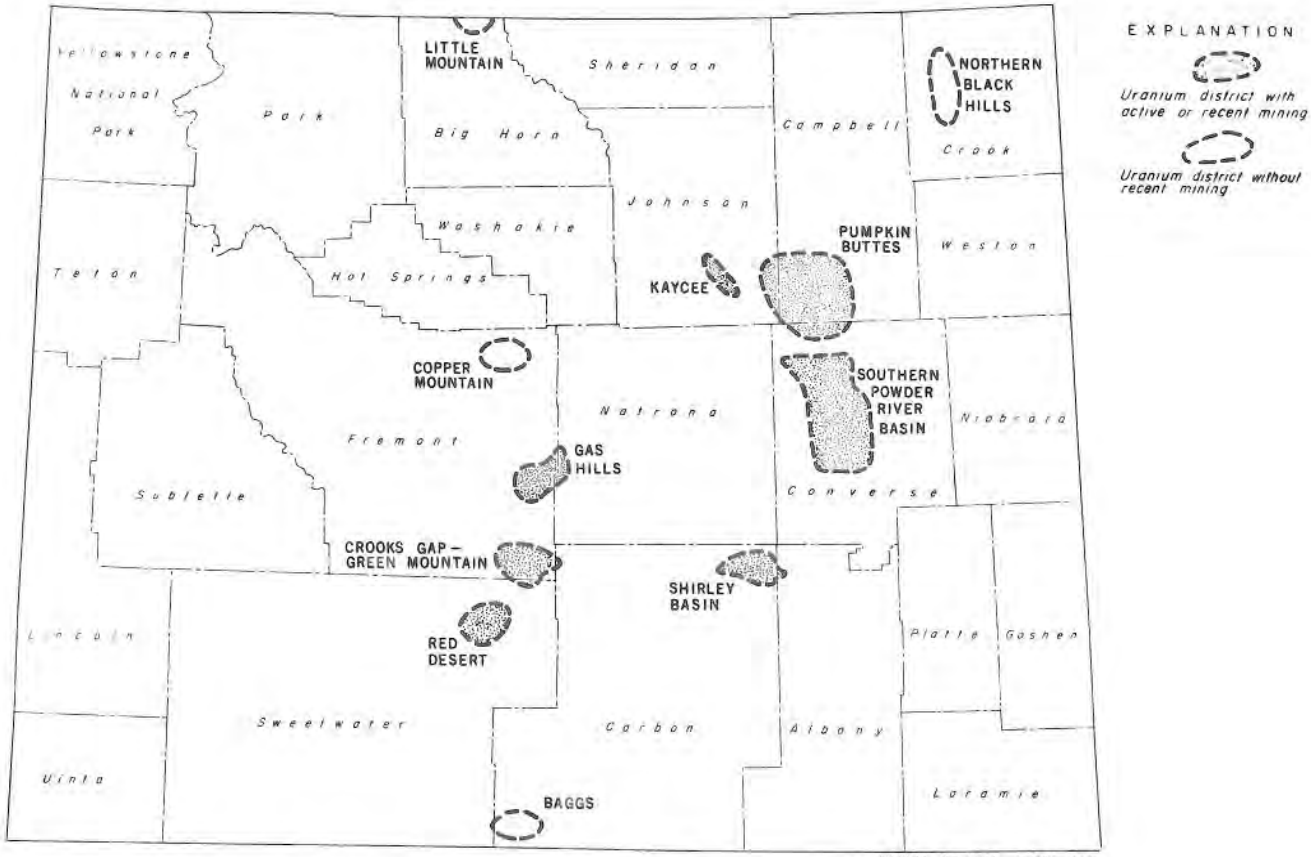
by Ray E. Harris, Uranium and Industrial Minerals Geologist, Geological Survey of Wyoming

Uranium

Uranium activity in Wyoming remained at low levels during the Second Quarter of 1986 compared to late-1970's activity. One mine and mill continued to process uranium in Wyoming: COGEMA - Pathfinder Mines' Shirley Basin Operations. COGEMA - Pathfinder Mines also continued to upgrade their Gas Hills mill.

Four other uranium companies are planning development/mining operations on their properties. An application for an *In Situ* Uranium Permit for recovery testing was received by the Wyoming Department of Environmental Quality (DEQ) from AGIP Mining for the Juniper Ridge area, Poison Basin District, west of Baggs.

Malapai Resources is reportedly considering developmental work in the Powder River Basin. A revision to their uranium permit was processed by DEQ. Malapai and Westinghouse, owner of the Irigary Ranch *In Situ* Project, negotiated an agreement to conduct testing. Malapai's project is adjacent to the Irigary Ranch site. Reportedly, Malapai will conduct a small scale



MAJOR ACTIVE AND INACTIVE URANIUM DISTRICTS

in situ leach uranium removal program with a temporary or portable recovery plant.

Everest Exploration continues *in situ* work at the Highland site in Converse County.

London Central Power Exchange is holding the Leuenberger Ranch *in situ* property in Converse County as an investment for possible future production.

Other companies continued assessment drilling and mine and mill maintenance work in Wyoming. AGIP, American Nuclear, Cherokee Exploration, Everest Minerals, Malapai Resources and Minerals Exploration conducted some drilling this quarter. Reclamation work proceeded at Bear Creek Uranium's Bear Creek Mine in Converse County, Exxon's Highland Operation in Converse County, Petrotomics (Texaco) mine at Shirley Basin, Carbon County, and Uranium Resources' mine in the southern Powder River Basin, Converse County.

The dismantling and selling of equipment from the Silver King - Tennessee Valley Authority uranium projects continued. Equipment from their Morton Ranch project was sold by auction on April 2nd.

Reclamation projects were also news. COGEMA - Pathfinder protested a DEQ rule regarding delays in reclamation work requirements. The DEQ agreed to drop the proposed rule saying it did not help the uranium industry.

The uranium tailings pile located south of Riverton was also in the news as the Wyoming Congressional Delegation asked the U.S. Secretary of Energy to move the pile to the American Nuclear site in the Gas Hills. The Federal department has recommended *in situ* stabilization. Wyoming's DEQ and the Congressional Delegation have favored removal of the tailings.

