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2005 Minerals Yearbook

WYOMING

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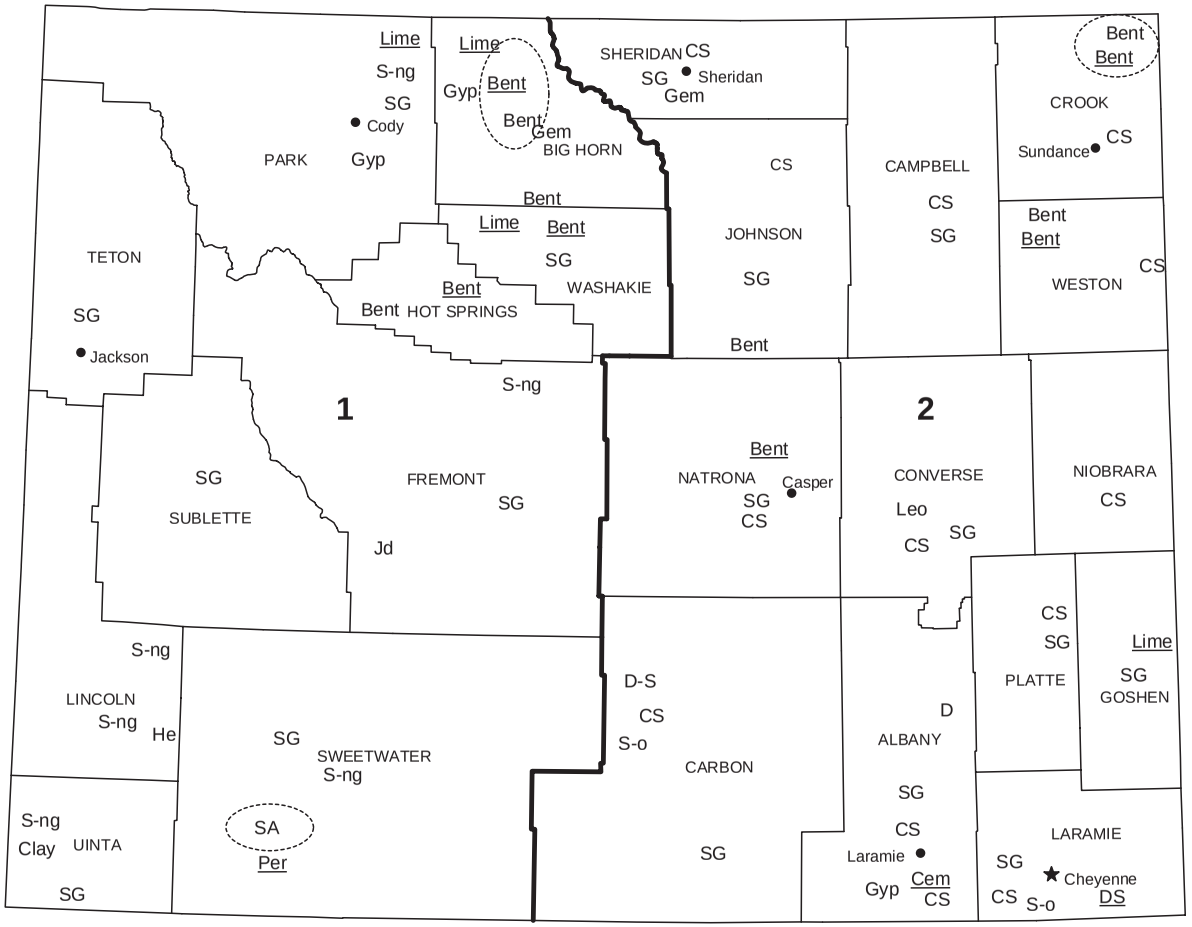
WYOMING



MINERAL SYMBOLS (Major producing areas)

