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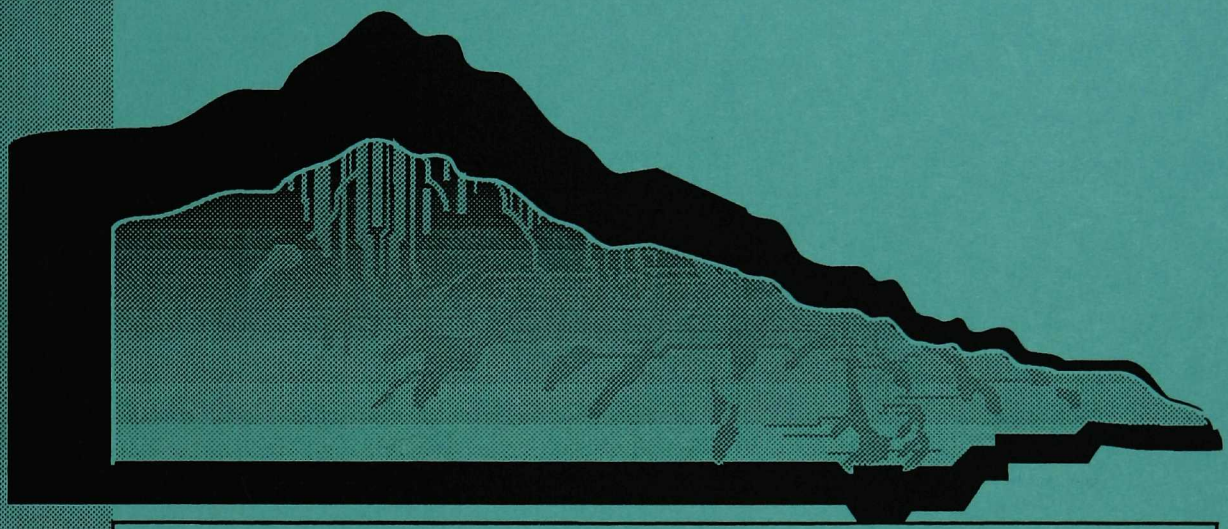
Colorado Mineral and Mineral Fuel Activities, 1994



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Division of Minerals and Geology
Department of Natural Resources
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COLORADO MINERAL AND MINERAL FUEL ACTIVITIES, 1994

INTRODUCTION

The Colorado oil and gas industry, as in previous years, was a significant contributor to the economy of the state. The value of production in 1994 is $445 million for oil, $564 million for natural gas, and $27 million for carbon dioxide for a total value of $1,036 million. In 1993 the value of production was $509 million for oil, $659 million for natural gas, and $59 million for carbon dioxide for a total value of $1,227 million. Sales have exceeded the $1 billion mark in each of the last five years.

In 1994, Colorado coal production achieved a record high at over 26 million tons. At an estimated average price of $15 per ton, the value of 1994 production is approximately $400 million.

According to U.S. Bureau of Mines estimates, the total value of non-fuel mineral production in Colorado in 1994 was about $440 million, up $8 million from the $432 million reported in 1993. This 2% expansion was due chiefly to increased production of gold, lead, zinc, dimension stone, construction sand, gravel, and aggregate. Declines in the value and quantity of molybdenum produced in the state offset some of the gains in the construction material industry.

The total value of produced mineral and mineral fuel resources in Colorado for 1994 is an estimated $1,876 million down from $2,098 million in 1993.

OIL AND GAS

Production and Prices

Colorado natural gas production rose to historic levels in 1994 as did carbon dioxide production; oil production declined slightly (Figure 1). Table 1 shows Colorado's oil and gas production for 1993 and 1994.

YEAR	OIL, BARRELS	AVERAGE PRICE PER BARREL	GAS, MCF	AVERAGE PRICE PER MCF	CARBON DIOXIDE, MCF	AVERAGE PRICE PER MCF	PRODUCING WELLS
1993	31,356,602	$16.23	433,831,322	$1.52	269,427,188	$0.22	13,592
1994(E)	28,248,969	$15.74	473,145,448	$1.30	306,114,102	$0.09	12,592

TABLE 1: Production and price figures for oil and gas in Colorado during 1993 and 1994. Production data for 1993 are from the Colorado Oil and Gas Conservation Commission (COGCC). Oil and gas prices are from the COGCC. Production data and well counts for 1994 are from Petroleum Information and are not yet final.