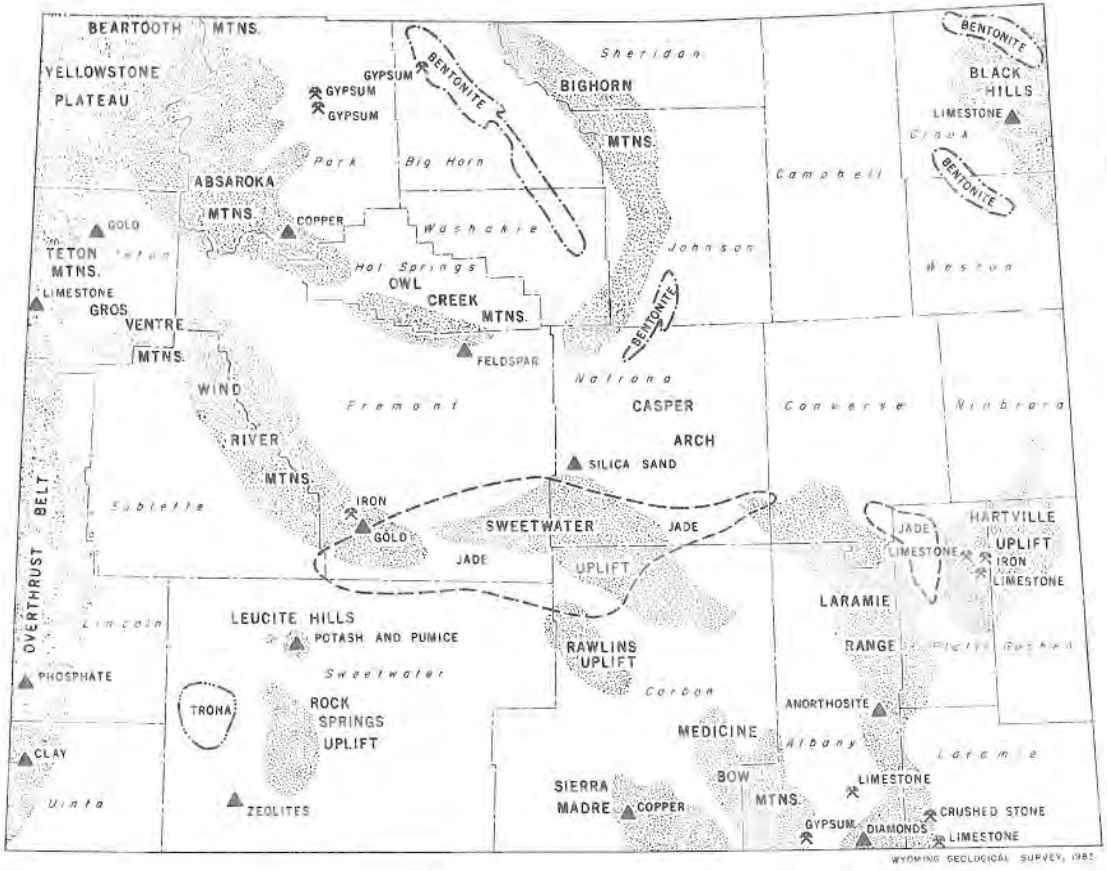
The prospects for uranium mining in Wyoming remain about the same as they have for the past several years (see forecast, p. 3). No further reductions are expected in Wyoming production as a result of the unshielded reactor meltdown at Chernobyl in the Soviet Union and its release of massive amounts of radiation. Wyoming's current production is exported to France, where nuclear power is an established majority source of electricity, and seems to be popularly accepted, at least much more so than in West Germany and parts of eastern Europe.

In the United States, a milestone was reached this quarter as the 100th nuclear power plant unit became operational. There now are 102 operating nuclear power plants in the country. Ventures such as those by AGIP, Everest and Malapai may represent opportunities to provide fuel for these plants from domestic sources. Under present market conditions, however, most fuel needed by U.S. reactors will be imported from Canada and Australia.

In June, the U.S. Department of Energy proposed selling the uranium processing plants it now operates at a loss. These plants isotopically enrich the uranium-235 content of natural uranium ore from 0.7 percent to about three percent required for nuclear plant fuel, and supply Defense Department contracts for weapons grade material (90 percent enrichment). Since much enriched uranium fuel is now imported, or planned to be imported, these plants, which are also of an older technology, are costly and inefficient. It remains to be seen whether private industry would be interested in their purchase. The plants being considered for sale are in Portsmouth, Ohio, and Paducah, Kentucky.

Trona

There are a number of optimistic signs for Wyoming's trona industry, which has been experiencing stagnant



SELECTED MINERAL AND ROCK OCCURRENCES

growth over the past several years. Trona, Wyoming's largest source of mineral revenue after hydrocarbons (oil, gas and coal), is used in the manufacture of glass, detergents, sodium chemicals and other industrial products. The consumption of products that use soda ash (refined trona) has remained relatively steady, particularly since the prime user of soda ash, the bottle glass industry, was significantly cut back due to increased use of plastic bottles. Although the remaining users have not increased consumption enough to offset the loss of the glass industry, increased exports have offset lower domestic sales of soda ash. In fact, exports have been the reason for a great deal of the optimism. In April, South Korea ordered 30,000 tons of soda ash through a consortium of the six domestic producers of soda ash, five in Wyoming [Allied Chemical, FMC, Stauffer, TG (formerly Texasgulf) and Tenneco] and the California producer, Kerr-McGee.

Negotiators also continued to work with Japanese importers to increase the purchases of domestic soda ash by Japan. This purchase would help offset the balance of trade losses to Japan. However, Japanese tariffs and subsidized synthetic soda ash producers are obstacles to the projected sale.

Soda ash sales are up about 10 percent this quarter over the second quarter of 1985. This represents an increase in domestic soda ash demand as well as an increase in exports. Soda ash prices are expected to increase slightly.