Bent	Bentonite
Bent	Bentonite plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-S	Dimension sandstone
DS	Dimension stone plant
Gem	Gemstones
Gyp	Gypsum
He	Helium
Jd	Jade
Leo	Leonardite
Lime	Lime plant
SA	Soda ash
Per	Perlite plant
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel
	Concentration of mineral operations

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

0 100 Kilometers

Source: Wyoming State Geological Survey/U.S. Geological Survey (2005)

THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wyoming State Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Wyoming's nonfuel raw mineral production was valued[1] at $1.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $250 million, or nearly 24% increase from the State's total nonfuel mineral production value for 2004, which then was up $51 million (up 5%) from that of 2003. The State rose to 14th from 16th in rank among the 50 States in total nonfuel raw mineral production value and accounted for about 2.4% of the U.S. total value. Yet, per capita, the State ranked first in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 509,000, the value of production was about $2,550 per capita.

Soda ash was Wyoming's leading nonfuel mineral, by value, followed by bentonite, Grade-A helium, construction sand and gravel, and portland cement. Together, the five accounted for nearly 96% of the State's total nonfuel raw mineral production value. In 2005, the mineral commodities with the largest increases in value were soda ash, bentonite clay, and construction sand and gravel; the unit values of each also increased, especially that of soda ash. A small increase in soda ash production led to a more than $180 million rise in its value. Larger increases in the production of bentonite and construction sand and gravel, relative to that of soda ash, resulted in increases in the two commodities values of $39 million and more than $12 million, respectively. Smaller yet significant increases took place in the values of crushed stone, crude gypsum, and lime. Although production of portland cement was down more than 10%, its value was up slightly. The largest decrease in value took place in Grade-A helium, down about $3 million.

In 2005, Wyoming continued to be first in rank in the quantities of soda ash and bentonite clay produced, and second in Grade-A helium production. Wyoming also continued to be a producer of significant quantities of construction sand and gravel and gypsum. The United States is the world's second leading producer of soda ash, which is produced mainly from trona ore. Wyoming was one of only three soda ash-producing States and is home to the world's largest known deposit of trona. Soda ash (sodium carbonate) is an inorganic chemical that is used extensively in the manufacture of glass, paper, soap and detergents, and textiles, and, in the form of sodium bicarbonate, in food products. California and Colorado produce significantly smaller quantities of natural soda ash.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

The Wyoming State Geological Survey[2] (WSGS) provided the following narrative information. Production data in the text that follows are those reported by the WSGS and are based on the agency's own surveys and estimates. They may differ from production figures reported to the USGS.

Exploration and Development Activities

Industrial Minerals

Diamond.—Interest in diamond exploration in Wyoming increased during 2005 with inquiries by numerous companies concentrating on kimberlite districts and indicator mineral anomalies in the southeastern part of the State. Limited exploration for diamonds was reported in the Iron Mountain, State Line, Middle Sybille Creek, and Happy Jack-Eagle Rock Districts. A few kimberlites reportedly were discovered in the Happy Jack-Eagle Rock District west of Cheyenne, although these discoveries were not verified by the WSGS. Wyoming has essentially been unexplored for diamonds, although there exists significant potential for recovery of gem-quality diamonds from the State's underlain Archean rocks.

In a divergence from the trend of looking at known kimberlite districts and indicator mineral anomalies, one company expressed interest in the potential for unconventional diamond deposits hosted by lamprophyres and metakomatiites within the State.

Prospectors from Cody collected pyrope garnets (diamond indicator minerals) from a very large region in the Bighorn Basin west of Worland. The pyrope garnets were derived from anthills across an area covering several square kilometers.

