

Utah Mineral Industry Activity Review
and
Summary of Oil and Gas Drilling and Production
1980

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and
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MINERAL INDUSTRY ACTIVITY REVIEW, 1980

Part I – MINERAL RESOURCES

By Martha Ryder Smith¹

INCOME TO UTAH FROM MINERAL RESOURCES

Introduction

Total income from the production and sale of mineral resources in Utah for 1980 was nearly \$2 million, up almost 33 percent from 1979's \$1½ million (Table 1). Actual production for most minerals was down from that of 1979; the increase in value was due largely to the increase in prices of gold, silver, copper, and petroleum*. Production of copper, gold, and silver was down because of the extended copper industry strike in mid-1980. Production of coal was up as was that of natural gas, clay, and lime.

Income from Sale of Minerals

Metals – The value for copper produced in Utah in 1980 was far greater than that for any other single mineral commodity with the exception of crude oil (Table 2 and Figure 1). Of the other metals, only gold, silver, and iron are reported (Figures 2 and 3). According to the U.S. Bureau of Mines, gold, molybdenum, and silver, all by-products of copper production, ranked next highest in recovered values, followed by iron and vanadium.

More than three-fourths of the state's value for metals came from the Utah Division of Kennecott Minerals Corporation and from the Carr Fork operation of Anaconda, both located in the Oquirrh Mountains, southwest of Salt Lake City.

Production of iron was down because of the closing of one of the major iron mines in southern Utah. Tungsten is also now produced by less than three companies, as are beryllium, lead, magnesium, molybdenum, selenium, tellurium, vanadium, and zinc. No production figures are reported for these metals.

Mineral Fuels – As a result of the "energy crisis," there has been an increase in activity in Utah's petroleum and coal industries (Figures 4, 5, and 6). The value of crude oil produced in 1980 far exceeds that of any other mineral commodity. Coal ranks third, after copper.

New discoveries of oil and gas, especially in the Thrust Belt area, northeast of Salt Lake City in Summit County, have encouraged record-breaking exploration

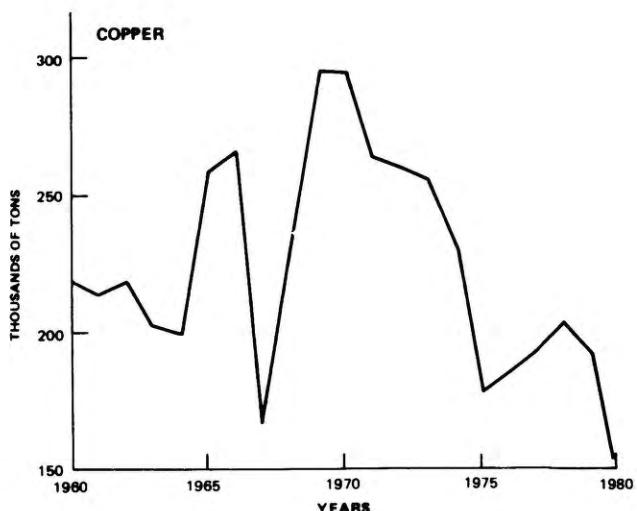


Figure 1. Production of copper in Utah, 1960-80.

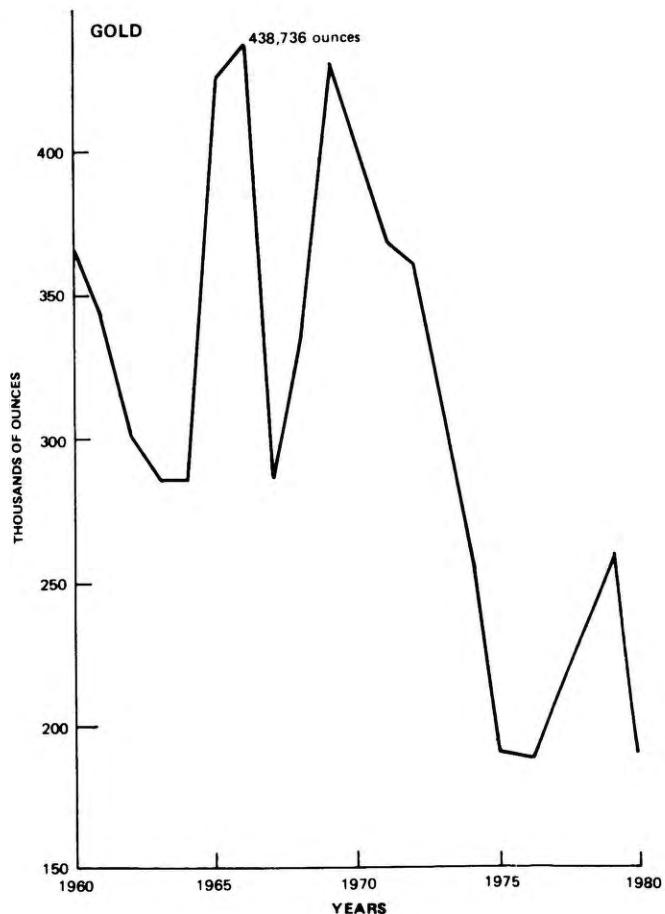


Figure 2. Production of gold in Utah, 1960-80.

¹Mineral Resource Specialist, Utah Geological and Mineral Survey.

*The 1979 production figures have been adjusted from those reported in the Mineral Industry Activity Review, 1979 as more accurate data have become available. Actual values are not available for some commodities, such as petroleum, gas, and coal. Production and values for many commodities are not revealed because of the limited number of operators and are reported as a composite figure by the U. S. Bureau of Mines.

Table 1. Income from mineral resources in Utah.

	1979 (in thousands)	1980 (in thousands)
Total income from sale of minerals (see Table 2)	\$1,498,400	\$1,916,710
State taxes on mineral properties ¹	28,682	30,768
State mine occupation tax ¹	10,520	15,609
Income to state from mineral leases on federal land ² (see Table 4)	12,587	17,027
Income to state in lieu of taxes from federal land ² (see Table 4)	8,869	8,147
Income to state from mineral rentals on state lands ³ (see Table 4)	7,685	9,113
Income to state from mineral royalties from state lands ³ (see Table 4)	2,721	4,126
Total wages paid to workers in the mineral industry ⁴ (see Table 6)	296,369	365,000

Sources:

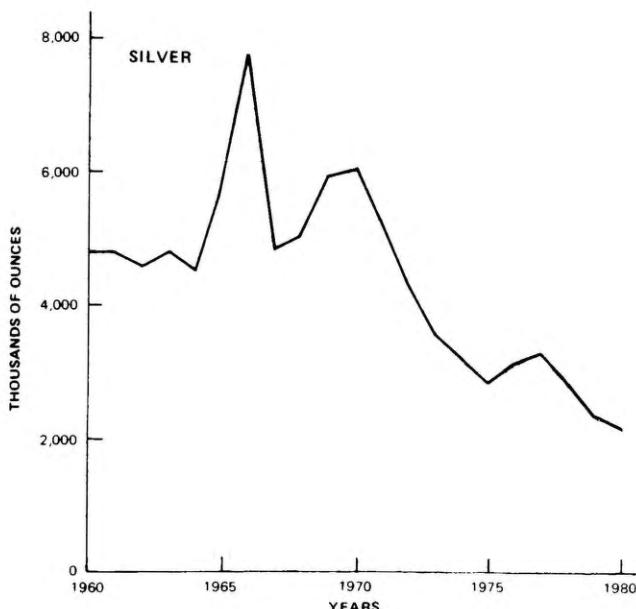
¹ Utah State Tax Commission, *Analysis of Net Collections Report*, June 30, 1981, Salt Lake City.² U. S. Bureau of Land Management, *Facts and Figures, 1980*, Salt Lake City.³ Utah Division of State Lands, *Annual Reports and Fiscal Reports, 1980*, Salt Lake City.⁴ Utah Department of Employment Security, *Annual Report, 1980*, Salt Lake City.

Figure 3. Production of silver in Utah, 1960-80.

drilling and resulted in the discoveries of new fields. Wildcat wells are testing the Thrust Belt from Idaho to Arizona; portions of the Great Basin, especially west of the Wasatch Front in central Utah, are also being explored. When drilling by Amoco in the southern part of Great Salt Lake found no oil, the company moved its rig off the lake, and its discovery of heavy oil near Rozel Point in the northern part of the lake has been plugged for the present. Known oil and gas fields are being extended in the Uinta Basin and in southeastern Utah. In spite of record-breaking drilling in Utah, the production of crude oil dropped in 1980, but that of natural gas has increased. Price increases nearly doubled the value of petroleum products over that of 1979.

Coal production increased about 12 percent in 1980, to 13.6 million short tons (Table 2). Buyers from the Far East are interested in buying Utah coal in an effort to protect themselves from the potential tyranny of a single source of fuel. Interest in leasing coal land from the federal government is high (selected tracts are offered for open bid from time to time, after environmental impact studies have been made).

Table 2. Reported mineral production in Utah, 1979-80.

Minerals	Unit	1979		1980	
		Production	Value (thousands)	Production	Value (thousands)
METALS					
Copper ¹	metric tons	193,082	\$396,000	157,775	\$356,251
Gold ¹	troy ounces	260,916	80,232	179,538	109,978
Iron ¹	1,000 short tons	1,618	19,391	1,307	18,590
Silver ¹	1,000 troy ounces	2,454	27,216	2,203	45,476
Tungsten ¹	1,000 pounds	12	90	W	W
	Total Value		522,929		530,245
	Total Value*		606,000		617,000
MINERAL FUELS					
Coal ²	1,000 short tons	12,096	300,000 ⁵	13,629	325,000 ⁵
Crude oil ³	1,000 barrels	27,564	24,979	700,000 ⁵	700,000 ⁵
Natural gas ³	mcf	76,960,105	87,765,597	80,000 ⁵	80,000 ⁵
Uranium (est.)	1,000 1b U ₃ O ₈	2,000 ⁵	2,000 ⁵	40,000 ⁵	40,000 ⁵
	Total Value		745,000		1,145,000
NONMETALLICS					
Clay ¹	1,000 short tons	355	1,246	365	1,517
Gypsum ¹	"	722	6,552	287	2,612
Lime ¹	"	198	8,250	259	13,293
Pumice ¹	"	28	280	35	347
Salt ¹	"	1,204	14,723	1,157	19,373
Sand, Gravel ¹ (construction)	"	10,363	18,621	8,906	17,234
Stone (crushed) ¹	"	3,424	11,059	2,919	11,776
Stone (dimension) ¹	"	5	216	3	272
	Total Value		60,947		66,424
Items for which production not revealed ^{1,4}			169,520		175,041
	TOTAL		\$1,498,396		\$1,916,710

Sources and Notes:

¹ U. S. Bureau of Mines, "The Mineral Industry of Utah in 1981," *Mineral Industry Surveys* (annual, Preliminary), January, 1982, Washington, D. C.

² Utah Geological and Mineral Survey data provided by Hellmut H. Doelling, 1980. These may differ from those provided by other sources because of different methods of collection. Includes data from several mines closed at end of year and not reported to U. S. Department of Energy.

³ Utah Division of Oil, Gas and Mining, *Monthly Oil and Gas Production Report*, 1980, Salt Lake City.

⁴ Items not revealed: Beryllium, carbon dioxide, cement, gilsonite, lead, magnesium metal and salts, molybdenum, perlite, phosphate rock, potassium salts, industrial sand and gravel, sodium sulfate, sulfur, vanadium, vermiculite, zinc, and items indicated by "W".

⁵ Estimated value:

Coal - \$24 per short ton (average contract price for 1979-80 was \$23-26 per short ton).

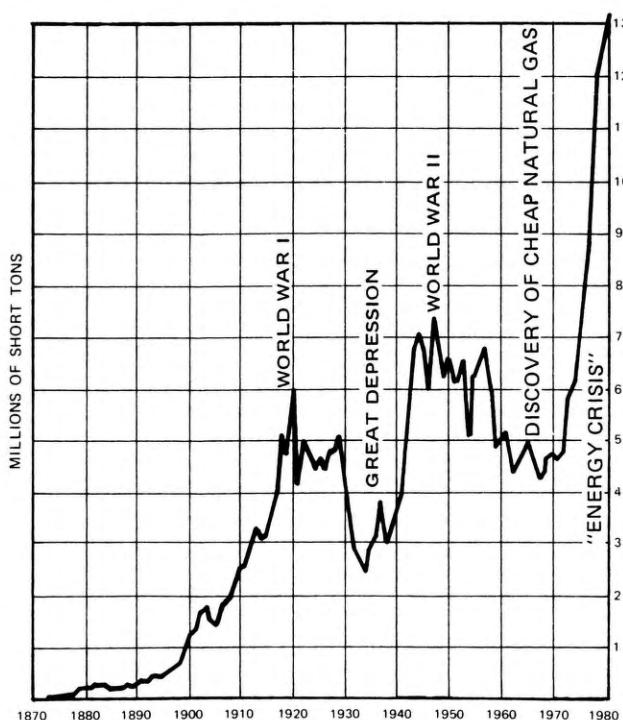
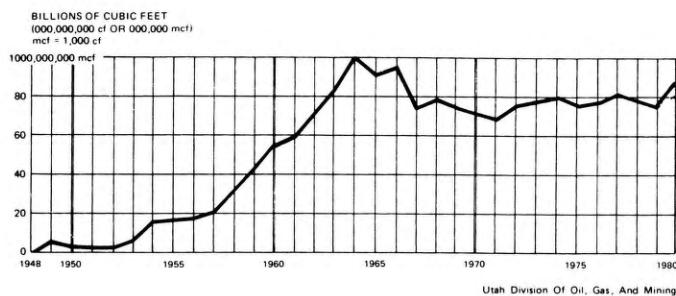
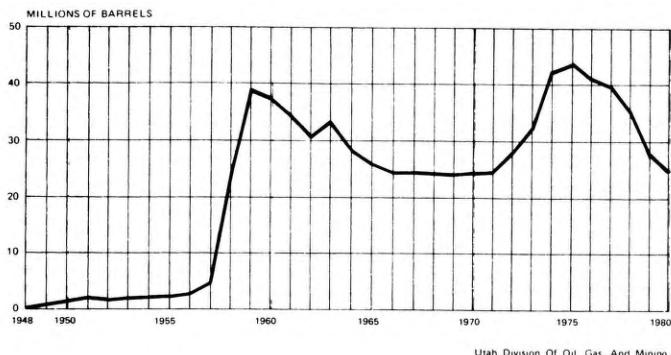
Crude oil - estimated average price \$28 per barrel, 1980 (values for crude oil and natural gas combined for 1979).