Phosphate

The first load of phosphate slurry was received by the Chevron phosphate plant southeast of Rock Springs from its mine north of Vernal, Utah, through its new slurry pipeline. The plant, under construction since 1982, is 93 percent complete according to company officials. The first production of phosphate fertilizer

MINERAL RESOURCE AND RESERVE BASE ESTIMATES FOR WYOMING

PETROLEUM

Remaining Resources (January 1, 1986)

Discovered (Includes 10 billion barrels recoverable by enhanced recovery techniques)	13.4 billion barrels[1]
Undiscovered	7.6 billion barrels[1]
Total	21.0 billion barrels

Remaining Reserve Base (January 1, 1986)

Measured reserves (Proved reserves)	0.82 billion barrels[2]
Indicated and inferred reserves	2.8 billion barrels[3]
Total	3.62 billion barrels

NATURAL GAS

Remaining Resources (January 1, 1986)

Discovered	19.2 trillion cubic feet[1]
Undiscovered (there is at least another 115 trillion cubic feet of noncombustible CO_2 gas)[9]	58.0 trillion cubic feet[1]
Total	77.2 trillion cubic feet[1]

Remaining Reserve Base (January 1, 1986)

Measured reserves (Proved reserves)	9.88 trillion cubic feet[2]

COAL

Remaining Resources (January 1, 1986)

Identified (Discovered)	136.2 billion tons[4]
Undiscovered	800.0 billion tons[5]
Total	936.2 billion tons

Remaining Reserve Base (January 1, 1986)

Demonstrated strippable (Measured and indicated reserve base)	27.3 billion tons[4]
Demonstrated underground-minable (Measured and indicated reserve base)	38.4 billion tons[4]
Total	65.7 billion tons

TRONA

Original Resources (1983 estimate)

Trona	81.7 billion tons[6]
Mixed trona and halite	52.7 billion tons[6]
Total	134.4 billion tons

URANIUM

Remaining Resource (January 1, 1983)		995,000 tons[7]
Remaining Reserve Base (January 1, 1983)	ORE	U_3O_8
Ore recoverable at $30 or less/ton	29.4 million tons	39,700 tons[7]
Ore recoverable at $30.01-$50.00/ton	225.1 million tons	151,500 tons[7]
Ore recoverable at $50 or less/ton	254.5 million tons	191,200 tons

OIL SHALE

Original Resources (January 1, 1983)

Identified (Discovered) ..... 320 billion barrels of shale oil[8]

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[1] Modified from Barlow, J.A., Jr. and Doelger, M.J., 1983, *Wyoming mineral resources:* Barlow and Haun, Inc., Casper, 14 p.

[2] Energy Information Administration, 1985, *U.S. crude oil, natural gas, and natural gas liquids reserves: 1984 Annual Report, October.* (1984 and 1985 production has been subtracted).

[3] Modified from Barlow and Doelger (1983), footnote 1.

[4] Wyoming Geological Survey, March, 1985. (Modified from Berryhill, H.L., Jr. and others, 1950, *Coal resources of Wyoming:* U.S. Geological Survey Circular 81, 78 p.

[5] Averitt, Paul, 1975, *Coal resources of the United States:* U.S. Geological Survey Bulletin 1412, p. 15.

[6] Culbertson, W.C., 1983, *Genesis and distribution of trona deposits in Wyoming* (abstract) in *Genesis and exploration of metallic and nonmetallic mineral and ore deposits of Wyoming and adjacent areas:* Geological Survey of Wyoming Public Information Circular 19, p. 34.

[7] U.S. Department of Energy, 1983, *Statistical data of the uranium industry:* Open-file Report GJO-100-(83), 77 p.

[8] Knutson, C.F., and Dana, G.F., 1982, *Developments in oil shale in 1981:* American Association of Petroleum Geologists Bulletin, Volume 66, no. 11, p. 2513.

[9] Derived from Exxon information.

from this plant should occur in July. The plant uses Utah phosphate and Wyoming sulfur to make the fertilizer.

Lower crop prices and an oversupply of agricultural products continue to reduce demand for phosphate for fertilizer. Although phosphate is not mined in Wyoming, the operation of the plant in Rock Springs will favorably affect Wyoming's economy, in contrast to plant and mine closings elsewhere in the United States. For example, two plants in Idaho, owned by Beker Industries and J.T. Simplot Company, are scheduled to shut down when Chevron's new plant starts up in July.

Sulfur

Interest in Wyoming's sulfur as well as interest in sulfur in the rest of the U.S. increased dramatically during the second quarter of 1986 due in part to the publication of an article in the Wall Street Journal (April 14, 1986) stating that Canadian sources of sulfur will be depleted by 1989. Since the publication of that article, a scramble to tie up domestic sulfur sources has started. In Wyoming, sulfur is produced by eight gas sweetening plants and refineries. Probably most of this production, some of which has been stockpiled, will be marketable at prices 10 to 20 percent higher than the present rates of $142.00/ton (F.O.B. Gulf Coast). Also, natural sulfur deposits in Wyoming continue to attract interest. There is apparently no activity occurring at the sulfur deposit near Thermopolis recently acquired by the Continental Sulfur Company (see Geo-notes No. 10, page 28). The Geological Survey of Wyoming has received inquiries regarding the sulfur deposits near Cody and in Star Valley, but no property has reportedly been acquired. The Geological Survey also published Open File Report 86-15 to aid potential sulfur consumers locate sources of refined and natural sulfur.

Gypsum

Nationally, gypsum producers produced more in 1985 than ever before, and should continue to increase production again in 1986. This may not necessarily be true for Wyoming, however. The cement plant in Laramie, consumer of nearly 14,000 tons of gypsum per year, or about four percent of the State's production, is closed for plant modernization (see Cement). Regionally, construction activities are down, therefore less gypsum is required for wallboard relative to national increases in demand. Gypsum production by Celotex and Georgia - Pacific in the Bighorn Basin, however, should remain constant or drop slightly below 1986 levels. This decrease in construction in the region (particularly Billings and Great Falls, Montana, and Casper) is related in part to the depressed condition of the oil and gas industry.

Bentonite

Preliminary figures show that Wyoming's bentonite industry, suffering from declining oil and gas drilling since 1982, took another hit this year. With falling oil prices the rig count is significantly down. Wyoming bentonite is used primarily in well drilling fluid, and is exported to all areas of the U.S. As drilling footage decreases, the demand for bentonite decreases. It is likely that bentonite production may drop 20 percent or so in 1986 from 1985 levels. So far, no producer has announced closings.

Cement

The production of cement in Wyoming ceased in 1986 as the Laramie cement plant, formerly operated by Monolith Portland Cement, was purchased by Centex Cement Enterprises in December of 1985. The plant is closed for modernization. The operator, now Mountain Cement,

Inc., continues to improve the plant and develop new sources of limestone and gypsum for future plant operation. The company is currently exploring for gypsum resources to augment or replace that from the Red Mountain Quarry, owned by Mountain Cement. An alternative haul route from the Red Mountain Quarry is also being proposed, saving almost 50 percent of the haul distance. Plans to modernize the plant continue, and production is expected to resume in the future.