Two companies proposed budgets to search for hidden olivine lamproites in the Leucite Hills, northeast of Rock Springs, aware that most olivine lamproite rock deposits throughout the world have yielded diamonds. The geologic characteristics of the Leucite Hills are very similar to Australia's Ellendale field, where both leucite-lamproites and hidden olivine-lamproites are found, and where commercial mining of olivine-lamproites for diamonds is carried out. Thus the occurrence of hidden olivine lamproites in the Leucite Hills was deemed a distinct possibility by the companies. Earlier, preliminary studies conducted by the WSGS on two lamproite deposits discovered in the northeastern edge of the Leucite Hills showed the presence of diamond-stability chromites. However, the first indication was that these chromite deposits were not likely to be highly mineralized in diamond.

[2]Wayne M. Sutherland, Assistant Staff Geologist; Bob Gregory, Geological Analyst; and W. Dan Hausel, Senior Economic Geologist; Natural Resources Division, Wyoming State Geological Survey, coauthored the text of the State mineral industry information.

De Beers began development of an underground diamond mine at the Snap Lake kimberlite deposit in Northwest Territories, Canada. It was anticipated that the development of Snap Lake might serve to generate more interest in the Iron Mountain kimberlite deposit in Wyoming. Geochemical data for the Iron Mountain kimberlites suggest diamond potential similar to diamondiferous kimberlites in the State Line District to the south. Diamond-indicating pyropes were recovered from all Iron Mountain kimberlites sampled with the exception of a carbonatized dike in the southern portion of the district. One macro- and some micro-diamonds were recovered in the past from a small number of these kimberlites tested for diamond (Coopersmith and others, 2003, p. 7-11). The Snap Lake Mine is based on a diamondiferous kimberlite dike only 2.4-meters thick and is scheduled for full production in 2007 (AMEC plc, 2005; Hausel, 2005). In the past, several companies declined to explore the Iron Mountain diamondiferous kimberlites because they were of dike-type geologic formation. DeBeers showed that narrow dikes can be feasibly mined, even in the Arctic of Canada.

Gemstones.—The collection and marketing of precious and semiprecious gemstones as well as unique geologic materials from Wyoming continued as a diverse and untracked small-scale activity. As in previous years, sale of these materials during 2005 by amateur collectors, prospectors, semiprofessionals, and professional dealers took place primarily at gem and mineral shows, in local jewelry and rock shops, and over the Internet. These mineral commodities included agates, iolite, jasper, kyanite, labradorite, nephrite jade, opal, quartz, ruby, sapphire, and satin spar. Kimberlite, lamproite, and other types of rock specimens also were sold under similar conditions.

A report released by the WSGS, addressing the geology of the Cedar Rim opal deposit in central Wyoming indicated that the deposit was dominated by significant amounts of common opal, accompanied by some fire opal. However, it showed only traces of precious opal. Only a very small part of the large deposit has been examined, but the report indicated there was potential for more fire opal and the possibility of hidden precious opal seams (Hausel and Sutherland, 2005). Opals collected by the WSGS weighed as much as 77,100 carats. Release of the WSGS report triggered a staking rush in the Beaver Rim area that made national news and swamped local U.S. Bureau of Land Management offices with claim applications. Opal hunters eventually filed more than 1,100 claims and attracted investors from as far away as Japan. Opal exploration activity in the Cedar Rim area continued throughout 2005, with one prospector reporting the discovery of high-quality fire opal at a shallow depth.

Minor activity by Colorado-based Eagle-Hawk Mining Company continued at both the Palmer Canyon and Grizzly Creek gemstone deposits. Faceted iolites from these deposits yielded several gemstones in the 15 to 20 carat size range. A large gem ruby recovered earlier in the year from the area was faceted into an 8.5-carat gemstone. Individual exposed masses of apparent gem-quality iolite observed in the area may exceed 100,000 carats in weight.

Metals

Copper.—Preliminary investigations were begun by two companies seeking copper-gold mineralization in the Sierra Madre and Hartville uplifts. The Ferris-Haggarty and Kurtz-Chatterton properties in the Sierra Madre were of specific interest.

