2008 SUMMARY OF MINERAL ACTIVITY IN UTAH

BY ROGER L. BON AND KEN KRAHULEC

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Cover photos: *(top) Chalcopyrite-garnet skarn, North Ore Shoot, Bingham Canyon, Salt Lake County; (middle) chalcopyrite-quartz vein, Cactus mine, San Francisco district, Beaver County; (bottom) malachite-stained granodiorite breccia, OK mine, Beaver County.*

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ABSTRACT

Utah mines and energy companies produced a record gross value of $9.54 billion in energy and mineral commodities in 2008. On an inflation-adjusted basis, this is $1.41 billion higher than the previous record of $8.13 billion in 2006. Mineral production (excluding oil and gas) also reached a record high $5.05 billion including base-metals production of $2.9 billion, industrial-minerals production of $1.05 billion, energy-minerals production of $0.71 billion, and precious-metals production of $0.39 billion. Preliminary estimates from the U.S. Geological Survey rank Utah 4th nationally in the value of nonfuel minerals produced in 2008, and Utah accounted for about 5.9% of the total U.S. nonfuel minerals production value. Utah remained the only state that produced beryllium concentrates, magnesium metal, or gilsonite. Mineral exploration activity continued to increase in 2008 with 64 Notices of Intent to Explore being filed with the State compared to 53 in 2007 and 35 in 2006. More than 6000 new federal unpatented mining claims in Utah were recorded by the U.S. Bureau of Land Management in 2008. New mine developments included the permitting of one new coal mine, and the startup of three uranium mines and one iron ore mine. Development of a new base-metal mine in west-central Utah is ongoing with production planned for 2009. The outlook for 2009 is for a moderate decrease in the value of nonfuel minerals based largely on projections for higher production of base and precious metals offset by significantly lower base-metal prices.

INTRODUCTION

The Utah Geological Survey (UGS) has compiled mineral activity summaries for the state on an annual basis since 1989. These mineral summaries have been published in the May issues of *Mining Engineering*, a publication of the Society for Mining, Metallurgy, and Exploration. Prior to 1989, the summaries were also published separately by the UGS on an infrequent basis. The summaries from 1996 through 2007 are available on the UGS Web site at geology.utah.gov/utahgeo/rockmineral/index.htm#minactivity.

Data for this summary come from several sources: production questionnaires that are sent to operators; commodity price data obtained from the U.S. Geological Survey (USGS) and other sources; mine permit data obtained from the Utah Division of Oil, Gas, and Mining (DOGM); and data obtained from individual company Web sites, trade industry publications, and correspondence. Production data and values are compiled and discussed by the major commodity or mineral components of each industry sector. The industry sectors include base metals, precious metals, industrial minerals, and energy minerals. Individual company data are compiled, but not discussed except when obtained from a publicly available source. Exploration and development data are organized primarily by district and area.

INDUSTRY OVERVIEW

The gross value (in inflation-adjusted dollars) of all energy and mineral commodities produced in Utah in 2008 was a record $9.54 billion, $1.41 billion more than the previous record high of $8.13 billion reached in 2006 (figure 1). The 2008 value is largely due to increased base- and precious-metals values and increased crude oil and natural gas prices and production.

The value of Utah's mineral production (excluding oil and natural gas) in 2008 is estimated to be a record high $5.05 billion (table 1), $369 million (8%) higher than the revised value of $4.68 billion for 2007. All segments of Utah's mineral industry showed an increase in values compared to 2007. Contributions from each of the mineral sectors were as follows: base metals, $2.90 billion (57% of total); industrial minerals, $1.05 billion (21% of total); energy minerals, $708 million (14% of total); and precious metals, $390 million (8% of total) (figure 2; table 1). Compared to 2007, the 2008 values of (1) base metals increased $73.3 million (3%), (2) industrial minerals increased $132 million (14%), (3) energy minerals increased $96.4 million (16%), and (4) precious metals increased $68.1 million (21%).

Preliminary estimates from the USGS rank Utah 4th nationally in the value of nonfuel minerals produced in 2008, and Utah accounted for about 5.9% of the total U.S. nonfuel mineral production value (USGS, 2009). Based on annual production tonnages provided by the Energy Information Administration, Utah ranked 13th in coal production in 2007 (Energy Information Administration, 2008), and will likely retain the same ranking for 2008.

Metal prices, which had been on a five-year increase, reached near-historic highs in mid-2008, but rapidly declined in the second half of the year. This run-up in metal prices led to substantially increased mineral exploration and development in Utah. In addition to the initiation of mining at several uranium mines in San Juan County, advanced-stage exploration and development is ongoing in the Iron Springs (Fe) and Rocky Range-Beaver Lake (Cu-Au) mining districts.

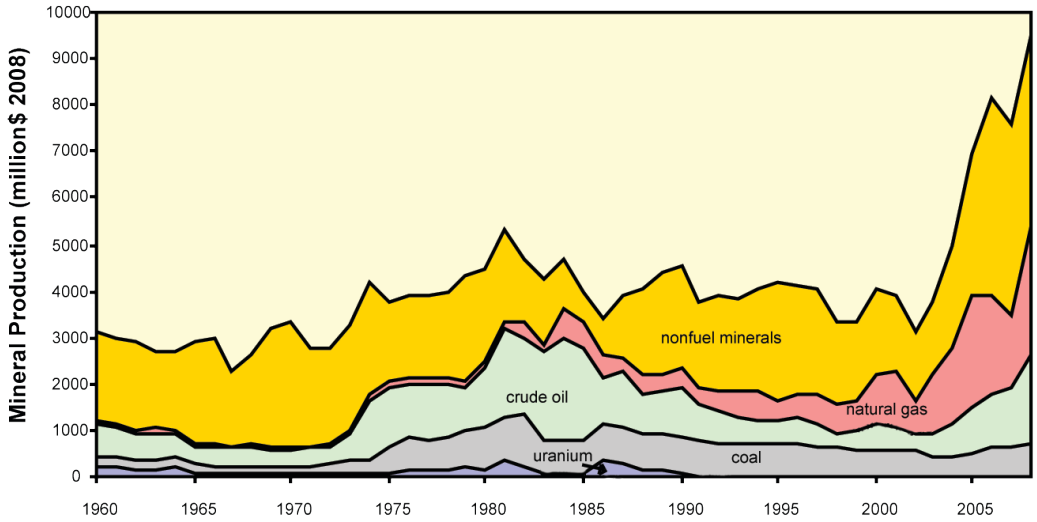

Figure 1. *Total annual value of Utah's energy and mineral production 1960–2008, inflation adjusted to 2008 dollars.*

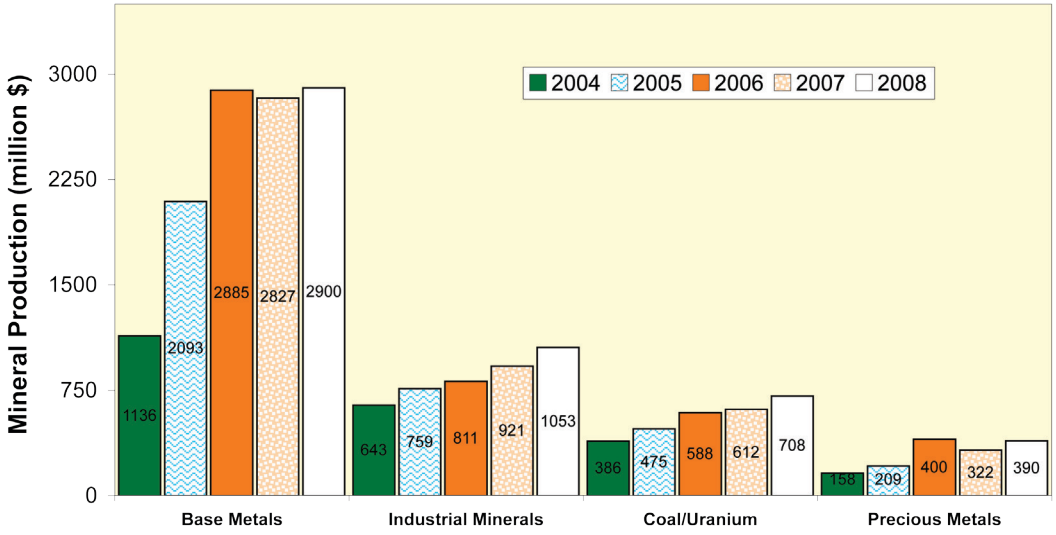

Figure 2. *Value of Utah's annual mineral production in nominal dollars, by industry sector, from 2004 through 2008 (*note: coal production only for 2004–2007, coal and uranium for 2008).*

