

2003 Summary of Mineral Activity in Utah

R.L. Bon and R.W. Gloyn, Utah Geological Survey

SUMMARY

The value of Utah's mineral production (including coal) in 2003 is estimated to be \$1.82 billion, essentially the same as 2002. Contributions from each of the major industry segments are: base metals, \$690 million (38.0% of total); industrial minerals, \$555 million (30.5% of total); coal, \$436 million (24.0% of total); and precious metals, \$136 million (7.5% of total). Base metals was the only segment that gained in value in 2003.

The changes in Utah's mineral valuation by industry segment for the years 1999 through 2003 are shown in figure 1. Compared to 2002, the 2003 values of (1) base metals increased \$78 million (12.8%), (2) industrial minerals decreased \$10 million (1.8%), (3) coal decreased \$31 million (6.8%), and (4) precious metals decreased \$36 million (20.5%).

The value of mineral production is projected to remain flat or decrease slightly in 2004 due to decreased coal and base-metal values and flat to declining industrial mineral values, offset by higher precious-metal values. Base- and precious-metal prices increased significantly in 2003 and should remain at or above their respective 2003 year-end prices during 2004. A decrease in copper production will offset most of the valuation gains from higher base- and precious-metal prices. Industrial mineral prices should also remain at their current levels as the economic recovery continues, although a reduction in demand for several commodities is projected. Coal prices should remain at the same level as in 2003, although production will be lower.

During 2003, the Utah Division of Oil, Gas and Mining (DOG M) received five Large Mine permit applications (2 ha [5 acres] and larger disturbance) and 20 new Small Mine permit applications (less than 2 ha [5 acres] disturbance). The five Large Mine permit applications include three new mine applications and two applications to change from a Small Mine permit to a Large Mine permit. All of the Small Mine permits are for new operations.

Mineral exploration statewide increased significantly in 2003. Twenty-one Notices of Intent to explore on public lands were filed with DOGM in 2003, compared to 11 in 2002, 14 in 2001, and 15 in 2000.

Nationally, Utah ranked 10th in the value of nonfuel minerals produced in 2002 (latest year that production figures are available) and accounted for about 3% of the total U.S. nonfuel mineral production value. Utah also ranked 12th in coal production in 2002. The state should retain similar rankings in 2003.

OUTLOOK

The value of mineral production in Utah is expected to remain flat or decrease slightly in 2004. Operator surveys indicate that in 2004, base-metal and coal values will be slightly lower while precious-metal values will be higher. Industrial mineral values will be flat to slightly lower. A moderate increase in metal prices is forecast for the year, but decreased copper production will reduce overall values. The opening of one or two small base-metal mines in the next two to three years will add incrementally to the state's base-metal values. Precious-metal

production will be slightly higher in 2004 due to increased production from Kennecott's Bingham Canyon mine, but will be partially offset by lower gold production from Kennecott's Barneys Canyon mine. Industrial-mineral values will also be flat to lower with lower regional demand for sand and gravel, crushed stone, and cement offset by increased demand for salt and brine, and lime products. Coal prices are expected to increase slightly while production will decline in 2004 due to the closure of several mines. The recent run-up in metal prices should increase exploration for these metals for the next few years.

MINE PERMIT SUMMARY

During 2003, DOGM received five Large Mine permit applications (2 ha [5 acres] and larger disturbance) and 20 new Small Mine permit applications (less than 2 ha [5 acres] disturbance). The Large Mine permit applications were all industrial mineral mines. Two of the Large Mine permit applications were made to change from a Small Mine permit to a Large Mine permit, and three applications were for new mines. The 20 Small Mine permit applications include 16 industrial mineral mines, two precious-metal mines, and two gemstone mines. The number of both Large Mine and Small Mine permit applications is the same as 2002.

In 2002, DOGM recorded production from 81 Large Mines (excluding sand and gravel), one less than in 2001. The Large Mines include four base-metal mines, four precious-metal mines, 13 coal mines, and 60 industrial-mineral mines (including gemstones, geodes, fossils, and others). Ninety-four Small Mines reported production in 2002, 16 fewer than in 2001. These Small Mines included nine precious-metal, 60 industrial-mineral, and 25 gems, fossils, geodes, and other operations.

EXPLORATION PERMITS

Mineral exploration statewide increased significantly in 2003. Twenty-one Notices of Intent (NOIs) to explore on public lands were filed with the state in 2003, compared to 11 in 2002, 14 in 2001, and 15 in 2000. The 21 approved NOIs by county include: Beaver – 5, Box Elder – 1, Juab – 2, Iron – 2, Millard – 2, Tooele – 6, Uintah – 1, and Utah – 2. Ten of the NOIs were approved for base- and precious-metal exploration, nine for industrial minerals, and two for exploration of gems, fossils, geodes, and other minerals.

NATIONAL RANKINGS

The U.S. Geological Survey (USGS) ranked Utah 10th in the nation in the value of nonfuel mineral production in 2002 (latest year that production figures are available), compared to 9th in 2001. USGS data show that Utah accounted for 3% of the total U.S. nonfuel mineral production value. The 2002 data also show that Utah remained the only state that produced beryllium concentrates. Additionally, Utah was second in the production of copper, gold, and magnesium compounds; second of two magnesium-metal-producing states and three potash-producing states; third in molybdenum concentrates; fourth of four states that produced phosphate rock; fifth in bentonite; and sixth in salt. The state was tied for third in perlite, rose

from fifth to fourth in the production of silver, and dropped from fifth to ninth in the production of gemstones. Additionally, Utah was a significant producer of construction sand and gravel, Portland cement, lime, and common clays (Tanner, 2004). USGS data show that between 1992 and 2002 the value of nonfuel mineral production in Utah ranged from a low of \$1.23 billion in 2002 to a high of \$1.85 billion in 1995 (figure 2). The value of nonfuel mineral production for 2002 is estimated to be \$1.23 billion, about \$130 million (9%) less than 2001. The Utah Geological Survey's (UGS) estimate for the value of nonfuel mineral production for 2003 is \$1.38 billion, just 2% higher than 2002.

BASE- AND PRECIOUS-METAL PRODUCTION

Base-metal production, with an estimated value of \$690 million, was the largest contributor to the value of minerals produced in 2003 (figure 1). In descending order of value, those metals were copper, magnesium metal, molybdenum, and beryllium. The 2003 base-metal values were about \$78 million (12.8%) more than 2002. Precious-metal production, valued at \$136 million, included gold (88% of total value) and silver (12% of total value). Precious-metal values in 2003 were \$36 million (20.5%) less than 2002. Kennecott Utah Copper Corporation's Bingham Canyon mine is located about 32 km (20 mi) southwest of Salt Lake City in Salt Lake County and is the state's sole producer of copper and molybdenum, and the major producer of gold and silver. The combined value of minerals produced from the Bingham Canyon mine is more than one-third of the total value of all minerals produced statewide.