Gold.—Exploration activity rose during 2005, with at least two companies, Quincy Gold Corporation, Toronto, Ontario, Canada, and Nevada-based Bald Mountain Mining Company, exploring the Lewiston District in the South Pass greenstone belt. A third company, St. Joe Minerals Ltd., Lakewood, CO, explored the South Pass-Atlantic City trend owing to its similarities to a recent major gold discovery in the Great Lakes area of the United States. Inquiries were also made regarding the gold occurrence at Oregon Buttes, which was proposed to have been derived from the South Pass greenstone belt in a buried area adjacent to the Continental Fault (Hausel, 1991, p. 2, 81-82). Hecla Mining Company, Coeur d' Alene, ID, intersected significant magnetic induced polarization anomalies in this area and drilled into a potential sulfide-bearing iron formation. Norwest Corporation, Salt Lake City, UT, explored and tested for gold at the Dickie Springs–Oregon Butte paleoplacer deposit. Georgia-based Encampment Resources LLC and a number of consultants investigated gold properties in both South Pass and in the Rattlesnake Hills.

Newmont Mining Corporation, Denver, CO, explored for gold at the Bear Lodge Mountains site in northeastern Wyoming. Barrick Gold Corporation, Toronto, Ontario, Canada, planned to initiate exploration at this site, as well as the nearby Mineral Hill area. The Bear Lodge alkalic complex contains several rare-earth metal and gold anomalies. Earlier exploratory drilling at Smith Ridge in the Bear Lodge Mountains identified a gold resource of about 5,200 kilograms (kg) (168,000 ounces).

Platinum-Group Metals and Nickel.—In addition to its investigation of several gold properties, Encampment Resources continued to explore for platinum-group metal and nickel resources in the southeastern area of the State. Drilling and trenching exploration methods were employed, which targeted deposits in the Mullen Creek and Lake Owen layered complexes. The company reported the intersection of several promising anomalies that exhibited appreciable thicknesses.

Commodity Review

Industrial Minerals

Production of industrial minerals generally increased during 2005 compared with that of 2004. Bentonite, construction aggregate, gypsum, and trona increases appeared to reflect increases in both the construction industry and in exploration for energy minerals.

Bentonite.—Wyoming continued to lead the Nation in the production of sodium bentonite during the year. End uses for bentonite production included approximately 26% for pet waste absorbent (kitty litter), 23% for foundry sand bonding agent,

22% for drilling mud, 13% for binder in iron ore pelletizing, and 16% for other uses (Virta, 2007). Production of bentonite increased by approximately 2% more than that of 2004 to a level of nearly 4.19 million metric tons (Mt). Employment in the bentonite industry rose by approximately 10% compared with that of 2004 (Wyoming Mining Association, undated§[3]). However, the number of mills operating in Wyoming during 2005 remained unchanged from that of 2004.

Dimension Stone.—The only dimension stone quarry that operated in Wyoming during 2005 was Strid Marble & Granite's sandstone quarry at Rawlins. Strid produced a stone that was marketed as Wyoming Gray Sandstone. It was processed in Cheyenne along with other rock types from a variety of sources, including stone from Platte County quarries no longer in operation.

Gypsum.—Gypsum production was continued at Big Horn and Park Counties in the Big Horn Basin where mine-mouth plants produced wallboard. A third small quarry in Albany County produced gypsum for use as a retardant in the manufacture of cement.

Soda Ash and other Sodium Compounds.—Wyoming is the leading trona and natural soda ash producer in the world. Trona, a naturally occurring mineral, is processed to yield soda ash. Trona production in 2005 was approximately 4% higher than in 2004. The higher production resulted from increased demand in a tight market coupled with increased plant production efficiency. Producer data indicate that soda ash is the ninth most widely used chemical in the United States.

Trona mined in Wyoming during 2005 was processed into soda ash and other sodium chemicals at four plants operated by four companies west of Green River. Except for about 1.1 Mt produced using solution mining methods, all trona produced in Wyoming used conventional underground mining methods, including longwall and room and pillar techniques (Harris, 2005).