Construction Aggregate

The production of construction aggregate for non-federal highway construction projects should increase in 1986 as the upgrading of access roads to Peacekeeper missile silos has begun. Several contracts for construction materials have been let, and new quarries have been opened in Goshen, Laramie and Platte Counties. Elsewhere, the production of construction aggregate should remain about the same as 1985. Major projects such as the Shute Creek, Carter Creek and Whitney Canyon gas plants and the Chevron fertilizer plant are nearing completion, so the demand for construction aggregate in Lincoln, Sweetwater and Uinta Counties should decrease.

Other industrial minerals

The production of other industrial minerals in Wyoming (clay, decorative and ornamental stone, ballast, shale and sodium sulfate) should not change much from 1985 to 1986. Burlington Northern, Inc., through its minerals and oil subsidiary, Meridian Minerals, is applying for a mining permit to produce ballast from a quarry in quartzite north of Guernsey. If developed, this production would take some production away from Burlington Northern's current suppliers of ballast, which include the Guernsey Stone Company in Wyoming.

The production of sugar rock (limestone used in sugar refining) has ceased (see Geo-notes No. 9, p. 21), but Holly Sugar, in Torrington, is reportedly looking for a source of limestone to replace rock hauled from South Dakota. Holly Sugar's Lost Day quarry north of Fort Laramie still ships stockpiled limestone to the Laramie River power plant at Wheatland for stack scrubbing and dust control purposes.

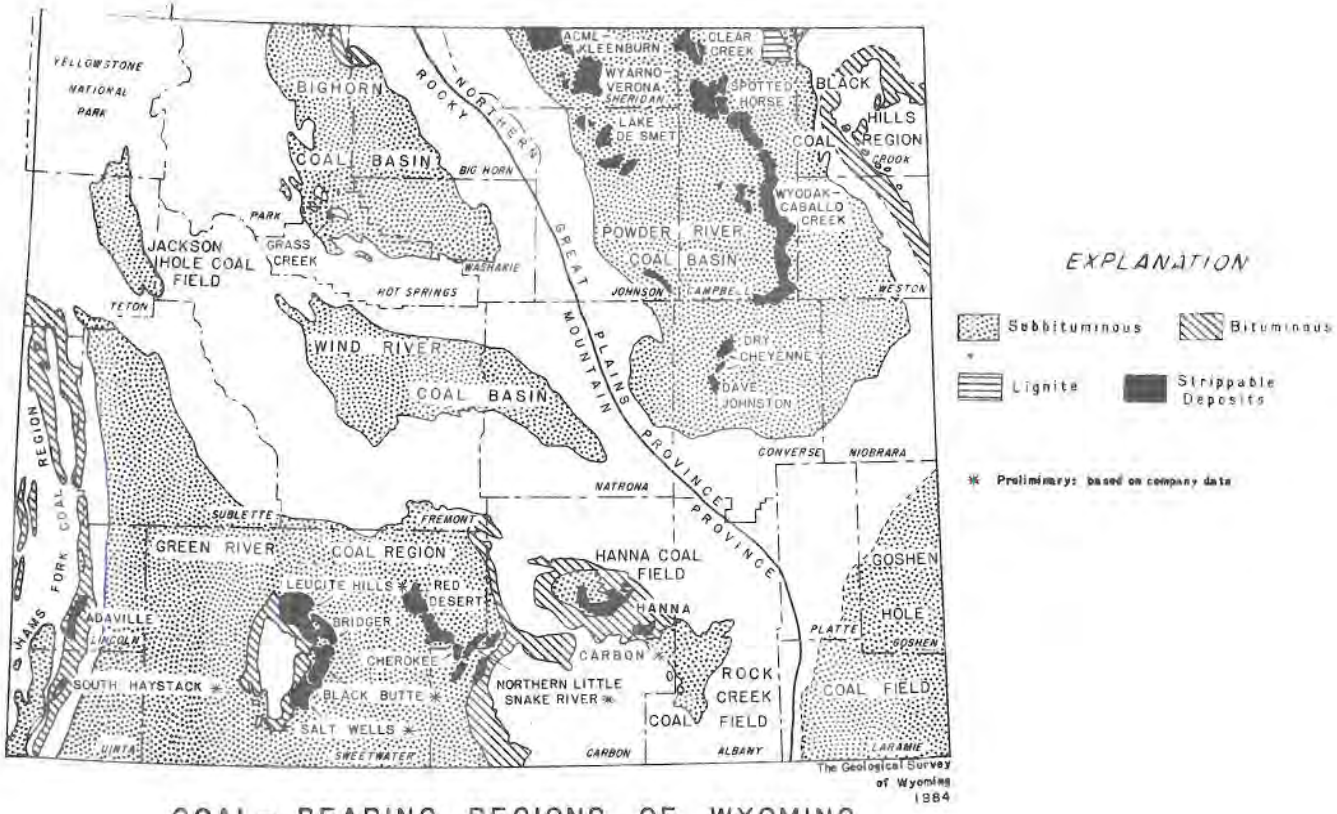
It is unlikely that any zeolite operations will begin in Wyoming this year. Large zeolite (natural ion-exchanger minerals used in water softeners, industrial refining and odor control) deposits are present in Wyoming southeast of Riverton and south of Bitter Creek.

A "pumice" mining operation near Superior in Sweetwater County has been proposed. This proposal, however, has run into a number of objections based on the presence of archaeological values and ice caves. The rock proposed for mining is a leucite-bearing volcanic rock suitable for dimension and decorative stone as well as for lightweight aggregate such as used in cinder blocks.