Natural gas - estimated average price 95 cents per mcf, 1980.

Data for natural gas liquids not available.

Uranium - estimated value \$20.00 per pound U₃O₈.

*Total value of metals produced including those withheld (U. S. Bureau of Mines).



Only one company has at the present time produced oil from oil shale in Utah by an *in-situ* process. At present, leasing restriction of federal lands and the large amount of capital needed for research and development are slowing up new development of both oil shale and tar sand. The U. S. Department of Energy has solicited applications from oil shale companies for federal money to develop workable techniques, and has awarded large sums to several applicants.

The uranium industry, in contrast with the others, is in a slump as a result of public fear of nuclear reactors and the consequent restrictive and costly regulations on the building of new power plants.

A pilot geothermal plant is being planned in the Milford area of Beaver County to produce the first geothermal electricity in Utah.

Nonmetallics — In 1980 the production and value of the industrial minerals (gypsum, sand, gravel, and stone) dropped, due to a slump in the construction industry (Figures 7, 8 and 9). Only production of clay and lime showed an increase (Figure 8). Production of salt was also down in 1980 (Figure 10).

No production figures were reported for cement, gilsonite, phosphate rock, sodium sulfate, potassium and magnesium salts, sulfur, vermiculite, and perlite.

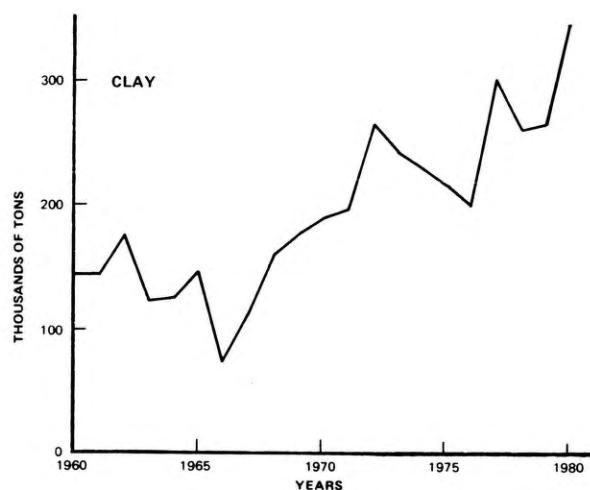


Figure 7. Annual production of clay in Utah, 1960-80, in short tons.

Income from Taxes

Income to the counties from taxes on mineral properties was up by more than \$2 million, from 1979's \$28.7 million to 1980's \$30.8 million. The mine occupation tax (two percent on the production of oil and gas, one percent on metals) increased from \$10.5 million in 1979 to \$15.6 million in 1980 (see Table 1).

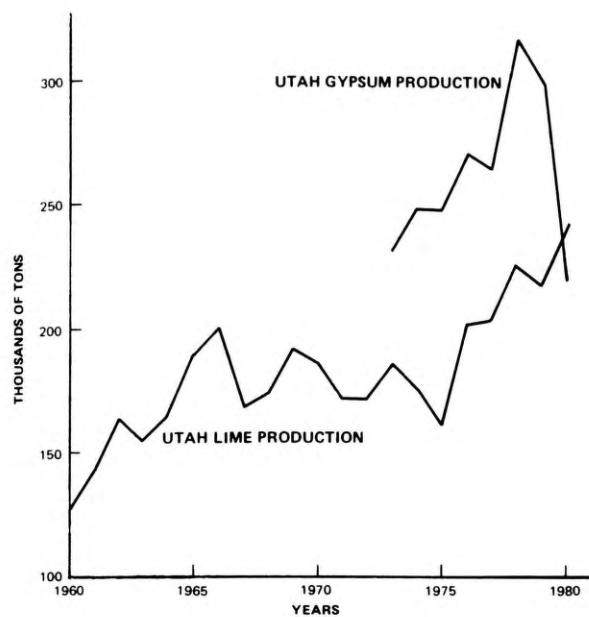


Figure 8. Annual production of gypsum and lime in Utah, 1960-80, in short tons.

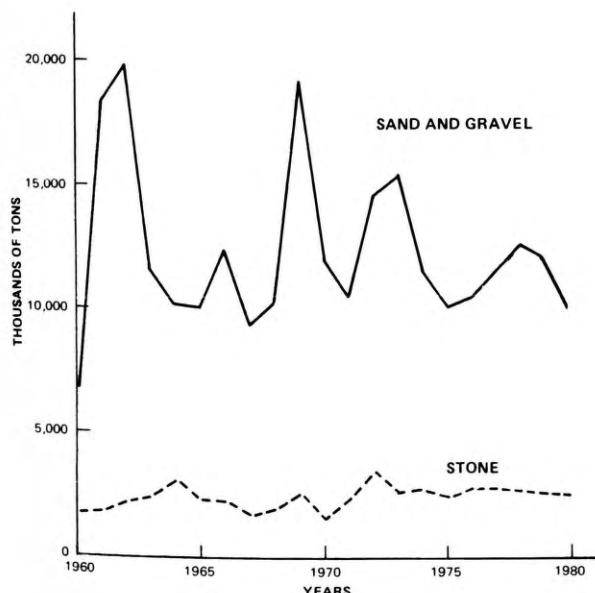


Figure 9. Annual production of sand and stone in Utah, 1960-80, in short tons.

Income to Utah from Mineral Resources on Federal Lands

More than two-thirds of Utah's land is administered by the federal government (Figure 11 and Table 3). Nearly 54 percent of the state is administered by the U. S. Bureau of Land Management, which collects lease money from federal land used by the mineral industry and royalties on minerals produced from the land. Half of that income is given to the state (Table 4). In fiscal

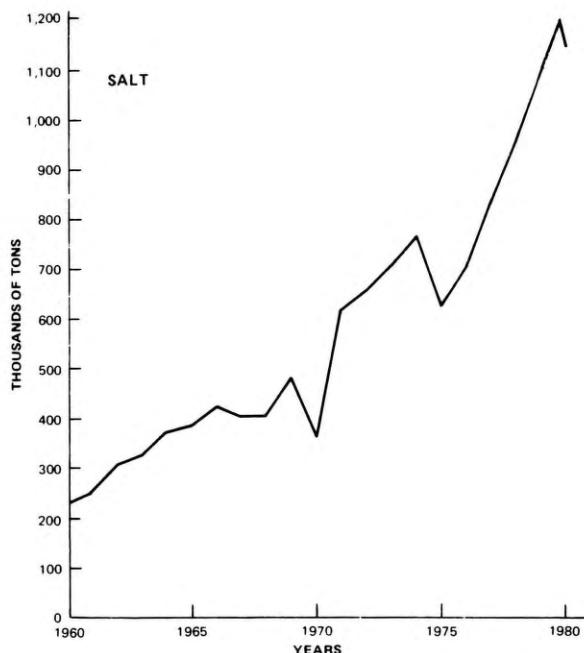


Figure 10. Annual production of salt in Utah, 1960-80, in short tons.

year 1980, Utah received \$17,027,000 in royalties, up \$4.4 million from 1979's \$12.6 million. In addition, the Bureau of Land Management gave over \$8 million to the counties in which its acreage lies, *in-lieu* of property taxes the counties cannot otherwise collect.

In 1980, 28,997 new mineral claims were recorded on federal land in Utah, making a total of 232,909 mining claims in the state. Utah has nearly 45,000 more claims than Nevada, which has the next-highest number. A break-down of the mineral production from federal lands is shown on Table 5.

Income from Mineral Resources on State Lands

The Utah Statehood Act (July 16, 1894) provided that Utah would receive sections 2, 16, 32 and 36 of each township in the state to support the public school system; this totalled 5,844,196 acres. Later some withdrawals of land were made by the federal government for defense and other purposes, and the state was allowed the right to select other lands *in-lieu* of those lands for which title was not vested. In 1958 a bill was passed by Congress that permitted the state to select *in-lieu* mineral lands if the lands lost contained minerals. The state's application for entitlement to oil shale lands in the Uinta Basin was denied in 1981 on the grounds that the selected lands were not of equal value to those lost.

Income to the state from mineral leases on state land was \$9,113,000 in fiscal year 1980, up from 1979's \$7,685,000. Income from mineral royalties was

Table 3. Land ownership in Utah, 1980.

Total land (includes 1,805,000 acres of water)	54,346,000 acres
Federal land (includes land administered by U. S.	
Department of Interior, U. S. Department	
of Agriculture, U. S. Military)	34,964,000 acres (68.0% of total)
Withdrawn or segregated	7,686,000 acres (22.0% of federal land)
Available for mining and mineral exploration	27,278,000 acres (78.0% of federal land)
Indian land	2,274,000 acres (4.3% of total)
State land	3,940,000 acres (7.5% of total)
Private land	11,532,000 acres (20.2% of total)

Source: Bureau of Land Management, *Facts and Figures, 1980*, Salt Lake City.

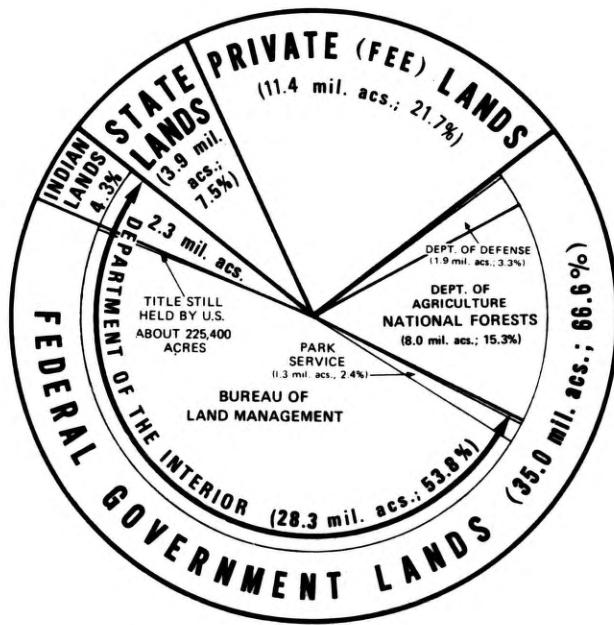


Figure 11. Distribution of land ownership in Utah.

\$4,126,000 in 1980, up from \$2,721,000 in 1979 (Table 5).

In 1977, a "Sagebrush Rebellion" had been initiated by Nevada, claiming that Nevada and other western states had been blackmailed by the federal government into giving up major portions of the land in the state as a condition of statehood and that the ownership and control of the land should go back to the states. Ronald Reagan, elected President in the fall of 1980, has shown some sympathy with the movement; however, public support for the movement seems to be weakening.

Employment and Wages in the Mineral Industry

Total wages paid to workers in the mineral industry rose from \$296 million in 1979 to \$365 million in 1980 (Tables 1 and 6). The average annual employment for the mining industry increased from 17,694 in 1979

to 18,500 in 1980. The average monthly wages rose by nearly \$200.

Employment in metal mining dropped by about 500 workers; only lead-zinc mining showed an increase. The latter reflects the opening of lead-zinc-silver mines in the Park City and Tintic districts.

Coal mining showed an increase of more than 300 workers, from 4,225 to 4,547. The average monthly wage was \$2,000, up from \$1,790 in 1979.

Oil and gas extraction showed an increase of nearly 1,000 workers, from 3,551 to 4,520, reflecting the expansion of the industry with an average monthly wage of \$1,698.

The chemical and fertilizer mineral industries employ about 400 workers, at an average monthly wage of \$1,629. Sand and gravel producers in the state employ about 200 workers. The average monthly wage in that field was \$1,331.

MINERAL INDUSTRY ACTIVITY, 1980

Metals

The first metal produced in Utah was in 1849, in what is now Iron County. By 1852 a small amount of iron was produced but production was relatively unimportant until a blast furnace and mill were built near Provo, Utah County, in the early 1920s.

Commercial metal mining in Utah began in 1863. Copper ore was discovered in 1862, and lead ore was discovered in 1863 in Bingham Canyon in the Oquirrh Mountains west of Salt Lake City. The discovery of a rich deposit of placer gold in Bingham Canyon in 1864 initiated state-wide prospecting for precious metals. Within a few years many important mining districts, containing copper, silver, lead, zinc, and lode gold, but little placer gold, had been discovered. Between 1863 and 1867 gold and small quantities of silver were produced. Silver was the leading metal until 1905, and copper has been the leading mineral in most years since then. Silver, gold, lead, zinc, molybdenum and other

Table 4. Income to Utah from minerals on state and federal lands.

Year	State Land ¹		Federal Land ²		
	Mineral Rentals	Royalties	Mineral Rentals	Payment to State ³	To Counties in lieu of Taxes
1976	\$4,564,996	\$2,339,360	\$19,313,361	\$7,534,726	
1977	5,504,683	2,243,795	17,238,478	8,619,239	\$7,471,599
1978	6,586,165	2,184,253	F23,776,083	11,888,042	6,435,508
1979	7,684,783	2,721,000	F25,173,132	F12,586,566	8,868,907
1980	9,112,736	4,126,000	F34,056,960	F17,026,954	8,146,654

F = Fiscal Year

Sources:

¹ Utah Division of State Lands, Various Annual and Fiscal Reports, Salt Lake City.² Bureau of Land Management, *Facts and Figures*, Various Years, Salt Lake City.³ Until 1977, Utah received 35 percent of mineral rentals; after 1977, the figure increased to 50 percent.Table 5. Mineral production from public lands, 1979-80
(exclusive of sand, gravel, and other construction materials).

Commodity	Fiscal Year, 1978-79			Fiscal Year, 1979-80		
	Quantity	Production Value	Royalty Value	Quantity	Production Value	Royalty Value
Petroleum, barrels	5,864,344	\$40,458,210	\$5,055,927	5,243,294	\$66,005,684	\$8,324,214
Natural gas, thousand cubic feet	24,959,995	18,758,805	2,265,932	25,495,728	40,752,110	5,029,050
Natural gasoline, gallons	5,256,070	1,232,699	51,927	3,566,244	1,452,601	106,813
Carbon dioxide, thousand cubic feet	222,867	27,859	3,482	4,030		5,500
Coal, tons	5,338,873	109,346,878	797,146	7,689,887	195,700,155	3,561,750
Phosphate, tons	0	0	0	0	0	0
Potash, tons	38,061	942,768	28,283	46,495	1,228,621	36,858
Other minerals, tons	1,663	68,778	8,597	2,175	21,109	27,308
TOTAL		\$8,211,294				\$17,091,493

Sources:

U. S. Geological Survey, *Federal and Indian Lands Oil and Gas Production, Royalty Income, and Related Statistics, and Federal and Indian Lands Coal, Phosphate, Potash, Sodium, Other Mineral Production, Royalty Income and Related Statistics, 1978-80*, Washington, D. C.U. S. Department of Energy, "Natural Gas Final Summary 1978"; "Crude Petroleum Final Summary 1978"; "Production of Coal, Bituminous and Lignite," *Energy Data Reports*, various years, Washington, D. C.

metals are produced today as by-products of copper production. In 1980, Utah ranked second in the production of copper, third in the production of gold, and fifth in the production of silver in the United States.

