

THE MINERAL INDUSTRY OF COLORADO

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

In 1999, the preliminary estimated value¹ of nonfuel mineral production for Colorado was \$555 million, according to the U.S. Geological Survey (USGS). This was about a 3% decrease from that of 1998,² following a 9.2% increase from 1997 to 1998. The State decreased in rank to 26th from 24th among the 50 States in total nonfuel mineral production value, of which Colorado accounted for almost 1.5% of the U.S. total.

More than 78% of Colorado's nonfuel mineral production value, up from 72% in 1998, came from industrial minerals, especially construction sand and gravel, portland cement, and crushed stone, the State's three leading nonfuel mineral commodities (in descending order of value). The higher percentage value in 1999 resulted, in part, from the increased production and values for the top three industrial minerals, especially construction sand and gravel. More importantly, the percentage value for metals went down because of reduced production and values. Each metal had at least a small decrease in production, but the significant changes were a 25% decrease in molybdenum production and value and the January 31 closing of the State's only operating zinc/lead mine. ASARCO Incorporated's Leadville unit, the Black Cloud Mine, closed because the mine's resources were depleted. Gold and silver values also decreased, by a combined total of about \$7 million, adding to the State's overall drop in nonfuel mineral value. In 1998, a \$53-million increase in construction sand and gravel, a \$13-million rise in portland cement, and a \$3-million increase in crushed stone accounted for most of the significant increase in value for the year. These increases were mitigated somewhat by a \$12-million decrease in the value of molybdenum and a more than \$8-million drop in the value of gold (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States during 1999, Colorado remained second in molybdenum and seventh in gold. While the State rose to 6th from 8th in construction sand and gravel and tied for 10th (up

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or 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 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

from 11th) with Kentucky in gemstones, it dropped from 5th to 6th in lead and from 6th to 7th in zinc.

The following narrative information was provided by the Colorado Geological Survey.³ The Henderson Mine in Clear Creek County, operated by Cyprus Amax Minerals Co., is the Nation's top producer of primary molybdenite. In 1999, the mine and mill produced an estimated 9,500 metric tons (t) of contained molybdenum, down about 30% from the 13,700 t produced in 1998. The Henderson Mine was shut down during August and September for installation of a 16-kilometer (km) conveyor belt from an underground haulage station to a surface transfer station. The conveyor belt replaced the 16-km underground train haulage system, which had been in use since the mine began production in 1976. Also, the mine will be changing its caving process to enable more efficient ore production and installing a new fleet of underground haulage trucks.

On December 2, 1999, Phelps Dodge Corp. completed its acquisition of Cyprus Amax Minerals Co., which includes all of Cyprus' Colorado molybdenum interests—the Henderson Mine, the Climax Mine in Lake County, and the Mount Emmons property in Gunnison County.

In 1999, the sole major precious-metal-producing mine in the State was the Cripple Creek and Victor Gold Mining Co. (CC&V) Cresson Mine in the Cripple Creek district, Teller County. During 1999, CC&V mined a total of 36 million metric tons (Mt) of material at the Cresson Mine, including 9.4 Mt of ore at a grade of 1 gram per metric ton (g/t) gold. The total 1999 gold production at the Cresson Mine was 7.2 t of gold and an estimated 2.5 t of silver. CC&V plans to increase metal production in 2000 to 7.65 t of gold and 2.7 t of silver.

CC&V continued its ambitious and successful exploration and development drilling program in 1999. At the end of 1998, the Cresson Mine had a proven and probable reserve of 115 Mt at a grade of 1.16 g/t gold for a total of 134 t of contained gold. Exploration in 1999 increased gold in ore reserves to 150 t.

In March 1999, AngloGold Ltd., the world's largest gold producer, purchased Minorco Group's 67% share of the CC&V. AngloGold is a subsidiary of Anglo American Corp. of South Africa.

Asarco's Black Cloud Mine near Leadville is an underground room and pillar mine with a daily production capacity of 794 t. The ore body is a complex massive sulfide deposit hosted by the Leadville Limestone. In January 1999, mining operations at the Black Cloud Mine ceased because of depletion of its ore.