Copper

Copper is the largest contributor to the value of nonfuel minerals in Utah. Significant price increases in 1994 and 1995 pushed the value of copper to historical highs and the value of base-metal production statewide to over \$1 billion for the first time in 1995. From 1995 through 2002, the price of copper fell significantly from \$3.04/kg (\$1.38/lb) in 1995 to \$1.67/kg (\$0.76/lb) in 2002. Copper prices rebounded in 2003, closing the year at over \$2.20/kg (\$1.00/lb) and averaging \$1.81/kg (\$0.82/lb). Copper production from Kennecott's Bingham Canyon mine increased moderately in 2003 to approximately 280,000 metric tons (mt) (310,000 short tons [st]) from 2002 production of approximately 260,000 mt (290,000 st) of copper metal. In 2002, Kennecott announced that current economic open-pit reserves will be exhausted in 10 to 12 years, and that no decision has been made to extend part of the mine underground, although a rigorous economic evaluation has been conducted. The company is also evaluating alternative open-pit scenarios to extend the mine reserve. Kennecott reports that the Bingham Canyon mine produces more than 10% of the annual refined copper requirements in the U.S. (Rio Tinto, 2004).

Magnesium Metal

Magnesium metal was the third-largest contributor to the value of base metals in 2003. Magnesium metal is produced from Great Salt Lake brines by U.S. Magnesium, LLC (formerly Magnesium Corporation of America [Magcorp]) at its electrolytic plant at Rowley in Tooele County (see figure 3). U.S. Magnesium purchased the assets of Magcorp in June 2002 from the

U.S. Bankruptcy Court. The plant's annual capacity is 43,000 mt (47,000 st) of magnesium metal (99.9% purity). It is the only active primary magnesium processing facility in the U.S. Magnesium production was less than capacity in 2003, due to depressed magnesium prices and modernization of the processing plant. The modernization work was completed in 2003 and the company will evaluate the possibility of expanding operations as the market improves. Magnesium metal prices reached an 11-year low in 2002, but started to improve during the 4th quarter of the year.

Molybdenum

The sole molybdenum producer in Utah is Kennecott's Bingham Canyon mine, which produced more than 7,200 mt (8,000 st) of by-product molybdenum concentrate (MoS_2) in 2003, a decrease of more than 20% from 2002. Production was lower due to a combination of lower amounts of molybdenum in the copper ore and lower smelter throughput. The Bingham Canyon mine was one of six molybdenum-producing mines in the U.S. in 2003. The USGS reports that in the U.S., mine output of molybdenum increased 5% in 2003 (Magyar, 2004). However, over the past two years U.S. molybdenum production dropped by 20%.

Beryllium

Utah continues to be the nation's sole producer of beryllium concentrates. Beryllium ore (bertrandite) is mined at Brush Resource's Topaz and Hogs Back mines in Juab County and processed along with imported beryl at the company's plant a few miles north of Delta in Millard County. The product (beryllium hydroxide) is then sent to the company-owned refinery and finishing plant in Ohio, where it is converted into beryllium metal, alloys, and oxide. In 2003, about 42,000 mt (47,000 st) of ore was mined and trucked to the processing plant. The mine produced substantially more ore than in previous years due to increased demand and reduced processing of stockpiled ore. The use of beryllium in electronic and electrical components, and aerospace and defense applications accounted for an estimated 80% of total consumption. Sales of alloy products increased during the first half of 2003 (Cunningham, 2004).

Gold and Silver

Gold production in 2003 is estimated to be more than 9,300 kg (300,000 Troy ounces [oz]), a 25% decrease from the 12,400 kg (400,000 oz) produced in 2002. Gold is produced from two surface mines owned by Kennecott Corporation: one primary producer (Barneys Canyon mine) and one by-product operation (Bingham Canyon mine), both located in Salt Lake County. Several other small mines in the state are known to produce minor amounts of gold and silver, but metal-specific production is not reported, and not included in the above totals. The Barneys Canyon mine exhausted its economic ore reserves in late 2001 and ceased mining, but will continue to produce gold from its heap-leach pads at a much reduced rate into 2005, when those pads will be depleted. A combination of lower gold-content copper ore and lower smelter throughput reduced gold production from the Bingham Canyon mine in 2003.

Silver production is estimated to be approximately 0.109 million kg (3.5 million oz) in 2003, about 3,100 kg (100,000 oz) less than 2002. Silver is produced as a by-product metal from

the Bingham Canyon mine. The lower production of silver is due to the same factors that caused a similar reduction in gold.

INDUSTRIAL-MINERALS PRODUCTION

Industrial-minerals production, with an estimated value of \$555 million, was the second-largest contributor to the value of minerals produced in 2003 (figure 1). Since 1993 (first year of data recording by the UGS), the value of industrial minerals has varied from a low of \$412 million in 1994 to a high of \$583 million in 1999. Within the past five years, those commodities or commodity groups that have realized substantial gains include sand and gravel and crushed stone; Portland cement and lime; and salines, including salt, magnesium chloride, potash (potassium chloride), and sulfate of potash (SOP). Other major commodities produced in Utah, in descending order of value, include phosphate, gilsonite, expanded shale, common clay, bentonite, and gypsum.

Portland Cement and Lime

Portland cement and lime were the highest-value (up from second in 2002) industrial minerals produced in 2003, with a combined value of \$167 million, about \$8 million (5%) less than in 2002. Two operators produce Portland cement in Utah: Holcim, Inc. (formerly Holnam, Inc.) and Ash Grove Cement Company. Holcim's Devils Slide mine and plant are east of Morgan in Morgan County, and Ash Grove's Leamington mine and plant are east of Lynndyl in Juab County. The companies have a combined capacity of more than 1.4 million mt (1.5 million st) of cement annually. Both plants operated at or above capacity in 2003, with total production of nearly 1.5 million mt (1.7 million st). In addition to limestone, both Holcim and Ash Grove Cement mine modest amounts of shale and sandstone that are used in the manufacture of cement.

Lime production was about 6% higher in 2003 than in 2002, with an estimated production of about 586,000 mt (650,000 st). There are two suppliers of lime in Utah, with a combined capacity of more than 0.9 million mt (1.0 million st) per year: Graymont Western U.S., Inc. (formerly Continental Lime Company), which produces dolomitic quick lime and high-calcium quick lime; and Chemical Lime of Arizona, Inc., which produces dolomitic quick lime and hydrated lime. Both operations serve markets in Utah and surrounding states. Graymont Western's plant is in the Cricket Mountains, approximately 56 km (35 mi) southwest of Delta in Millard County, and is one of the 10 largest lime plants in the United States. Chemical Lime of Arizona's plant is about 13 km (8 mi) northwest of Grantsville in Tooele County.