Table 1. *Utah estimated mineral production values in nominal dollars, by industry sector, from 1999 through 2008; value is in millions.*

Year	Base Metals	Industrial Minerals	Energy Minerals	Precious Metals	Total Value
1999	$626	$583	$460	$153	$1822
2000	$749	$500	$456	$212	$1916
2001	$693	$538	$480	$240	$1951
2002	$612	$565	$467	$172	$1815
2003	$690	$555	$384	$136	$1765
2004	$1136	$643	$386	$158	$2324
2005	$2093	$759	$475	$209	$3536
2006	$2885	$811	$588	$400	$4684
2007	$2827	$931	*$612	$322	*$4681
2008	$2900	$1053	$708	$390	$5051
**revised data. Note that totals may not equal the sum of individual parts due to rounding.*					

During 2008, DOGM received four new Large Mine permit applications (5 acres and larger disturbance) and 24 new Small Mine permit applications (less than 5 acres disturbance). Sixty-four Notices of Intent to explore on public lands were filed with DOGM in 2008, compared to 53 in 2007 and 35 in 2006. More than 6000 (down from 15,000 in 2007) new federal unpatented mining claims were recorded by the Bureau of Land Management (BLM), and the Utah School and Institutional Trust Lands Administration (STILA) reported signing contracts on 196 tracts of land in 2008.

Utah was rated as the eleventh-best regulatory environment for mining in the 2008/2009 Fraser Institute Survey of Mining Company's Policy Potential Index (down from fourth-best in the 2007/2008 survey). The Fraser Survey compares the favorability of the political environment in 14 U.S. states, 12 Canadian provinces and territories, and 45 countries. Most states in the U.S. dropped in ranking due to perceived changes in the mining statutes and a more rigorous approach to environmental regulations.

NATIONAL RANKINGS

The USGS, in 2008, ranked Utah 4th in the nation in the value of nonfuel minerals production (USGS, 2009, p. 10), unchanged from 2006 and 2007. Additional information from USGS personnel show that Utah remained the only state that produced beryllium concentrates, magnesium metal, or gilsonite. Utah continued to be ranked 2nd in the quantity of copper, potash, and magnesium compounds produced (in descending order of value); 3rd in molybdenum concentrates, gold, and bentonite clay; 4th in phosphate rock and silver; and 5th in salt. The state was also a significant producer of Portland cement, construction sand and gravel, lime, common clays, and gemstones (Arnold Tanner, USGS, written correspondence, March 2009).

The USGS's estimate of the value of nonfuel minerals production for 2008 is a record $4.17 billion (USGS, 2009, p. 10), about $240 million (6%) higher than in 2007 (figure 3). The UGS's estimate for the value of nonfuel minerals production for 2008 is $4.34 billion, an increase of $273 million (7%) compared to a revised $4.07 billion for 2007.

A summary of estimated mineral values by the UGS from 1999 through 2008 is shown in table 1.

BASE- AND PRECIOUS-METALS PRODUCTION

The value of base and precious metals totaled $3.29 billion in 2008, an increase of $141 million (4%) compared to 2007. Base-metals production, with an estimated value of $2.90 billion, was the largest contributor to the value of minerals produced in 2008 (figure 2; table 1). In descending order of value, those metals were copper, molybdenum, magnesium, vanadium, iron, and beryllium. The 2008 base-metals value was about $73.3 million (3%) higher than 2007, and will likely establish a benchmark for base-metal values for years to come. Precious-metals production, valued at $390 million (figure 2; table 1), includes gold (86% of total value) and silver (14% of total value). Precious-metals values in 2008 were $68 million (21%) higher than in 2007, and near the record high of $400 million established in 2006.

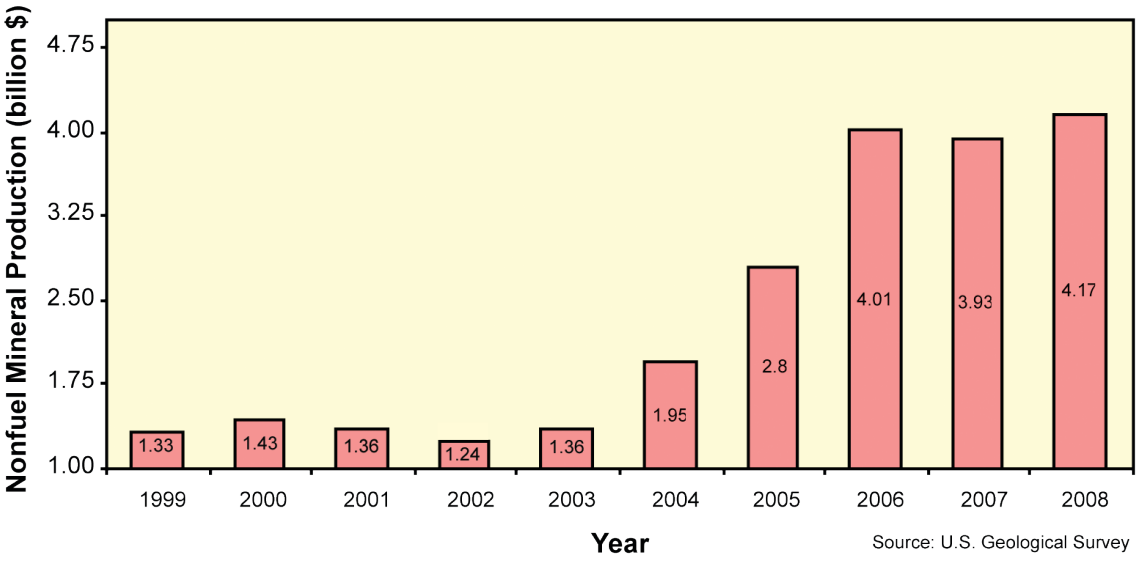

Figure 3. *Total annual value in nominal dollars of Utah's nonfuel minerals production from 1999 through 2008.*

Kennecott Utah Copper Corporation's (KUC) Bingham Canyon mine, located about 32 km (20 mi) southwest of Salt Lake City in Salt Lake County, is the state's major producer of copper, gold, and silver, and its sole producer of molybdenum. KUC is the second-largest copper producer in the U.S. based on 2008 production, and KUC supplied approximately 12% of the U.S.'s annual refined copper requirements (Rio Tinto, 2009). The combined value of minerals produced from the Bingham Canyon mine in 2008 was about 61% of the total value of all minerals produced statewide.

Copper

Copper was the largest contributor to the value of nonfuel minerals in Utah. Substantial price increases, which began in 2003, raised the value of copper produced to a near all-time high, and the value of base-metals production statewide to nearly $3 billion. The Bingham Canyon mine produced about 238,000 metric tons (mt) (262,000 short tons [st]) of copper in 2008, compared to the 212,000 mt (234,000 st) produced in 2007. Rio Tinto (KUC's parent company) also reported that refinery production was 201,000 mt (222,000 st) compared to 266,000 mt (293,000 st) in 2007 (Rio Tinto, 2009). KUC is in the fifth year of an aggressive mine life extension program.

The Lisbon Valley Copper mine, located 72 km (45 mi) southeast of Moab in San Juan County, began operating in December 2005, but due to lower-than-anticipated recovery grades and excessive processing costs, the mine went to a leach-only system in 2008. Mining has been curtailed, but leaching will continue until the ore pad has been depleted.

Molybdenum

Molybdenum was the second-largest contributor to the value of Utah's base-metals production in 2008. Kennecott's Bingham Canyon mine produced about 10,600 mt (11,700 st) of co-product molybdenum in 2008, compared to 14,900 mt (16,400 st) produced in 2007. Rio Tinto reported that the lower molybdenum production was due to a 17% decrease in ore grades compared to 2007 (Rio Tinto, 2009). The USGS reports that the Bingham Canyon mine was one of eight domestic copper mines to recover molybdenum as a by-product. The USGS also reports that the total U.S. mine output of molybdenum in concentrate increased about 8% from that of 2007 (USGS, 2009, p. 108–109).