COAL UPDATE

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

Coal deliveries from Wyoming mines in the First Quarter of 1986 (Table, p. 29) indicate that coal production is about the same, or slightly behind, 1985's record year. Although there is not enough data available at present to make a reliable production estimate for 1986, it is almost certain that our March, 1986, production forecast (see Table, p. 3 of this issue and Wyoming Geo-notes No. 10, March, 1986) of 148.0 million



COAL- BEARING REGIONS OF WYOMING

REPORTED COAL DELIVERIES IN TONS[1]

	1984 MONTHLY	1984 CUMULATIVE	1985 MONTHLY	1985 CUMULATIVE	1986 MONTHLY	1986 CUMULATIVE
JANUARY	9,540,200	9,540,200	11,601,200	11,601,200	11,646,300	11,646,300
FEBRUARY	9,654,600	19,194,800	10,473,900	22,075,100	10,317,700	21,964,700
MARCH	10,875,000	30,069,800	11,674,900	33,750,000	11,238,520	33,203,220
APRIL	8,721,400	38,791,200	11,632,800	45,382,800		
MAY	9,481,500	48,272,700	11,497,900	56,880,700		
JUNE	9,464,500	57,737,200	11,692,200	68,572,900		
JULY	11,019,600	68,756,800	11,893,500	80,466,400		
AUGUST	11,433,000	80,189,800	12,107,100	92,573,500		
SEPTEMBER	10,440,000	90,629,800	11,325,000	103,898,500		
OCTOBER	10,492,500	101,122,300	11,048,500	114,947,000		
NOVEMBER	11,814,200	112,936,500	10,589,700	125,536,700		
DECEMBER	11,486,800	124,423,300	11,459,300	136,996,000		
TOTAL REPORTED DELIVERED TONNAGE	124,423,300		136,996,000			
TOTAL TONNAGE NOT REPORTED	6,322,479		3,428,446			
TOTAL TONNAGE PRODUCED[2]	130,745,779		140,424,446			

[1] Source: National Marketing Reports by Coal Marketronix, compiled from FERC Form 423 filed monthly by electric utilites.

[2] Source: Wyoming State Mine Inspector's Annual Report.

tons for 1986 was too high. Several factors may be contributing to less coal production so far this year, but the most probable cause is the availability of lower-priced fuel alternatives (oil and gas) to utilities that are capable of fuel switching. Another strategy utilities are using to take advantage of low natural gas and fuel oil prices is to shut down part of their coal-fired capacity (e.g. a single generating unit) and displace it with gas- or oil-fired generation on site, if possible, or purchased from other sources. Hopefully, this will be a short-lived phenomena that will end when oil and gas ceases to have a price advantage over coal.

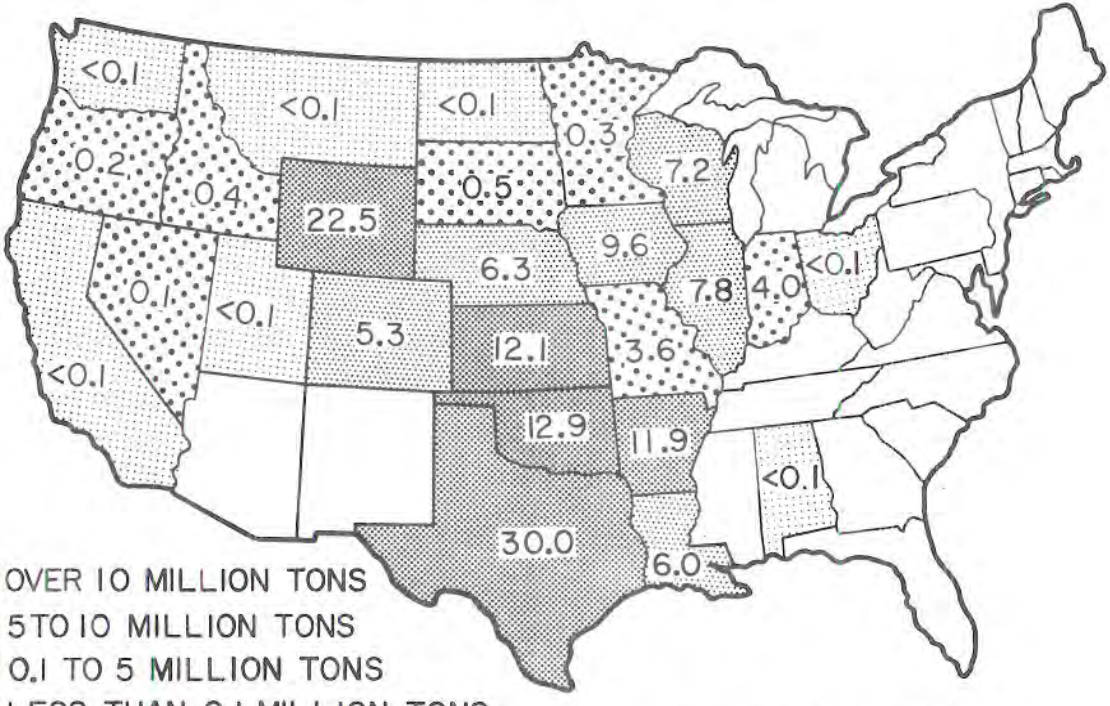
Future production losses for Wyoming coal producers could also occur in states that pass legislation requiring utilities to use local coal at least in a limited capacity. For example, Oklahoma has passed a law that requires coal-fired utilities in that state to burn at least ten percent Oklahoma coal. The law, which goes into effect on January 1, 1987, is expected to boost Oklahoma's coal industry by creating an additional 2,000 jobs and increase annual revenues from mining and industry-related companies by $35 to $50 million. Almost 13 million tons of Wyoming coal were shipped to Oklahoma utilities last year, and it was the third largest consumer of Wyoming coal that year. Oklahoma utilities are experimenting with ways to mix their 13,000 Btu/pound coal with Wyoming coal that averages about 8,600 Btu/pound. The law requires that the coal mix be calculated on a Btu basis; the requirement is nullified if the Oklahoma coal costs over five percent more than the Wyoming coal on a Btu basis (this prevents the law from causing excessive electric rate increases).

On a more positive note, several coal-consuming states have enacted their own legislation that requires electric utilities to reduce sulfur dioxide emissions for acid rain abatement. These states appear to be emphasizing the use of low sulfur Western and Appalachian coal rather than installation of stack scrubbers. Electric utility companies in Wisconsin are planning other alternatives for reducing sulfur dioxide emissions: Wisconsin Electric Power Company has announced that four units of their Oak Creek generating plant will be retrofitted with atmospheric fluidized bed combusters (FBC) which will enable them to use high sulfur coal; Wisconsin Power and Light is participating in a project to upgrade low sulfur western coal through the use of the Koppelman process, which produces K-Fuel (see p. 8 and 10 of Wyoming Geo-notes No. 8, September, 1985). The proposed K-Fuel plant is located near Gillette. The K-Fuel, which has a heating value of 12,000-13,000 Btu/pound, negligible moisture and low

sulfur, would then be blended with high-sulfur Illinois Basin coal and burned in Wisconsin Power and Light's cyclone boilers. In addition to individual states acting to decrease sulfur dioxide emissions, utility companies are also moving to decrease sulfur dioxide emissions at their own electric plants in an effort to protect themselves from acid rain legislation that now seems inevitable.