COLORADO OIL & GAS PRODUCTION

1975 TO THE PRESENT

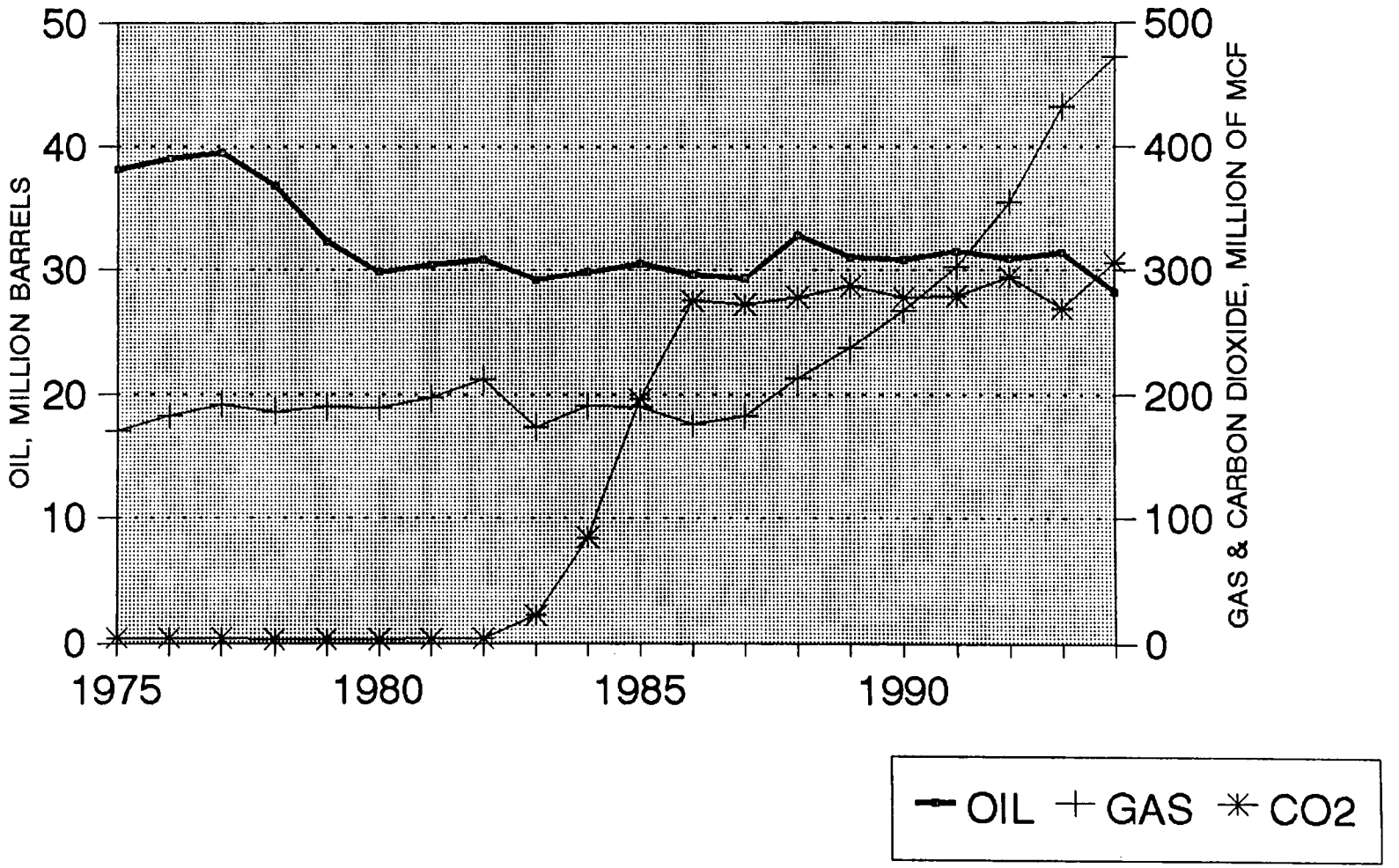

Figure 1

Drilling Activity

A total of 2,008 drilling permits were issued by the Colorado Oil and Gas Conservation Commission (COGCC) in 1994, slightly down from the 2,065 permits issued in 1993. A total of 940 permits were for sites in Weld County, one of the most active counties for oil and gas drilling in recent years. In 1993, there were 1,227 well permits issued for Weld County. Approximately 500 of the 1994 Weld County permits were sought by one operator, Snyder Oil.

In 1994 a total of 1,189 wells were drilled in the state, down slightly from the 1,358 wells drilled in 1993. An estimated 275 of the 1994 wells drilled were wildcats. According to the Oil and Gas Journal, the 1994 rig count for Colorado averaged 30, down slightly from the 1993 average of 34 rigs. In 1994 an estimated 9,992 people in the state were employed in the oil and gas extraction portion of the petroleum industry.

Production

In 1993 the Denver Basin's Wattenberg field was one of the most active fields in the United States, and production surged from 3.5 million barrels of oil in 1992 to 5.8 million barrels in 1993 from 5,800 producing wells (Energy Information Administration [EIA]). In 1994 the COGCC implemented restrictive Wattenberg field rules throughout Weld County, and mandated casing protection for all fresh water aquifers in the Denver Basin through the Fox Hills Sandstone.

The Raton Basin of southeast Colorado was opened to production with the late 1994 completion of a 24 mile Colorado Interstate Gas pipeline in Las Animas County. The line connects Amoco and Evergreen Resources coalbed methane wells to Trinidad where the gas is sold locally and along the Front Range. In addition, Meridian Oil completed a Cretaceous Pierre discovery in Huerfano County in Sec. 25, T. 28 S., R. 69 W. which flowed 200 thousand cubic feet (MCF) per day from perforations at 4,815 to 5,005 feet (Oil & Gas Journal).

In northwestern Colorado, Barrett Resources greatly expanded its oil and gas reserves in 1994 with acquisitions and increased drilling density in its Piceance Basin Wasatch and Mesaverde fields. In the Sand Wash Basin, Basin Exploration discovered a new Entrada-Nugget zone at Hiawatha West field in Moffat County. Western Gas Resources Inc. of Denver made a discovery in Sec. 9, T. 9 N., R. 93 W. in a 9,400 feet Cretaceous Almond test (Hart's Oil and Gas World).