An additional 10 to 12 operators quarried about 1.6 million mt (1.4 million st) of limestone and dolomite in 2003 that was used mainly for construction and flue-gas desulfurization in coal-fired power plants. A small amount of limestone and dolomite is also crushed to a fine powder and marketed as "rock dust" to the coal mining industry. The three largest suppliers of crushed limestone used for construction are (1) Staker and Parsons Company, from two quarries in Utah County; (2) Harper Construction Company, from one quarry in Salt Lake County; and (3) Pelican Point Rock Products Company (formerly Larsen Limestone Company), from one quarry in Utah County.

Salt, Magnesium Chloride, Potash (Potassium Chloride), and Sulfate of Potash

Brine-derived products, including salt, are the second-highest contributors (up from third-highest in 2002) to the value of industrial-minerals production in Utah during 2003, with a combined value of about \$155 million, about \$6.9 million (4.7%) more than in 2002. In addition to salt, brine-derived products include magnesium chloride and potash (potassium chloride and SOP). One company (North Shore Limited Partnership) produces a small amount of concentrated brine that is used as an ingredient in mineral food supplements. The location of operators around Great Salt Lake is shown in figure 3. The statewide production of salt and other brine-derived products, excluding magnesium metal, is estimated to be 3.35 million mt (3.72 million st) in 2003, about 36,000 mt (40,000 st) higher than in 2002. Potash production (including SOP) is estimated to be about 355,000 mt (394,000 st) in 2003, approximately 40,000 mt (44,000 st) more than in 2002.

Salt production alone is estimated to be 2.5 million mt (2.75 million st) in 2003, about 225,000 mt (250,000 st) less than in 2002, with most of the production coming from three operators processing brine from Great Salt Lake. These operators are, in descending order of production: (1) Great Salt Lake Minerals Corporation, (2) Morton International, and (3) Cargill Salt Company. In addition, three other companies produce salt and/or potash from operations not located on Great Salt Lake: (1) Reilly Chemical Company at Wendover in Tooele County (salt and potash), (2) Moab Salt, LLC near Moab in Grand County (salt and potash), and (3) Redmond Minerals, Inc. near Redmond in Sanpete County (salt).

Sand and Gravel and Crushed Stone

Sand and gravel, and crushed stone (including limestone and dolomite) were the third-highest contributors to the value of industrial minerals produced in Utah during 2003 (down from the highest in 2002), with an estimated value of \$140 million, about \$2.1 million (less than 2%) lower than in 2002. These materials are produced in nearly every county in Utah by commercial operators, and by federal, state, and county agencies. Due to the large number of operations, the UGS did not send production questionnaires to this group. However, production data are compiled by the USGS. Their preliminary 2003 data show production of 26.1 million mt (28.9 million st) of sand and gravel with an estimated value of \$101 million, and 7.68 million mt (8.52 million st) of crushed stone with an estimated value of \$39.1 million. This compares to 27.6 million mt (30.6 million st) of sand and gravel and 7.64 million mt (8.47 million st) of crushed stone produced in 2002, with a combined value of \$42.1 million (Tepordei and Bolen, 2004).

Phosphate

SF Phosphates, Ltd. (soon to be Simplot Phosphates) is Utah's only phosphate producer. The company's phosphate operation is 18 km (11 mi) north of Vernal in Uintah County. SF Phosphates was a partnership of Farmland Industries and J.R. Simplot, but is now wholly owned by J.R. Simplot. The mine produces roughly 2.7 to 3.6 million mt (3 - 4 million st) of ore annually, which is processed into 0.9 to 1.8 million mt (1 - 2 million st) of phosphate concentrate. The concentrate is transported in slurry form to the company's Rock Springs, Wyoming fertilizer plant via a 144-km- (90-mi-) long underground pipeline. During 2003, the

mine produced about 3.3 million mt (3.7 million st) of ore, about 7% less than in 2002, its highest production year.

Gilsonite

Gilsonite production for 2003 is estimated to be about 51,000 mt (57,000 st), about 7,200 mt (8,000 st) less than in 2002. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. All of the gilsonite mines are located in southeastern Uintah County. The three companies that produce gilsonite, in descending order of production, are: (1) American Gilsonite Company, (2) Zeigler Chemical and Minerals Company, and (3) Lexco, Inc. Gilsonite is marketed worldwide for use in over 150 products ranging from printing inks to explosives. Gilsonite production has been relatively stable for the past several years.

Expanded Shale and Perlite

Two companies produce lightweight “expanded” products from shale and perlite for use primarily in the construction and building industries. Utelite, Inc., mined nearly 158,000 mt (175,000 st) of shale in 2003 to manufacture “expanded shale” for use as a lightweight aggregate for the construction industry. Utelite’s mine is east of the town of Wanship in Summit County. Production of “expanded shale” was approximately 12% lower in 2003 than in 2002. Basin Perlite Company mined about 36,000 mt (40,000 st) of perlite ore to produce “expanded perlite” used mainly in the manufacture of building construction products. The perlite mine is located north and west of the town of Milford in Beaver County.

Common Clay and Bentonite

Nearly 193,000 mt (214,000 st) of common clay and approximately 60,000 mt (67,000 st) of bentonite were produced by five companies in 2003, a 20% decrease in common clay and a 90% increase in bentonite compared to 2002. Statewide, there were 11 active Large Mine and seven active Small Mine permits held by clay operators in 2003. Many of these mines, both Large and Small, operate intermittently. In descending order of production, the three largest producers of common clay in 2002 were: (1) Interstate Brick Company, (2) Interpace Industries, and (3) Paradise Management Company. Two companies (Western Clay Company and Redmond Minerals, Inc.) produce bentonite from pits located in central Utah. More than 75% of all common clay is used in the manufacture of brick. Bentonite is used as a sealant in many civil engineering applications, as a pet-waste absorbent (litter-box filler), as an additive in oil and gas drilling fluids, and as a binder in foundry molds. ECDC Environmental, LLC intermittently produces clay for use at their waste disposal facility near the town of East Carbon in Carbon County. Sufficient stockpiled material will preclude any additional clay mining by ECDC in the foreseeable future.

Gypsum

Four companies produced about 347,000 mt (385,000 st) of gypsum in 2003, nearly 32,000 mt (35,000 st) more than in 2002. In descending order of production, the companies are: (1) U.S. Gypsum Company, (2) H.E. Davis and Sons, (3) Nephi Gypsum, Inc., and (4) D.K.