Statistics on the distribution and utilization of Wyoming's 1985 coal production (McNair, 1986) indicate that Wyoming coal was used in 25 states (see Figure on page 32). Five states each consumed over ten million tons of Wyoming coal; as in 1983 and 1984, Texas continued as the largest consumer of Wyoming coal in 1985, with 30 million tons (up 4.4 million tons from 1984). Wyoming was the second largest consumer with 22.5 million tons (an increase of 3.4 million tons), followed by Oklahoma (12.9 million tons) and Kansas (12.1 million tons). These four states consumed over half of Wyoming's coal produced in 1985; 80 percent of the State's coal was consumed by only seven different states. Electric utility companies located in 17 different states used nearly 98 percent of the State's total production in 1985 (see Figure on page 33) to fuel steam-electric generating plants. The eight remaining states that consumed Wyoming coal used the coal primarily in industrial boilers and secondarily for residential/commercial heating. About 1.8 million tons of the 3.0 million tons in "other industrial" and "residential/commercial" categories went to Wyoming users. Most of this coal was used by other mineral-related industries in the State, including the trona, bentonite and cement industries. Additional coal was used at FMC Corporation's formcoke plant in Lincoln County (which converts non-coking subbituminous coal to formcoke through the company's patented process) and by sugar beet processing plants. Although 84 percent of Wyoming's coal was shipped to out-of-state consumers, a small amount of coal (132,000 tons) was shipped <u>into</u>

DISTRIBUTION OF WYOMING COAL, 1985
(IN MILLIONS OF TONS)

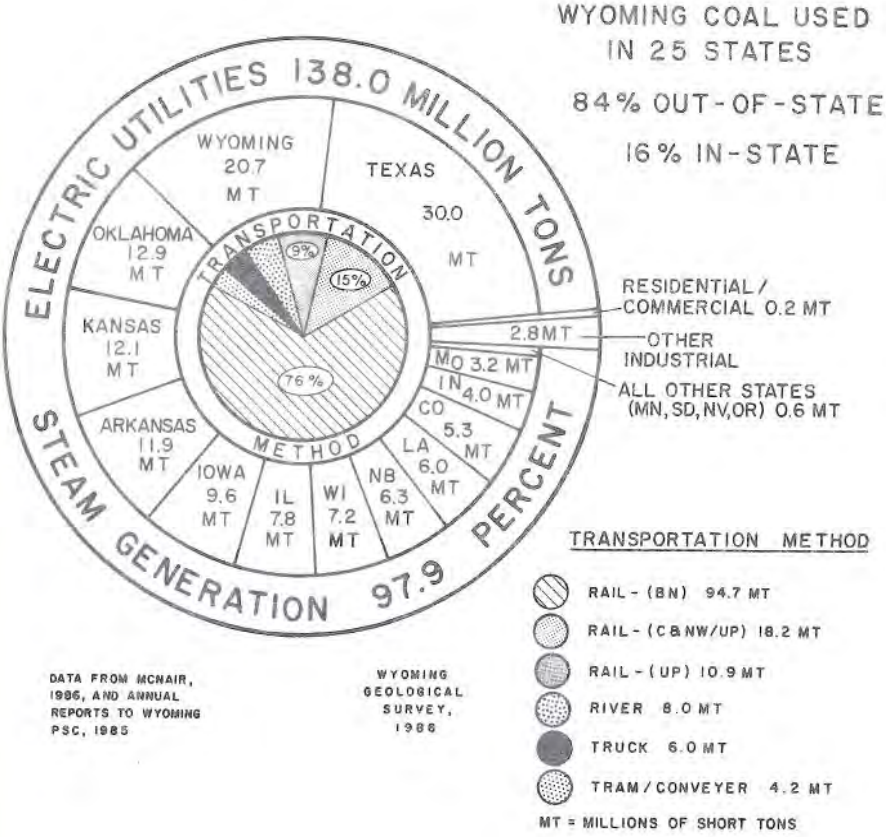


OVER 10 MILLION TONS
5 TO 10 MILLION TONS
0.1 TO 5 MILLION TONS
LESS THAN 0.1 MILLION TONS

140.9 MILLION TONS DISTRIBUTED TO 25 STATES

ADAPTED FROM MCNAIR, 1986
WYOMING GEOLOGICAL SURVEY, 1986

UTILIZATION AND TRANSPORTATION OF WYOMING COAL, 1985



DATA FROM MCNAIR, 1986, AND ANNUAL REPORTS TO WYOMING PSC, 1985

WYOMING GEOLOGICAL SURVEY, 1986

Wyoming from coal producers in Colorado, Utah, Montana and Pennsylvania.

As in 1984, 93 percent of the State's coal was shipped by rail in 1985. Coal shipments on the Burlington Northern Railroad (BN) in 1985 were down about 9.5 million tons since last year; accordingly, the percentage of the State's coal production shipped by BN dropped from 85 percent in 1984 to 76 percent in 1985. The Chicago and North Western/Union Pacific (C&NW/UP) joint venture railroad, which is currently competing with BN for coal transportation contracts out of the Powder River Basin, increased their coal shipments 12.2 million tons last year (a three-fold increase over 1984) and now account for about 15 percent of the total coal tonnage shipped. The Union Pacific Railroad Company (UP), serving mines in southern and western Wyoming, recorded a slight decrease in coal shipments in 1985.

The Second Quarter of 1986 began with a significant development in rail transportation in the Powder River Basin. C&NW announced that plans for a ten-mile long extension of their rail line northward into part of the Powder River Basin served solely by BN had been scrapped. The plans were abandoned when C&NW reached an agreement with BN to share the existing track into the area. Funding for the agreement, which will cost C&NW about $27 million, was obtained from a financing package between C&NW and UP when they were planning their joint venture into the Powder River Basin several years ago. It is expected that the new agreement will create additional competition between BN and C&NW for coal transportation from the three additional coal mines now served. A fourth mine, Cordero Mining Company's Cordero Mine, completed a 1.5-mile rail spur to the jointly-owned C&NW/UP and BN tracks last summer and will also be able to take advantage of the competition.