In the Paradox Basin of southwestern Colorado, PetroCorp Inc. of Houston drilled several successful Pennsylvanian Paradox Formation wells and will continue drilling. Petrocorp recently bought an additional 40% working interest in its 74,000 acre Ute Mtn Ute Indian lease for $2 million. Celsius Energy Co. of Salt Lake City made two new Paradox discoveries in Sec. 3, T. 37 N., R. 19 W. and Sec. 35, T. 38 N., R. 19 W. (Hart's Oil and Gas World).

To the southeast in the San Juan Basin, new coalbed methane drilling decreased drastically with the expiration of the qualifying period for the Section 29 tax credit at the end of 1992. However, tight gas sands have regained operators' attention. Higher production rates come from dewatering methane wells and recompletions of deeper gas sands as new technologies are applied. For example, Amoco is automating its 3,800 wells

with on-site terminals and solar-powered batteries. Amoco is also recavitating coalbed methane wells to improve production, drilling horizontal wells, and experimenting with enhanced recovery using N_2 and CO_2 injection (Oil & Gas Journal).

The North Park Basin is an area of the state about to experience a major loss of production. Jackson County faces the imminent loss of its natural gas supply as Canadian field goes out of production (Hart's Oil & Gas World). In an effort to assist the county, the Colorado State Land Board reduced its royalty rate in the county from 12½% to 6¼% for operators that drill in the first year of a new lease.

Reserves

The EIA listed a decrease in proved oil and an increase in proved gas reserves for Colorado at the end of 1993. Proved oil reserves declined nearly 7% in 1993 from 304 million barrels in 1992 to 284 million barrels in 1993. Field extensions contributed to natural gas reserves increase from 6,463 billion cubic feet (BCF) in 1992 to 6,979 BCF in 1993. Coalbed methane reserves also contributed to the general gas reserve increase by rising from 2,716 at the end of 1992 to 3,107 BCF at the end of 1993 (EIA).

Unconventional Reservoirs

Six horizontal wells and 97 coalbed methane wells were drilled in Colorado during 1992 (Oil & Gas Journal). In December of 1994, Petroleum Information counted 1,008 producing coalbed methane wells in Colorado, up from 942 in December of 1992. Coalbed methane production of approximately 134 BCF from the San Juan and Piceance Basins accounted for 31% of Colorado's flammable gas production in 1993. The 1994 coalbed methane production listed by Petroleum Information was 196 BCF or 40% of the estimated hydrocarbon gas production. Petroleum Information records a cumulative production of over 518 BCF of coalbed methane since the late 1980s.

Permitting and completion of new coalbed methane wells declined drastically in 1993 with the expiration of the qualifying period of the nearly $.90 per MCF tax credit at the end of 1992. Permits and completions in 1994 have continued that decline. Petroleum Information reported 34 coalbed methane well permits and 79 completions in 1993 and 59 permits and 27 completions for 1994.

COAL

The Colorado coal industry has exhibited an overall trend of production growth through the 1970s, 1980s, and early 1990s (Figure 2). In 1993 and 1994 Colorado coal companies produced record amounts of coal. Production in 1994 was 26,033,591 tons, up 19% from the 1993 figure of 21,835,000 tons. In 1994 coal was produced at 17 mines throughout the state, the largest being the Cyprus-Amax Twentymile Mine in Routt County with just over 5 million tons. In October the Twentymile Mine set a world record for monthly coal production from an underground mine; the mine produced 546,000 tons using a longwall mining system. The Colowyo Mine in Moffatt County and the West Elk Mine in Gunnison County were not far behind, each producing approximately 4.4 million tons.