Gypsum Industries. U.S. Gypsum operates the only active wallboard plant in Utah. The plant is located near the town of Sigurd in Sevier County. The Georgia Pacific plant, also near Sigurd, closed in 2002 and the company's mines in Utah are inactive. Georgia Pacific shifted wallboard manufacturing to the company's Las Vegas, Nevada facility.

Most gypsum produced in Utah is used for making wallboard, but several operators supply raw gypsum to regional cement companies where it is used as an additive to retard the setting time of cement and to the agricultural industry for use as a soil conditioner.

ENERGY MINERALS PRODUCTION

Coal

Utah's coal operators produced 20.8 million mt (23.1 million st) of coal valued at \$436 million from 12 underground mines and one surface mine in 2003 (figures 1 and 4). This production is approximately 2.0 million mt (2.2 million st), 8.7% less than in 2002. All of the mines and facilities are located in central Utah. Utah's only coal-waste recovery plant, located near the town of Wellington in Carbon County, is permanently closed, although the company's synfuel facility located at the Castle Valley railroad spur operated on a limited basis using coal waste purchased from other coal operators. The largest coal producer was the SUFCO mine, operated by Canyon Fuel Company, LLC (Sevier County), which produced a near-record high of more than 6.4 million mt (7.1 million st) of raw coal. In addition, the following four mines each produced in excess of 1.8 million mt (2.0 million st) of coal: (1) Deer Creek, operated by Energy West Mining Company (PacifiCorp, Inc.) (Emery County); (2) Skyline #3, operated by Canyon Fuel Company, LLC (Emery and Sanpete Counties); (3) West Ridge, operated by West Ridge Resources (Carbon County); and (4) Dugout, operated by Canyon Fuel Company, LLC (Carbon County).

Over half of Utah's coal was consumed by electric utilities within the state in 2003. Coal was also used for industrial purposes within the state, shipped to electric utilities and industrial users in other states, and exported overseas. The export market to Pacific Rim countries, which had accounted for up to 5.0 million mt (5.5 million st) of production in 1996, dwindled to less than 0.45 million mt (0.5 million st) in 2002, and to zero in 2003 due to lower overall demand and foreign competition. No overseas coal exports are anticipated in the next several years.

One new surface operation located in Carbon County, White Oak Mining and Construction Company's (Lodestar, Inc.) Whisky Creek mine, began producing coal in late 2001 and closed in early 2003. The mine was opened to salvage the remaining near-surface coal from the company's White Oak #1 and #2 underground mines, which were mined out in 2001. The Horizon mine, which produced a small amount of coal before being idled in late January 2002, was re-opened in 2003. The Willow Creek mine (RAG International, Inc.), which was closed following a mine explosion and fire in July 2000, is being reclaimed. Consolidation Coal Company's Emery mine in Emery County produced a small amount of coal in 2002 and about 206,000 mt (228,000 st) in 2003 before being idled and put up for sale. One new mine (UtahAmerican Energy Company's Lila Canyon mine) in Emery County is in the permitting stage and could begin producing within a year or so, depending on successful marketing. The Skyline #3 mine is scheduled to be closed in May 2004 due to significantly increased water

handling costs and related operational issues. The surge in energy prices that began in the fall of 2003 will have a positive effect on coal prices for the next few years.

Uranium

Although uranium prices have increased significantly since July 2003 (rising from \$23.14/kg [\$10.50/lb] to \$34.16/kg [\$15.50/lb] at year's end), no uranium ore was mined in Utah in 2003. U.S. Energy Company's Shootaring Canyon mill (Garfield County) remained idle the entire year while International Uranium Corporation's White Mesa mill (San Juan County) processed an "alternate feed." Eleven uranium/vanadium mines are listed as inactive statewide.

EXPLORATION AND DEVELOPMENT ACTIVITY

Exploration for base and precious metals remained low during 2003. The DOGM received 21 new notices of intent (NOIs) of which 14 were approved. Of the 21 applications, nine were for industrial minerals, eight for precious metals, two for base metals, and the remaining two were for a seismic research project and for road building. Half of the precious metals NOIs were from individuals, and most were located for areas unlikely to have any gold. The remaining precious metal NOIs were from companies and are either for existing mining districts or areas where previous drilling found some mineralization. The major base and precious metal exploration/development areas are discussed below and shown on figure 5. The Dragon halloysite property is included in the discussion because it is in a metal mining district and owes its existence to hydrothermal alteration.

Milford Area

Rocky Range-Beaver Lake Mountains Districts

During 2003, Western Utah Copper Company (WUCC) continued its activities in Beaver County with focus on securing and adding to its large exploration and development land position within the east-west-trending "Milford mineral belt" and elsewhere in Beaver County. The company also focused on bringing in a joint-venture partner to further WUCC's twin objectives of initiating a substantial exploration program within the "Milford mineral belt" and preparing major known copper deposits for production. In November 2003, WUCC completed its purchase of the Beaver County assets of Nevada Star Resources including most of the known copper deposits and prospective ground in the Rocky Range and Beaver Lake mining districts. Effective November 20, 2003, WUCC entered into an agreement with Palladon Ventures Ltd. covering WUCC's interests in the "Milford mineral belt," granting Palladon an option to bring certain deposits into production and the right to fund a multi-million-dollar exploration program on WUCC's non-reserve lands within the belt. Since entering into their agreement, Palladon and WUCC have been analyzing data and drill targets and plan to begin drilling on several targets in Spring 2004. At the end of 2003, WUCC's land position in the "Milford mineral belt" totaled about 20,600 net ha (50,900 ac).

San Francisco District

Franconia did no drilling on their leased Horn Silver zinc property in 2003 but is scheduled to drill four to six holes in 2004. The target is structurally controlled and manto style, sulfide and non-sulfide zinc mineralization along and adjacent to the Horn Silver fault west of and below the old workings. The three holes drilled in 2002 intersected multiple mineralized intervals from 1.6 to 17 m (5.2-55 ft) thick assaying 14 to 34% zinc.

Other Areas

Western Utah Copper Company has also been active in acquiring properties north and south of the "Milford mineral belt" which the company believes are prospective for gold deposits distal to the copper deposits on the main belt. WUCC acquired a large property position in the "Goldfinger trend" south of the belt in the Blue Mountain area and also in the "Golden Reef zone" several miles north of the town of Frisco in the San Francisco Mountains. As of early 2004, WUCC's land position in these areas totals about 11,375 net ha (28,100 ac). WUCC began a drilling program in the "Goldfinger trend" in January 2004 and early drill results are encouraging. Additional drilling is planned for both this and other areas.

