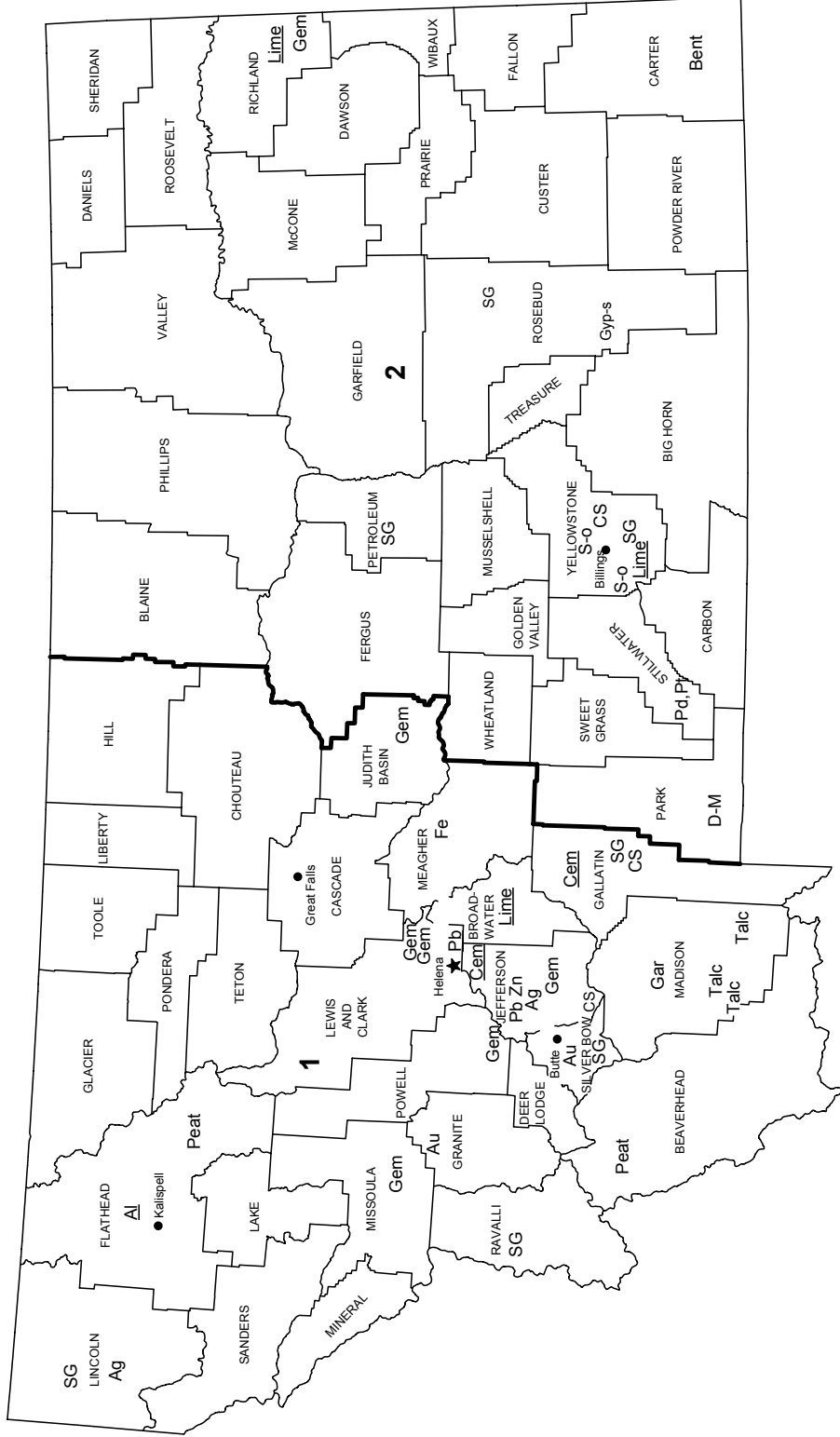


MONTANA



LEGEND

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

MINERAL SYMBOLS (Major producing areas)