COLORADO COAL PRODUCTION

1960 TO THE PRESENT

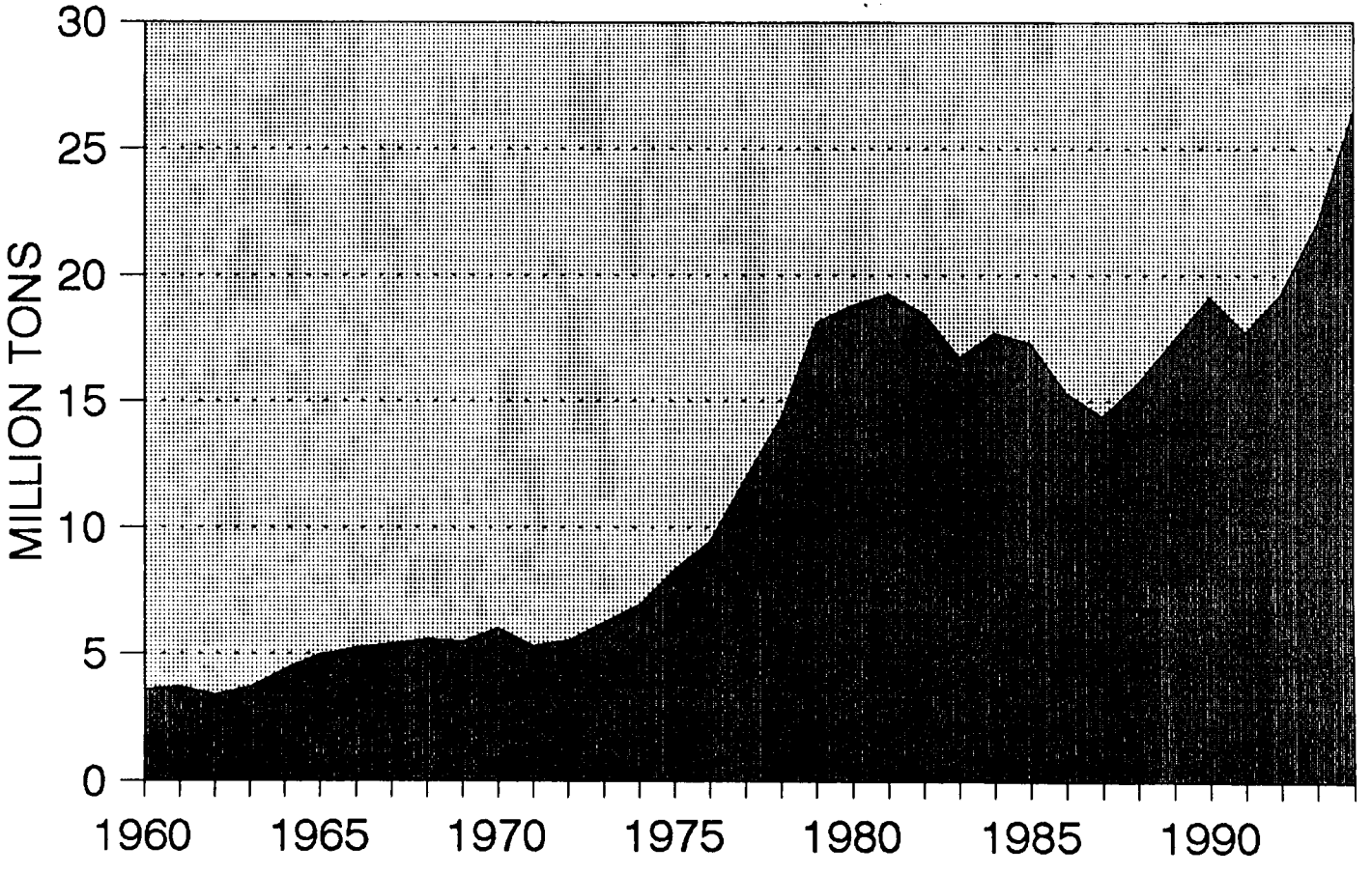

Figure 2

The Colorado coal industry should continue to experience growth over the next several years. American electricity producers and others in Pacific Rim countries, such as Japan, desire the low sulfur, high BTU, Western USA coals to blend with other supplies.

NON FUEL MINERALS

MOLYBDENUM

Cyprus-Amax announced in January 1993 that it was planning to cut production at the Henderson Mine by 40% because of an oversupply of molybdenum, low prices, and weakened demand due to the recession of 1991-1992. Production in 1993 was 24 million pounds of molybdenum oxide, down substantially from the 1992 figure of 33 million pounds (Figure 3). The price of molybdenum oxide in 1993 rose from $1.90 per pound to $2.75 at year's end. During the first half of 1994, European economies became more robust as they climbed out of recession. Demand for molybdenum increased, and by the end of 1994 the price of molybdenum oxide had skyrocketed to over $15 per pound. As of March 1995, the price on the London Metal Exchange is stable at about $14-$15 per pound.

Cyprus-Amax began to increase production at the Henderson Mine, Clear Creek County, in mid-1994 and ended the year with a production of 26.5 million pounds of molybdenum oxide. Approximately 9 million pounds were produced in the fourth quarter alone. The company began planning for further increases in production in 1994 by replacing worn out equipment at the Henderson Mine and announcing the reopening of the Climax Mine in Lake County.

Industry analysts forecast a 1995 molybdenum oxide production in Colorado of approximately 50 million pounds due to increased production at the Henderson Mine and the scheduled April reopening of the open pit mine at Climax. There are about 440 employees at the Henderson Mine. The Climax Mine will employ about 100 Cyprus-Amax staff in the mill and plant. About 50 contract miners will operate in the Climax open pit.

PRECIOUS METALS

Gold production in Colorado increased approximately 7% from 136,000 ounces in 1993 to an estimated 145,000 ounces in 1994. Gold production had declined to approximately 65,000 ounces in 1991 (Figure 4) due primarily to the exhaustion of minable reserves at the Summitville Mine in Rio Grande County. Production increases since then are due to two new significant gold producers in the state, the San Luis Gold Mine which has attained its planned production level, and the Pikes Peak Mining Company's deposits in the Cripple Creek district. Gold is also produced as a by-product of base metal mining at the Black Cloud Mine in the Leadville district.