Tintic Area

There was no significant metals exploration or development activity in the Tintic district, but Atlas Mining Company of Osborn, Idaho, began exploration and development work on their Dragon halloysite property located approximately 4.8 km (3 mi) due south of Eureka in Juab County. Work consisted of limited drilling to confirm and verify reserves, partial rehabilitation of the 137-m (450-ft) -deep main shaft, and milling and processing tests. Much effort was directed toward establishing new markets and uses other than the standard high-quality ceramic use. Of particular interest was development of microtubular applications, particularly for timed release of components using the natural halloysite tubes. The company is scheduled to begin production in mid-2004. Current reserves are estimated at 272,000 mt (300,000 st) of high-quality halloysite with an estimated value of \$596.00/mt (\$450.00/st). The company predicts a market demand of 5450 to 13,600 mt (6000-15,000 st) halloysite/year.

Clifton-Gold Hill Area

Dumont Nickel Inc., through its wholly owned Utah subsidiary Dumont Mining continued property acquisition and exploration on its joint-venture properties in the Clifton-Gold Hill area of westernmost Tooele County. During 2003, Dumont staked nearly 600 mining claims, optioned an additional 82 claims including the Kiewit gold-adularia-bearing altered zone, and leased four state sections around and between the claims previously optioned from Clifton Mining Company and Woodman Mining Company. These acquisitions increased Dumont's property position from about 18 km² (7 mi²) to over 72 km² (28 mi²). Additional acquisitions in early 2004 increased the size of the property position to 85 km² (33 mi²).

Exploration during 2003 was designed to confirm, upgrade, and expand previous exploration results on the properties. Exploration included (1) reconnaissance mapping and sampling the Cane Springs property and surrounding areas including two large jasperoid-jasperoid breccia bodies and drilling of three vertical holes totaling 366 m (1200 ft) to test the southeast extension of the mineralized shear zone, (2) extensive orientation and verification

sampling of the Clifton Shears and initiation of a core drilling program to test the depth potential of several of the better gold-silver-bearing shear zones, (3) a soil sampling survey (300 samples) over extensive zones of silicification covering an area of 4 km² (1.54 mi²) in the IBA property in the southwestern part of the district, and (4) initial surface sampling of the gold- and beryllium-bearing Kiewit altered zone. Results are as follows:

Cane Springs: The three drill holes intersected highly sheared and altered marble with pyrite, chalcopyrite, and arsenopyrite and mineralized jasperoid and jasperoid breccia over drill thicknesses of 52 to 55 m (170-180 ft). Up to four mineralized shear zones were intersected with individual thicknesses of 1 to 5 m (3-16 ft) containing 0.2 to 6.0 g/mt (0.006-0.17 oz/st) gold with associated copper. The best gold intercept was 0.3 m (1 ft) assaying 188 g/mt (5.5 oz/st) gold. In addition, anomalous gold and copper values in surface samples collected in areas away from the old mine workings suggest potential for additional mineralized shear zones or jasperoid breccias.

Clifton Shears: Over 250 surface samples (including 190 chip samples across eight shear zones) and 13 underground samples representing an aggregate total of 3445 m (11,300 ft) of sampling were collected by Dumont in a portion of the "Clifton Shears." The Clifton Shears are a 0.8 km wide by 2.4 km long (0.5 mi x 1.5 mi), northeast-trending zone with over 40 shear zones containing gold, silver, lead, and zinc values. Recent sampling confirmed previous sampling results and returned gold grades of up to 16.9 g/mt (0.49 oz/st) over widths 0.15-15.2 m (0.5-50 ft). The average width for all samples collected was 1.7 meters (5.7 ft), and the average grade was 0.6 g/mt (0.017 oz/st) gold. Previous sampling, compiled by Behre-Dolbear, indicated an average grade of about 1.7 g/mt (0.05 oz/st) gold, 274 g/mt (8 oz/st) silver, and 6% lead for the sampled shears. Drilling to test the downdip extension of the shears began in mid-December 2003 and was completed in late January 2004. Seven angle holes totaling 1280 m (4200 ft) were drilled along two lines. The drilling confirmed that the shears continue to a depth of at least 213 m (700 ft), but no assay results have been released to date.

IBA Area: A large, anomalous gold-silver zone was discovered which is still open to the north toward old trenches that contained samples assaying 17 g/mt (0.5 oz/st) gold.

Kiewit Zone: Dumont reported that limited initial surface sampling confirmed the presence of gold, and a composite grab sample representing 55 m² (600 ft²) assayed 3.8 g/mt (0.11 oz/st). Previous surface sampling in 1962 returned gold assays of 0.7 to 30.1 g/mt (0.02-0.88 oz/st).

Future work for 2004 includes (1) drilling a fan-shaped pattern of holes in propylitically altered quartz monzonite, (2) additional sampling and trenching with follow-up drilling in the Cane Spring area to evaluate both the known structure and surrounding areas including the gold-bearing jasperoid breccias, (3) additional mapping, sampling, and drilling of the "Clifton Shears" with emphasis on stockwork mineralization and cross-structures between the known shear zones, (4) additional surface sampling of the 1220-m (4000-ft) -long Kiewit gold zone followed by an initial six-hole drilling program, (5) additional soil sampling to extend the anomalous IBA gold zone and to define additional gold targets with drilling to test the anomalies at depth, and (6) district-wide mapping and geochemical grid sampling focusing on the gold-bearing silica breccia zones.

Gold Springs District

In early 2003, North American Gold, Inc. acquired a lease on 162 ha (400 ac) of unpatented ground in the Gold Springs district, a low-sulfidation, epithermal gold-silver district

straddling the Utah-Nevada line in western Iron County. The company drilled six holes totaling 970 m (3185 ft) with the deepest hole being 268 m (880 ft) deep. Three holes were drilled in the northern area (Jumbo vein area), and three holes were drilled in the southern area (Aetna vein area). The holes were angle holes designed to intersect the quartz-adularia veins and any adjacent stockwork or lower-grade, wall-rock mineralization. Although the drilling did intersect several gold intercepts of up to 3.4 g/mt (0.10 oz/st) gold and wider zones of 1.0 to 1.4 g/mt (0.03-0.04 oz/st) gold, results were not sufficient to justify holding the property. In early 2004 the property was returned to the vendor.

Lisbon Valley Area

Constellation Copper Company is proceeding with development of its Lisbon Valley Copper project. The company plans to begin facilities construction in 2004 with full production anticipated by mid-2005. The company announced plans to purchase the complete crushing and solvent extraction-electrowinning (SX-EW) facility originally used for the Equatorial Copper operation near Tonopah, Nevada, and has retained Merit Consultants International as construction manager. Merit began soliciting bids for both dismantling and moving the plant and for new facilities construction at the Lisbon Valley site. Total initial capital costs are estimated at \$49 million to bring the mine into production. A completed Technical Update to the original feasibility study indicated total life-of-mine costs (including capital and reclamation costs) of \$0.69/lb using a copper price of \$0.95/lb. The current proven and probable reserves for the Sentinel, Centennial, and GTO pits are 33.3 million mt (36.7 million st) grading 0.51% copper. The operation is fully permitted except for a State Air Quality permit which is under application.