- Ag Silver
- Al Aluminum plant
- Au Gold
- Bent Bentonite
- Cem Cement plant
- CS Crushed stone
- D-M Dimension stone
- Fe Iron
- Gar Garnet
- Gem Gemstones
- Gyp-s Synthetic gypsum
- Lime Lime plant
- Pb Lead
- Pb Lead plant
- Pd Palladium
- Peat Peat
- Pt Platinum
- S-o Sulfur (oil)
- SG Construction sand and gravel
- Talc Talc
- Zn Zinc

THE MINERAL INDUSTRY OF MONTANA

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

In 2002, the estimated value¹ of nonfuel mineral production for Montana was \$442 million, based upon preliminary U.S. Geological Survey (USGS) data. This was a 23% decrease from that of 2001² and followed a marginal decrease from 2000 to 2001. The State was 31st in rank (25th in 2001) among the 50 States in nonfuel raw mineral production value and accounted for more than 1% of the U.S. total.

Overall, metallic minerals accounted for nearly 60% of the State's total nonfuel mineral production value in 2002. By value, palladium remained Montana's leading nonfuel mineral, followed by construction sand and gravel, platinum, cement (portland and masonry), and gold. In 2002, the largest portion of the State's decrease in value resulted from a substantial drop in the average price and resulting value of palladium (although production actually increased by about 7%) and decreases in the production and values for gold and zinc. Smaller yet significant decreases also occurred in the production and values of lead and silver and less so for portland cement.

In 2001, increases occurred in the production and values of construction sand and gravel, up nearly \$27 million; palladium, up \$9 million; platinum, up \$7million; bentonite; and lead. These increases were not enough to offset decreases in copper, gold, and silver production and value, resulting in the net decrease for the year. No copper was produced in Montana in 2001 because of the August 2000 closing of Montana Resources Inc.'s copper-molybdenum Continental Pit near Butte, MT. Although its operation had been profitable at lower copper prices, the loss of its power contract and the resulting high prices for power made operations unprofitable. In anticipation of securing a power contract and reopening, the company raised capital and stripped waste during the fall of 2000. However, an affordable contract for a reasonable timeframe was not secured, and the mine remained closed (U.S. Geological Survey, 2002).

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 2002 USGS mineral production data published in this chapter are preliminary estimates as of July 2003 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. Specialist contact information may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²Values, percentage calculations, and rankings for 2001 may differ from the Minerals Yearbook, Area Reports: Domestic 2001, Volume II, owing to the revision of preliminary 2001 to final 2001 data. Data for 2002 are preliminary and are expected to change; related rankings may also change.

Montana continued as the only State to have mine production of primary palladium and platinum. The State remained first in the production of talc, second in bentonite, third of three States that produce industrial garnet, fourth in lead, sixth in gold, and seventh in silver. Montana increased in rank to 4th from 5th in zinc, to 7th from 10th in gemstones, and was a significant producer of construction sand and gravel.

The Montana Bureau of Mines and Geology³ provided the narrative information that follows. Mineral activity was brisk in the early part of 2002 because of increasing gold prices, but by July, the rush was over. Gold prices stagnated just short of the threshold levels needed to sustain interest and investment dollars for exploration or development in Montana.

Exploration

Minerals exploration has been limited for many years in the United States and markedly so in Montana. The 2002 field season was one of the least active on record for Montana. East of Boulder, Elkhorn Goldfields drilled a few holes on the north end of its property. O.T. Mining Corp. continued a soils program near its Ruby-Kit Carson property north of Butte. The results were positive, but permitting problems delayed drilling until the upcoming field season. Near Nye, Idaho Consolidated Metals Corp. changed its name to Beartooth Platinum Corp., following a funding shortfall. Drilling on the Stillwater chromite zone continued but was started too late in the season to make any significant footage advances before bad weather stopped operations.

West of White Sulphur Springs, placer gravels were tested along Elk Creek. Gold grades were lower than expected but were significant enough to justify more testing during the upcoming field season.