Production of gold in 1994 at Battle Mountain's San Luis Gold Mine in Costilla County was 73,000 ounces, up slightly from 72,000 ounces in 1992. The San Luis deposit (also known as El Plomo) contained about 12,149,000 tons of ore at 0.04 ounce per ton gold prior to the commencement of mining in 1991. Current minable reserves are 222,000 ounces of gold, enough at the current production rate for three more years of mining. The mine and mill are currently operating at their planned capacity. The total operating cost in 1994 was $317 per ounce as compared to $329 in 1993 and $463 in 1992. Battle

COLORADO MOLYBDENUM PRODUCTION

1970 TO THE PRESENT

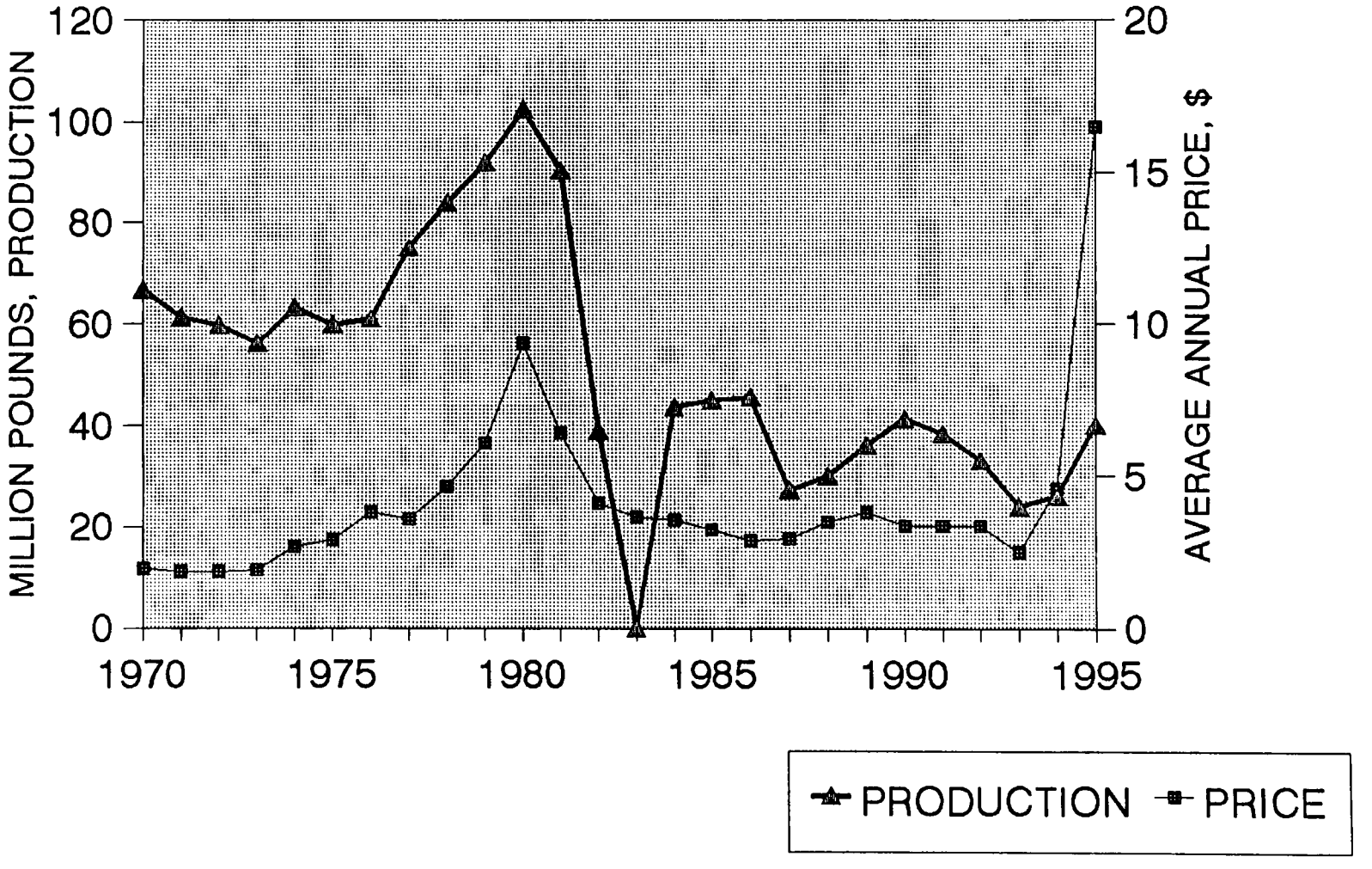

Figure 3

COLORADO GOLD PRODUCTION

1968 TO THE PRESENT

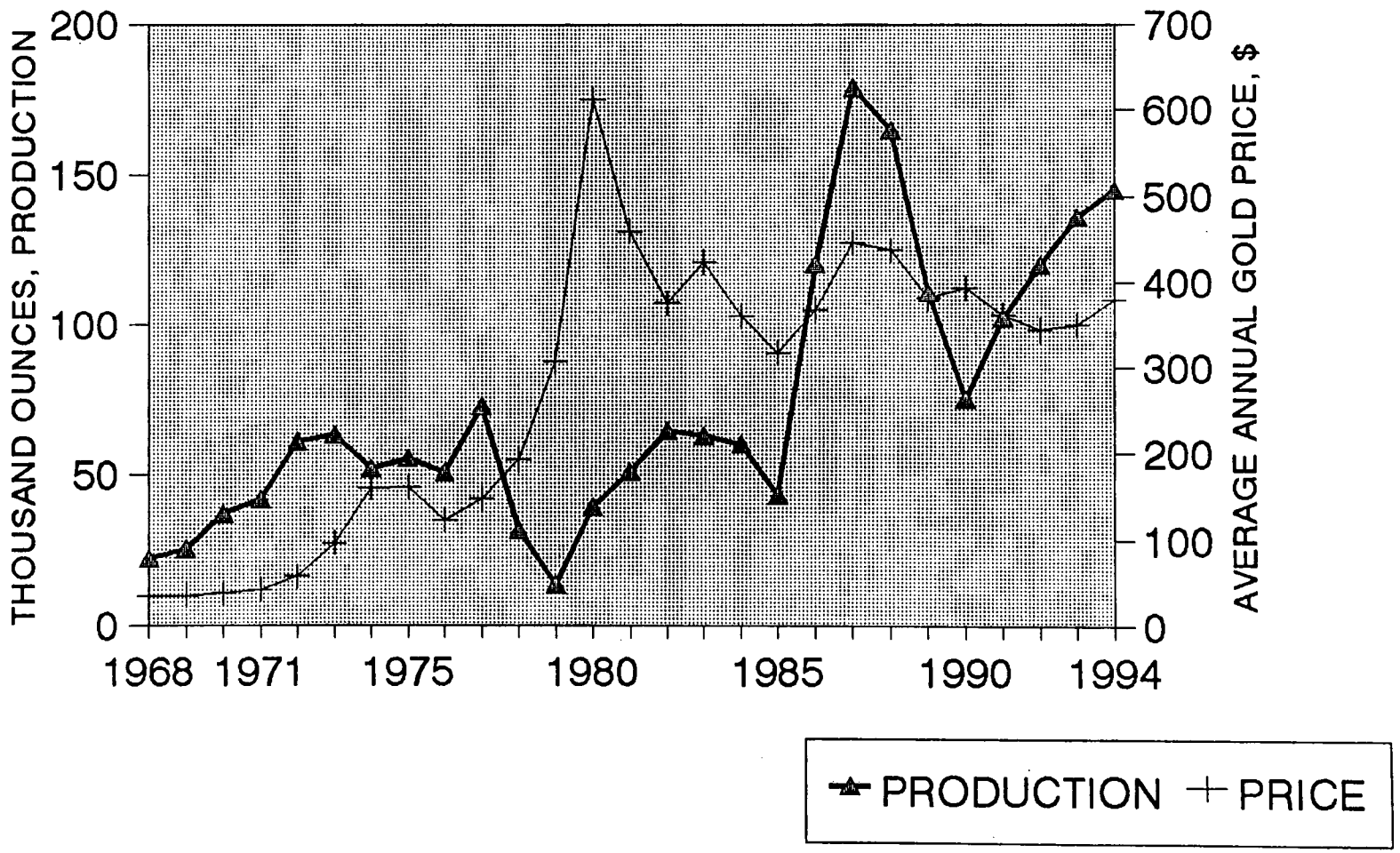

Figure 4

Mountain forecasts 1995 production will decrease to 68,000 ounces due to lower ore grades.

The Cripple Creek and Victor Gold Mining Company, a joint venture partnership between Pikes Peak Mining Company (a subsidiary of Independence Mining Company) and Golden Cycle Gold Corporation, produced 55,000 ounces of gold from the Ironclad open pit in 1994. Processing improvements lead to an approximate 10% increase in gold recovery from the 1993 level of 49,000 ounces. The Ironclad Mine was closed in the fall of 1994. Both the Ironclad and Globe Hill open pits are currently being reclaimed.

Cripple Creek and Victor Gold Mining Company received their amended permit for the new Cresson Mine in April 1994. Construction of the open pit mine, mill, beneficiation facility, and the valley-leach pad began in May and was completed in February 1995. The first gold bar from the Cresson Mine was poured in the third week of February. Estimated total construction cost is $86 million.