Magnesium

Magnesium metal was the third-largest contributor to the value of base metals in 2008. Magnesium metal is produced from Great Salt Lake brines by US Magnesium, LLC at its electrolytic plant at Rowley in Tooele County. The plant's annual capacity is 43,000 mt (47,000 st) of magnesium metal (99.8% purity). It is the only active primary magnesium processing facility in the U.S. Magnesium production in 2008 was moderately higher than in 2007. Average magnesium metal prices increased from $3.09/kg ($1.40/lb) in 2006 to $4.84/kg ($2.20/lb) in 2007, and to $7.70/kg ($3.50/lb) in 2008 (USGS, 2009, p. 98–99).

Vanadium

Vanadium is produced as a co-product with uranium in some, but not all, uranium mines in Utah and is recovered in the form of vanadium pentoxide (V_2O_5) during the milling of uranium ore. Two mines operated by Denison Mines, Inc. produced an undisclosed amount of vanadium-bearing ore in 2008. Vanadium pentoxide prices more than doubled in 2008, ranging from $7.30 to $18.40 per pound of V_2O_5 and averaged $14.75 for the year. The sharp rise in prices in 2008 was mostly due to reduced vanadium production in China and South Africa (USGS, 2009, p. 180–181).

Iron

Iron Bull Mining and Milling Company, a subsidiary of Palladon Ventures, Ltd., began producing ore at the historic Comstock–Mountain Lion open-pit mine, near Cedar City, in September 2008. Direct shipments to China were scheduled to begin immediately, but were delayed because of unavailable storage space at the selected West Coast port. A small amount of ore was mined and stored on the existing stockpile. Numerous infrastructure improvements to the mine, loadout, and railroad siding were made in 2008.

Beryllium

Utah continues to be the nation's sole producer of beryllium concentrates. Brush Resources operates a beryllium (bertrandite) mine in Juab County, and ore and imported beryl can both be processed through parallel circuits 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 Elmore, Ohio, where it is converted into beryllium metal, alloys, and oxide. Approximately 155,000 mt (171,000 st) of ore and an additional 80,000 mt (88,000 st) of imported beryl and beryl from the National Defense Stockpile were processed in 2008 (USGS, 2009, p. 30–31). The company's Monitor pit closed in 2008 and production began at the new Fluro-Roadside pit.

In 2005, Brush Engineered Materials, Inc. (the parent company) was awarded a $9 million contract under the Department of Defense's Defense Production Act, Title III Program. The contract is for the engineering and design of a new facility for the production of primary beryllium, the feedstock material used to produce beryllium metal products. The new facility, to be owned and operated by Brush Engineered Materials, started construction in 2008 and will take two to three years to

complete (USGS, 2009, p. 30–31). The new facility is located at an existing plant site in Elmore, Ohio.

Gold and Silver

Gold production in 2008 is estimated to be about 373,000 troy ounces (oz), about 30,000 oz less than in 2007. 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 may produce minor amounts of gold and silver, but production is not reported or 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 2009, when those pads will be depleted. Silver is also a by-product metal from the Bingham Canyon mine. Silver production was about 3.4 million oz in 2008, slightly less than that of 2007 (Rio Tinto, 2009).

INDUSTRIAL-MINERALS PRODUCTION

Industrial-minerals production, with an estimated value of $1.05 billion, was the second-largest contributor to the value of minerals produced in 2008 (figure 2; table 1). Industrial-mineral values exceeded $1 billion for the first time in 2008. The value of industrial minerals has grown substantially over the past 10 years, increasing from a low of $500 million in 2000 to the high of $1.05 billion in 2008, a 101% increase. Commodities or commodity groups that have realized the majority of these gains include sand and gravel and crushed stone; Portland cement and lime; salines, including salt, magnesium chloride, and potash (potassium chloride and sulfate of potash [SOP]); and phosphate rock. These commodities account for about 90% of the total value of Utah's industrial-minerals segment. Other commodities produced in Utah, in descending order of value, include gilsonite; bentonite, common clay, and kaolin; expanded shale; and gypsum. The overall value of industrial minerals increased because of increased production and substantial price increases for salt, magnesium compounds, potash, and phosphate rock, offset by reduced demands and value for construction-based materials such as sand and gravel, crushed stone, lime and quicklime, expanded shale, and gypsum.

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

Brine-derived products, including salt, were the largest contributors to the value of industrial minerals produced in Utah in 2008, with a combined value of $376 million, about $129 million (52%) more than in 2007. In addition to salt, brine-derived products include magnesium chloride and potash (potassium chloride and potassium sulfate). One company (North Shore Limited Partnership) produces a small amount of concentrated magnesium brine that is used as an ingredient in mineral food supplements. The statewide production of salt and other brine-derived products, excluding magnesium metal, is estimated to be 3.68 million mt (4.05 million st) in 2008, about 0.42 million mt (0.46 million st) more than in 2007. Potash production (including SOP) is estimated to be about 0.39 million mt (0.43 million st) in 2008, approximately 0.06 million mt (0.07 million st) more than in 2007.

Salt production alone was estimated to be 2.8 million mt (3.1 million st) in 2008, about 0.32 million mt (0.35 million st) more than in 2007, with most of the production coming from three operators processing brine from Great Salt Lake. The three operators are, in descending order of production: (1) Great Salt Lake Minerals Corporation, (2) Cargill Salt Company, and (3) Morton International. In addition, three other companies produce salt and/or potash from operations not located on Great Salt Lake: (1) Intrepid Potash–Wendover, LLC near Wendover in Tooele County (salt and potash), (2) Intrepid Potash–Moab, LLC near Moab in Grand County (salt and potash), and (3) Redmond Minerals, Inc. near Redmond in Sanpete County (rock salt). Redmond Minerals has significantly increased production over the past five years as a result of an aggressive marketing campaign.

Sand and Gravel, and Crushed Stone

Sand and gravel, and crushed stone (including limestone and dolomite) were the second-largest contributors to the value of industrial minerals produced in Utah during 2008, with an estimated value of $240 million, about $77.8 million (24%) lower than in 2007. These materials are produced in nearly every county in Utah by commercial operators as well as county, state, and federal agencies. Due to the large number of operations (approximately 140 active pits and quarries), the UGS does not send production questionnaires to this group. However, production data are compiled by the USGS. Based on preliminary 2008 data (Jason Willett, USGS, written communication, March 2009), Utah operators produced 31.9 million mt (35.1 million st) of sand and gravel valued at $192 million, and 6.17 million mt (6.80 million st) of crushed stone valued at $48 million. Crushed stone production includes raw materials for both lime and cement plants. This is a 13.2 million mt (14.5 million st) (32%) decrease in sand and gravel production and a 7.13 million mt (7.86 million st) (54%) decrease in the production of crushed stone compared to 2007. These decreases are mostly due to the decline in regional and local residential, commercial, and infrastructure construction.

Portland Cement and Lime

Portland cement and lime were the third-largest contributors to the value of industrial minerals produced in 2008, with a combined value of $238 million, about $2 million (1%) more

than in 2007. Two operators produce Portland cement in Utah: Holcim, Inc. and Ash Grove Cement Company. Holcim's Devils Slide plant and mine are located east of Morgan in Morgan County, and Ash Grove's Leamington plant and mine 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 name plate capacity in 2008, with total production of about 1.5 million mt (1.7 million st), essentially the same as in 2007. In addition to limestone, Ash Grove Cement mines a modest amount of shale and sandstone that are used in the manufacture of cement.

Lime production was about 16% lower in 2008 than in 2007, with an estimated production of about 717,000 mt (790,000 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., which produces dolomitic quick lime and high-calcium quick lime; and Chemical Lime of Arizona, Inc., which produces dolomitic quick lime and hydrated dolomitic 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. The addition of a fifth kiln to Graymont's Cricket Mountain plant will add about 500,000 mt (551,000 st) per year of capacity when completed. Chemical Lime of Arizona's plant is about 13 km (8 mi) northwest of Grantsville in Tooele County; it closed in mid-2008 because of the economic recession.