Mineral Fuels and Related Materials

Uranium.—The Smith Ranch-Highland operation in the southern Powder River Basin, Converse County, produced about 590,000 kg of yellowcake (U_3O_8) in 2005, a 5.2% increase compared with the 2004 production (Stauffenberg, 2005). That operation employs in-situ recovery from several well fields, along with a uranium extraction mill. Water and lixiviant are injected into uranium-bearing sandstones, where they dissolve uranium minerals, and are then pumped back to the surface. The uranium is extracted at the mill, and the water is recycled into the above-described process.

Wyoming hosts the largest uranium reserves in the United States. An estimated 165 million kilograms of U_3O_8 are considered to be recoverable at an assumed uranium price of $110.00 per kilogram. During the next few years, more in-situ operations are expected to begin or resume production in several Wyoming basins.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,420	148,000	3,510	151,000	4,160	190,000
Common	25	55	49	107	53	128
Gemstones	NA	13	NA	13	NA	14
Sand and gravel, construction	8,290	36,400	10,200	40,100	11,700	52,400
Stone, crushed	5,020	22,600	6,300 r	35,300 r	7,370	41,800
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004-05)	XX	792,000	XX	819,000	XX	1,010,000
Total	XX	999,000	XX	1,050,000 r	XX	1,300,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	10	2,620 r	$13,500 r	10	2,500	$12,500
Granite	1	W	W	1	W	W
Quartzite	--	--	--	1	9	44
Marble	1	W	W	1	W	W
Traprock	8	-- r	-- r	8	--	--
Volcanic cinder and scoria	1	27	145	2	1,100	5,280
Miscellaneous stone	1	1,430	7,510	1	1,560	8,240
Total	XX	6,300 r	35,300 r	XX	7,370	41,800

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate, graded, bituminous aggregate, coarse	W	W
Fine aggregate (-⅜ inch), stone sand, bituminous mix or seal	W	W
Coarse and fine aggregates, graded road base or subbase	W	W
Other construction materials	1	8
Unspecified:[2]		
Reported	7,230	41,100
Estimated	112	539
Total	7,340	41,600
Grand total	7,370	41,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate, graded[2]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[3]	--	--	--	--	W	W
Coarse and fine aggregate[4]	--	--	--	--	W	W
Other construction materials	--	--	--	--	1	8
Unspecified:[5]						
Reported	11	53	5,660	32,800	1,560	8,240
Estimated	11	52	101	488	--	--
Total	22	105	5,760	33,300	1,580	8,430

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes bituminous aggregate (coarse).
[3]Includes stone sand, bituminous mix, or seal.
[4]Includes graded road base or subbase.
[5]Reported and estimated production without a breakdown by end use.

TABLE 5
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	933	$6,770	$7.26
Asphaltic concrete aggregates and other bituminous mixtures	820	6,930	8.45
Road base and coverings	4,310	17,400	4.05
Road and other stabilization (cement)	226	666	2.95
Fill	200	747	3.74
Snow and ice control	30	328	10.93
Other miscellaneous uses[3]	21	211	10.05
Unspecified:[3]			
Reported	2,080	5,600	2.69
Estimated	3,050	13,700	4.51
Total or average	11,700	52,400	4.49

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	465	3,640	468	3,130	--	--
Asphaltic concrete aggregates and other bituminous mixtures	581	4,930	239	2,000	--	--
Road base and coverings[3]	2,520	10,100	1,880	7,410	136	568
Fill	91	469	109	278	--	--
Other miscellaneous uses[4]	5	31	46	509	--	--
Unspecified:[5]						
Reported	164	562	556	2,410	1,360	2,630
Estimated	801	3,750	2,240	9,980	--	--
Total or average	4,630	23,500	5,540	25,700	1,500	3,200

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes roofing granules and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.