The Cresson Mine has a 1994 proven and probable reserve of 73 million tons at a grade of 0.03 ounce of gold per ton for a total of 2.2 million ounces. There is an additional 1.4 million ounces of gold at the mine that have been classified as a resource. The deposit has an overall strip ratio of 1.7:1 and a leach pad recovery of 70 to 80%. The current mine plan calls for a daily mining rate of 60,000 tons with an estimated 1995 recovery of 100,000 ounces rising to 165,000 ounces in 1996.

Pikes Peak Mining Company conducted 12,500 feet of reverse circulation drilling on exploration targets in the Cripple Creek district during 1994. The exploration drilling intersected several zones of favorable mineralization. The 1995 exploration plan calls for 55,000 feet of drilling.

Sunshine Mining Company has entered into a lease agreement on the presently-closed Revenue-Virginius Mine near Ouray, Colorado. Over 14.5 million ounces of silver were produced during the mine's history from narrow, high-grade, tetrahedrite veins. The company began a reserve delineation program with seven surface and underground drillholes during 1994. Silver is found in association with the tetrahedrite, a complex copper-antimony sulfide, which can be successfully treated using Sunshine's patented hydro-metallurgical process. Proven and probable reserves at the Virginius Mine are 410,000 tons of ore containing approximately 5 million ounces of silver.