In late 2003, Constellation acquired additional leases southeast of the GTO deposit covering a portion of the deep, high-grade GTO Extension deposit. In December 2003, the company began a 25-hole exploration drilling program to further test this deposit. Drilling to date indicates an average mineralized thickness of 6.47 m (21.25 ft), at a grade of 3.25% copper, at depths of 106 to 142 m (350-465 ft). Previous drilling outlined a resource of approximately 0.907 million mt (1 million st) at an average grade of 1.9% copper amenable to underground mining. Constellation also did extensive drilling on the Cashin property in Colorado, approximately 24 km (15 mi) northeast of Lisbon Valley, to develop reserves that could supply feed for the Lisbon Valley mill.

A geologic report by Dr. Jon Thorson on the Lisbon Valley deposit is available on-line at Constellation's web site at www.constellationcopper.com.

Bromide Basin Area

Unico, Inc. continued exploration on their Bromide Basin properties. In 2003, the company (1) partially dewatered the Bromide tunnel to access several of the fault-intersection breccias along the vein and took selected bulk samples of the breccias, (2) continued driving the El Padre tunnel to intersect the Bromide vein approximately 122 m (400 ft) below the Bromide mine adit level, (3) mapped and sampled parts of the Kimble and Turner mine, and (4) begin screen testing of the Kimball-Turner stockpile. Significant results include discovery of a well-mineralized fault-intersection breccia in the Kimble and Turner mine, bulk testing of 318 kg (700 lb) of breccia ore with wire gold from the Bromide vein resulting in recovery of 217 gm (7 oz) gold (equivalent to 683g/mt [20 oz/st]), and recovery of an average 34 g/mt (1 oz/st) gold from

screened stockpile feed by sluicing. Work planned for 2004 includes extending the El Padre tunnel to intersect the Bromide vein (less than 60 m [200 ft]) of crosscut required), regional surface mapping and geochemistry, and detailed sampling of known and newly discovered mineralized structures. The company hopes to begin mining 45-54 mt/d (50-60 st/d) of 68 to 103 g/mt (2-3 oz/st) gold ore to be processed at the company's Deer Trail mill as soon as the El Padre tunnel intersects the Bromide vein.

Deer Trail Mine

Unico, Inc. mined a small amount of ore in 2003 from its Deer Trail property in Piute County, south of Marysvale. During the early part of the year, Unico began mining the high-grade mantos in the 3400 East orebody, but mining was curtailed pending upgrading the mill circuits to produce a cleaner, more salable concentrate. In mid-year, Unico began sampling and evaluating the dumps and tailings from the oxidized, gold-rich Upper (old) Deer Trail adit. The Upper Deer Trail adit dumps contain approximately 22,700 to 27,200 mt (25,000 to 30,000 st) of material. Based on a 907-mt (1000-st) composite sample, these dumps average 5.1 g/mt (0.15 oz/st) gold and 171 g/mt (5.0 oz/st) silver. Screen tests indicate that the grade can be substantially improved by screening. The property also contains 167,000 mt (184,000 st) of mill tailings that average 1.4g/mt (0.04 oz/st) gold and 103 g/mt (3.0 oz/st) silver. The company hopes to process up to 4500 mt (5000 st) or more of dump material per year once the mill rehabilitation is completed. In 2004, Unico plans to develop the 3400 orebodies in the PTH tunnel and sample and evaluate the Upper Deer Trail adit for additional ore pockets.

Bingham Canyon District

Kennecott Utah Copper did no deep exploration drilling in 2003 to test the deep porphyry roots and/or deep skarn potential of the Bingham porphyry system. Drilling in 2003 concentrated on in-fill drilling in the pit and extensive engineering drilling (RQD drilling) for pit planning and design to minimize overburden removal. Kennecott has announced no formal decision on the status of underground mining. Options currently being considered are continuing the approved open-pit mine plan, expanding the open pit ("Great Leap pit"), underground block caving, underground skarn mining, or any combination of the above. A decision is expected at the end of 2004. The current "approved" pit would allow mining until 2014, and the "expanded pit," not currently approved, would provide ore to 2024. Some of the ore resources currently included in the underground block-cave or underground skarn resources could be mined in the "Great Leap pit."

Grand Central Silver Mines announced the discovery of several southwest-trending, mineralized fault/breccia zones on its Southwest Bingham Canyon property based on extensive surface and underground sampling. The company reported the discovery of four surface gold zones and three underground gold zones, but no details have been released to date (March 2004) as to width, lateral extent, or precious and base metal grades of the zones. Exploration drilling will be required to verify that the surface and underground zones are connected. The property is located about 3650 m (12,000 ft) southwest of the bottom of the Bingham pit straddling the boundary between Tooele and Salt Lake Counties. The location of the property suggests it is near the outer limit of the lead-zinc zone and within a postulated arsenic-gold zone.

Silver Bell Mine

Unico, Inc. did no exploration work on their Silver Bell polymetallic, vein-manto deposit in the American Fork district in 2003. The company is currently looking for a joint-venture partner to help fund exploration and development, particularly to upgrade the estimated resources for the Silver Bell vein and to explore the property for manto-style mineralization adjacent to the vein proper. Estimated resources for the vein only, based on strike and dip projections, are 408,000 mt (450,000 st). Grade of the sulfide ore averages 0.6 g/mt (0.018 oz/st) gold, 1200 g/mt (35 oz/st) silver, 12.0% zinc, 5.0% lead, and 3.5% copper. Potential tonnage from associated manto deposits would be significantly larger.

REFERENCES

- Cunningham, L.D., 2004, Beryllium: U.S. Geological Survey Mineral Commodity Summary, 2 p.
- Magyar, M.J., 2004, Molybdenum: U.S. Geological Survey Mineral Commodity Summary, 2 p.
- Rio Tinto, 2004, Rio Tinto 2003 Annual Report and Financial Statements, p. 48.
- Tanner, Arnold, 2004, Utah-2002 annual estimate: U.S. Geological Survey Mineral Industry Survey, 12 p.
- Tepordei, V.V., and Bolen, W.P., 2004, Crushed stone and sand and gravel in the fourth quarter of 2003: U.S. Geological Survey Mineral Industry Survey, 12 p.

Figure 1. Value of Utah's mineral production from 1999 through 2003.