In the northwest corner of the State near Noxon and Libby, Noranda Minerals Corp. abandoned its permitted Montanore copper-silver project. The land was returned to Mines Management Co. of Spokane, and the permits returned to the appropriate State and Federal agencies. Adjacent to the Montanore property, the Sterling Mining Co. continued endeavors to permit its Rock Creek copper-silver property. The permits were granted but then withdrawn by the agencies in anticipation of a lawsuit by environmental groups. The "No impact" opinion of the U.S. Fish and Wildlife Service on grizzly bears on this project has not been reissued.

A new company received permission from the U.S. Forest Service to begin development of a gold mine 24 kilometers southeast of Big Timber along Deer Creek. The property comprised free-milling gold and auriferous pyrite contained in

³Robin B. McCulloch, Associate Research Mining Engineer, authored the text of the State mineral industry information provided by the Montana Bureau of Mines and Geology.

quartz veins in a granitic intrusive. Initial test results reported multiounce grades at many of the test sites. Declines extended 150 meters (m), but production was not anticipated before spring 2003.

Commodity Review

Industrial Minerals

Cement.—Near Three Forks, Holcim (US) Inc. continued producing cement. The company had applied for a permit to burn used tires as a partial fuel substitute for coal. In other states where the burning of tires is allowed, studies have shown no adverse environmental effects. The tires provide heat and iron for the cement processing while eliminating the tires from landfills. The company indicated that the demand and markets for cement have been steady to strong.

Garnet.—The Ruby Garnet Mine, owned by the Montana Oregon Investment Group, was offered for sale at \$1.7 million in 2002. However, the company decided to reclaim the mine and sell the equipment if the property was not sold by spring 2003.

Gemstones.—West of Lewistown, Belt Creek Mining Co. was formed into a new company called Yogo Creek Mining Co. Yogo Creek continued a steady production of Yogo sapphires. The company not only mined and processed the ore but cut the sapphires and mounted them in jewelry that was sold throughout the State. Current operations have mined sapphires from lower grade zones at higher production rates. It has successfully used high-pressure water jets to remove ore, thereby avoiding blasting. The process is expected to result in the fracturing of fewer stones.

Stone, Crushed.—East of the Diamond Hill Mine, Graymont Western U.S., Inc. quarried limestone for lime production at its plant and produced burnt and hydrated lime. Because of numerous repaving projects, hydrated lime production was up 15% from last year. The company upgraded an accidental-fall protection system for its bulk trucks and put in a new car puller at its railroad load-out facility.

Talc.—South of Ennis, Luzenac America Inc. continued production at its Yellowstone talc mine. It implemented a cost-savings plan expected to reduce expenses by 30%. Recovery was up 10%; 36,000 metric tons (t) of stockpiled material has been reprocessed. The company installed two bag houses at the mine for dust control and worked on a life-of-mine permit (50 years).

Near Dillon, Barretts Minerals Inc. improved the Stone Creek road and stream reclamation near its Treasure Mine and tested a long-term dewatering plan for its Regal Mine. The company increased packaging capacity at its plant south of Dillon. Company personnel indicated the demand for its talc was up slightly, but in general, the market and prices were flat.

Metals

Copper.—The Montana Resources Inc. Continental Mine (copper-molybdenum) in Butte remained on standby. Extensive reclamation was completed on many of the dumps. Conda Mining (a subsidiary of Washington Group International Inc.)

continued production of railroad ballast at its diorite quarry east of Butte near Pipestone. The rock is being used on many of the railroad beds in the Pacific Northwest region.

Gold.—North of Avon, an individual mined his patented gold placer deposit in Ophir Creek. He recovered a number of gold nuggets using a 1938 Austin Western Badger (cable backhoe) and a wooden long tom.

Near Whitehall, the Golden Sunlight Mine (gold-silver) (a subsidiary of Placer Dome U.S. Inc.) started development of underground reserves. The Small Mines Development Co. was contracted to drive the decline and to mine the gold-bearing pyritic ore pods below the existing pit. Surface reserves were also developed and mined on the northwest side of the pit. For a while, the increase in the price of gold has made the permitted pit expansion economic, but a court ruling requiring pit backfill made it uneconomic. The State Department of Environmental Quality and the U.S. Bureau of Land Management were preparing a supplemental Environmental Impact Statement to address the pit-backfill issue. If the pit-backfill issue is nullified, the mine is projected to have 5 years of life remaining. If not, it is scheduled to close in September 2003.