Other mines in the state that produced minor amounts or by-product gold in 1994 include the Black Cloud Mine in Leadville and the Franklin Mine near Idaho Springs, Colorado.

BASE METALS

The Black Cloud Mine near Leadville is the state's sole significant base metal producer. The mine has a capacity of 900 tons per day and operates from two underground shafts. Staffing at the mine will remain at 135 to 150 employees as long as metal prices remain at current levels.

The orebody is a complex massive sulfide replacement deposit in the Mississippian age Leadville Limestone. The ore grade is 7-9% lead, 3-5% zinc, 2 ounces per ton silver, and 0.08 ounces per ton gold.

CONSTRUCTION MATERIALS AND INDUSTRIAL MINERALS

The sand, gravel, and aggregate industry throughout the state has enjoyed another good year. Approximately 45 million tons of sand, gravel, and aggregate were produced in the state in 1994, slightly down from 47 million tons in 1993 (Figure 5). The value of the 1994 production is estimated to be $190 million. The decrease in production is due to the completion of the new Denver International Airport and a slowdown in new home and commercial construction. Production in 1995 is projected to decline slightly.

The Colorado Yule Marble Company is mining white marble from the historic Yule Marble Quarry near Marble, Colorado. In 1994 the company produced 4,400 tons of salable marble primarily as 15 to 20 ton blocks. Approximately 15% of the production was sent overseas, primarily to Italy, Japan, and Indonesia, where it is fabricated into consumer products.

Gypsum production in 1994 at the Eagle Mine near the town of Gypsum, Eagle County was at nameplate capacity, 400,000 tons, up 20% from the 1993 production of 337,000 tons. Approximately 45% of the wallboard produced at the plant goes to the Colorado construction industry and the remainder is marketed throughout the USA.

The White River Nahcolite Company substantially increased their 1994 production from the 1992 level of 20,000 tons of nahcolite, $NaHCO_3$, but are still below the plant nameplate capacity of 125,000 tons a year at their solution mine in the Piceance Basin, Rio Blanco County. The company produces both food and industrial grade sodium bicarbonate from the 25 foot-thick "Boies Bed", a Tertiary age lacustrine deposit, at a depth of 2,000 feet. They are currently drilling solution cavity no. 4 which has a projected yield of 125,000 tons at a well spacing of 3,000 feet.

In a related development, Natrona Resources Inc. of Glenwood Springs has commissioned initial engineering designs for a sodium bicarbonate and soda ash plant and solution mine on more than 7,000 acres of lease holdings just to the east of the White River Nahcolite Company Mine.

EXPLORATION ACTIVITIES

American Copper and Nickel Co. conducted a stream sediment sampling reconnaissance program for Proterozoic-hosted, massive sulfide, base metal deposits in various parts of the state in 1993 and part of 1994. Corporate restructuring has resulted in the closure of the Denver office and the cancellation of future exploration programs in Colorado.

Challenger Gold, Inc. discontinued its gold exploration program on the Baca Land Grant property along the foothills of the Sangre de Cristo Mountains in Saguache County after finding "live" oil in the drill cuttings of some of their exploration drillholes. Further investigation indicated the source of the oil is Cretaceous age sedimentary rocks buried under shallow valley alluvium. Prior to this discovery, it was thought there were no Cretaceous age rocks in this part of the Sangre de Cristo Mountains. Challenger is currently assessing the opportunity for an oil exploration program in the area.

Hendricks Minerals Canada Ltd. completed 14,000 feet of surface and underground diamond drilling at the Cross Mine in the Caribou district, Boulder County. The Cross Mine is thought to be a stockwork vein gold deposit associated with the contact of a Tertiary