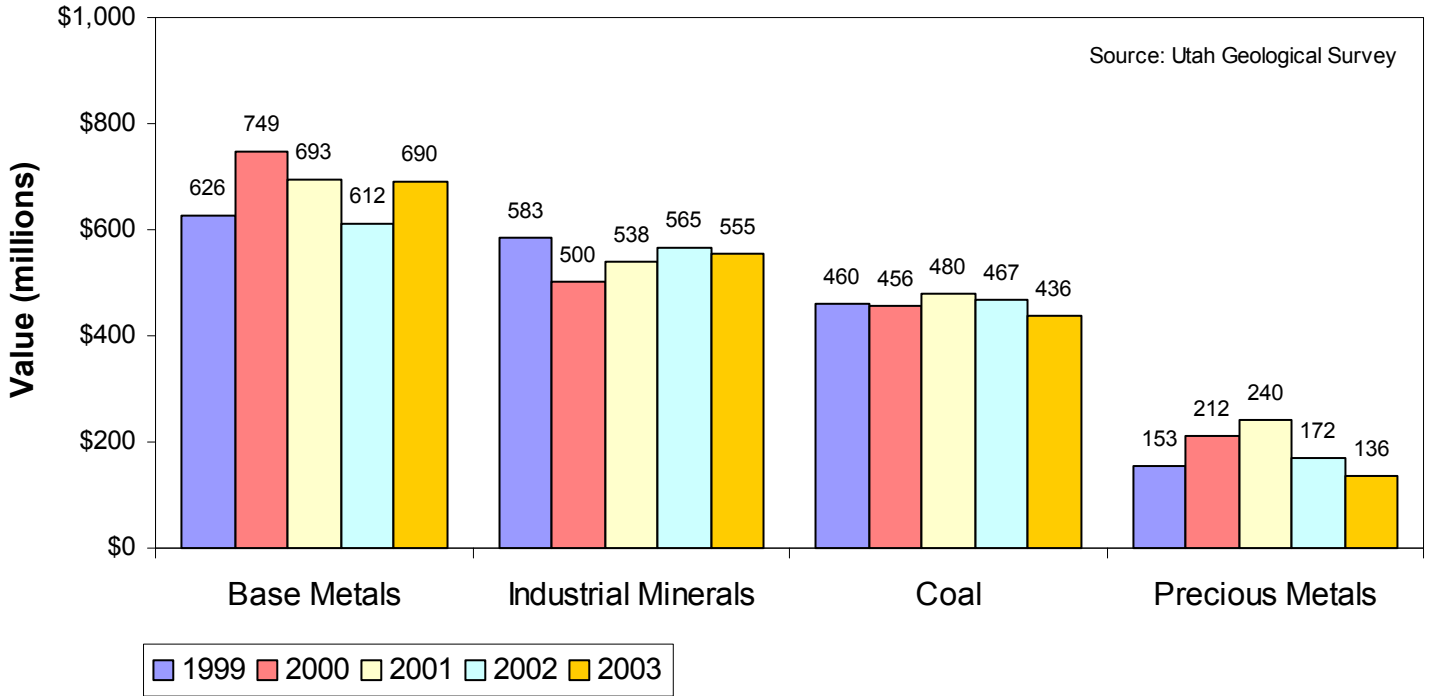


Figure 2. Value of Utah's nonfuel mineral production from 1993 through 2002

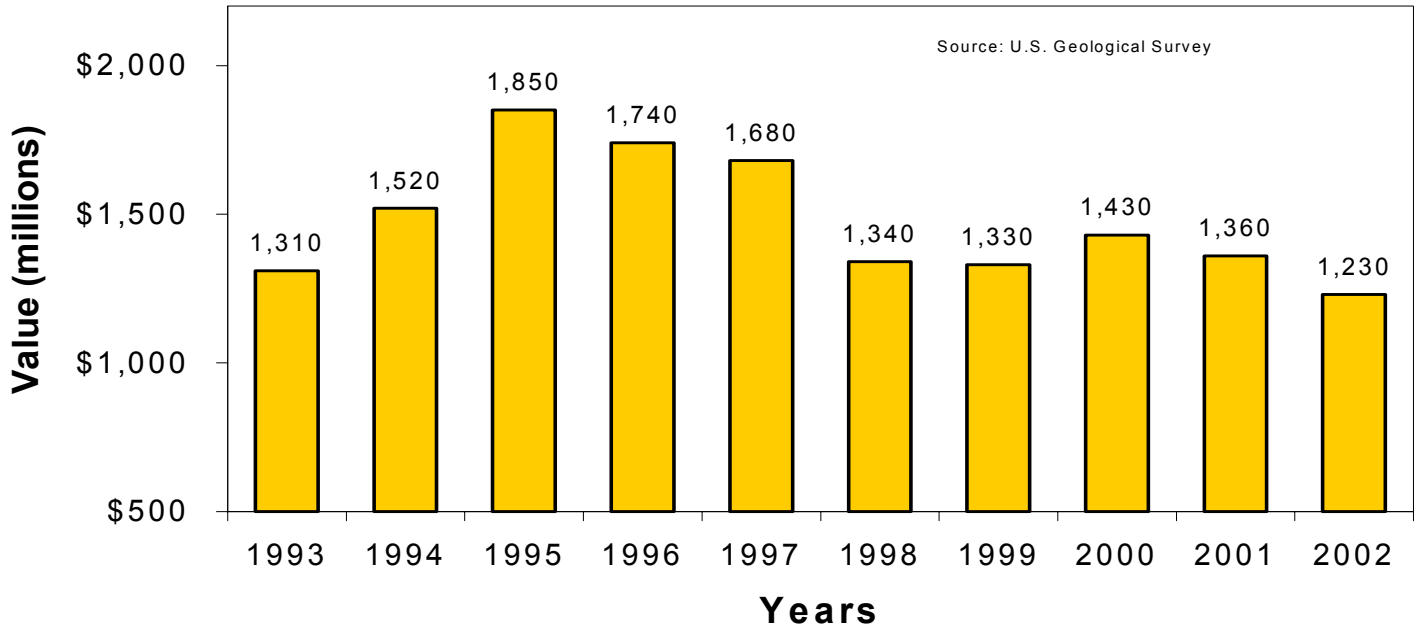


Figure 3. Location of brine processing plants around Great Salt Lake.