Beryllium — *Brush Wellman, Inc.*, has the only active beryllium mine in the United States, at Spor Mountain in Juab County. The ore is processed at a mill near Delta, Millard County.

The beryllium occurs in bertrandite, a beryllium silicate mineral found, with fluorite, in Tertiary tuffs.

The Spor Mountain deposit was identified in 1960 and a process to recover the beryllium has been developed by Brush Beryllium Company (now Brush Wellman, Inc.). The company has recently acquired additional mining claims and has adapted the mill to handle imported ore. The capacity of the mill to process bertrandite has been increased by 25 percent, and a uranium recovery circuit has reportedly been added to recover the small amounts of uranium present in the ore.

The company employs more than 100 employees and is the largest beryllium producer in the free world.

Table 6. Average annual employment and wages for the mineral industry of Utah, 1979-80.

	1979		1980	
	Average No. of Employees	Average Wage	Average No. of Employees	Average Wage
All Mining	17,694	\$1,719	18,500	\$1,911
Metal Mining	8,962	1,780	8,429	2,020
Iron ores	264	1,768	184	2,052
Copper ores	6,415	1,875	5,733	2,129
Lead and zinc ores	215	1,640	421	2,015
Gold and silver ores	9	757	14	1,028
Ferroalloy ores, except vanadium	4	995	3	2,019
Metal mining services	439	1,502	416	1,692
Miscellaneous metal ores	1,616	1,506	1,658	1,732
Anthracite, Bituminous Coal & Lignite Mining	4,225	1,790	4,549	2,008
Oil and Gas Extractions	3,551	1,576	4,520	1,698
Oil & gas field services	2,691	1,512	3,628	1,624
Drilling oil & gas wells	746	1,794	1,278	1,730
Oil & gas field exploration services	502	1,147	780	1,353
Oil & gas field services, n.e.c.	1,443	1,492	1,670	1,671
Other oil and gas extraction	860	1,913	892	2,003
Mining & quarrying/nonmetallic minerals	956	1,366	1,001	1,521
Crushed & broken stone, including riprap	70	1,340	65	1,544
Sand and gravel	236	1,303	207	1,331
Clay, ceramic & refractory minerals	10	838		
Chemical & fertilizer mineral mining	373	1,415	406	1,629
Barite	63	1,232	88	1,338
Fluorspar	3	1,156		
Other chemical & fertilizer mineral mining	307	1,455	318	1,855
Miscellaneous nonfuel, nonmetallic minerals	246	1,427	263	1,582
Other mining and quarrying	21	831	60	1,164

Source:

Utah Department of Employment Security, "Labor Market Information," *Annual Reports, 1978, 1979, 1980, Vol. III*, Salt Lake City, Utah.

Its 1980 production of BeO concentrates increased significantly over that of 1979.

In 1980 the price of domestic beryllium was \$140 a pound, up from \$120 in 1979. Domestic reserves of bertrandite ores are estimated by the U. S. Bureau of Mines to contain about 28,000 tons of beryllium, most of which is in Utah.

Copper – (also see Lode Minerals) Before 1880, most of the copper produced in Utah was a by-product of lead and silver mining. Large deposits of sulfide copper ore were found at Bingham in 1862 and in 1899 the first smelter primarily for the reduction of sulfide

copper ore was built. The immense lowgrade porphyry copper deposit at Bingham had been known for many years, but it was not until 1904 that a successful porphyry copper concentrating mill was designed and built. The deposit was operated first as an underground mine, then, since 1907, as an open pit. Bingham has produced more copper than any other single mine in history and is now the largest producer of copper and the second largest producer of gold and molybdenum in the United States.

Refined copper prices in the United States averaged 102 cents a pound in 1980, with a high of 134 cents in February and a low of 93 cents in June. The

average price for 1979 was 93 cents. Production of copper in Utah was down in 1980 because of a two month copper strike affecting Kennecott, and a three month shutdown for repairs at Anaconda's Carr Fork mine (Figure 2). The industry-wide copper strike began on July 1, but Kennecott reached an agreement with the union in late August, providing for a 39 percent wage increase over the next three years. Most customers had stocked up in anticipation of the strike and were not severely affected.

Anaconda's new Carr Fork copper mine was not involved in the copper strike; its contract expires in October, 1981. The Carr Fork mine, near Tooele (Tooele County) was closed for three months (May through July) when the production shaft was damaged by a falling ore skip. No one was hurt, but equipment repairs and replacement cost the company more than \$2.5 million, with lost production estimated at \$10 million.

The Carr Fork mine employs more than 800 workers and has the capacity to produce concentrate containing 50,000 metric tons of copper annually. The concentrate had been shipped to Anaconda's smelter in Anaconda, Montana, until the smelter was closed by a strike in September. In November, Anaconda announced that the smelter would not reopen because of its inability to comply with federal environmental regulations. Copper ore from the Carr Fork mine is now being shipped to Japan for smelting.

Kennecott Copper Corporation has been renamed Kennecott Minerals Corporation. At the end of the year Kennecott was sinking a massive 4,200 foot deep shaft at the old Bingham townsite to mine the North Offshoot ore body adjacent to the Bingham Pit. Investment will be more than \$30 million over a five-year period. Exploratory drilling had found the ore deposit to be twice as rich as the average grade from the Bingham Pit. The proposed underground development may be part of the same ore body now being mined by Anaconda's Carr Fork operations less than a mile to the southwest of Kennecott's new shaft. Kennecott has been open pit mining the Bingham Pit since the turn of the century.

More than three-fourths of the state's total value for metals came from the Utah Copper Division of Kennecott Minerals Corporation and from the Carr Fork operation of Anaconda Company, a subsidiary of the Atlantic Richfield Company.

Placer Gold — Placer gold has been found in many areas in Utah, but only one has provided any significant recovery: Bingham placer at the mouth of Bingham Canyon, southeast of Salt Lake City. This site was mined out within a few years of its discovery, but it served as the inspiration for metal prospecting all over the state.

Most of the known placer gold in the state is very fine and difficult to recover. Small amounts of gold are widely distributed across the Colorado Plateau, and placers have been worked along the Dolores, San Juan, and Colorado rivers and in the Henry Mountains.

Energy Development Company has started placer mining operations for gold on three patented claims held in partnership with Dennis Ekker in the Henry Mountains mining district. The company will provide financing for the project, which will be operated by Ekker, and both will share equally in the proceeds. The properties are located at the confluence of two major drainage systems carrying gold-bearing sand and gravel. Gravel samples at the site are reported to contain between 0.25 and 0.5 ounces of gold per short ton. The property has a 50-year history of gold production.

Blake Mining Company has applied for a permit to operate a placer at the junction of the Dolores and Colorado rivers, at the north end of the La Sal Mountains.

Iron — U. S. Steel closed its Desert Mound iron mine near Cedar City, Iron County, in February. Much of the iron used by U. S. Steel's Geneva works near Provo, Utah County, now comes from the Atlantic City mine in Wyoming. The Desert Mound mine will be reopened if there is a rise in demand for steel in the western United States. U. S. Steel has cut back production at its Geneva plant, and has recently shut down 15 plants around the country as a result of fierce competition from Japan and Germany, lowered demand for steel, and high costs of installing anti-pollution equipment. At the end of the year an agreement with the Environmental Protection Agency for a water control plan had been reached for the Geneva works and a shut-down was averted.

Lode Minerals (Gold, Silver, Lead, and Zinc) — Gold, silver, lead, zinc, and copper minerals are commonly found together in lode ore. In Utah, ore containing these minerals was known by 1848, but production was insignificant until the building of the smelters and the railroads after 1870. Most of the present production of gold and silver is a by-product of the porphyry copper operation at Bingham (Figures 3 and 4). Prices of lead and zinc have been severely depressed and no production has been reported for 1980.

The high prices for gold and silver have encouraged serious exploration and development as well as promotional activity in mining districts across the state. The average price for gold in 1980 was \$613.28 per troy ounce, double 1979's \$307.50. Silver averaged \$21.50 per ounce, up from \$11.09 in 1979.

Anaconda Company has purchased a metals lease of 1,280 acres from Falcon Enterprises. The lease is located in Dugway Valley, Tooele County, just east of Topaz Mountain. Anaconda has drilled several 4,000-foot holes and reports mineralization in at least one.

Asarco, Inc. announced a lease option on the West Tintic holdings of Chief Consolidated Mining Company. Meanwhile, it has begun an exploration program on the property.

Kennecott Minerals announced plans to spend \$3 million exploring for gold and silver in the East Tintic mining district, in Utah County. Exploration is on land leased from Chief Consolidated Mining Company, AMAX Arizona, Inc., Eureka Standard Consolidated Mining Company, and Standard Mining Company. The Trixie, Eureka Standard, Sioux Ajax, and Homansville fault structures are targeted for exploration. Kennecott is operating the Trixie and Water Lily mines, producing lead, zinc, silver, and some gold. The company has announced plans for further exploration and development. For the past three years it has been rehabilitating the Water Lily mine in the East Tintic district.

Noranda Mining Company, subsidiary of Noranda Minerals Ltd., Toronto, Canada, is reopening the United Park City mine in the Park City district, Summit County. It is negotiating with Park City Consolidated to reopen the Park City Consolidated mine, which is adjacent to the United Park City mine. Closed since 1942, the Park City Consolidated mine produced approximately 500,000 tons of lead, zinc, and silver ore in 12 years; silver content was reported to average 15 ounces per ton.

Noranda Mining Company also had an agreement in principle with New Park Resources, Inc., of New Orleans, to reopen and develop the Mayflower mine near Park City. The Mayflower was operated by New Park Mining Company from 1932 until it was closed in 1972. Its ore averaged .5 ounce of gold and 5 ounces of silver per ton of headfeed ore. Twenty million dollars will be spent to modernize the property, with plans to mine and mill 120,000 tons of ore per year.

Noranda reports that about one-half of the lead, zinc, and silver in its Ontario mine in Park City has been recovered in 100 years of operation. The Ontario, which was reopened in the fall of 1980, has produced more than 21 million tons of Pb-Zn-Ag ore.

Ranchers Exploration and Development Corporation started construction of a 500 ton-per-day mill at its Escalante silver mine in Iron County. During 1980 the proposed vertical-crater-retreat mining method was successfully tested and about 200,000 tons of ore stockpiled on the surface. Development was started in September, 1979; initial production was expected in

late 1981. The deposit has more than 1.8 million tons of ore with ten ounces of silver per ton and small amounts of lead and zinc.

Shield Development plans to reopen its mine near Milford in Beaver County. The mine, leased to Essex in 1973, was closed down in 1975. Three million dollars will be required to put it back into production of 1,750 tons per day.

Sunshine Mining Company of Kellogg, Idaho, has a 50 year option to explore and lease Chief Consolidated Mining Company's Burgin mine, in Utah County, operated from 1967 to 1978 by Kennecott. The mine produced approximately 1.8 million tons of lead-zinc-silver ore. It was closed in 1978 because of low prices, water problems, and poor ground. The mine was originally discovered by the United States Geological Survey as a result of a geochemical study of hydrothermal alteration in the overlying volcanic rocks. There are no outcrops to show the presence of the ore body. Recent exploration has found mineralization where water may not be a problem, and Sunshine plans to reopen the mine.

Kennecott is proposing to add additional equipment to its Burgin mill, which it still holds, to enable it to produce gold and silver as well as lead and zinc.

Tintic Mountain Mining Company reported finding commercial grade lead, silver, and gold on its patented lode claims in Juab County.

Toledo Mining Company is conducting preliminary studies on a tract of mining claims in the Ophir district in Tooele County, including the Wandering Jew mine and other lead-silver properties. Toledo has also undertaken a feasibility study of its Milford copper property in Beaver County which contains an estimated 82.4 million tons of copper, molybdenum, gold, silver, and tungsten.

Yankee Gold and Silver, Inc., a Salt Lake City based firm, announced acquisition of 80 percent control of Hack 'N Mack mines stock. Hack 'N Mack has 14 patented claims and 52 unpatented claims in the Ophir mining district, Tooele County, with a history of silver production from the Chloride Point, Monarch and other mines. Yankee has also acquired 50 percent interest in the Patrick Henry mining claim adjacent to Yankee's Silver Belle mine in American Fork Canyon, Utah County.

Magnesium — AMAX, Inc. purchased NL Industries, Utah Magnesium Division, with facilities on Great Salt Lake, for \$60 million. AMAX plans to increase the capacity of the plant from the present 28,000 tons of magnesium to 45,000 tons per year. This would make AMAX the second largest producer of magnesium in the world (Dow Chemical is first). The plant present-

Table 7. Inventory of Utah's mineral energy resources, January 1, 1981.

Resource	Estimate of Reserve or Resource (Gross) Year First Produced	Estimate of Total Production to End of 1980	Total Remaining of Reserve (Percent)	Estimate % Recoverable (of Col. 3)	Possible Additional Resource (Inferred/Speculative Catagory)
Coal	24.00 billion short tons 1850 ¹ 1870 ²	409 million short tons	23.60 billion short tons (98.4%)	no estimate	15.00 billion short tons (3)
Resource-Gross					
Natural Gas	3.10 trillion cu. ft. 1895 ¹ 1928 ²	1.89 trillion cu. ft.	1.20 trillion cu. ft. ⁷ (39%)	85-90%	0.706 to 0.900 trillion cu. ft. (760 to 900 bill. cu. ft.)
Reserve					
Oil & Natural Gas Liquids	915.00 million barrels 1907	715.00 million barrels	200.00 million barrels ⁴ (22%)	Nearly 100%	200-300 million barrels Liquids
Oil-Impregnated sandstone (tar sand)	26.00 billion barrels of oil in place No production	None	26.00 billion barrels of oil in place (100%)	15-20%	1.5-2.0 billion barrels
Resource-Gross					
Oil Shale	120 billion barrels ⁵ 1977 Resource-Gross	12,000 bbls. (pilot)	120 billion barrels ⁵ (100%)	35-40%	no estimate
Uranium	35 million short tons ⁶ Reserve	18.70 million short tons	16.30 million short tons (47%)	no estimate	no estimate

Source and Notes:

*Compiled by Utah Geological and Mineral Survey staff.