COLORADO SAND, GRAVEL, & AGGREGATE PRODUCTION
1980 TO THE PRESENT

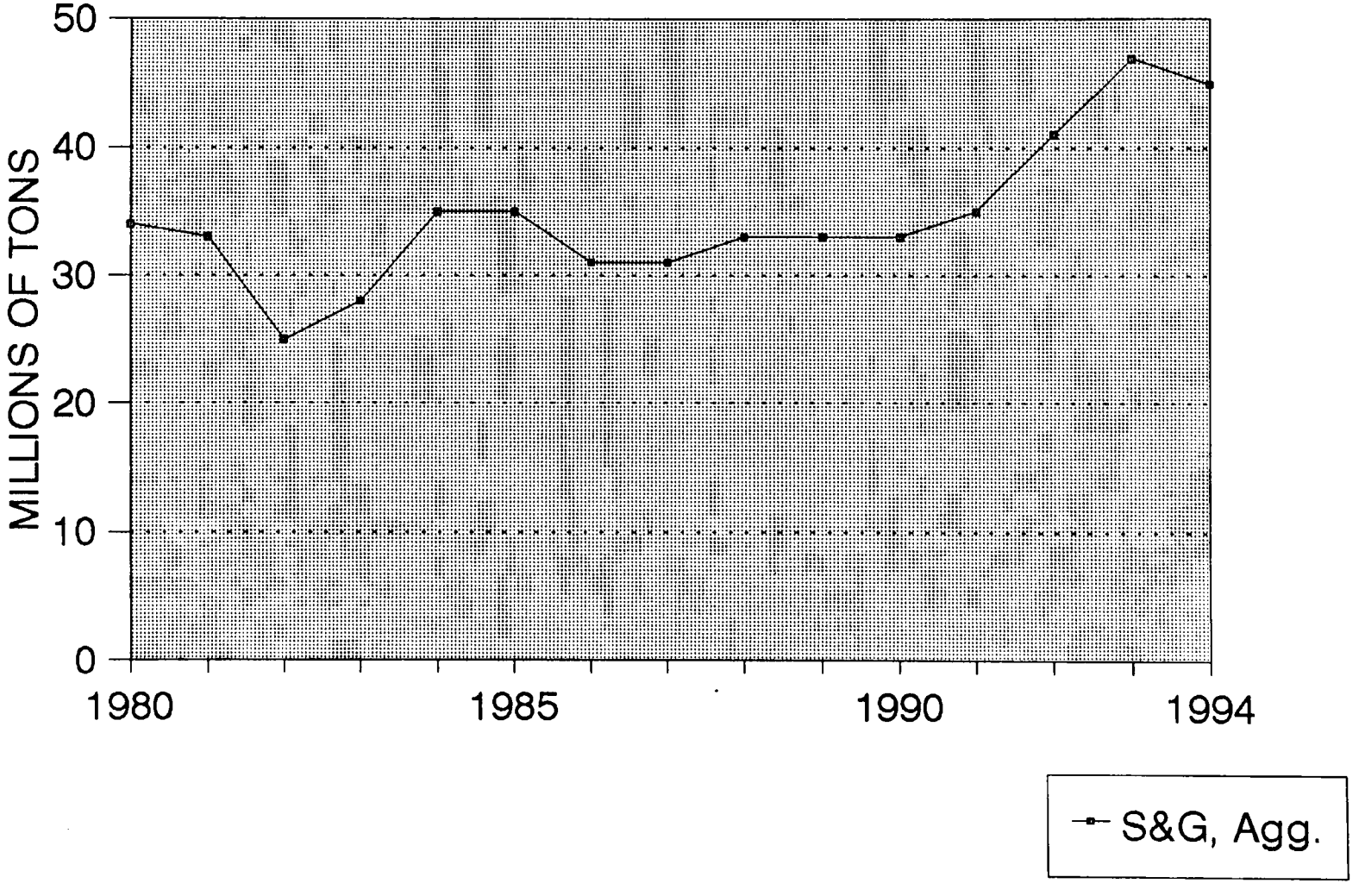

Figure 5

age quartz monzonite intrusive and surrounding Precambrian rocks. Also, a 5,000 sample, surface soil geochemical sampling program and an induced polarization survey were completed. Preliminary reserve calculations indicate 1.1 million tons at a grade of 0.08 ounce per ton including a high grade zone of 387,000 tons at a grade of 0.21 ounces per ton.

Royal Gold Inc. of Denver has entered into an agreement with Union Pacific Minerals Inc. to conduct exploration for precious metal deposits in Colorado and Wyoming on Union Pacific lands. Royal Gold was to have selected 50,000 acres by the end of August, 1994. The agreement calls for an initial term of 15 months and a minimum expenditure of $400,000.

Summo Corporation, a partnership consisting of Denver-based St. Mary Minerals Inc., MLP Associates, and other investors, completed several exploration drillholes on the Cashin sandstone-hosted copper deposit in Montrose County. A preliminary ore reserve calculation indicates that there are 11 million tons at a grade of 0.6% copper. Metallurgical tests confirm that the ore is amenable to a solution extraction-electrowinning process. More drilling is planned for the 1995 exploration season.

The Powderhorn district in Gunnison County is estimated to contain approximately 500 million tons of titanium ore. Most of the titanium resource is in perovskite, a mineral that presents unique processing problems. Teck Resources has been conducting an evaluation program on the Powderhorn titanium resource since 1990. In 1994 Teck completed the purchase of a 100% interest in the property.

Colorado Diamond Co., a subsidiary of Redaurum Red Lakes Mines Ltd. of Toronto, announced encouraging results from a 10,000 ton bulk sampling program on their Kelsey Lake kimberlite prospect in the State Line district of Larimer County. Over 60% of the diamonds recovered are of gem quality including a 14.2 carat white diamond, the largest ever discovered in the State Line district and the eighth largest found in North America. In 1995 the company plans to construct a 275,000 ton per year processing plant for a trial mining program. The produced diamonds will be sold to test their market value. There are eight kimberlite pipes on the Kelsey Lake prospect. Pipe no. 2, with a surface area of 9.5 acres, will supply the ore for the 1995 trial mining program.

Royalstar Resources Ltd. completed a 3,300 ton, Phase 1 bulk sampling program from their Sloan 2 pipe test adit at their Sloan kimberlite prospect in the State Line district. A total of 8,842 diamonds aggregating 327 carats were recovered from 3,000 tons of processed ore. The grade ranges from 16 to 23 carats per hundred tons. The largest recovered stone is a 5.5 carat, good clarity diamond. Plans for 1995 include an additional 700 feet of drifting and crosscutting below high grade zones indicated by surface sampling. Testing in the 1980s yielded over 21,000 diamonds from the Sloan kimberlites.

Phelps Dodge is actively looking at mineral opportunities in Colorado. BHP is conducting a base metals exploration program in undisclosed areas.