After a year filled with legal problems, the Yule Marble Quarry near Marble, CO, is back in production under new ownership. The new owner is Sierra Minerals Corp., based in Englewood, CO. Sierra Minerals began producing about 90 t of marble per month from stockpiled inventory. The company started cutting new stone in January 2000.

³James A. Cappa, Chief, Minerals and Mineral Fuels, at the Colorado Geological Survey, authored the text of mineral industry information submitted by that agency.

The Centex American Gypsum Corporation produced 408,000 t of gypsum in 1999 from its open pit gypsum mine and plant in Gypsum, Eagle County. That amount is an increase of 10% over the 1998 production of 370,000 t. In April 1999, the company completed a 2-year expansion program to increase the production capacity of the mine and plant to 500,000 metric tons per year. Production is expected to increase to that level in 2000 and 2001.

Holnam Inc. has begun construction on a \$200-million addition to its existing cement plant in Florence to meet increased demand because of Colorado's strong economy. Grupo Mexico has applied for various permits for its proposed

cement plant in the designated free trade zone south of Pueblo.

American Soda, L.L.P. of Glenwood Springs spent most of 1999 acquiring permits from Garfield and Rio Blanco Counties and the Bureau of Land Management for its Piceance Creek Basin soda ash solution mine, pipeline, and processing and loading facilities. All of the permits have been granted and construction is underway. The company plans to use a steam tunnel to convert the sodium bicarbonate from the nahcolite to sodium carbonate, or as it is commonly known, soda ash. American Soda plans to produce about 1.3 Mt of soda ash and sodium bicarbonate per year. The planned solution mine will be located near Meeker, CO. A 67-km pipeline will transport the pregnant solution to a redesigned Unocal oil shale processing plant north of Parachute for further refining and packaging.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	258	1,970	257	1,840	259	1,800
Gemstones	NA	254	NA	257	NA	262
Lime	30	1,850	40	1,820	40	1,800
Sand and gravel: Construction	32,100	142,000	42,900	195,000	45,200	209,000
Stone:						
Crushed	9,720	60,800	12,000	63,800	12,300	67,300
Dimension metric tons	10,800	3,250	14,200	3,410	13,600	3,580
Combined values of cement, clays (bentonite, 1998), gold, gypsum (crude), helium (Grade-A), lead, molybdenum, peat (1997-98), sand and gravel (industrial), silver, zinc	XX	313,000	XX	306,000 r/	XX	271,000
Total	XX	524,000	XX	572,000 r/	XX	555,000

p/ Preliminary. r/ Revised. 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
COLORADO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	6	1,790	\$11,100	\$6.22	6	2,470	\$16,200	\$6.56
Granite	6	5,710	38,000	6.66	7	6,090	29,100	4.78
Sandstone and quartzite	6	403 r/	2,940 r/	7.29 r/	9	651	3,450	5.30
Traprock	1	W	W	3.72	1	W	W	5.52
Volcanic cinder and scoria	2	W	W	W	2	W	W	4.46
Miscellaneous stone	3	W	W	W	7	W	W	5.46
Total or average	XX	9,720	60,800	6.26	XX	12,000	63,800	5.34

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
 COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS
 IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	154	\$945	\$6.14
Other coarse aggregate	15	132	8.80
Total or average	169	1,080	6.37
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	4.10
Bituminous aggregate, coarse	W	W	4.39
Railroad ballast	W	W	5.33
Total or average	1,760	7,430	4.23
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	6.11
Other fine aggregate	W	W	5.61
Total or average	W	W	3.91
Coarse and fine aggregates:			
Graded road base or subbase	672	2,770	4.12
Unpaved road surfacing	W	W	5.58
Terrazzo and exposed aggregate	W	W	5.55
Crusher run or fill or waste	W	W	3.72
Total or average	1,470	5,870	3.99
Other construction materials	W	W	4.88
Agricultural:			
Agricultural limestone	W	W	W
Poultry grit and mineral food	W	W	W
Other agricultural uses	W	W	W
Total or average	W	W	W
Chemical and metallurgical: Cement manufacture	W	W	5.92
Special:			
Mine dusting or acid water treatment	W	W	28.43
Asphalt fillers or extenders	W	W	W
Other fillers or extenders	W	W	W
Total or average	W	W	27.57
Other miscellaneous uses: Other specified uses not listed	W	W	9.50
Unspecified: 3/			
Actual	4,130	25,300	6.13
Estimated	1,680	9,500	5.66
Total or average	5,810	34,800	6.00
Grand total or average	12,000	63,800	5.34