¹Approximate first production.

²First records kept.

³Under less than 3,000 ft. of cover.

⁴New fields have been discovered but estimates of their reserves have not been added.

⁵25+ gallons per ton grade. 10 feet or thicker.

⁶0.26 percent grade (approximate)

⁷Includes reserves of sour gas and gas in tight sands and gas being used in pressure maintenance and secondary recovery operations most of which will become producible in future.

ly employs 700 workers. Great Salt Lake brines are concentrated in solar ponds to precipitate MgCl salts which are then reduced to magnesium metal by an electrolytic process.

Zirconium — *Western Zirconium* announced plans for a \$3 to \$5 million expansion of its new 50 million dollar plant at Little Mountain just west of Ogden in Weber County. The expansion is to allow recovery of hafnium as a by-product of zirconium production. The first zirconium ingots were produced in the spring of 1980; plans are to produce three to four million pounds per year and employ 430 workers. The zirconium concentrate is imported from Australia.

Mineral Fuels

Table 7 gives an inventory of Utah's known mineral energy resources at the end of 1980. These resources include coal, natural gas, oil, oil from tar sand and oil shale deposits, and uranium. While there is great interest in Utah's tar sand and oil shale, actual production is still in the research and development stage.

Coal — Utah coal production in 1980 was a record-breaking 13.6 million tons, up 12.7 percent from that of 1979. Almost three-fourths of 1980's production (72.5 percent) was used for power generation; 14.8 percent for industrial use; 8.8 percent for metallurgical use, and 3.9 percent for space heating. Almost half of Utah's coal, 48.9 percent, was used in the state; 42.7 percent was shipped to other states, and 8.4 percent was exported to the Far East. Tables 8 and 9 show the distribution of Utah coal production by county and by field. Production estimates through the year 2000 are given in Table 10.

The overseas demand for Utah coal was instigated not only by the threatened availability and high price of petroleum from the OPEC countries but also by a coal miners' strike in Australia. Japan, Taiwan, and Korea, to avoid depending on any single source of coal, began to negotiate with coal producers in the United States.

Utah's coal production is entirely from underground mines. Therefore, Utah coal is more expensive to produce than the surface coal from surrounding states,

Table 8. Utah coal production, by county through 1980 (thousands of short tons).

County	Through 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Carbon	248,000	3,347	2,956	2,866	2,754	2,984	3,868	4,390	4,005	5,292	5,489
Emery	60,647	1,097	1,656	2,445	2,901	3,126	3,057	3,107	3,640	5,147	6,324
Grand	2,650	---	---	---	---	---	---	4	*	---	---
Kane	77	12	---	---	---	---	---	---	---	---	---
Sevier	1,704	158	184	339	391	827	1,043	1,337	1,558	1,657	1,822
Summit	4,244	12	6	---	---	---	---	---	---	---	---
Other counties	1,762	---	---	---	---	---	---	---	50	---	---
TOTALS	319,084	4,626	4,802	5,650	6,046	6,937	7,968	8,838	9,253	12,096	13,635

*Insignificant production

Source: Compiled by H. H. Doelling, Chief, Economic Section, Utah Geological and Mineral Survey

Table 9. Utah coal production, by field through 1980 (thousands of short tons).

Field	Through 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Book Cliffs	208,800	2,738	2,507	2,467	2,187	2,241	2,534	2,722	2,207	2,725	2,993
Coalville	4,244	12	6	---	---	---	---	---	---	---	---
Emery	1,640	142	146	230	250	134	193	348	497	732	763
Kaiparowits Plateau	25	12	---	---	---	---	---	---	---	---	---
Sego	2,650	---	---	---	---	---	---	4	*	---	---
Wasatch Plateau	99,481	1,722	2,143	2,953	3,609	4,562	5,241	5,764	6,499	8,640	9,879
Other fields	2,244	---	---	---	---	---	---	---	50	---	---
TOTALS	319,084	4,626	4,802	5,650	6,046	6,937	7,968	8,838	9,253	12,097	13,635

*Insignificant production

Source: Compiled by H. H. Doelling, Chief, Economic Section, Utah Geological and Mineral Survey

but its high quality and low sulfur content make it more desirable for metallurgical and industrial purposes as well as generating electricity.

Utah's coal industry is now in its third "boom" period (Figure 6). The first period was during World War I, followed by a drop in production during the Great Depression of the 1930s. The second period was during World War II, followed by a production lag as oil and natural gas became plentiful and inexpensive. In the 1970s the threat of losing our overseas sources of cheap oil from the Middle East led to the conversion of many industries and especially power-generating facilities to coal. High costs and fear of radiation damage from nuclear reactors influenced decisions to use coal instead of uranium for generating electricity.

Money allocated by Congress for coal research and development in 1980 was \$745 million. The appropriation for *in-situ* coal gasification research and development was \$10 million.

Between 1974 and 1978, plans to build 84 coal-fired power plants and 80 nuclear plants were cancelled. Many of the proposed nuclear plants may be built as coal-fired plants. Reasons for the cancellations are: 1) Regulatory problems, including lack of coordination between federal, state and local governments; 2) sharp decline in the rate of increased demand for electricity; 3)

difficulties in getting financing for power plant construction, and 4) lack of available construction materials and skilled workers.

Estimated in-place reserves of Utah coal total about 23.6 billion tons. Historically, the central region fields have accounted for the bulk of Utah's production, with 97 percent of the cumulative output coming from Carbon and Emery counties alone (Figure 12). Although nearly 41 percent of the State's identified reserves are located in the Kaiparowits and Kolob fields, environmental concerns have prevented large scale development in that area to date (Figure 6).

In 1980, the Utah Geological and Mineral Survey continued, in cooperation with the U. S. Geological Survey, its drilling program of the lower Blackhawk Formation in the Muddy Creek area of Sevier, Sanpete, and Emery counties. A total of 27 drill holes proved more than 500 million tons of coal in the area, with about 233 million tons considered recoverable. The results of the program are reported in *Muddy Creek Coal Drilling Project, Wasatch Plateau, Utah*, by Archie Smith, Utah Geological and Mineral Survey, Special Studies 55, 1981.

Altex Oil has a one-third interest in the 24,000 acre Eastland Coal prospect in San Juan County, and says extensive drilling has so far delineated a 77 million ton coal reserve on 8,000 acres.

Table 10. Estimated future production of coal in Utah (million short tons).

Year	Tons	Year	Tons
1981	14.30	1987	14.76- 18.26
1982	15.10	1988	14.60- 18.60
1983	15.30	1989	14.30- 20.30
1984	15.60- 16.5+	1990	18.85- 22.45
1985	15.55- 16.55	2000	22.00
1986	15.63- 17.63		

Beaver Creek Coal Co. (formerly Swisher Coal Company) received approval from the U. S. Department of Interior to reopen its Huntington Canyon No. 4 mine in Emery County. The mine was shut down in 1978 because of lack of accessible reserves. Plans are to produce 12 million tons in the next 15 years. Beaver Creek Coal Company also has a 15-year \$86 million coal sales agreement with Nevada Power Company to sell more than one million tons per year from its Grodon Creek mine near Price.

Atlantic Richfield purchased Beaver Creek Coal Company for a reported \$38 million. The company produces about 400,000 tons of coal a year.

Coastal States Energy (Getty Oil Company) plans to develop three mines in the Eccles Canyon in Carbon County over the next ten years. Total cost is estimated to be \$120 million. Mine plans have been approved by the State and by the Office of Surface Mining. Surface work was started on the Skyline mine, west of Price, in mid 1980. Production is expected to start in 1982 and to reach five million tons per year by 1990.

Mountain Fuel Resources with Pacific Gas and Electric, Mono Power Company, and Conoco Coal Development is doing a feasibility study of a facility to produce 250 billion BTU/day of gas and methane from coal (coal gasification). The plant will use as much as seven million tons of Utah coal annually.

Sharon Steel acquired ownership of the U. S. Fuel Company's King mine at Hiawatha in Carbon County when it purchased the mining properties of UV Industries last November (1979). Sharon has tripled U. S. Fuel's exploration budget and plans to open another mine, the King 6, in the Hiawatha area, and to expand rail and loading facilities at the mines. The company is upgrading the present coal preparation plant and plans to build a second and larger plant by 1985. A fourth mine, near Moreland, is also projected for 1985. The four mines are expected to have a total capacity of 3.3 million tons of coal per year.

The first shipment of Utah coal for steam power generation was sent to Japan by **Plateau Mining Com-**

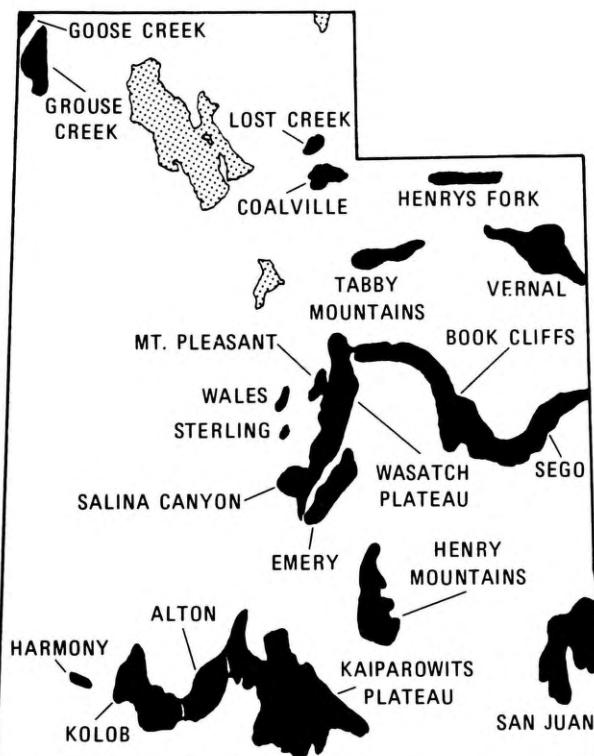


Figure 12. Locations of coal fields in Utah.

pany. Twenty three thousand tons were shipped by rail to California for transhipment.

Getty Oil purchased UNC Resources' Plateau Mining Company coal mines, Star Point 1 and 2 (Carbon County) for \$60 million. Reserves are estimated at 60 million tons of coal in 5,200 acres. Last year UNC produced about 850,000 tons of coal.

Boeing Engineering and Construction Company is planning to build a coal-slurry pipeline from Emery County to the west coast.

Coal Search Corporation closed its Knight mine in Salina Canyon, Sevier County, because of marketing problems. The mine has a capacity of 500,000 tons per year but produced only 60,000 in 1980.

Price River Coal Company's No. 3 mine was closed for one month because of a fire discovered on New Year's eve. Price River Coal Company is owned by American Electric Power Company, a subsidiary of Indiana and Michigan Electric Company, and mines approximately one million tons of coal each year for the Tanners Creek power station near Cincinnati, Ohio.

U. S. Steel is selling 28 percent of its coal reserves to Royal Land Company, a subsidiary of Standard Oil Company of Ohio, for \$700 million. Eight hundred million tons of coal are involved, including that in "B" Canyon in Carbon County, Utah. The sale is to raise

money for modernization, diversification, and restructuring of its steel business (see Iron).

Utah International, which holds coal leases in the Alton coal field in Kane County, has expressed its dissatisfaction with former Interior Secretary Cecil Andrus' decision to permit some coal mining of the Alton Hills coal seam, but none near Bryce Canyon National Park. The decision deletes more than 24 million tons of coal from potential mining. Utah Construction is concerned with protecting the many attributes of the park, but believes it can design mining operations to minimize environmental impact.

Geothermal — Utah has a large number of hot springs and wells, mostly concentrated in the Hinge Line (Figure 13). Nine known geothermal resource areas (KGRA's) have been identified, eight of which are in the southwestern part of the state. It is possible that some of the springs in these areas are heated by buried igneous bodies.

The most significant of the KGRA's thus far appears to be that at the Roosevelt area northeast of Milford in Beaver County. Deep drilling by Phillips Petroleum found temperatures as great as 240°C (465°F). Phillips Petroleum and Utah Power and Light Company are planning a 20 megawatt pilot geothermal power plant. At the end of 1980, a contract to build the geothermal power plant had been approved by the Utah Public Service Commission; construction is scheduled to begin in 1981, and to be completed in 1983 or 1984. If successful, several larger plants will be built. The potential capacity of the geothermal reservoir is estimated to be between 700 and 900 megawatts. Deep drilling is also testing the potential of the Cove Fort-Sulfurdale area northeast of Roosevelt High School.

About 1500 lower-temperature (20° to 120°C) springs and wells have been identified throughout the state. The heat for these low-temperature springs and wells is believed to be derived from water that circulates at depth, where it is heated and subsequently rises to the surface. Many of these warm springs or wells are being used or considered for direct heat applications. The Utah Geological and Mineral Survey Research Section is continuing its study of the low-temperature geothermal assessment of these springs and wells.

Oil Shale — Utah contains extensive deposits of oil shale (Figure 14), a dense, fine-grained, sedimentary rock rich in organic material (kerogen). The oil shale deposits are found principally in the Uinta Basin in northeastern Utah, in Tertiary lake bed deposits of the Green River Formation; reserves are "very large" (Table 11).

