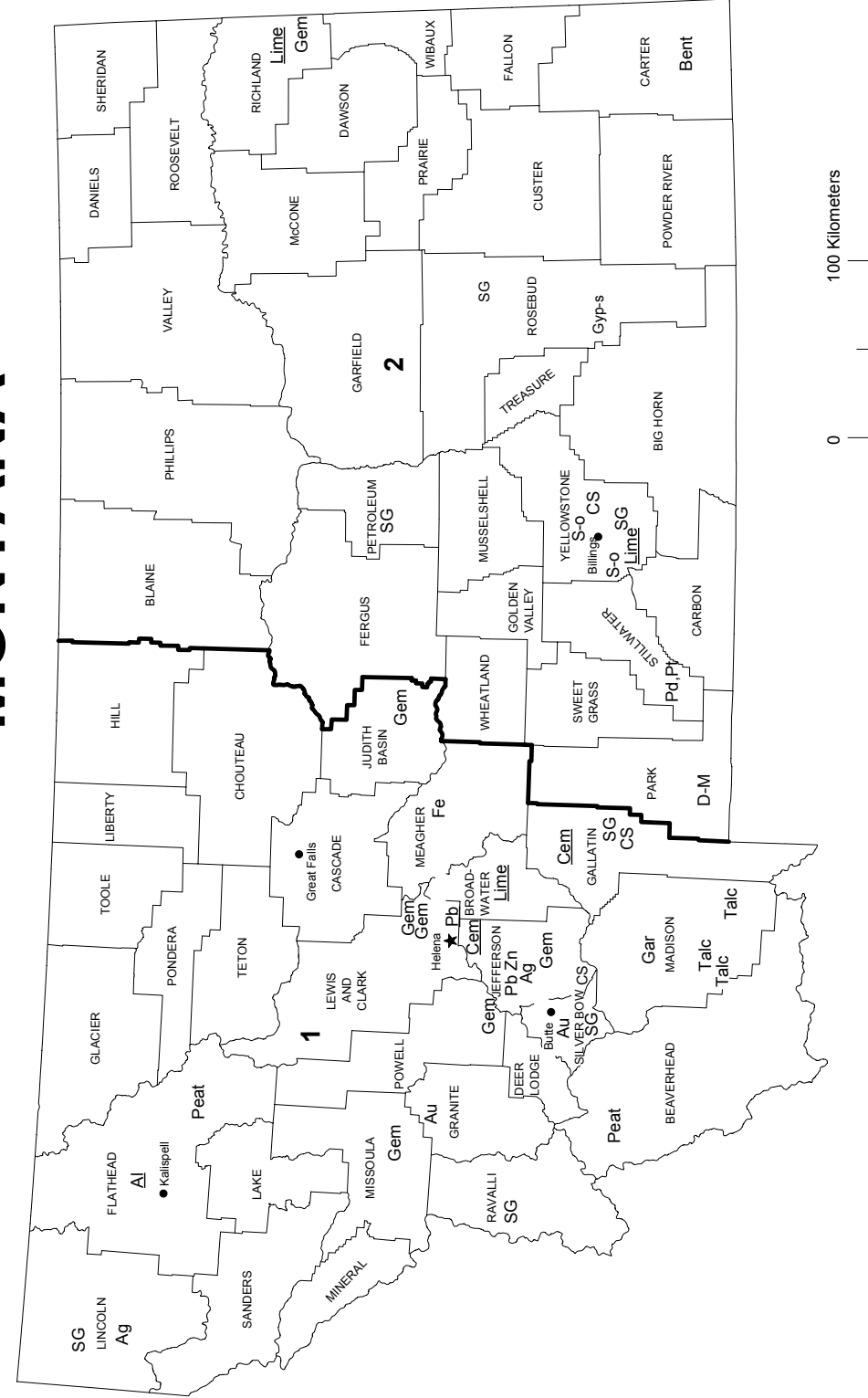


# MONTANA



## 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 marble
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 2001, the estimated value<sup>1</sup> of nonfuel mineral production for Montana was \$503 million, based upon preliminary U.S. Geological Survey (USGS) data. This was about a 15% decrease from that of 2000<sup>2</sup> and followed a 15.3% increase in 2000 from that of 1999. The State was 29th in rank (25th in 2000) among the 50 States in nonfuel raw mineral production value, of which Montana accounted for more than 1% of the U.S. total.