Statewide, DOGM lists 40 active limestone operations including 18 Large Mine and 22 Small Mine permits. Total limestone production reported in 2008 was 4.7 million mt (5.2 million st). Other uses of limestone include construction as well as flue-gas desulfurization in coal-fired power plants. A small amount of limestone is also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Phosphate

Simplot Phosphates, LLC is Utah's only phosphate producer. The company's phosphate operation is 18 km (11 mi) north of Vernal in Uintah County. 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-mile) underground pipeline. During 2008, the mine produced about 3.4 million mt (3.8 million st) of ore, slightly more than in 2007.

Gilsonite

Gilsonite production for 2008 is estimated to be about 69,000 mt (76,000 st), a decrease of about 8200 mt (9000 st) from 2007. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. Gilsonite is marketed worldwide for use in over 150 products ranging from printing inks to explosives. All of Utah's 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) Lexco, Inc., and (3) Zeigler Chemical and Minerals Company. Although lower in 2008, gilsonite production has been increasing modestly over the past several years.

Expanded Shale

Only one company, Utelite, Inc., produced lightweight "expanded" products from shale for use primarily in the construction and building industries. Mine production was about 204,000 mt (225,000 st) in 2008, an increase of 22,700 mt (25,000 st) from that in 2007. Utelite's shale plant and mine are east of the town of Wanship in Summit County.

Common Clay, Bentonite, and High-Alumina Clay

Five companies produced approximately 265,000 mt (292,000 st) of common clay, bentonite, and high-alumina clay in 2008. Statewide, there were 21 active mine permits held by common clay, bentonite, and high-alumina clay operators in 2008. Many of these mines operate intermittently. The two largest producers of common clay in 2008 were Western Clay Company (bentonite) and Interstate Brick Company (common clay). In addition, Interpace Industries (common clay), Redmond Minerals, Inc. (bentonite), and Sandy Nell (high-alumina clay) produced lesser amounts. 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 a component of oil and gas drilling fluids, and as a binder in foundry molds. High-alumina clays are currently being used only in the manufacture of Portland cement.

Gypsum

Seven operators produced 272,000 mt (300,000 st) of gypsum in 2008, about 100,000 mt (110,000 st) (26%) less than in 2007. In descending order of production, the three largest producers were (1) U.S. Gypsum Company, (2) Sunroc Corporation (Clyde Companies), and (3) Georgia Pacific Gypsum. Georgia Pacific Gypsum and U.S. Gypsum operate the only two wallboard plants in Utah. Both plants are near the town of Sigurd in Sevier County. The Georgia Pacific plant, which reopened in 2006 after being closed since 2002, shut down again in early 2008. 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. The decreased production of gypsum is likely related to the downturn of the housing industry.

ENERGY-MINERALS PRODUCTION

Coal

Seven Utah coal operators produced 22.1 million mt (24.4 million st) of coal valued at $682 million from nine underground mines in 2008 (figures 1 and 4). This production was 0.09 million mt (0.1 million st) less than in 2007. Approximately 60% of Utah's coal is consumed in-state by three electric utilities. All of the mines and coal-related facilities are located in east-central Utah (figure 5). Utah's synfuel plant, DTE Utah Synfuels, LLC, closed in late December 2007 because of the loss of synfuel tax credits. Covol Technologies' Wellington air-sparge processing plant began operating in December 2005 and continued to process coal during 2008. Covol Technologies is a subsidiary of Headwaters, Inc., and the plant is rated at about 227 mt (250 st) per hour. Arch Coal Company's new (2006) Castle Valley coal preparation plant operated on an as-needed basis in 2008, and processed coal from the company's Skyline and Dugout mines. The plant has the capacity to process up to 1.8 million mt (2.0 million st) of coal per year.

The largest coal producer was the Sufco mine, operated by Canyon Fuel Company, LLC, which produced 6.3 million mt (6.9 million st) of coal in 2008. In addition, the following four mines each produced in excess of 1.8 million mt (2.0 million st) of coal: (1) Skyline #3, operated by Canyon Fuel Company, LLC; (2) Deer Creek, operated by Energy West Mining Company (Rocky Mountain Energy); (3) Dugout Canyon, operated by Canyon Fuel Company, LLC; and (4) West Ridge, operated by West Ridge Resources.

Following a mine disaster in August 2007, the Crandall Canyon mine, operated by UtahAmerican Energy, Inc., was permanently closed, and the company's Aberdeen mine was idled in early 2008. UtahAmerican Energy's new Lila Canyon mine (figure 5) received all of its required permits late in 2007, and roads and site work were initiated in 2008. The development of two rock slopes that will provide access to the coal will begin in 2009, and will take about 18 months to complete. Initial coal production is planned for 2011.

Uranium

Denison Mines, Inc. produced uranium and uranium/vanadium ore from three mines and produced uranium oxide (U_3O_8) and vanadium pentoxide (V_2O_5) from the White Mesa mill, which is located in San Juan County. According to Denison, the mill is the only conventional uranium mill currently operating in the U.S. It is strategically located within hauling distance of all of Denison's current U.S. mine and exploration properties on the Colorado Plateau, the Henry Mountains area, and the Arizona Strip. Mill production for 2008 is expected to yield 0.45 million kg (1.0 million lb) of U_3O_8 and 0.68 million to 0.91 million kg (1.5–2.0 million lb) of vanadium (Denison Mines, 2009).

OUTLOOK FOR 2009

The outlook for 2009 is for a moderate decrease in the value of nonfuel minerals production based largely on projections for higher production of base and precious metals offset by significantly lower prices for base metals. Overall, the value for industrial minerals will decline as Utah's economy continues to contract, although the downturn could be partially mitigated by infrastructure construction funded by the "stimulus" legislation enacted by Congress in early 2009. The value of coal will remain nearly the same, as higher prices will be offset by slightly lower production in 2009. One new coal mine

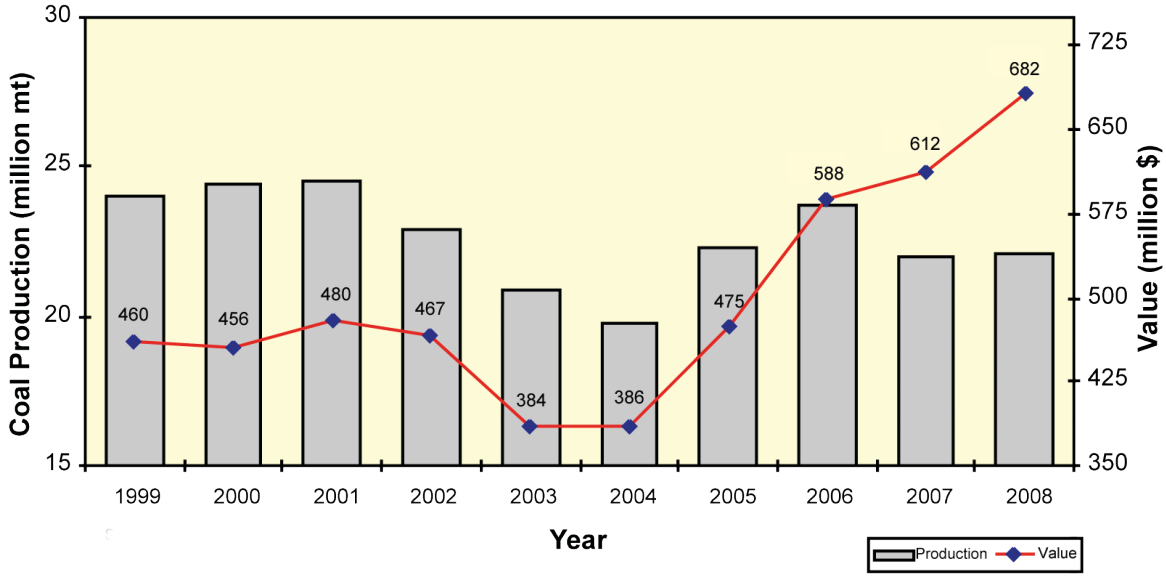

Figure 4. *Utah's annual coal production and value in nominal dollars from 1999 through 2008.*