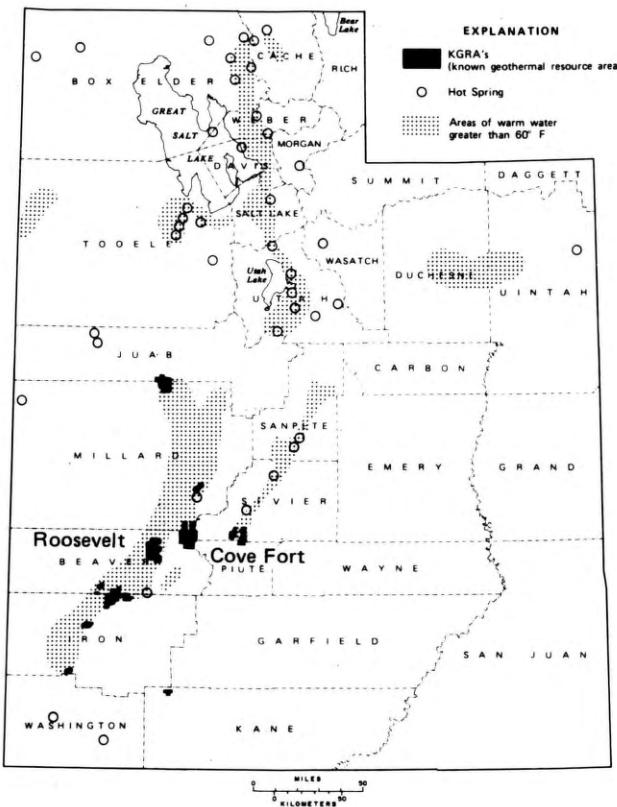
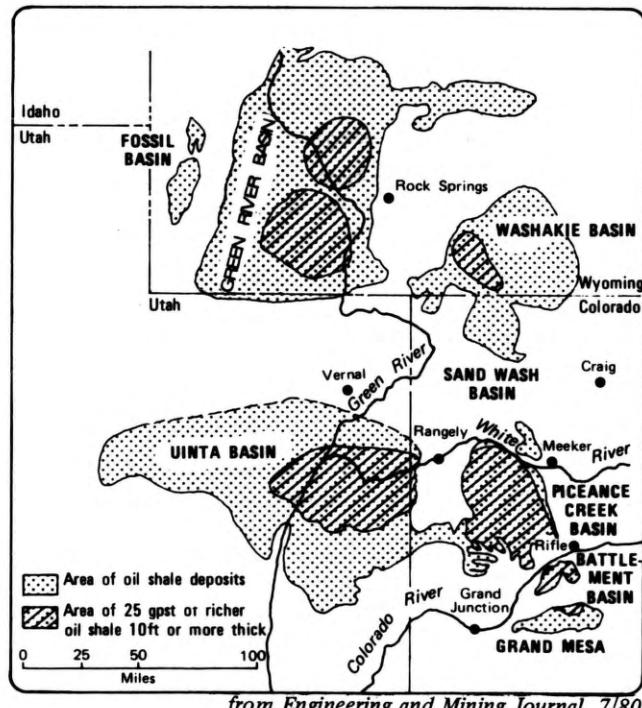


Figure 13. Locations of geothermal resources in Utah.



from *Engineering and Mining Journal*, 7/80

Figure 14. Locations of oil shale areas in Utah, Colorado, and Wyoming.

Table 11. Oil shale resources in Utah.

Grade	Gross Size of reserve	Area (sq. mi.)
Shale of all grades	1.0 to 1.5 trillion bbls.	10,000+
15 gals/ton, 15 + feet thick	320 billion bbls.	3,200
25 gals/ton, 25 + feet thick	120 billion bbls.	1,175

Source:
Petroleum Section, Utah Geological and Mineral Survey.

Most of the oil shale is on federally controlled land which has not been opened for leasing. In 1974, Utah sued the U. S. Department of Interior in an effort to gain ownership of 157,000 acres of land in the energy-rich Uinta Basin. The state is owed land *in-lieu* of that taken by the federal government for National Forests, Parks, and military use. However, the U. S. Supreme Court ruled that the state could not claim lands which were of greater value than those which had been taken away.

Little or none of the oil can be extracted from the rock by solvents or mechanical means; it must be heated (retorted) to pyrolyze the organic matter and convert it to oil. Some drilling and testing has been done on private or state land. The U. S. Department of Energy is offering money for development of economically viable techniques to extract the oil and a number of companies have shown an interest.

Only one company has actually produced shale oil at this time. Geokinetics, Inc., working under a state oil shale lease in Uintah County, developed a method of producing oil by an *in-situ* process in shallow, high grade oil shales. The beds are shattered by explosives to produce vertical fractures through the oil shale bed. The oil shale is then ignited around the fractured area; heat converts the solid hydrocarbons to crude shale oil and gas which are driven into the shattered area and then pumped from the production hole. Through 1980 the company has produced about 15,000 barrels of shale oil.

Tar Sand (oil-impregnated sandstone; asphalt rock)

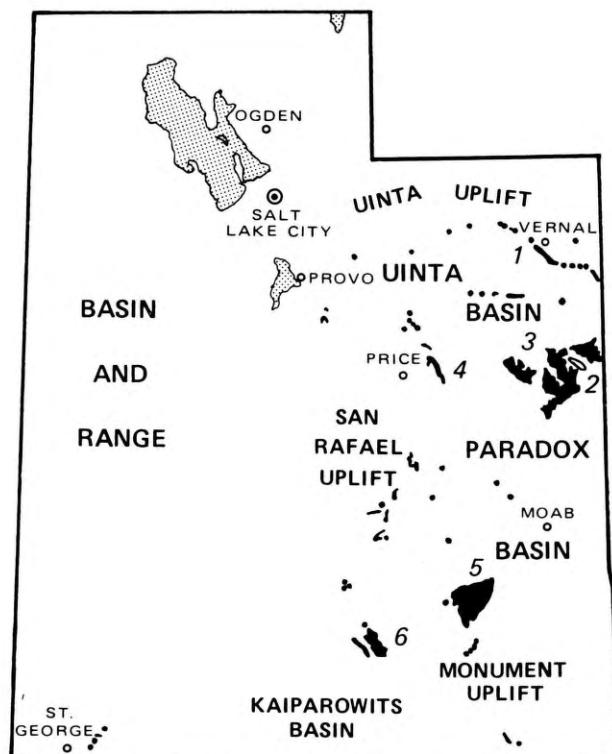
— Tar sand is a porous rock impregnated with a bituminous material (commonly called tar or asphalt). The bituminous content may range from a few to 20 percent by weight. The rock is crushed and used for paving roads. Recently, as the price of crude oil has risen and foreign supplies jeopardized, interest has developed in recovering the extensive reserves of "tar" as a source of crude oil. It can be extracted with warm water and solvents and with various mechanical assists.

Tar sand deposits are scattered through eastern Utah, with the richest in the eastern part of the Uinta Basin (Figure 15). Perhaps as much as 90 percent of the tar sand occurrence in the United States is found in Utah. The bulk of the deposits are found in sandstone in the upper part of the Tertiary Wasatch Formation with some in the lower part of the Green River Formation. Estimated reserves are shown on Table 12.

Table 12. Tar sand resources in Utah.

Deposit	Size (billions of bbls)	Area (sq. mi.)
Central Southeast		
Tar Sand Triangle	12.5-16.0	200 - 300
Circle Cliffs	1.3	27.7
Uinta Basin		
Asphalt Ridge	1.2	20 - 25
P. R. Spring	4.0 - 4.5	240 - 270
Hill Creek	1.2	115 - 125
Sunnyside	3.5 - 4.0	35 - 90

Source:
Petroleum Section, Utah Geological and Mineral Survey.



1. Asphalt Ridge
2. P. R. Spring
3. Hill Creek
4. Sunnyside
5. Tar Sand Triangle
6. Circle Cliffs

Figure 15. Locations of major tar sand deposits in Utah.

The rising price of crude oil has made the commercial recovery of the "tar" economically possible. The U. S. Department of Energy is offering funds to encourage research for the development of practical techniques.

One company, Enercor, is building a pilot plant in the northern part of Salt Lake City to test a hot water extraction process developed at the University of Utah. Other processes being tested involve the use of steam and retorting both in the ground and on tar sand that has been mined and taken to the surface for processing. At present no oil is being recovered on a commercial scale.

Uranium-Vanadium — Sedimentary deposits of uranium containing carnotite ore were discovered in southeastern Utah about 1900; the history of uranium mining dates from 1904, following the discovery by Marie and Pierre Curie of radium and its association with uranium. A few thousand tons of selectively mined and hand-sorted ore were produced in Utah before 1925, providing less than 15 grams of radium valued at about \$180,000 per gram.

In the mid-1930s about 108,000 tons of uranium ore were mined for the associated vanadium, until the vanadium market was glutted in 1944. The discovery of atomic fission and the atomic bomb spurred recovery of the uranium in the tailings; by 1948 the Atomic Energy Commission had established a guaranteed price schedule that stimulated exploration and mining. Ore was found in literally thousands of deposits in southeastern Utah. After 1958 the uranium market was saturated, prices dropped, and mine output declined.

The abrupt rise in prices of petroleum products in the late 1970s encouraged the planning and building of nuclear power plants to provide alternative sources of energy, but several accidents at nuclear plants have created public concern for their safety. New regulations to insure safety increased the cost and time of construction of the plants, and a concurrent drop in the rate of increase of demand for electricity resulted in the delay or cancellation of a large number of nuclear power plants. As a result, demand for uranium dropped, as did prices.

Most of Utah's uranium is produced from about 60 mines in the Colorado Plateau in Emery, Garfield, Grand, and San Juan counties. The deposits are mainly in continental sedimentary rocks, mostly sandstone and conglomerate, and follow buried stream beds. About 80 percent of Utah's uranium comes from the Triassic Chinle Formation, 15 percent from the Jurassic Morrison, and the rest from various other units. Some is

found at Spor Mountain in Juab County; it is also recovered as a by-product from Bingham Canyon. Vein-type deposits are found in the volcanics of the Marysvale area. Uranium is also found in the phosphatic shales of northern Utah, and in several ranges in western Utah. Most of these deposits are very low grade but some are very large and contain vanadium and other elements of potential economic value.

Four mills in Utah (one under construction) have the capacity to produce 2.5 million pounds of U_3O_8 per year, with the potential to increase this to nine million pounds by 1988.

Utah, with Arizona, ranks fifth or sixth in the production of uranium in the United States. Reserves of the two states are about 64 million short tons of .06 percent U_3O_8 containing a total of 38,000 tons of U_3O_8 , and constitute about five percent of the total reserves in the United States. At this time production figures for Utah uranium are not released, in order to avoid disclosing company proprietary data.

Average contract prices for 1980 deliveries of U_3O_8 increased in the first half of 1980 from \$25.40 to \$26.00 per pound, but dropped towards the end of the year to \$24.00. Prices were \$44.00 per pound two years ago; it is estimated that a price of \$45.00 is required to open up new properties. Many small mines have closed because the price is less than the cost of operating the mine, but others, expecting the slump to be of short duration, are continuing exploration and development.

Production figures for vanadium also are not revealed but Utah ranked second of five producing states in 1980.

Homestake Mining is investing about \$6 million in its new uranium mine at its La Sal properties near Moab.

Mountain States Resources has been doing exploratory drilling at its Lucky Strike claims in Emery County. It has acquired two more uranium properties adjacent to its Cane and Sinbad properties.

Uradco halted activity at its Avalanche No. 13 mine near Blanding, San Juan County, because of the softening uranium market.

Cleghorn-Washburn Mining Company resumed mining at its Blue Cap mine, in the La Sal Creek area in San Juan County.

Geo-Energy Resources is operating its Firefly Claims in San Juan County, and is shipping to the Atlas Mill at Moab.

Cotter Corporation began exploratory drilling on its claim in Twin Corral Canyon near the Dirty Devil River in Wayne County. A series of fifty 1000-foot holes will be drilled.

Table 13. Production of clays in Utah for the years 1976-80.

Year	Common Clay, Shale		Bentonite				Fire Clay	
	short tons	value	short tons	value	short tons	value	short tons	value
1976	197,000	\$440,000			2,000	\$ 8,000	5,000	\$27,000
1977	223,000	590,000	1,000	\$12,000	6,000	24,000	14,000	87,000
1978	253,000	755,000	1,000	17,000	6,000	24,000	w	w
1979	341,000	1,077,000	1,000	17,000	7,000	32,000	w	w
1980	349,000	1,230,000			9,000	72,000	w	w

W = Data withheld

Source: U. S. Bureau of Mines, *Mineral Industry Surveys*, Washington, D. C., 1981.

Mountain States Resources is doing exploratory drilling on its 3,680 acre Sinbad-Solo prospect in Emery County. Results so far are promising.

Falcon Enterprises has increased its holdings in the Wah Wah Mountains in Beaver County where discoveries of uranium have spurred exploration by several companies.

Uranium Resources and Development Company, a subsidiary of Pennsylvania Power and Light Company, is selling its 23,000 acres of uranium holdings in Utah. The company plans to concentrate on its Wyoming holdings.

Energy Fuels Nuclear opened its White Mesa uranium mill, six miles south of Blanding in San Juan County, in May. Capacity is 2,000 tons of ore per day.

Western Nuclear has Bureau of Land Management authorization to build a road to and drill on its claims in the Tushar Mountains in Beaver County.

Nonmetallics

Nonmetallics and industrial minerals are widely distributed throughout Utah. Since the mid-1950s the output of these minerals has become increasingly important. Reserves of industrial minerals (clay, sand and gravel, gypsum, lime, and stone) are very large and their increased use reflects the growth of the population and industry of the state. Reserves of salines (common salt, potassium salts, magnesium salts, and sodium sulfate) are also extremely large, both in the brines of Great Salt Lake and in bedded deposits in southern Utah.

Alunite — Large deposits of alunite are found in the Marysvale area of southwestern Utah; these are not at present being mined but are potential sources of potassium sulfate and alumina. Reserves have been estimated at 3.7 million tons. Alunite was mined during the two World Wars when foreign sources of supplies were cut off.

Barite — Most of the known barite in Utah is associated with the base and precious metal deposits and can only be produced as a by-product. About 30 known occurrences are scattered over the Basin and Range province in the western part of the state. Total production is probably only a few thousand tons, and no barite production was reported in Utah in 1980. Raw ore is imported from neighboring states and processed in mills in Salt Lake City. In 1979, 143,000 short tons were processed at a value of \$11,465,000; and in 1980, 51,000 tons at a value of \$13,817,000. Price for barite in 1980 averaged \$28.46 per short ton f.o.d. mine, up from \$25.46 in 1979.

Utah now has six mills for crushing and grinding barite, including a new mill added in 1980 by All Minerals Corporation to its Murray grinding plant. The strong demand by the drilling industry has resulted in a 12 percent increase in the use of barite in drilling muds. Utah ranks fifth in the production of processed barite, following Louisiana, Texas, Nevada, and Missouri.

Clay — Total tons of clay produced in 1980 were 365,000 with a total value of \$1,517,000, up from 355,000 tons in 1979 with a total value of \$1,246,000. Table 13 gives a breakdown by type.

Utah has about 30 clay operations, not all of which are currently active. Clays mined in Utah include halloysite, used in making petroleum catalysts and brick; fire clay for low-heat refractory products; bentonite for drilling muds, lining irrigation ditches, fillers, and other uses; fuller's earth for filtering purposes, and common clay and shale for making brick, tile, and structural clay products.

The price of clays depends on their composition and purity and ranges from \$2 to \$222 per short ton.