In other transportation news, the C&NW/UP joint venture recently secured two additional coal transpor-

tation contracts and BN secured an additional contract. C&NW/UP signed a long-term contract with Louisiana Gasification Technology, Inc. to deliver 300,000 to 600,000 tons of coal per year from an unspecified (and yet to be contracted) mine in the southern Powder River Basin to the company's coal gasification plant at Plaquemine, Louisiana. Shipments are due to begin in early 1987. A one-year coal transportation contract was also signed between C&NW/UP and the Lower Colorado River Authority (LCRA)/City of Austin, Texas. This contract calls for delivery of between 3 and 4.5 million tons of coal to the Fayette (Seymour) Power Project's Units 1 and 2. The winning bid rate of $21.11/ton was $0.64/ton lower than the bid submitted by BN and $0.72/ton lower than the winning bid (also submitted by C&NW/UP) for coal haulage last year. The bids were higher than the utility anticipated (a ceiling price of $19.31/ton was set when asking for bids). The utility attributed this higher rate to the lack of competition for the Missouri-Kansas-Texas Railroad (MKT) at the end of the haul. BN won a seven-year, one million tons per year transportation contract with the Platte River Power Authority in Fort Collins, Colorado. The coal will be shipped for $7.13/ton from Nerco's new Antelope Mine in northern Converse County. The 250-MW Rawhide Energy Station is 250 miles south of the mine. The previous rate for this coal haulage was $8.63/ton; the utility expects to save $1.5 million each year on freight rates.

In the March issue of Geo-notes (No. 10, 1986), it was reported that Decker Coal Company, operator of two Montana coal mines north of Sheridan would lay off 60 miners (not 50 as reported) in May of this year. Only 19 miners were actually forced off the job when the time came; other work force reductions were attained by voluntary layoffs, and the work force was effectively trimmed by only 40 workers. Decker cited the cancellation of the long-term contract with LCRA as part of the reason for the layoffs. Because of this cancellation, the company's parent firm, Kiewit Mine and

Engineering Company, has filed a $1 billion lawsuit against LCRA.

Employment in Wyoming mines continued to fluctuate in the second quarter of 1986. In April, Arch Mineral Corporation announced the rehiring of 20 miners that had been laid off in late November and December, 1985. Arch was rehiring to support operation of a third dragline that was placed in service at their Seminoe No. 2 mine near Hanna. In early April of this year, the State's only major underground coal mine, Carbon County Coal Company's (CCCC) Carbon County No. 1, laid off 200 to 220 people (out of a work force of 268). This layoff cuts the mine employment in the Hanna Basin by over one-third. The coal company had failed to reach an out-of-court settlement with the mine's only customer, Northern Indiana Public Service Company (NIPSCO), and had not sold any coal from the mine since early in 1986. An appeal of the Federal court's decision in a contract dispute between CCCC and NIPSCO (which resulted in cancellation of CCCC's contract and a damage award of $181 million) will be heard on June 6, 1986. CCCC is retaining some workers at the mine in the event that the Court of Appeals requires specific performance of the contract and the mine reopens.

In the Powder River Basin, Kerr-McGee Coal Corporation laid off nine employees at their Jacobs Ranch and Clovis Point Mines in early March, 1986. The nine people were part of a nationwide layoff of 325 employees by Kerr-McGee that was attributed (by the company) to be a direct result of the drastic drop in oil prices and worsening economic conditions experienced by the company. The two mines combined to produce about 14.4 million tons of coal in 1985; the Jacobs Ranch mine was the second largest mine in the State with almost 13 million tons produced.

No new coal supply contracts with Wyoming mines have been announced since the last coal update in March, 1986, but some activity, resulting in price reductions

for selective utility companies, has occurred. Iowa Public Service (IPS) recently completed contract renegotiations under a price reopener clause in the 1.8 million tons per year contract with Carter Mining Company's Rawhide Mine. Before renegotiation, IPS was paying $23.29 a ton delivered in February, 1986; with freight rates of $14.18 a ton subtracted, FOB mine price for the coal was $9.11 per ton. The new contract calls for an FOB mine price of $6.84 per ton, a decrease of $2.27 per ton (McGraw-Hill, 1986a). The utility is also evaluating bids for 0.9 to 1.4 million tons of coal delivered to the same plant, the George Neal Unit No. 4, for the last half of 1986.

Nebraska Public Power District (NPPD) recently renegotiated a 2.0 million tons per year coal supply contract with Atlantic Richfield Company's Black Thunder Mine that resulted in price reductions expected to save the utility $83 million to $88 million in the next decade (McGraw-Hill, 1986b).

A Colorado utility company, Platte River Power Authority (PRPA), is currently negotiating with Nerco Coal's Antelope Mine to bring about a reduction in price on the 0.8 million tons per year coal delivery contract to the utility's Rawhide plant near Fort Collins, Colorado. PRPA is citing an "economic hardship" provision in the contract as a reason for seeking price cuts. The current delivery contract with Nerco was signed in 1978, but delays in completing Nerco's Antelope Mine forced PRPA to sign a substitute contract in the interim with Thunder Basin Coal Company's Black Thunder Mine. PRPA paid a delivered price of $16.28 per ton (91.9 cents/million Btu's) from Black Thunder in December, 1985; in January, 1986, the delivered price from Antelope was $20.80 per ton (117.6 cents/million Btu's). As mentioned above, the utility recently secured a transportation rate reduction with BN.