International Pursuit Corp. and Nevoro Gold Corp. merged and became Apollo Gold Corp. Apollo injected critical capital into the Montana Tunnels Mine (lead-zinc-gold) just months prior to exhaustion of developed reserves. Apollo planned to expand the existing pit to develop an additional 18 million metric tons of reserves through a three-phase program. Most of the year was spent on development, with full production expected to resume in April 2003. The company has increased mill capacity to 16,000 metric tons per day (t/d), put a lift on the tailings dam, constructed a buttress on the dam to strengthen it for the extended mine life, and plans to increase recovery in the mill. The mill has been processing low-grade ore to offset costs during the development stage. The development is anticipated to extend the mine's life at least 8 years.

At nearly the same time, Apollo Gold initiated gold reserve identification at the Diamond Hill Mine (gold), near Townsend. The property is well developed, but lacks sufficient reserves to justify production. Drilling was suspended during mid-summer; initial results looked promising.

Platinum-Group Metals.—At the Stillwater Mine Co., near Nye, Johns-Manville Corp. sold its remaining 5% net smelter return on the J-M Reef to Franco-Nevada Mining Corp. Norilsk Nickel Mining and Metallurgical Co. (Russia) made an offer to purchase 51% to 56% of the Stillwater Mining Co. for \$341 million. Much of the payment would be in palladium that is produced as a byproduct from the Russian nickel operation. The agreement also stipulates that the Stillwater Mining Co. must purchase 31 t of palladium annually from Norilsk. Norilsk would like to acquire American markets and obtain a position on the New York Stock Exchange. Although approval has been reached within the companies, the Stillwater stockholders and employees have voiced considerable resistance.

The Stillwater Mine has intercepted a high-grade deposit that will increase production and lower the cost of producing palladium and platinum. Despite their financial troubles, Stillwater has a low rate of employee turnover. The mine's ventilation system has been upgraded, development has started below the 980-m level, and drifting is continuing westward

toward the West Fork of the Stillwater River drainage. The company has completed its crushing facilities for the mine levels above the shaft collar.

South of Big Timber at Stillwater Mining's East Boulder mine, production of palladium ore has increased to 900 t/d. The company has completed laying rail in the access crosscut, finished the backfill plant, and completed six ramp systems. A new power cable and a fiber-optic cable were brought underground. It also put a compressor underground and is readying facilities to move all of the offices underground.

The operation has 320 employees, and it is self-funding with production grades steady at 14 grams of platinum-group metals per metric ton. The company expects to bring ore production to 1,130 t/d in 2003.

Reference Cited

U.S. Geological Survey, 2002, The mineral industry of Montana, in Area reports—Domestic: U.S. Geological Survey Minerals Yearbook 2000, v. II, p. 28.1-28.6.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA^{1,2}

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2000		2001		2002 ^P		
	Quantity	Value	Quantity	Value	Quantity	Value	
Clays:							
Bentonite	W	W	252	16,200	247	15,800	
Common	W	W	W	W	13	37	
Gemstones	NA	267	NA	320	NA	400	
Gold ³	kilograms	9,310	83,800	W	W	4,240	41,600
Lead ³	metric tons	W	W	7,290	7,020	W	W
Palladium ³	kilograms	10,300	228,000	12,100	237,000	13,000	138,000
Platinum ³	do.	3,110	54,900 ^r	3,610	61,900	3,900	70,100
Sand and gravel, construction		9,950	40,600	14,600	67,200	16,100	75,300
Stone:							
Crushed		3,070	12,600	3,070	12,400	3,200	13,300
Dimension	metric tons	W	W	8,990	2,400	9,080	2,570
Zinc ³	do.	16,400	20,200	22,600	21,900	W	W
Combined values of cement ^c , copper (2000), garnet (industrial), lime, molybdenum concentrates (2000), peat, silver, talc (crude), and values indicated by symbol W		XX	140,000 ^r	XX	149,000	XX	85,100
Total		XX	580,000 ^r	XX	575,000	XX	442,000