Fluorite — Fluorite was first mined in 1918, and a total of 150,000 to 200,000 tons have been produced. Little has been mined since 1960; most deposits are

relatively small and low grade. Reserves have been estimated at about 450,000 tons of 40 percent CaF_2 minimum grade.

Gilsonite (Asphalt) — Utah is the only state with commercially marketable quantities of gilsonite. Gilsonite is a solid hydrocarbon which occurs in north-eastern Utah, in Uintah and Duchesne counties, as veins in northwest-trending vertical fractures cutting gently-dipping Tertiary rocks. Gilsonite production began in 1888; original reserves were estimated at about 45 million tons. Gilsonite is used to produce metallurgical grade coke and gasoline. It is used for ink, sealers, binders, and graphite.

American Gilsonite, near Bonanza in Uintah County, is one of the two largest gilsonite producers in the state. It recently completed a new \$5.3 million consolidation processing plant to replace four other scattered operations. The gilsonite is mined underground from several large veins, cleaned, dried, sized, and shipped all over the world. Production averages over 100,000 tons per year.

In January 1981, **SOCAL** (Standard Oil of California), which had a 50 percent interest in American Gilsonite, bought out Barber Oil Company's 50 percent interest for \$22 million. American Gilsonite also owns some undeveloped oil shale land.

Midas Gilsonite was organized in 1980 to mine a small gilsonite vein near Ouray, Uintah County. Original production was expected to be only ten tons per day. The vein is on land leased from the state.

Lime and Cement — Production of lime rose from 198,000 short tons in 1979 to 259,000 in 1980, and average prices rose from \$41.18 to \$46.62 in 1980. Values of lime produced rose from \$8.3 million in 1979 to \$13.3 million in 1980. Environmental regulations expanded markets for lime, used in desulfurization of stack gases of thermal power plants, smelters, refineries, and other chemical plants, and for cleaning effluent industrial water. Production of lime is energy intensive and prices vary with the cost of fuel, energy efficiency, and market area.

Production of cement in Utah is not reported. The average price rose from \$46.55 per short ton in 1979 to \$51.00 in 1980.

Beehive Chemical Company is planning to build a cement plant on 40 acres near the Keigley Quarry in Utah County.

Continental Lime Company has achieved a successful start up of its Cricket Mountain lime plant at Bloom in Millard County. The \$8 million plant employs 25 workers and produces quick lime for use in mining

and power industries. The company has about 40 years of limestone ore reserves in the Cricket mountains.

Martin Marietta Corporation is constructing a new cement plant at Leamington in Juab County. The plant, to be in operation in early 1982, will cost \$85 million.

Phosphate Rock — Phosphatic shales present in the northern part of the state were discovered in 1907 by prospectors looking for gold. Since then production of phosphate has been intermittent; most has been from the Crawford Mountains (Rich County) and the area north of Vernal in Uintah County. Presently production is from the Vernal area.

Utah ranks sixth or seventh in the production of phosphate rock in the United States. The rock is used principally for fertilizer, also for animal food supplements and industrial and food-grade products. Prices rose from an average of \$20.6 per short ton in 1979 to \$22 in 1980, with higher prices for high grade and quality. Sales were reduced because of high interest rates, tight farm credit, and bad weather conditions that kept the farmers from applying fertilizer.

Utah has sizeable reserves of phosphate. The principal occurrences are found in the following areas: Uinta Mountains, which have 1,825 million tons of reserves with better than 18 percent P_2O_5 found in the Vernal area; 191 million tons in the Flaming Gorge area, and 203 million tons in the western Uintas; in the Wasatch Range there are 24 million tons in the Dry Bread Hollow area in Weber County. (see *Phosphate in Utah*, Utah Geological and Mineral Survey Circular 66, 1980).

In 1980, **Chevron Resources**, a subsidiary of Standard Oil of California, purchased Stauffer Chemical Company's phosphate and fertilizer holdings in Utah for \$130 million. The holdings include Utah's only active phosphate mine and mill, at Vernal, in Uintah County; a fertilizer plant at Garfield, near Salt Lake City, and a rail terminal at Phoston in Heber Valley in Wasatch County.

Chevron Resources plans to make fertilizer from the phosphate rock, using sulfur extracted from gas produced by Chevron from the Carter Creek field in southwestern Wyoming to convert the phosphate rock to phosphoric acid. If the proposed synfuel projects near Vernal becomes reality, by-product nitrogen will also be used for making fertilizer. Present capacity of the plant is about 450,000 tons of phosphate concentrates a year; new construction is planned to increase the capacity to 750,000 tons. Estimated reserves owned by Chevron Resources are about 700 million tons.

Potash — In 1916 solar salt plants were used to produce potash (K_2O) from brines of the Bonneville Salt Flats in western Utah. Magnesium salts and sodium

sulfate are also recovered from the concentrated brines of the Great Salt Lake (Table 14).

Bedded salt deposits containing potash were discovered in 1924 at the northern end of the Paradox Basin in southeastern Utah, in wells drilled for oil and gas. In 1969 Texas Gulf Sulfur Company began production of potash from sylvite near Moab in Grand County. Thick deposits (up to 14,000 feet) of salt in the Paradox Basin cover an area of more than 6,000 square miles in Utah; in addition to being a source of potash, this salt has potential for the storage of petroleum and for the disposal of radioactive wastes.

Three companies produced potash in Utah in 1980. *Great Salt Lake Minerals and Chemical Corporations* recovers the potash from Great Salt Lake brines, concentrating them in solar ponds in Weber County. *Kaiser Aluminum and Chemical Company* in western Tooele pumps potassium-rich brines from wells in Lake Bonneville sediments, and then concentrates them into solar ponds. *Texas Gulf, Inc.* (Grand County) recovers potassium from Pennsylvanian evaporites near Moab from depths of 4,000 feet by dissolving the salts with water and pumping them to the surface for recovery.

Data on Utah's production of potash is not revealed. Average prices for potash have been increasing rapidly, from 76 cents per metric ton unit of K_2O in 1978 to 95 cents in 1979 and 130 cents in 1980.

In 1980 *Phillips Petroleum* had obtained an option to explore for potash on 60,000 acres of land in the Ten Mile Wash area, 15 miles northwest of Moab in Grand County.

Salt (Sodium Chloride) — Common salt has been extracted from the brine of Great Salt Lake by solar evaporation, or simply collected from around the lake, since before the coming of the first white settlers to Utah. The early settlers also produced salt from open pit mines near Salina, Nephi and Manti in central Utah.

Production of common salt in 1980 was down to 1,157,000 short tons from 1979's 1,204,000 short tons (Table 2), in part because the mild winter resulted in a smaller demand for deicing salt. Prices were up, from an average price of \$12.23 per ton in 1979 to \$16.74 in 1980. Presently most of the common salt in Utah is produced by five companies from the surface brines of Great Salt Lake. Near-surface deposits of bedded salt are mined near Redmond in Sevier County; most of this salt is mixed with very fine red clay and is used primarily as stock feed.

Morton Salt Company, Salt Lake City, one of two large salt producers on the southern arm of Great Salt Lake, reports that its production of salt has been cut in half because of freshening of the lake since the con-

Table 14. Mineral content of Great Salt Lake.

Dissolved ion	Quantity (million short tons)
Sodium	1,479.50
Potassium	121.90
Magnesium	152.40
Calcium	6.70
Chloride	2,557.20
Sulfate	321.00
Lithium	0.75
Bromine	1.69
Boron	0.58

Source:

Research Section, Utah Geological and Mineral Survey.

struction of the Southern Pacific rock-fill causeway 20 years ago. The causeway has restricted movement of water in the lake. The inflow from the south and east, diluting the brine in the southern arm of the lake while that in the northern arm is relatively concentrated. Rising lake levels have also reduced the brine concentration and the potential for greater salt production. *Great Salt Lake Minerals and Chemical Corporation* Weber County, near Ogden, has completed a new salt processing plant to increase its product mix and production rate of sodium chloride.

Sulfur — Utah first produced sulfur from hot springs in the late 1860s, and it has been mined from volcanic deposits of Cove Creek and Sulfurdale in Millard and Beaver counties. Since 1906 most of Utah's sulfur has been produced as a by-product from smelting metallic sulfides and from the refining of sulfur-rich crude oil and some gas; production not reported.

Vermiculite — Vermiculite is one of a number of materials used as light weight aggregate (any material suitable for producing a concrete significantly lighter in weight than that made from normal sand and gravel), as insulation, and as a soil conditioner and growing medium. The average price in 1980 was \$194 a short ton. One Utah plant reported production of vermiculite in 1980.

References Cited

Utah Mining Association's *Management Digest*, published monthly, 1980, Salt Lake City; *The Salt Lake Tribune* and the *Deseret News*, daily, Salt Lake City; *The Tooele Bulletin*, weekly, Tooele; *Beaver County News*, weekly, Milford; *The Vernal Express*, weekly, Vernal. *Moab Times - Independent*, weekly, Moab; press releases from the U. S. Bureau of Land Management, price and production data from *Mineral Industry Surveys* (monthly) and the *Mineral Commodity Summaries*, 1981 from the U. S. Bureau of Mines, U. S. Department of the Interior, Washington, D. C.

PART II – SUMMARY OF OIL AND GAS ACTIVITIES, 1980

By Karl W. Brown¹

Summary of Drilling Activity, 1980

A total of 306 oil and gas related drilling operations were reported as completed in 1980. Four of these were drilled for gas storage and other service functions in existing fields.

A summary of the remaining 302 oil and gas test wells follows:

	Exploratory Wells (all types)	Development Wells
Successful Wells – Oil	13) 17.3%	62) 82.6%
Successful Wells – Gas	19)	78)
Dry Holes	92)	39)
TOTALS	123	179

Drilling activity was reported in 20 of Utah's 29 counties. The three most active counties accounted for 77 percent of the total wells: Uintah, 98 wells; Grand, 85 wells; and San Juan, 49 wells. The three "Thrust Belt" counties, Morgan, Rich, and Summit, reported 27 wells for 9 percent of the total. Of these, 22 were in Summit, 2 in Morgan, and 3 in Rich County.

Two significant new discoveries were completed in Summit County in the Thrust Belt near the Wyoming border. The Fawcett No. 1, a gas discovery, opened the Cave Creek field and the Bountiful Livestock No. 1, an oil and gas discovery, opened the Anschutz Ranch East field. The Cave Creek field is shut in awaiting completion of a plant to process the large reserve of sour gas. The Anschutz Ranch East field is progressing with outpost extension tests to evaluate the extent of the field.

The significant increase in the number of wells in Summit County was due to development wells being drilled in Anschutz Ranch and Pineview fields.

The concentration of activity in Uintah County came largely from the drilling and completion of gas wells in the Natural Buttes area, most in the "tight gas sand" play. Activity in Grand County was largely a total of many shallow drilling operations in the Greater Cisco oil and gas producing area.

San Juan County activity resulted mostly from the drilling of new wells within old producing areas of the Greater Aneth oil field – "infill drilling" operations. Also the development drilling in Bug field was significant.

The level of exploratory drilling – "wildcatting" in Utah in 1980, particularly the drilling of deep wells in previously untested areas, remained relatively low.

Summary of Oil and Gas Production, 1980

Production of oil and gas comes from 122 fields and 8 undesignated areas within 11 counties in the state. These fields produced a total of 24.9 million barrels of oil and 87.8 MCF of gas during 1980 from formations ranging in age from Tertiary to Mississippian.

For location, type of production (oil or gas), and producing formation, see Map 61, *Oil and Gas Fields and Pipelines of Utah, Including the Thrust Belt Area of Southwestern Wyoming, January 1982*, by Karl W. Brown and Howard R. Ritzma, available from the Utah Geological and Mineral Survey.

Acknowledgements

The following tabulations were compiled and adapted from statistical information furnished by the Committee on Statistics of Drilling, American Association of Petroleum Geologists (CSD/AAPG); Petroleum Information (PI); American Petroleum Institute (API); and the Utah State Division of Oil, Gas and Mining (DOGM).

IMPORTANT NOTE: Drilling and completion data in the following tables are based on actual dates when wells were drilled and completed either as producing wells or as dry holes and not the arbitrary dates on which completion information was made available to public files. Thus the following data differ considerably from data derived from commercial sources and published by petroleum industry associations, trade journals and professional groups.

¹Petroleum Geologist, Utah Geological and Mineral Survey.

Table 15. Summary of all wells, by type of well (with footage tabulation).

TYPE OF WELL	State Total	Successful Wells	Percent Success	Footage for All Wells	Footage for Successful Wells	Footage Percent Successful	Average Total Footage	Average Successful Footage
Exploratory	123	32	26.02	720,736	264,785	36.74	5,859.6	8,274.5
New Field Wildcat	89	12	13.49	513,899	104,928	20.53	5,743.6	8,744.0
Deeper Pool Test	1	1	100.00	9,108	9,108	100.00	9,108.0	9,108.0
Shallower Pool Test	2	2	100.00	13,730	13,730	100.00	6,865.0	6,865.0
Outposts-Extensions	31	17	54.84	186,718	117,019	62.67	6,023.1	6,883.5
Non-Exploratory								
Development	179	140	78.21	919,749	738,063	80.25	5,138.3	5,271.9
TOTAL (all wells)	302	172	56.93	1,640,485	1,002,848	61.13	5,432.1	5,830.5
Miscellaneous*	4			6,846				
TOTAL	306			1,650,050				

*Includes gas storage and water/gas injection wells.

Source:

Petroleum Information Corporation, Rocky Mountain Region Report, Four Corners – Intermountain Edition and Completion Cards, Various Reports, 1980; American Petroleum Institute (API), 1980; Committee of Statistics of Drilling, American Association of Petroleum Geologists (CSD/AAPG), 1980.

Table 16. Summary of all wells, by type of well and by county.

Type Of Well	County														Total						
	Box Elder	Cache	Carbon	Daggett	Duchesne	Emery	Garfield	Grand	Juab	Millard	Morgan	Rich	San Juan	Sanpete	Summit	Tooele	Uintah	Utah	Wasatch	Wayne	
EXPLORATORY																					
New Field Wildcat																					
Successful - Oil																					
Successful - Gas																					
Dry Hole	9	1	1	2	1	1	5	14	4	2	2	3	14	2	7	1	3	1	2	2	77
Deeper Pool Test																					
Successful - Oil																					
Successful - Gas																					
Dry Hole																					
Shallower Pool Test																					
Successful - Oil																					
Successful - Gas																					
Dry Hole																					
Outpost - Extensions																					
Successful - Oil																					
Successful - Gas																					
Dry Hole																					
NON EXPLORATORY																					
Development																					
Successful - Oil																					
Successful - Gas																					
Dry Hole																					
Miscellaneous																					
TOTAL	9	1	2	2	13	1	5	85	4	2	2	3	49	2	22	1	98	1	2	2	306

Source:

Petroleum Information Corporation, Rocky Mountain Region Report, Four Corners – Intermountain Edition and Completion Cards, Various Reports, 1980; American Petroleum Institute (API), 1980; Committee of Statistics of Drilling, American Association of Petroleum Geologists (CSD/AAPG), 1980.