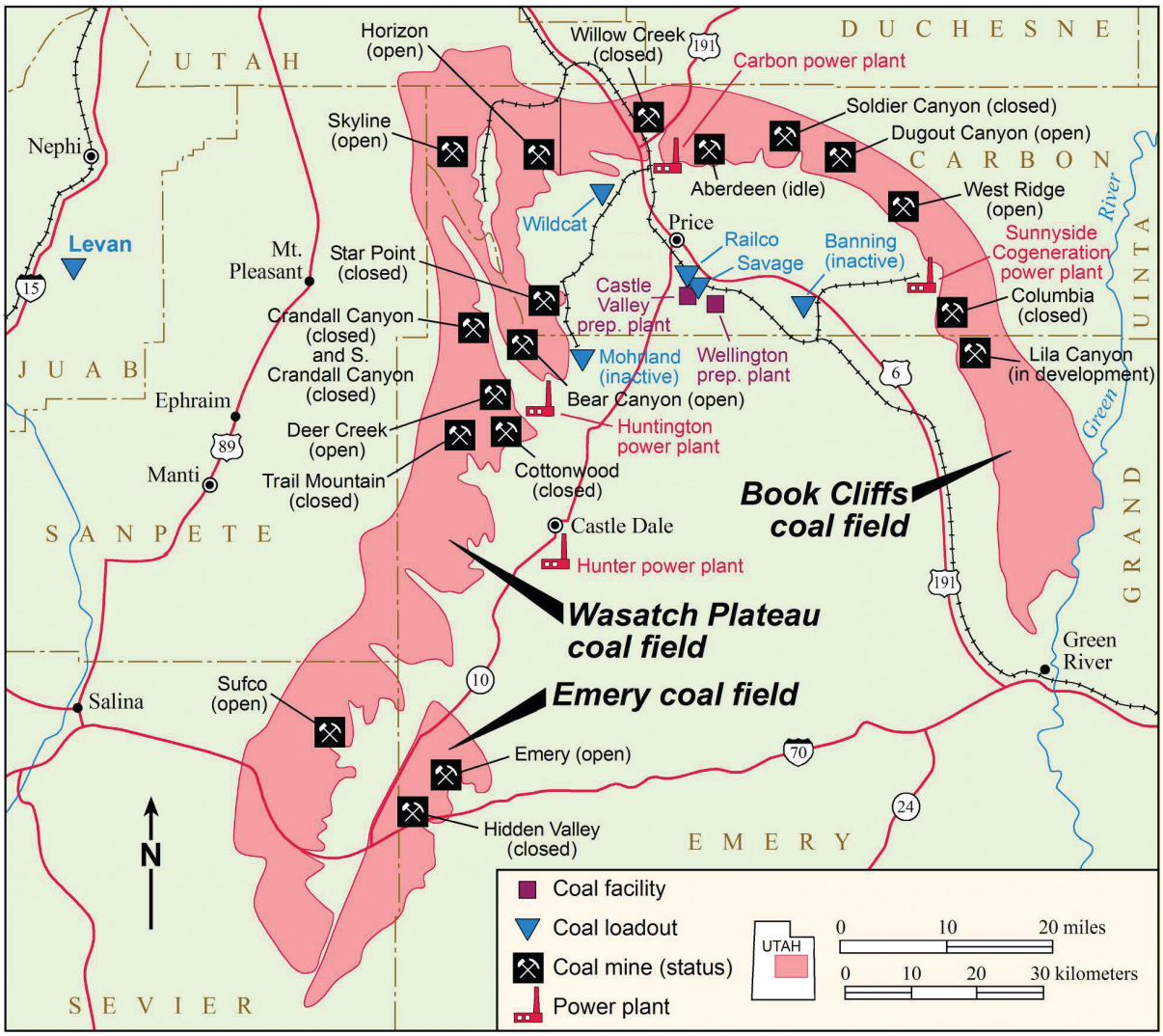

Figure 5. *Location and status of central Utah's coal mines and processing plants. Data from Utah Division of Oil, Gas, and Mining files.*

is in development; it is scheduled to begin production in 2011. The boom in uranium exploration and the reopening of several mines and a second uranium mill have been tempered by a sharp decline in spot uranium prices, but this new activity, in time, will add significantly to Utah's energy minerals sector. The construction of a titanium sponge plant adjacent to U.S. Magnesium's magnesium facility on the west shore of Great Salt Lake will add incremental demand for magnesium and begin a new era in metal processing in the state. One new iron mine is in development but has not shipped ore, and one new copper mine is in development with first production scheduled for early 2009.

EXPLORATION AND DEVELOPMENT ACTIVITY

Mineral exploration and development work continued at a brisk pace in Utah during 2008. Most efforts were focused on copper, molybdenum, gold, silver, zinc, and uranium. Commodity prices reached the peak of this price cycle in mid-2008 and collapsed late in the year. The information in this section is largely derived from numerous individual company Web sites and press releases. The locations of the major projects and mining districts discussed below are shown on figure 6.

Claims, Leases, and Mine Permits

The number of unpatented mining claims filed in Utah has risen dramatically in recent years from a low of 508 in 2001 to over 6000 in 2008. Many of the new claims were staked for uranium on the Colorado Plateau. San Juan County recorded the most mining claims again this year with over 1000, followed by Wayne, Grand, Juab, Beaver, and Emery Counties, all with over 500 claims each (Opie Abeyta, Utah BLM, written communication, March 2009).

The Utah School and Institutional Trust Lands Administration, which manages about 1.8 million ha (4.4 million acres) of state-owned lands in Utah, reported issuing leases and/or contracts on 196 tracts in 2008. These were divided among the following commodities: metalliferous minerals-63, potash-42,

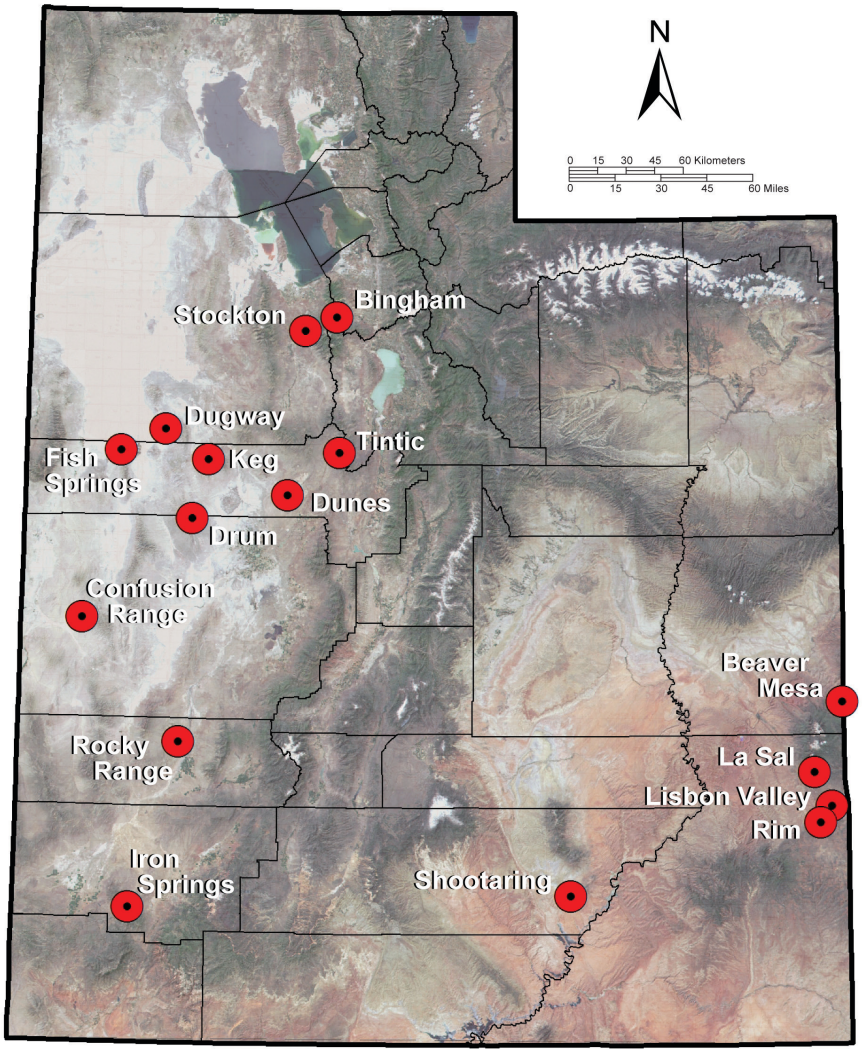

***Figure 6**. Major base-metal, precious-metal, and uranium exploration districts and areas in Utah in 2008.*

geothermal-39, sand and gravel-21, mineral materials-12, oil shale-5, humic shale-4, bituminous/asphaltic sands-3, coal-3, gypsum-2, building stone-1, and clay-1 (William Stokes, SITLA, written communication, March 2009).