^cEstimated. ^PPreliminary. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Recoverable content of ores, etc.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	2000				2001			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	8	2,300	\$9,650	\$4.20	6	1,760	\$7,500	\$4.27
Granite	3	161	620	3.85	3	W	W	3.65
Sandstone and quartzite	4	W	W	3.49	3	584	2,120	3.64
Traprock	2	W	W	4.33	2	W	W	4.14
Volcanic cinder and scoria	--	--	--	--	3	W	W	3.58
Miscellaneous stone	11	59	229	3.88	8	91	352	3.87
Total or average	XX	3,070	12,600	4.12	XX	3,070	12,400	4.06

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

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

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch), riprap and jetty stone	W	W	\$6.35
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	4.08
Railroad ballast	W	W	4.13
Fine aggregate (-3/8 inch), stone sand, bituminous mix or seal	W	W	3.58
Coarse and fine aggregates:			
Graded road base or subbase	77	\$276	3.58
Unpaved road surfacing	W	W	3.70
Other construction materials	190	679	3.57
Agricultural:			
Limestone	W	W	3.35
Poultry grit and mineral food	W	W	13.26
Chemical and metallurgical:			
Cement manufacture	W	W	3.53
Lime manufacture	W	W	5.25
Sulfur oxide removal	W	W	3.64
Special, mine dusting or acid water treatment	W	W	4.44
Other miscellaneous uses and specified uses not listed	W	W	4.63
Unspecified:²			
Reported	43	172	4.00
Estimated	1,100	3,800	3.64
Total or average	3,070	12,400	4.06

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

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

²Reported and estimated production without a breakdown by end use.

TABLE 4
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1 1/2 inch) ²	W	W	W	W
Coarse aggregate, graded ³	W	W	W	W
Fine aggregate (-3/8 inch) ⁴	W	W	--	--
Coarse and fine aggregates ⁵	W	W	W	W
Other construction materials	18	65	171	614
Agricultural ⁶	W	W	W	W
Chemical and metallurgical ⁷	W	W	W	W
Special ⁸	W	W	--	--
Other miscellaneous uses and specified uses not listed	W	W	--	--
Unspecified:⁹				
Reported	43	171	(10)	(10)
Estimated	960	3,500	90	320
Total	2,180	8,720	881	3,720

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

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

²Includes riprap and jetty stone.

³Includes concrete aggregate (coarse) and railroad ballast.

⁴Includes stone sand (bituminous mix or seal).

⁵Includes graded road base or subbase and unpaved road surfacing.

⁶Includes agricultural limestone and poultry grit and mineral food.

⁷Includes cement manufacture, lime manufacture, and sulfur oxide removal.

⁸Includes mine dusting or acid water treatment.

⁹Reported and estimated production without a breakdown by end use.

¹⁰Less than 1/2 unit.

TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY MAJOR USE CATEGORY¹

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregates (including concrete sand)	1,100	\$5,980	\$5.46
Plaster and gunit sands	8	49	6.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	10	78	7.80
Asphalt concrete aggregates and other bituminous mixtures	1,020	5,300	5.18
Road base and coverings ²	3,130	12,600	4.02
Fill	613	2,070	3.37
Snow and ice control	21	73	3.48
Filtration	26	201	7.73
Other miscellaneous uses	1,440	7,810	5.41
Unspecified:³			
Reported	1,830	10,700	5.88
Estimated	5,400	22,000	4.11
Total or average	14,600	67,200	4.59

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

²Includes road and other stabilization (cement).

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

TABLE 6
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products ²	677	3,020	437	3,090	--	--
Asphaltic concrete aggregates and road base materials ³	2,820	12,700	1,280	4,890	65	308
Fill	463	1,400	138	607	12	57
Other miscellaneous uses ⁴	143	791	1,350	7,290	(5)	2
Unspecified: ⁶						
Reported	1,690	10,200	136	515	1	2
Estimated	4,300	18,000	1,200	4,700	--	--
Total	10,100	45,800	4,500	21,100	78	368

-- Zero.

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

⁴Includes filtration and snow and ice control.

⁵Less than 1/2 unit.

⁶Reported and estimated production without a breakdown by end use.