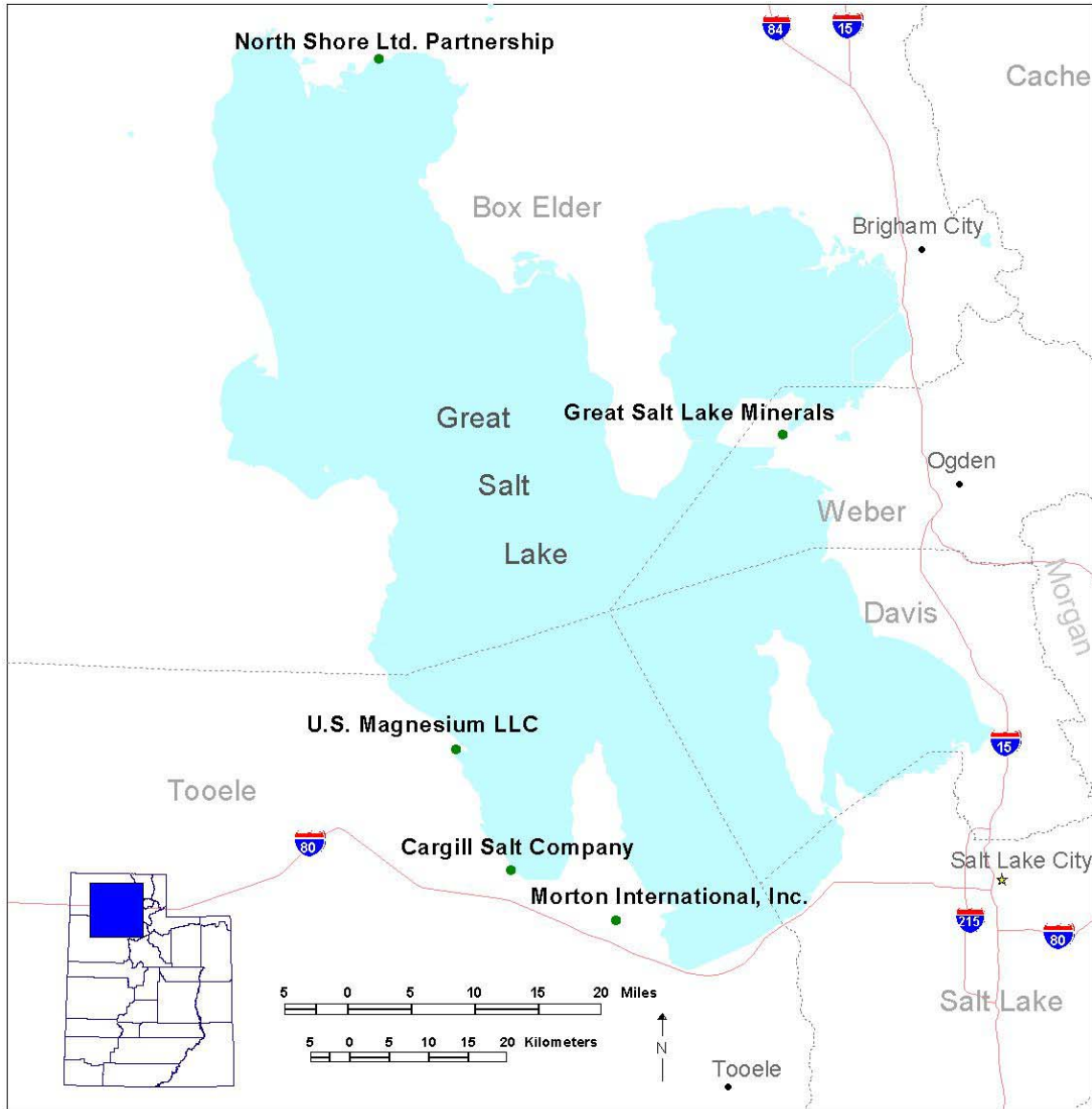


Figure 4. Utah's coal production and value from 1994 through 2003.

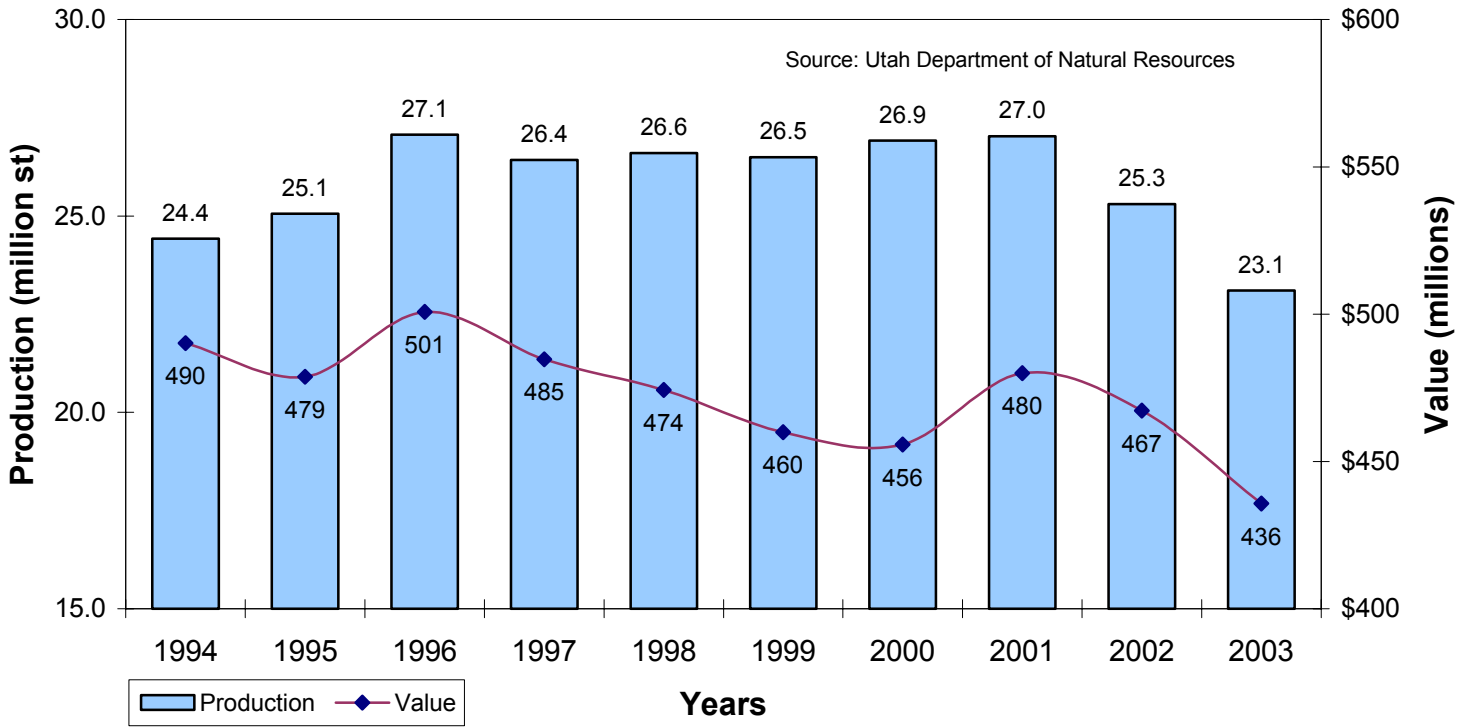


Figure 5. Major base- and precious-metals exploration areas in Utah during 2003.