During 2008, DOGM approved no new Large Mine permits (greater than 5 acres disturbance), 24 Small Mine permits (less than 5 acres disturbance), and 27 Exploration Notices of Intent permits. The 24 Small Mine permit applications were for the following: industrial minerals-12; energy minerals-10; precious metals-1; and gems, fossils, and other-1. Exploration Notices of Intent were dominated by energy minerals-19, followed by base metals-4, precious metals-2, and industrial minerals-2.

Base Metals

Buoyed by near-record metal prices, base metals had another strong year in Utah. However, metal prices peaked in June 2008 and fell precipitously later in the year. The Bingham Canyon mine continued to produce exceptional profits, while another copper mine near Milford and an iron mine near Cedar City are apparently poised to begin production in 2009. Unfortunately, the Lisbon Valley Cu SX-EW operation, southeast of Moab, failed and declared bankruptcy.

Bingham Canyon

Kennecott Utah Copper Corporation's Bingham Canyon mine earned about $1 billion in 2008. Higher (on average) metal prices were more than offset by lower tonnages and higher unit costs. Bingham remains the U.S.'s second-largest producer of both Cu and Mo. KUC is in the fifth year of an aggressive development program with current efforts concentrated on extending the mine life plan from the current date of 2019 to 2036. KUC's development work increased the resource at the mine by 692 million mt (763 million st) averaging 0.48% Cu, 0.032% Mo, and 0.18 ppm Au. Alternative future mine plans being studied include open-pit laybacks and/or various underground options. Five underground options are be-

ing studied; four are porphyry Cu-Mo block caves on deep porphyry roots beneath the pit and another is a higher grade Cu-Au skarn resource (Rio Tinto, 2009).

KUC also announced plans for construction of a $270 million molybdenum autoclave process facility. The plant would convert molybdenite concentrates to molybdenum trioxide (MoO_3) and ammonium dimolybdate. The new facility will have the capacity to produce 13.6 million kg (30 million lb) of Mo products and an additional 4090 kg (9000 lb) of rhenium per year. The project has been delayed by low metal prices, but may be restarted. KUC also announced that they have recently identified a world-class molybdenite deposit under the current pit (Rio Tinto, 2009).

KUC brownfields exploration in 2008 included running 157 line-km (97.5 line-mi) of induced polarization surveys. Magnetotelluric surveys and additional airborne magnetics were flown over portions of the Oquirrh Mountains that were not previously covered. Six deep holes (totaling 5584 m [18,316 ft]) were completed in the Bingham area south and west of the Bingham pit (Russ Franklin, Kennecott Exploration Company, written communication, March 2009). No analytical results have been released.

Iron Springs

Palladon Iron Corporation/Iron Bull Mining & Milling (Iron Bull) acquired the Iron Mountain property (former Comstock–Mountain Lion open-pit), which hosts an estimated resource of 16 million mt (18 million st) averaging 52% Fe. The ore occurs as massive magnetite replacement/skarn deposits adjacent to Miocene laccoliths. In 2008, Iron Bull installed a power substation, crusher, radial stacker, and rail loadout; upgraded the rail spur; and began mining. The plan is to ship the ore directly to China without concentrating. The first ore shipment is currently delayed by congestion at a West Coast port.

Tintic

Andover Ventures/Genco Resources purchased 65% of Chief Consolidated Mining Company. Chief Consolidated's main assets are in the East Tintic district, Utah County. Chief is applying for permits for renewed operations at the Burgin mine. The Burgin replacement deposit consists of a more than 1 million mt (1.1 million st) high-grade Ag-Pb-Zn resource. In addition, Anglo American US, Inc. is drill-testing a porphyry Cu-Au-Mo lithocap on Big Hill near the center of the district. Anglo began drilling the target in late 2008; no results are yet available.

Quaterra Resources, Inc. acquired about 1300 ha (3200 acres) of patented and unpatented mining claims covering the Southwest Tintic porphyry Cu system in 2007. The property hosts a known resource of approximately 360 million mt (400 million st) of 0.33% Cu and 0.01% Mo.

Crypto

Lithic Resources Ltd. acquired the Crypto Zn skarn in the Fish Springs mining district of western Juab County in 2005. A 1993 Cyprus Minerals Company estimate shows a shallow oxide resource of 2.8 million mt (3.1 million st) averaging 7.0% Zn and a deep sulfide resource of 5.4 million mt (6 million st) averaging 8.8% Zn. In 2008, Lithic completed a core drilling program aimed at confirming and expanding the historical Zn resource at Crypto. Reported intercepts include 23.9 m (78.3 ft) at 185 ppm In (indium) and 30 m (98.5 ft) at 17.9% Zn.

Rocky–Beaver Lake

Copper King Mining Corporation controls about 37,200 ha (92,000 acres) in the Milford area and has been actively exploring the Rocky and Beaver Lake mining districts for the past several years. The districts host seven partially defined Cu skarn and breccia pipe deposits. Current proven ore reserves total approximately 2.2 million mt (2.4 million st) averaging about 1.3% total Cu with possible Au-Ag credits. Copper King has stripped about 1.45 million mt (1.6 million st) of overburden from the Hidden Treasure skarn, stockpiled some ore, and is awaiting start-up of a 2270 mt per day (2500 st/d) flotation mill in early 2009.

Inland Explorations

Inland Explorations Ltd. was formed in 2006 specifically to conduct base-metal exploration in Utah. The company has aggressively pursued a grassroots exploration program and has acquired four properties to date: (1) Keg, (2) Dugway, (3) Thompson Knoll, and (4) Dunes (Sand Mountain). The target at the Keg property is a porphyry/skarn deposit. The Dugway target is a Cu-Pb-Zn-Au-Ag carbonate-hosted replacement deposit on the southwest flank of the Dugway district. Thompson Knoll lies in the Confusion Range of west-central Utah. The Thompson Knoll targets are both skarns and sediment-hosted Au-Ag, similar to that in the adjoining Kings Canyon deposit. Dunes is a base- and precious-metal, massive-sulfide replacement target associated with gently dipping structures.

Lisbon Valley Copper

The Lisbon Valley Mining Company began mine and leach pad development in 2005. Plant construction at the new open-pit, heap leach, SX-EW Cu operation was completed in 2006. The operation experienced metallurgical problems throughout 2007 and 2008 as it attempted to ramp up to full production. Fundamentally, the recovery of Cu from the pads was substantially slower than anticipated. Despite efforts to increase production, the operation has continued to underachieve, so mining was suspended in early 2008. Approximately 15,900 mt (17,500 st) of Cu has been placed on the leach pads and

leaching of this material is expected to continue for the next one to three years. All exploration by Lisbon Valley on the Flying Diamond–Stateline resources, discovered under cover a few miles southeast of their open-pit operation, has ceased.

Stockton

Geoinformatics Exploration, Inc. purchased Kennecott Exploration's Stockton porphyry Cu deposit in 2008. The deposit is about 16 km (10 mi) southwest of Bingham and hosts a resource, estimated by Kennecott, of approximately 172 million mt (190 million st) at 0.41% Cu and 0.14 ppm Au beginning at a depth of about 225 m (740 ft). The best new hole intersected 517 m (1696 ft) averaging 0.23% Cu, 0.09 ppm Au, 1.1 ppm Ag, and 0.01% Mo. Stephanie Murillo Maikut completed an M.S. thesis on the district under Dr. William Chavez at the New Mexico Institute of Mining and Technology in 2008 (Maikut, 2008).

Miscellaneous Base-Metals Developments

Silver Verde May Mining Company acquired 82 claims and a 259 ha (640 acre) state lease covering a porphyry Cu-Mo system in the West Tintic mining district, Juab County. It also has an additional 40 claims and a 271 ha (670 acre) state lease on a sediment-hosted Au target on the south flanks of Maple Peak, Juab County.