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, sandstone and quartzite, traprock, and volcanic cinder and scoria.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
 COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	(4/)	(4/)
Coarse aggregate, graded 5/	--	--	--	--	(4/)	(4/)
Fine aggregate (-3/8 inch) 6/	--	--	--	--	(4/)	(4/)
Coarse and fine aggregate 7/	W	W	W	W	(4/)	(4/)
Other construction materials	--	--	--	--	4,220	17,100
Agricultural 8/	--	--	--	--	--	--
Chemical and metallurgical 9/	--	--	W	W	W	W
Special 10/	--	--	--	--	--	--
Other miscellaneous uses	--	--	W	W	--	--
Unspecified: 11/						
Actual	W	W	--	--	W	W
Estimated	--	--	--	--	W	W
Total	164	975	855	4,860	8,180	40,900
	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	(4/)	(4/)	--	--	--	--
Coarse aggregate, graded 5/	(4/)	(4/)	--	--	--	--
Fine aggregate (-3/8 inch) 6/	(4/)	(4/)	--	--	--	--
Coarse and fine aggregate 7/	95	364	25	119	--	--
Other construction materials	100	672	--	--	--	--
Agricultural 8/	W	W	--	--	--	--
Chemical and metallurgical 9/	--	--	--	--	--	--
Special 10/	W	W	--	--	--	--
Other miscellaneous uses	W	W	--	--	--	--
Unspecified: 11/						
Actual	1,110	7,350	--	--	16	86
Estimated	514	2,840	865	5,010	--	--
Total	1,850	11,800	890	5,130	16	86

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/ No production for District 3.

3/ Includes riprap and jetty stone and other coarse aggregate.

4/ Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), and railroad ballast.

6/ Includes stone sand (bituminous mix or seal), and other fine aggregate.

7/ Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other construction materials.

8/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

9/ Includes cement manufacture.

10/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
 BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	5,860	\$30,600	\$5.22
Plaster and gunite sands	79	504	6.38
Concrete products (blocks, bricks, pipe, decorative, etc.)	707	4,320	6.11
Asphaltic concrete aggregates and other bituminous mixtures	2,410	10,700	4.45
Road base and coverings 2/	5,360	23,400	4.36
Fill	1,290	3,630	2.83
Snow and ice control	147	601	4.09
Other miscellaneous uses 3/	273	1,200	4.40
Filtration	11	93	8.45
Unspecified: 4/			
Actual	12,300	53,700	4.35
Estimated	14,500	66,100	4.57
Total or average	42,900	195,000	4.54

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	608	5,500	1,080	5,310	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	59	292	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,180	6,020	443	2,080	W	W
Road base and coverings 3/	2,400	12,200	1,300	4,340	442	1,530
Fill	W	W	411	1,240	W	W
Other miscellaneous uses 4/	W	W	W	W	W	W
Unspecified: 5/						
Actual	3,240	14,200	W	W	W	W
Estimated	3,640	15,100	3,000	13,100	1,800	7,850
Total	11,500	54,000	9,030	38,300	2,670	11,200
Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	2,990	14,400	1,040	4,250	217	1,540
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	441	2,900	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	W	W
Road base and coverings 3/	476	2,380	470	1,830	268	1,110
Fill	133	365	321	1,010	W	W
Other miscellaneous uses 4/	301	1,330	W	W	W	W
Unspecified: 5/						
Actual	3,970	16,600	W	W	W	W
Estimated	3,690	19,500	791	3,510	1,540	6,990
Total	12,000	56,700	5,270	23,200	2,510	11,400

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 plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration, railroad ballast, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.