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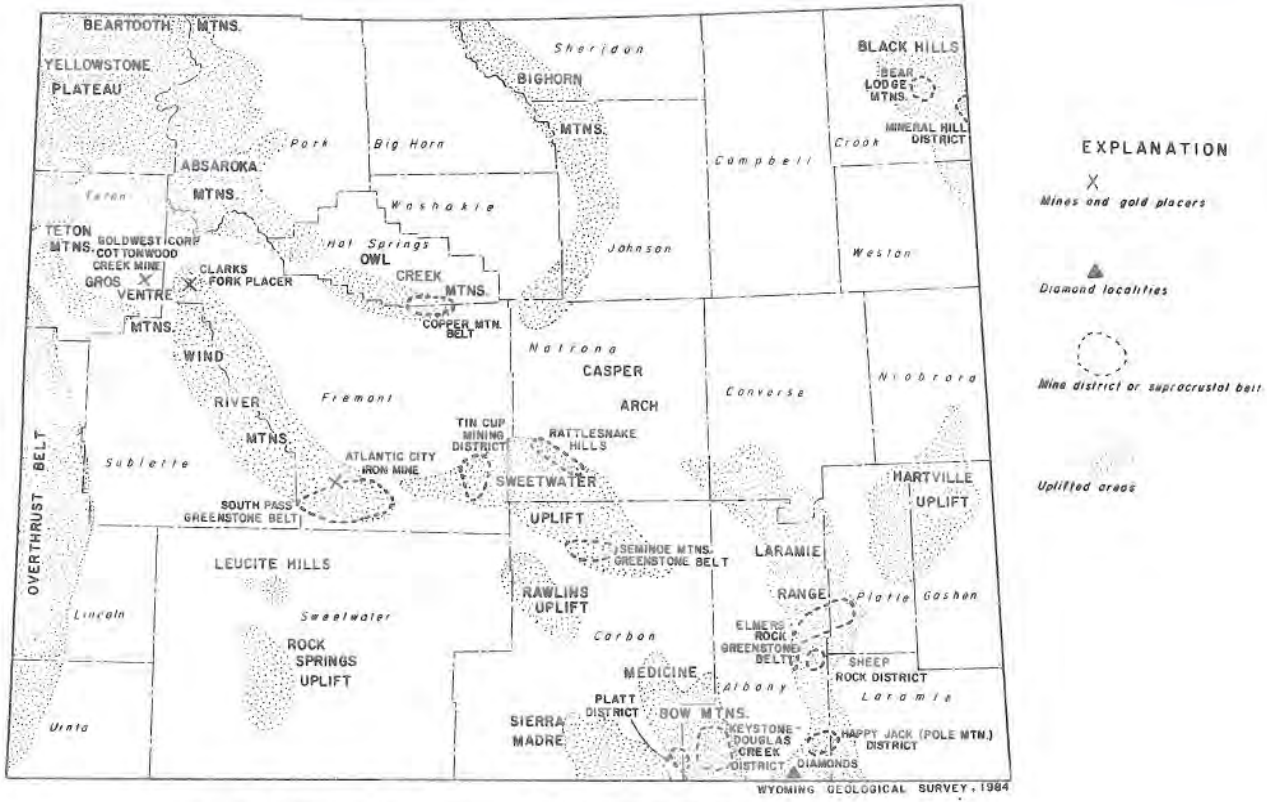
METALS AND PRECIOUS MINERALS UPDATE

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

In the Second Quarter, exploration for precious metals and massive sulfides were reported in the State. The exploration localities of some companies, however, were not disclosed. Some reported activities included: (1) the filing for a permit by a company to test gold mineralization in the McGraw Flats area 20 miles south of Lander; (2) the start-up of the field season for the Geological Survey of Wyoming's South Pass COGEOMAP mapping program; (3) a request by Henrietta Mines and Kirkwood Oil and Gas to the State Board of Land Commissioners to reduce royalties on a low-grade gold and copper deposit 20 miles west of Cheyenne; and (4) a proposal by Fremont Iron and Steel Company to construct a steel mill at Douglas, Wyoming. It was also recently announced that the University of Wyoming will receive the Anaconda Minerals collection of reports and maps.

A Littleton, Colorado, company filed for a permit with the Wyoming Department of Environmental Quality to test gold mineralization at McGraw Flats south of Lander, Wyoming. McGraw Flats lies east of the Miners



REGIONS OF EXPLORATION ACTIVITY FOR STRATEGIC MINERALS

Delight gold mine, and east of the South Pass Archean greenstone belt.

Gold at McGraw Flats was initially mined in the late 1800s, and a network of ditches were constructed to supply water to the dry placers. By 1905, much of the gold was being mined by hydraulic methods. Mining sporadically continued into the 1930's. The gold is localized in Oligocene age conglomerate of the Twin Creek alluvial fan, and the amount of gold produced from these deposits is unknown (Antweiler and others, 1980).

Along the western flank of the South Pass greenstone belt, the Geological Survey of Wyoming began mapping activities for the 1986 field season in the Anderson Ridge and Parting of the Ways Quadrangles. The COGEOMAP project (jointly funded project of the Geological Survey of Wyoming and the U.S. Geological Survey) is designed to map the entire South Pass greenstone belt and to catalogue mineral occurrences and resources in the belt. A preliminary report on this area was published by Hausel (1986).

One intriguing gold assay produced from a grab sample collected along the Anderson Ridge fault in 1985 prompted a reexamination of that area (see Geo-notes No. 10, p. 42). This sample contained low, but anomalous gold (2.3 ppm), and was collected from a relatively wide part of the Anderson Ridge fault in sec. 21, T.29N., R.101W. West of this sample locality (sec. 25, T.29N., R.102W.), a boulder conglomerate originates from the Anderson Ridge fault and continues to the southwest. Initial panned concentrates from the conglomerate have so far produced no detectable gold.

Recently, Henrietta Mines of Canada, and Kirkwood Oil and Gas of Casper, Wyoming, met with the State Board of Land Commissioners in an attempt to have the Board reduce royalties for the Copper King property west of Cheyenne. The Copper King mine is located on

State-owned land in the Silver Crown District of the Laramie Range. The Copper King deposit is a Proterozoic-age, large tonnage, low-grade, gold-copper occurrence. Based on incomplete drilling, the Copper King property reportedly contains the following resources:

Tons	Au(oz)	Cu(%)	Stripping Ratio (waste to ore)
2.8 million	0.044	0.36	0.5
6.0 million	0.038	0.32	1.2
13.5 million	0.028	0.26	1.8
35.0 million	0.022	0.21	2.0

The Board of Land Commissioners is seeking additional information on the leases held by the companies.

Fremont Iron and Steel Company is optimistic that they will receive funding to construct a mini-steel mill at Douglas, Wyoming. The mill could employ as many as 260 people, and would be designed to process scrap metal into usable steel products.

The Anaconda Collection, weighing more than 40 tons, represents the product of more than 100 years of mining history of properties from around the world. Approximately one ton of reports and maps are on Wyoming properties alone. It was recently announced by Anaconda officials that the collection will be housed at the University of Wyoming Western Heritage Center, yet to be constructed.

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