In other base-metals developments in Utah, (1) Kennecott Corp. staked over 600 claims in the adjoining Ophir and Stockton mining districts, Tooele County, (2) RTM Exploration and Holdings LLC controlled about 777 ha (1920 acres) of sediment-hosted Cu-Mo prospects in the Uinta Basin, (3) International Beryllium Corporation has acquired 371 claims adjacent to Brush-Wellman's Spor Mountain beryllium mine, Juab County, and (4) Unico, Inc. continued work on the Deer Trail Zn-Pb-Ag mine and mill near Marysvale in central Utah.

Precious Metals

Strong prices for precious metals over the past year have sustained the high level of Au and Ag exploration activity in Utah. These efforts are largely focused in the eastern Basin and Range Province of western Utah.

Silver Dome

The Silver Dome property in the southern Fish Springs district is a 2023 ha (5000 acres) property acquired by Cordex for Columbus Gold Corporation and later spun off as Columbus Silver Corp. Silver mineralization at Silver Dome is hosted in flat-lying Ordovician sandstones. The target at Silver Dome is bulk-minable Ag mineralization amenable to open-pit development. Columbus Silver completed 13 reverse-circulation holes totaling 1639 m (5375 ft) in a Phase I drilling program in late 2008.

Keg

The Keg project is another Ag property acquired by Cordex and Columbus Gold. This 405 ha (1000 acre) property covers an area of stockwork quartz veining in a window of quartzite surrounded by Tertiary volcanic rocks and alluvium. Mapping, sampling, and a ground magnetic survey have been completed.

Confusion Range

Maestro Ventures acquired the Kings Canyon sediment-hosted Au-Ag property in southwestern Millard County in 2007. The property was explored in the early 1990s, primarily by Crown Resources. The property contains several known Au zones with the largest defined resource holding about 6.2 million mt (6.8 million st) averaging roughly 1 ppm Au. In 2008, Maestro completed 974 m (3195 ft) of drilling in a 10-hole program to verify and expand the existing resources. The best hole (KC08-01) cut an interval of 30 m (100 ft) averaging 1.16 ppm Au. Preliminary bottle roll tests show Au recoveries of 86 to 91%.

Drum Mountains

Copper King Mining Corporation initially acquired about 486 ha (1200 acres) of mostly patented mining claims in the Drum (Detroit) mining district in 2007. Copper King later acquired an additional 445 ha (1100 acres) of unpatented claims in the district through a merger with Western Utah Copper Company, giving Copper King a large land package including some previously defined small Au resources.

Miscellaneous Precious-Metals Developments

Newmont Mining Corp. staked over 200 claims in the Stateline district of Iron County. It completed 14 drill holes in the fall, focused on Miocene (16.5 Ma) volcanic-hosted, low-sulfidation, epithermal quartz-adularia-carbonate-pyrite ± fluorite, Au-Ag veins. Additional holes are planned for 2009.

In other precious-metals developments, (1) Grand Central Silver Mines, Inc. continued work on a 46 ha (114 acre) tract on the western fringe of the Bingham district in 2008, (2) Miranda Gold Corporation controlled about 130 claims on the Lookout Pass sediment-hosted Au property in southeastern Tooele County, (3) Astral Mining Corp. controlled 23 claims in the Gold Springs district of Iron County, and (4) Almaden has located 50 claims in the Black Mountains of Iron County.

Uranium

The rise in the price of uranium since 2001 has increased exploration and development activity in Utah. Long-term uranium prices in 2008 were about $154/kg ($70/lb) of U_3O_8;

however, the spot price was lower, ranging from just $88 to $110 per kg ($40–$50/lb). Historically, Utah has been the third-largest uranium-producing state, and the majority of its production is from the Colorado Plateau. The following paragraphs report the major uranium events in Utah in 2008 with miscellaneous uranium activities summarized in table 2.

Denison Mines

Denison Mines Corp. owns the 1800 mt (2000 st) per day, dual-circuit (uranium-vanadium) White Mesa mill near Blanding. The mill switched from processing alternate feed waste material to uranium ore in April 2008. The mill began operating on a 136,000 mt (150,000 st) ore stockpile from company-owned mines, but is also accepting ore from other companies for toll milling. Uranium recoveries are averaging over 90%. The mill could produce about 1.36 million kg (3 million lb) of U_3O_8 and 2 million kg (4.5 million lb) of V_2O_5 annually by 2010.

In late 2006, Denison's Pandora mine, in the eastern La Sal district, was the first Utah property to resume uranium production. The Pandora mine ships about 136 mt per day (150 st/d) 110 km (70 mi) south to the White Mesa mill. Reserves at the Pandora mine are estimated at 263,000 mt (290,000 st) at 0.22% U_3O_8. Denison also plans to reopen the Beaver Shaft mine, 3 km (2 mi) to the west of the Pandora mine, in 2009.

In 2008, production began at Denison's Rim mine in the Dry Valley (East Canyon) district of San Juan County. The Rim mine is operating at about 45 mt per day (50 st/d) with reserves estimated at about 136,000 mt (150,000 st) at 0.22% U_3O_8 and 2% V_2O_5.

Denison's Henry Mountains Complex (Tony M mine and Bullfrog properties) in the Shootaring Canyon district hosts the largest known uranium resource in Utah, estimated at about 2.1 million mt (2.3 million st) averaging 0.28% U_3O_8, and an existing stockpile of 200,000 mt (220,000 st) of 0.138% U_3O_8. The mine was rehabilitated and mining resumed in late 2007 before declining uranium prices and lower-than-anticipated head grades forced its closure in late 2008.

Energy Fuels

Energy Fuels, Inc. is also exploring and rehabilitating historical uranium mines. The Whirlwind mine, on Beaver Mesa directly under the Utah-Colorado border about 45 km (28 mi) northeast of Moab, could begin producing in 2009. The Whirlwind resource is about 149,000 mt (164,000 st) of ore averaging 0.20% U_3O_8 and 0.66% V_2O_5. Energy Fuels anticipates mining 45 to 180 mt per day (50–200 st/d); however, the mine is currently on standby due to low uranium prices.

In 2007, Energy Fuels acquired the 284 ha (702 acre) Hecla Shaft mine, near La Sal, which is currently in rehabilitation. The mine, renamed Energy Queen, has an estimated resource of 161,000 mt (178,000 st) of ore averaging 0.22% U_3O_8 and 0.86% V_2O_5, with access via an existing 229-m-deep (750 ft), lined shaft.

Uranium One

Uranium One, Inc. acquired the uranium assets of the U.S. Energy Corp. in 2006 and Energy Metals in 2007. These assets include the Shootaring Canyon (Ticaboo) uranium mill in the Henry Mountains district. This 680 mt per day (750 st/d) mill is reportedly being re-permitted for operation. Other assets include the Velvet mine (210,000 mt [231,000 st] averaging 0.43% U_3O_8) in the Lisbon Valley district, which has been permitted for mining.

NEW MINERALS INFORMATION

The following publication provides new information on the mineral resources of Utah. This and other publications are available through the Utah Department of Natural Resources Map and Bookstore (mapstore.utah.gov). Additional geographic information system (GIS) data on Utah are available for free download at agrc.its.state.ut.us and geology.utah.gov/databases/index.htm.

Hydrocarbon Systems and Production in the Uinta Basin, Utah is a new CD published in 2008 as Rocky Mountain Association of Geologists and Utah Geological Association Publication 37, edited by Mark W. Longman and Craig D. Morgan. The volume contains a series of papers on the stratigraphy, oil and gas fields, and related topics on the Uinta Basin of northeastern Utah. The CD includes papers on the (1) "Distribution, Amount, and Maturity of Coal Resources of most of the Sego Coalfield, Utah" by David E. Tabet and others, (2) "Gilsonite Resources of the Uinta Basin, Utah" by Taylor Boden and Bryce T. Tripp, and (3) "Sediment-Hosted Polymetallic Mineralization in the Uinta Basin, Duchesne and Uintah Counties, Utah" by G.R. Conn and Ken Krahulec.