Table 17. Oil and gas production, by county and field (alphabetically), 1980.

County/Field	No. of Wells Producing	Status	Annual Oil (bbls)	Cumulative Gas (MCF)	All Time Oil (bbls)	Cumulative Gas (MCF)
Box Elder						
Rozel Point	0	P&A	0	0	2,421	0
Total	0		0	0	2,421	0
Carbon						
Clear Creek	3		0	102,580	0	135,142,802
Farnham Dome		SI	0	0	0	2,547,418
Grassy Trail		P&A	0	0	4,147	0
Peters Point	12		12,806	399,524	122,601	2,151,295
Nine Mile	1		0	14,954	0	398,022
Stone Cabin		P&A	0	0	0	369,997
Undesignated	1		0	7,755	111	40,579
Total	17		12,806	524,813	126,859	141,650,131
Daggett						
Clay Basin	16		5,434	1,836,006	318,390	139,327,328
Total	16		5,434	1,836,006	318,390	139,327,328
Duchesne						
Altamont-Bluebell	301		7,444,810	11,506,568	126,433,525	162,236,123
Blacktail Ridge		P&A	0	0	4,810	11,602
Castle Peak	1		1,688	1,914	131,284	137,572
Chokecherry		P&A	0	0	7,340	6,224
Cottonwood Wash		P&A	0	0	32,958	22,512
Duchesne	1		10,248	3,609	616,012	204,537
Eight Mile Flat		P&A	0	0	16,469	0
Flat Mesa		P&A	0	0	54,500	0
Indian Ridge	2		32,136	139,801	215,840	635,351
Monument Butte	11		17,047	28,293	681,490	380,663
Nutter Canyon	1		999	7,708	53,563	73,090
Pleasant Valley		P&A	0	0	2,886	0
Rock Creek		P&A	0	0	903	1,744
Sowers Canyon	1		234	34	2,564	27,684
Starr Flat		P&A	0	0	10,970	4,842
Undesignated	17		351,310	587,085	1,149,732	1,571,033
Total	335		7,858,472	12,275,012	129,414,846	165,312,977
Emery						
Ferron	5		0	137,399	38,771	8,388,898
Grassy Trails	1		2,265	0	130,392	0
Total	6		2,265	137,399	169,163	8,388,898
Garfield						
Upper Valley	24		674,312	0	19,137,766	0
Undesignated		P&A	0	0	1,969	0
Total	24		674,312	0	19,139,735	0
Grand						
Agate	1		0	9,258	196,975	160,594
Bar X	11		0	586,549	203	17,924,557
Big Flat		P&A	0	0	82,600	51,710
Blaze Canyon	1		532	0	17,846	0
Bookcliffs	1		0	7,065	0	384,261
Bryson Canyon	7		0	347,733	0	9,252,699
Bull Canyon		P&A	0	0	10,564	200
Cisco Area (Greater)	32		41,822	1,467,534	290,616	6,846,827
Danish Wash		P&A	0	0	0	66,042
Diamond Ridge		P&A	0	0	0	261,455
East Canyon	3		0	164,159	3,028	5,997,525
Fence Canyon	1		136	55,930	1,049	742,265
Gravel Pile	1		222	0	8103	39,529
Horse Point	3		0	177,634	0	1,792,329

(continued)

Table 17 continued

County/Field	No. of Wells		Annual Cumulative		All Time Cumulative	
	Producing	Status	Oil (bbls)	Gas (MCF)	Oil (bbls)	Gas (MCF)
Left Hand Canyon		P&A	0	0	20,003	59
Long Canyon	1		18,191	16,941	795,754	871,008
Moon Ridge	1		0	32,808	0	1,306,981
Overlook	1		253	55,399	524	467,463
Pear Park	1		0	18,811	0	131,619
Salt Wash	2		13,373	16,993	1,221,328	11,663,123
San Arroyo	31		2,505	1,850,723	124,835	73,985,319
Segundo Canyon	2		0	57,176	0	1,153,912
Seiber Nose		P&A	0	0	15,584	0
Stateline	4		405	138,081	410	1,716,069
Westwater	10		0	280,887	0	31,743,232
Undesignated	18		51,999	1,029,065	140,946	1,138,664
Total	132		129,438	6,312,746	2,930,368	167,697,442
Rich						
Hogback	1		0	1,962,567	0	5,406,167
Total	1		0	1,962,567	0	5,406,167
San Juan						
Akah	1		2,779	361	465,239	437,507
Alkali Canyon		P&A	0	0	3,919	40,085
Anido Creek	3		5,308	0	696,907	498,644
Big Indian	1		6,983	996,920	142,641	20,834,073
Bluff	8		13,719	28,114	1,391,338	1,950,963
Bluff Bench		P&A	0	0	16,436	7,526
Boundary Butte	18		130,908	0	4,552,218	11,398,023
Broken Hills	1		2,284	1,379	88,654	48,296
Bug	1		8,949	4,356	8,949	4,356
Chinle Wash	1		712	11,272	4,912	2,686,406
Cleft		P&A	0	0	3,537	1,031
Cottonwood Creek		P&A	0	0	452	0
Cowboy	3		3,933	0	132,031	44
Desert Creek	1		8,142	3,494	558,275	476,520
Gothic Mesa	9		26,764	47,920	1,583,015	562,721
Grayson		P&A	0	0	6,441	5,331
Greater Aneth	499		6,740,910	7,314,832	306,457,439	294,231,623
Hatch		P&A	0	0	15,267	40,891
Ismay Flodine	24		78,633	90,663	9,829,999	16,575,363
Lisbon	13		717,594	17,078,414	43,015,271	357,704,063
Little Valley	1		9,651	1,032,643	61,038	6,172,455
Lone Mt. Creek		P&A	0	0	62,897	42,346
Mexican Hat	3		7,038	0	34,890	316
McElmo Mesa	1		11,700	18,086	2,167,613	2,559,189
Patterson Canyon	1		971	0	13,609	16,608
Rabbit Ears		P&A	0	0	54,068	154,717
Recapture Creek	8		36,577	42,643	1,727,473	2,426,624
Rockwell Flat	1		4,085	4,583	71,646	86,739
South Ismay	1		3,138	1,215	86,838	93,270
Squaw Canyon	1		42,663	44,294	71,914	66,145
Tohonaldla	2		33,534	7,429	1,830,503	845,958
Turner Bluff	1		1,520	2,400	58,625	21,200
Whitebelly Wash		P&A	0	0	58	60,154
Wilson Canyon	1		2,915	4,462	65,060	107,569
Yellow Rock	1		2,525	772	79,300	46,620
Undesignated	4		9,604	11,874	33,106	27,265
Total	609		7,913,539	26,748,126	375,391,578	720,230,641
Sanpete						
Joes Valley		SI	0	0	0	434,382
Total	0		0	0	0	434,382

(continued)

Table 17 continued

County/Field	No. of Wells Producing	Status	Annual Cumulative Oil (bbls)	Gas (MCF)	All Time Cumulative Oil (bbls)	Gas (MCF)
Summit						
Anschutz Ranch	6		146,549	7,128,631	146,549	7,128,631
Anschutz Ranch East	1		278,386	1,245,319	278,386	1,245,319
Brider Lake	4		159,947	2,988,043	10,109,817	30,607,906
Cave Creek		SI	0	0	0	0
Elkhorn	2		225,043	168,349	936,919	199,930
Lodgepole	3		84,012	16,157	272,648	68,992
Pineview	26		2,947,634	3,436,189	16,232,524	17,386,019
Undesignated	1		1,805	0	1,805	0
Total	43		3,843,376	14,982,688	27,978,648	56,636,797
Uintah						
Agency Draw		P&A	0	0	913	740
Ashley Valley	14		295,866	0	18,831,526	0
Bluebell	34		1,001,690	844,026	5,313,294	5,766,949
Bonanza	1		428	24,175	428	290,758
Brennan Bottom	3		18,403	2,958	830,324	803,459
Buck Canyon		P&A	0	0	0	485,956
Coyote Basin	1		27,519	9,124	807,260	310,933
Fence Canyon	3		36	213,643	303	4,055,163
Flat Rock	2		1,926	1,975	28,277	2,134
Gusher		SI	0	0	68,907	129,798
Halfway Hollow	3		10,527	6	102,694	2,548
Horseshoe Bend	8		1,984	109,409	163,015	13,312,804
Island	13		13,266	1,603,287	22,911	6,455,398
Main Canyon	1		883	183,740	423,154	125,095
Natural Buttes	166		139,545	13,093,208	284,903	58,459,434
Oil Springs	1		0	10,283	19,219	1,989,066
Pariette Bench	6		23,721	16,157	498,817	358,957
Pine Springs	1		66	46,193	181	152,605
Randlett		P&A	0	0	5,578	0
Red Wash (Greater)	353		2,934,563	4,367,785	114,990,506	316,338,100
Red Wash (Mesaverde)	2		299	0	16,598	1,934,056
Refuge		P&A	0	0	14,318	9,931
River Bend	1		0	5,540	0	5,540
River Junction	2		7,578	470	155,846	191,838
Rock House	5		0	103,339	8,570	7,242,819
Roosevelt	4		21,271	0	3,236,725	306,636
Seep Ridge	3		40	203,257	2,592	2,847,167
Southman Canyon	4		11,000	273,045	12,868	952,772
Undesignated	23		26,689	1,933,399	55,641	2,641,034
Total	654		4,537,299	23,045,019	145,895,368	425,171,690
Wasatch						
Undesignated		P&A	0	0	483	0
Total	0		0	0	483	0
Washington						
Anderson Junction	1		1,042	0	2,732	0
Virgin	1		671	0	8,288	0
Total	2		1,713	0	11,020	0
STATE TOTALS	1839		24,978,654	87,765,597	701,378,879	1,830,182,788

Source:

Utah Division of Oil, Gas and Mining. *Monthly Oil and Gas Production Report*, Salt Lake City, 1980.

Abbreviations used in this report:

P&A = Plugged and Abandoned

SI = Shut In

1 bbl = 42 gallons

1 MCF = 1,000 cu. ft.

Table 18. Discovery wells completed in Utah, 1980.
(See map on inside back cover for discovery well locations.)

No.	County	Field	Operator	No.	Name	Location	Date Comnc'd	Date Comp.	TD	Formation at TD	Initial Production	Formation Producing	(Gross) Interval Producing
A. SUCCESSFUL NEW FIELD WILDCATS													
1	San Juan	Bug	Wexpro	1	Bug	NESE-12-36S-25E	11-17-79	2-19-80	6383	Paradox	608 BO/D+ 1128 MCFG/D	Desert Cr. Zone Paradox Fm.	6289-93
2	San Juan	Bug	Wexpro	4	Bug	NESW-16-36S-26E	6-25-80	8-29-80	6370	Paradox	758 BO/D+ 1453 MCFG/D	Desert Cr. Zone Paradox Fm.	6284-98
3	San Juan	Unnamed	Megadon-Pool	27-1A	Lion Mesa-Fed.	NESW-27-27S-21E	4-17-80	6-20-80	8100	Paradox	80 BO/D+ 100 MCFG/D	Cane Cr. Zone Paradox Fm.	7389-7450
4	Summit	Anschutz Ranch East	Amoco	1	Bountiful Livestock	NWSW-16-4N-8E	3-29-79	1-4-80	14,045	Nugget	1054 BO/D+ 4053 MCFG/D	Nugget (L. Jur.)	13,172-13,515
5	Summit	Cave Creek	Amoco	1	Fawcett & Son	NENW-36-5N-7E	9-30-78	6-6-80	18,055	Cretaceous (sub-thrust)	66 B Cond./D+ 2207 MCFG/D	Madison (Miss.)	15,396-15,490
6	Uintah	Unnamed	Chancellor & Ridgeway	3	Rat Hole Unit	NENW-25-145-25E	9-25-79	10-9-80	4,561	Mancos	190 MCFG/D	Mancos B (Cret.)	3926-4329
7	Uintah	Unnamed	Coseka Resources	10-10-14-23	Crooked Canyon Unit	SWNE-10-14S-23E	7-5-80	12-2-80	6,880	Mancos	91 MCFG/D	Mancos B (Cret.)	6237-6380
8	Uintah	Unnamed	Coseka Resources	3-11-15-21	Wolf Point Unit - Fed.	SESW-11-15S-21E	10-31-79	7-18-80	10,216	Morrison	128 MCFG/D	Morrison (U. Jur.)	9806-68
9	Uintah	Unnamed	Cotton Pet.	1	Love Unit	NWSW-11-11S-21E	10-31-79	1-19-80	8,069	Mesaverde	1122 MCFG/D	Mesaverde (U. Cret.)	6659-7334
10	Uintah	Unnamed	Mapco Production	7-25A	Federal	SWNE-25-9S-18E	9-28-79	2-19-80	9,570	Mesaverde	331 MCFG/D	Mesaverde (U. Cret.)	9158-9387
11	Uintah	Unnamed	Pacific Transmission Supply	23-17	Federal	NESW-17-8S-23E	12-27-79	6-22-80	10,012	Mesaverde	227 MCFG/D	Wasatch (Eocene)	8260-8434
12	Uintah	Unnamed	Petrodyne Prod.	3	Jensen	NWNW-21-5S-23E	5-5-80	8-12-80	2,667	Moenkopi	375 MCFG/D	Morrison (U. Jur.)	950-969
B. SUCCESSFUL DEEPER POOL TESTS													
13	Uintah	Unnamed	Coseka Resources	2X-16-14-22	Pine Springs Unit	SWSE-16-14S-22E	9-20-79	1-21-80	9,108	Dakota	1858 MFCG/D	Dakota (L. Cret.)	9030-60
C. SUCCESSFUL SHALLOWER POOL TESTS													
14	San Juan	Squaw Canyon	McCulloch	2-19	Federal	NWNW-19-38S-26E	9-21-79	1-4-80	5,730	Akah (Paradox)	74 BO/D	Honaker Trail (U. Hermosa)	4322-94
15	Uintah	Unnamed	Cotton Pet.	12-1	Love Unit	NWNW-12-11S-21E	3-12-80	5-28-80	8,000	Wasatch	13 B Cond./D+ 1812 MCFG/D	Wasatch (Eocene)	6240-69