RECLAMATION AND THE ENVIRONMENT

The U.S. Department of Energy and the State of Utah agreed in 2005 to move the 10.8 million mt (11.9 million st) of uranium mill tailings (Atlas mill) located along the Colorado River near Moab. The tailings are estimated to average about 100 ppm uranium and 400 ppm vanadium (Don Metzler, written communication, March 2007). The tailings will be moved 48 km (30 mi) north to a site near Crescent Junction. The Department of Energy has decided to transport the tailings by rail to the 100-ha (250-acre) disposal cell recently approved by the Nuclear Regulatory Commission. The reclamation project has an anticipated completion date of 2019.

Table 2. *Urainum projects in Utah in 2008.*

Property	District	County	Company	Progress
Cedar Mountain	Cedar Mountain	Emery	Magnum Uranium Corp.	Resource: 1.5M tons @ 0.05% U_3O_8
Hidden Splendor	Delta	Emery	Bluerock Resources Ltd.	Resource: 37,000 tons @ 0.25% U_3O_8
Green River South (Sahara)	San Rafael River	Emery	Uranium Power Corp.	15,425 feet drilled in 23 holes, including 3 feet @ 0.41% U_3O_8
Sahara	San Rafael River	Emery	Uranium One Inc.	Resource: 109,000 tons @ 0.23% U_3O_8
San Rafael	San Rafael River	Emery	Magnum Uranium Corp. - Uranium One Inc.	Down Yonder indicated resource: 199,100 tons @ 0.18% U_3O_8
Sinbad	San Rafael River	Emery	Target Exploration & Mining	15 hole, 3300-foot drilling program, including 1.07% U_3O_8 over 1.6 feet
Tidwell Bottoms	San Rafael River	Emery	Carnotite LLC	Small mine permit in place
BBP	San Rafael Swell	Emery	Bluerock Resources Ltd.	5778 acres acquired
Big Muddy	San Rafael Swell	Emery	Magnum Uranium Corp.	1160 acres acquired
Four Corners	San Rafael Swell	Emery	International Ranger Corp.	47,120 acres acquired
Frank M	Henry Mountain	Garfield	Uranium One Inc.	Resource: 1.5 M ton @ 0.12% U_3O_8
Henry	Henry Mountain	Garfield	Trigon Uranium Corp.	Controls 30,000 acres
Henry South	Henry Mountain	Garfield	Trigon Uranium Corp.	30,600 acres acquired
Little Egypt	Henry Mountain	Garfield	Magnum Uranium Corp.	1180 acres acquired
North Wash	Henry Mountain	Garfield	Vane Minerals LLC	26 holes drilled, including 9.5 feet @ 0.36% U_3O_8
Shootaring Mtn.	Henry Mountain	Garfield	Atom Energy Ltd.	25% interest in 104 claims acquired
Tony M	Henry Mountain	Garfield	Denison Mines Corp.	Permited 5.3 million pound U_3O_8 resource
Whirlwind	Beaver Mesa	Grand	Energy Fuels Inc.	Resource: 204,022 tons @ 0.21% U_3O_8 and 0.71% V_2O_5
Mineral Canyon	Mineral Canyon	Grand	Wave Uranium	Staked over 500 claims
North Yellow Cat	Thompson	Grand	Terra Ventures	Acquired 4720 acres
Thompson Project	Thompson	Grand	White Canyon Uranium Ltd.	Acquired 6670 acres
Koorsharem	Marysvale	Piute	International Ranger Corp.	120 acres acquired
Marysvale	Marysvale	Piute	Trigon Uranium Corp.	Resource: 750,000 tons @ 0.08% U_3O_8
Marysvale	Marysvale	Piute	Magnum Uranium Corp.	1730 feet in three holes including 4.5 feet @ 0.16% U_3O_8
Dunn Mine	Dry Valley	San Juan	Midasco Capital Corp.	Resource: 143,400 tons @ 0.12% U_3O_8
Rim-Columbus	Dry Valley	San Juan	Denison Mines Corp.	Permitted resource: 69,456 tons @ 0.22% U_3O_8 and 1.8% V_2O_5
Round Mountain	Elk Ridge	San Juan	Global Uranium Corp.	60 claims
Blue Jay	Fry Canyon	San Juan	White Canyon Uranium Ltd.	Some historic drilling
Energy Queen	La Sal	San Juan	Energy Fuels Inc.	Permitted Resource: 258,000 tons @ 0.24% U_3O_8 and 0.96% V_2O_5
La Sal	La Sal	San Juan	Vane Minerals LLC	80 acres acquired
La Sal West	La Sal	San Juan	USA Uranium Corp.	2200 acres acquired
La Sal West	La Sal	San Juan	Lifespan Inc.	Old uranium mine
North Alice Extension	La Sal	San Juan	Vane Minerals LLC	Resource: 43,000 tons @ 0.14% U_3O_8
Pandora	La Sal	San Juan	Denison Mines Corp.	Mining about 100 tons per day; 1.3 million pound U_3O_8 reserve
Snowball	La Sal	San Juan	Denison Mines Corp.	Permitted
Wray Mesa	La Sal	San Juan	Trigon Uranium Corp.	10,000 acres acquired
Pine Ridge	La Sal Creek	San Juan	Global Uranium Corp.	70 claims
Dar	Lisbon Valley	San Juan	Mesa Uranium Corp.	1000 acre property
Lisbon mine	Lisbon Valley	San Juan	Mesa Uranium Corp.	22 holes (~60,000 feet), including 3.5 feet @ 0.28% U_3O_8
Locuist	Lisbon Valley	San Juan	Anglo Canadian Uranium	780 acres acquired
Patti Ann	Lisbon Valley	San Juan	Bluerock Resources Ltd.	92,000 tons stockpile @ 0.09% U_3O_8
Velvet	Lisbon Valley	San Juan	Uranium One Inc.	Permitted Resource: 306,164 tons @ 0.34% U_3O_8
Calliham (J.H. Ranch)	Ucolo	San Juan	Midasco Capital Corp.	Resource: 170,000 tons @ 0.20% U_3O_8
Daneros (Lark)	White Canyon	San Juan	White Canyon Uranium Ltd.	Permitted resource: 210,000 ton @ 0.3% U_3O_8
Geitus	White Canyon	San Juan	White Canyon Uranium Ltd.	Resource: ~40,000 ton @ 0.3% U_3O_8
Happy Jack	White Canyon	San Juan	Vane Minerals LLC	Permitted
Red Canyon	White Canyon	San Juan	Trigon Uranium Corp.	5000 acres acquired
La Sal	White Mesa	San Juan	Laramide Resources	Resource: 441,000 tons @ 0.31% U_3O_8

Reclamation at the 81 ha (200 acre) Midvale Superfund slag site (Bingham Consolidated Smelter) is complete and the site, along the Jordan River, is undergoing mixed-use development as Bingham Junction. Scheduled development includes 48 ha (119 acres) of houses, apartments, retail, and office space with an additional 4.5 ha (11 acres) of wetlands.

Kennecott Utah Copper's South Zone in southwestern Salt Lake County has been removed from the Environmental Protection Agency list of potential Superfund sites. Kennecott has spent more than $400 million on clean-up efforts in the area.

REFERENCES

Butler, B.S., Loughlin, G.F., Heikes, V.C., and others, 1920, The ore deposits of Utah: U.S. Geological Survey Professional Paper 111, 672 p.

Denison Mines, 2009, White Mesa mill: Online, http://www.denisonmines.com/SiteResources/ViewContent.asp?DocID=96&v1ID=&RevID=379&lang=1, accessed March 30, 2009.

Energy Information Administration, 2008, Annual coal report 2007: Online, http://www.eia.doe.gov/cneaf/coal/page/acr/acr_sum.html, accessed March 22, 2009.

Maikut, 2008, Hydrothermal alternation characterization and stable isotope geochemistry as vectors towards ore near Stockton, Utah: Socorro, New Mexico Institute of Mining and Technology, M.S. thesis, 188 p.

Rio Tinto, 2009, Rio Tinto 2008 annual report: Online, http://www.riotinto.com/documents/Investors/Rio_Tinto_2008_Annual_report.pdf, accessed March 22, 2009.

Romney, M.P., 1963, Utah's Cinderella minerals—the nonmetallics: Utah Historical Quarterly, v. 31, no. 3, p. 224.

U.S. Geological Survey, 2009, Mineral commodity summaries 2009: Online, http://minerals.usgs.gov/minerals/pubs/mcs/, accessed March 22, 2009.