D. SUCCESSFUL OUTPOST – EXTENSION TESTS

16	Duchesne	Monument Butte	Paiute Oil	14-8	P.O.M.C.O.	SWNE-8-9S-17E	1-31-80	5-13-80	6,400	Green River	NA	Green River (Eocene)	4128-5090
17	Grand	Cisco	Ambra Oil & Gas	27-2-80A	Tumbleweed	NWNE-27-20S-21E	5-20-80	8-7-80	3,130	Morrison	81 BO/D (Comingled)	Dakota & Cedar Mt. (L. Cret.)	2680-2704
18	Grand	Westwater	Coseka Resources	4-30-16-24	Middle Cyn.	SWSW-30-16S-24E	4-30-80	7-31-80	5,750	Dakota	160 MCFG/D	Dakota (L. Cret.)	2800-2854
19	Grand	Westwater	Texas Oil & Gas	1	Bailey-Fed.	SWSE-9-17S-23E	11-22-80	12-20-80	5,700	Dakota	1400 MCFG/D	Dakota (L. Cret.)	5324-5366
20	San Juan	Recapture Creek	Davis Oil	1	McCracken Point - Fed.	NWNW-19-40S-23E	2-28-80	5-22-80	5,675	Hermosa	40 BO/D	Ismay Zone	5428-32
21	San Juan	Patterson Canyon	Wexpro	1	Patterson Unit	NWNE-5-38S-25E	11-29-79	4-26-80	5,888	Hermosa	294 BO/D+ 720 MCFG/D	Paradox Fm.	5532-38
22	San Juan	Bug	Wexpro	10	Bug	NENW-22-36S-26E	10-5-80	12-20-80	6,394	Paradox	57 BO/D+ 150 MCFG/D	Desert Cr. Zone	6320-30
23	Summit	Anschutz Ranch	Amoco	1-B	Island Ranch	SESE-22-4N-7E	11-10-79	4-10-80	7,303	Nugget	53 B Cond./D+ 2024 MCFG/D	Paradox Fm.	6196-7001
24	Uintah	Gypsum Hills	Belco	40-30GR	No. Duck Creek	SENW-30-8S-21E	9-20-80	11-25-80	5,698	Green River	28 BO/D	Green River (Eocene)	5262-66
25	Uintah	Roosevelt	Bow Valley	1-18-A 2E	Harrison	NESW-18-1S-2E	7-29-79	2-13-80	14,154	Wasatch	80 BO/D+ 68 MCFG/D	Wasatch (Eocene)	12,380-14,046
26	Uintah	Unnamed	Chancellor & Ridgeway	4	Rat Hole Unit	SESW-13-14S-25E	10-5-79	10-11-80	5,696	Mancos	57 MCFG/D	Mancos B (Cret.)	4898-5239
27	Uintah	National Buttes	Continental	36-7	Conoco State	SWNW-36-8S-20E	12-1-79	5-23-80	7,765	Wasatch	90 MCFG/D	Wasatch (Eocene)	6,676-6,929
28	Uintah	Unnamed	Coseka Resources	13-15-15-23	Main Cyn. Federal	NWNW-15-15S-23E	11-4-79	8-28-80	8,427	Cedar Mtn.	398 MCFG/D	Dakota (L. Cret.)	8,124-8,211
29	Uintah	Unnamed	Coseka Resources	13-17-14-23	Crooked Cyn. Unit	NWNW-17-14S-23E	10-4-79	8-5-80	9,346	Morrison	134 MCFG/D	Dakota (L. Cret.)	9,108-9272
30	Uintah	National Buttes	Pacific Transmission Supply	24-22	Federal	SESW-22-8S-22E	10-9-79	4-10-80	8,808	Mesaverde	1,366 MCFG/D	Wasatch (Eocene)	6382-8140
31	Uintah	Unnamed	Cotton Pet.	1-18A	Love Unit	SESW-18-11S-22E	8-27-80	9-16-80	6,475	Mesaverde	725 MCFG/D	Wasatch (Eocene)	5150-66
32	Uintah	Flat Rock	Del Rio	30-2A	Flat Rock	NESW-30-14S-20E	12-27-79	10-20-80	4,410	Wasatch	120 BO/D+ 28 MCFG/D	Wasatch (Eocene)	3594-4018

Sources:

Petroleum Information Corporation, Rocky Mountain Region Report, Four Corners – Intermountain Edition and Completion Cards, Various Reports, 1980.

American Petroleum Institute (API), 1980.

Committee of Statistics of Drilling, American Association of Petroleum Geologists (CSD/AAPG), 1980.

Table 19. Production, by field, 1980.

Field	No. of Wells Producing	Status	Annual Oil (bbls)	Cumulative Gas (MCF)	All Time Oil (bbls)	Cumulative Gas (MCF)
Agate	1		0	9,258	196,975	160,594
Agency Draw		P&A	0	0	913	740
Akah	1		2,779	361	465,239	437,507
Alkali Canyon		P&A	0	0	3,919	40,085
Altamont-Bluebell	335		8,446,500	12,350,594	131,746,819	168,003,072
Anderson Junction	1		1,042	0	2,732	0
Aneth (Greater)	499		6,740,910	7,314,832	306,457,439	294,231,623
Anido Creek	3		5,308	0	696,907	498,644
Anschutz Ranch	6		146,549	7,128,631	146,549	7,128,631
Anschutz Ranch East	1		278,386	1,245,319	278,386	1,245,319
Ashley Valley	14		295,866	0	18,831,526	0
Bar X	11		0	586,549	203	17,924,557
Big Flat		P&A	0	0	82,600	51,710
Big Indian	1		6,983	996,920	142,641	20,834,073
Blacktail Ridge		P&A	0	0	4,810	11,602
Blaze Canyon	1		532	0	17,846	0
Bluff	8		13,719	28,114	1,391,338	1,950,963
Bluff Bench		P&A	0	0	16,436	7,526
Bonanza	1		428	24,175	428	290,758
Book Cliffs	1		0	7,065	0	384,261
Boundary Butte	18		130,908	0	4,552,218	11,398,023
Brennan Bottom	3		18,403	2,958	830,324	803,459
Bridger Lake	4		159,947	2,988,043	10,109,817	30,607,906
Broken Hills	1		2,284	1,379	88,654	48,296
Bryson Canyon	7		0	347,733	0	9,252,699
Buck Canyon		P&A	0	0	0	485,956
Bug	1		8,949	4,356	8,949	4,356
Bull Canyon		P&A	0	0	10,564	200
Castle Peak	1		1,688	1,914	131,284	137,572
Cave Creek		SI	0	0	0	0
Chinle Wash	1		712	11,272	4,912	2,686,406
Chokecherry		P&A	0	0	7,340	6,224
Cisco (Greater)	32		41,822	1,467,534	290,616	6,846,827
Clay Basin	16		5,434	1,836,006	318,390	139,327,328
Clear Creek	3		0	102,580	0	135,142,802
Cleft		P&A	0	0	3,537	1,031
Cottonwood Creek		P&A	0	0	452	0
Cottonwood Wash		P&A	0	0	32,958	22,512
Cowboy	3		3,933	0	132,031	44
Coyote Basin	1		27,519	9,124	807,260	310,933
Danish Wash		P&A	0	0	0	66,042
Desert Creek	1		8,142	3,494	558,275	476,520
Diamond Ridge		P&A	0	0	0	261,455
Duchesne	1		10,248	3,609	616,012	204,537
East Canyon	3		0	164,159	3,028	5,997,525
Eight Mile Flat		P&A	0	0	16,469	0

(continued)

Table 19 continued

Field	No. of Wells Producing	Status	Annual Oil (bbls)	Cumulative Gas (MCF)	All Time Oil (bbls)	Cumulative Gas (MCF)
Elkhorn	2		225,043	168,349	936,919	199,930
Farnham Dome		SI	0	0	0	2,547,418
Fence Canyon	4		172	269,573	1,352	4,797,428
Ferron	5		0	137,399	38,771	8,388,898
Flat Mesa		P&A	0	0	54,500	0
Flat Rock	2		1,926	1,975	28,277	2,134
Gothic Mesa	9		26,764	47,920	1,583,015	562,721
Grassy Trail	1		2,265	0	134,539	0
Gravel Pile	1		222	0	8,103	39,529
Grayson		P&A	0	0	6,441	5,331
Gusher		SI	0	0	68,907	129,798
Halfway Hollow	3		10,527	6	102,694	2,548
Hatch		P&A	0	0	15,267	40,891
Hogback Ridge	1		0	1,962,567	0	5,406,167
Horse Point	3		0	177,634	0	1,792,329
Horseshoe Bend	8		1,984	109,409	163,015	13,312,804
Indian Ridge	2		32,136	139,801	215,840	635,351
Island	13		13,266	1,603,287	22,911	6,455,398
Ismay Flodine	24		78,633	90,663	9,829,999	16,575,363
Joes Valley		SI	0	0	0	434,382
Lefthand Canyon		P&A	0	0	20,003	59
Lisbon	13		717,594	17,078,414	43,015,271	357,704,063
Little Valley	1		9,651	1,032,643	61,038	6,172,455
Lodgepole	3		84,012	16,157	272,648	68,992
Lone Mt. Creek		P&A	0	0	62,897	42,346
Long Canyon	1		18,191	16,941	795,754	871,008
Main Canyon	1		883	183,740	423,154	125,095
McElmo Mesa	1		11,700	18,086	2,167,613	2,559,189
Mexican Hat	3		7,038	0	34,890	316
Monument Butte	11		17,047	28,293	681,490	380,663
Moon Ridge	1		0	32,808	0	1,306,981
Natural Buttes	166		139,545	13,093,208	284,903	58,459,434
Nine Mile Canyon	1		0	14,954	0	398,022
Nutter Canyon	1		999	7,708	53,563	73,090
Oil Springs	1		0	10,283	19,219	1,989,066
Overlook	1		253	55,399	524	467,463
Pariette Bench	6		23,721	16,157	498,817	358,957
Patterson Canyon	1		971	0	13,609	16,608
Pear Park	1		0	18,811	0	131,619
Peters Point	12		12,806	399,524	122,601	2,151,295
Pineview	26		2,947,634	3,436,189	16,232,524	17,386,019
Pine Springs	1		66	46,193	181	152,605
Pleasant Valley		P&A	0	0	2,886	0
Rabbit Ears		P&A	0	0	54,068	154,717
Randlett		P&A	0	0	5,578	0
Recapture Creek	8		36,577	42,643	1,727,473	2,426,624
Red Wash (Greater)	353		2,934,563	4,367,785	114,990,506	316,338,100
Red Wash (Mesaverde)	2		299	0	16,598	1,934,056

(continued)

Table 19 continued

Field	No. of Wells Producing	Status	Annual Cumulative		All Time Cumulative	
			Oil (bbls)	Gas (MCF)	Oil (bbls)	Gas (MCF)
Refuge		P&A	0	0	14,318	9,931
River Bend	1		0	5,540	0	5,540
River Junction	2		7,578	470	155,846	191,838
Rock Creek		P&A	0	0	903	1,744
Rockhouse	5		0	103,339	8,570	7,242,819
Rockwell Flat	1		4,085	4,583	71,646	86,739
Roosevelt	4		21,271	0	3,236,725	306,636
Rozel Point		P&A	0	0	2,421	0
Salt Wash	2		13,373	16,993	1,221,328	11,663,123
San Arroyo	31		2,505	1,850,723	124,835	73,985,319
Seep Ridge	3		40	203,257	2,592	2,847,167
Segundo Canyon	2		0	57,176	0	1,153,912
Seiber Nose		P&A	0	0	15,584	0
South Ismay	1		3,138	1,215	86,838	93,270
Southman Canyon	4		11,000	273,045	12,868	952,772
Sowers Canyon	1		234	34	2,564	27,684
Squaw Canyon	1		42,663	44,294	71,914	66,145
Starr Flat		P&A	0	0	10,970	4,842
Stateline	4		405	138,081	410	1,716,069
Stone Cabin		P&A	0	0	0	369,997
Tohonadla	2		33,534	7,429	1,830,503	845,958
Turner Bluff	1		1,520	2,400	58,625	21,200
Upper Valley	24		674,312	0	19,137,766	0
Virgin	1		672	0	8,288	0
Westwater	10		0	280,887	0	31,743,232
Whitebelly Wash		P&A	0	0	58	60,154
Wilson Canyon	1		2,915	4,462	65,060	107,569
Yellow Rock	1		2,525	772	79,300	46,620
Undesignated	64	2 (P&A)	441,407	3,569,178	1,383,793	5,418,575
TOTALS	1839		24,978,654	87,765,597	701,378,879	1,830,182,788

Source:

Utah State Division of Oil, Gas and Mining, *Monthly Oil and Gas Production Report*, 1980.

Abbreviations used in this Report:

P&A = Plugged and Abandoned

1 bbl = 42 gallons

SI = Shut In

1 MCF = 1,000 cu. ft.

Table 20. Footage drilled, by County, 1980.

County	Total No. of Wells Drilled	Total Footage	Number of wells in various footage catagories						
			0' to 1,999'	2,000' to 4,499'	4,500' to 7,999'	8,000' to 11,999'	12,000' to 16,499'	16,500' to 21,999'	22,000' +
Beaver	0								
Box Elder	9	14,520	1	5	2		1		
Cache	1	2,287		1					
Carbon	2	3,100		2					
Daggett	2	4,407		2					
Davis	0								
Duchesne	13	86,569			4	3	6		
Emery	1	9,450				1			
Garfield	5	26,558	3		2				
Grand	85	301,594	12	47	25	1			
Iron	0								
Juab	4	61,392					3	1	
Kane	0								
Millard	2	17,166			1	1			
Morgan	2	24,333			1			1	
Piute	0								
Rich	3	32,198		1			1	1	
Salt Lake	0								
San Juan	49	199,216	11		36	2			
Sanpete	2	5,330		2					
Sevier	0								
Summit	22	181,650		3	8	6	4	1	
Tooele	1	7,864			1				
Uintah	98	630,219	3	2	64	24	5	1	
Utah	1	13,000							
Wasatch	2	12,009		1		1			
Washington	0								
Wayne	2	11,745		1	1				
Weber	0								
Total	306	1,644,607	30	67	145	39	21	4	

Source:

Petroleum Information Corporation, Rocky Mountain Region Report, Four Corners – Intermountain Edition & Completion Cards, Various Reports, 1980.