Overall, metallic minerals accounted for about 67% of the State's total nonfuel mineral value in 2001. By value, palladium was Montana's leading nonfuel mineral, followed by gold, platinum, portland cement, construction sand and gravel, and zinc. In 2000, increases of \$114 million in the value of palladium and \$34 million in platinum led Montana's increase in nonfuel mineral production value. Smaller increases also occurred in gold, dimension stone, and masonry cement (table 1). The largest decreases in value were those of copper (down more than \$20 million), molybdenum, construction sand and gravel (down \$10 million), portland cement and zinc (down about \$6 million each), and talc (down about \$2 million) (descending order of change). All other nonfuel minerals had relatively smaller to incremental decreases in value.

Based upon USGS estimates of the quantities produced in the 50 States in 2001, 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, fifth in zinc and lead, and sixth in gold and silver. Montana increased in rank to 10th from 12th in gemstones and was a significant producer of construction sand and gravel and dimension stone.

The Montana Bureau of Mines and Geology provided the narrative information that follows.<sup>3</sup> Mining in Montana during

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<sup>1</sup>The 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 2001 USGS mineral production data published in this chapter are preliminary estimates as of August 2002 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>.

<sup>2</sup>Values, percentage calculations, and rankings for 2000 may differ from the Minerals Yearbook, Area Reports: Domestic 2000, Volume II, owing to the revision of preliminary 2000 to final 2000 data. Data for 2001 are preliminary and are expected to change; related rankings may also change.

<sup>3</sup>Robin B. McCulloch, Associate Research Mining Engineer, authored the text of mineral industry information submitted by the Montana Bureau of Mines and Geology.

2001, like the previous year, featured generally low commodity prices and increased energy costs. Continued high electricity and natural gas prices resulted in closure or layoffs for some companies, and for others, continued care-and-maintenance status. Some operations resorted to diesel-powered generators by midyear, and railroad companies were looking at the feasibility of using locomotives to generate electricity. By fall, prices started to decline and at yearend, power rates were lower than those prior to the energy crisis.

Near Whitehall, Placer Dome Inc.'s Golden Sunlight Mine continued production of low-cost gold. The company was in higher grade ore in the bottom of the pit with no stripping costs. The result was record-breaking gold production. During the summer, the company celebrated pouring 62 metric tons (t) of gold. In Montana, only Butte has produced more gold, reaching 87 t. A sampling program of waste dumps revealed that many contained economic reserves in the top 9 meters (m). Testing indicated further enrichment could be accomplished with inexpensive screening.

Placer Dome secured an affordable power contract through June 2002. A diamond drilling program was conducted on remaining reserves below the existing pit floor at the Golden Sunlight Mine. Results were very encouraging and have led to development on the west wall for exposed reserves.

In the northwestern portion of the State, the Columbia Falls aluminum plant closed for a year and sold its contracted electricity.

New development was started in the Ophir Creek drainage north of Avon on a recently patented gold placer claim. Some overburden was stripped, test lots of pay gravel were processed, and some sizable gold nuggets were produced.

Montana Oregon Investment Group resumed operations at the Ruby-Garnet Mine, near Alder. Market and prices have been steady, but production has been down as the company completed dragline repairs. A cutter-head dredge was tested on the site with disappointing results. The company completed enough onsite reclamation to reduce its bond by two-thirds.

Barretts Minerals Inc. applied for a life-of-mine permit from the Department of Environmental Quality for its Regal pit, located east of Dillon. The application was processed and permitted within the year. Barretts has completed a centralized packing system at its plant and has increased silo storage capacity. Company representatives indicated they had seen market expansion in some specialty areas. However, in general, demand was down, and prices were steady, while shipping and production costs were up due to increased energy prices.

In East Helena, the ASARCO Incorporated lead smelter was put on care-and-maintenance status. The company cited low lead and precious-metal prices as the major reasons for the closure decision.

Continental Lime Inc. at Townsend changed its name to Graymont Western US Inc. It applied for a mine expansion

permit on the North Ridge deposit, which contains 9 million metric tons of reserves. Because of the increase in energy costs, the company has been experimenting with alternative fuels. Graymont has enjoyed a thriving business in hydrated lime, a side benefit of the numerous repaving projects across Montana. Hydrated lime is an effective anti-stripping additive in asphalt. Company officials have indicated demand has been steady for their burnt-lime product.

East of Lewistown, Small Mines Development and Vortex Mining Co. have entered into a joint venture to produce Yogo sapphires. The new company is called Belt Creek Mining Co. After 1 year, the new company has nearly completed a decline, has constructed a new wash plant, and has started research on different methods of mining. The plant has more than doubled production capabilities and has almost eliminated downtime. During next year, the company plans to complete a piece of experimental equipment designed to allow excavation of the sapphire-bearing material using high-pressure water jets. It is hoped that this will eliminate fracturing of the stones due to blasting.

The largest mining operation in Montana continued to be Stillwater Mining Co. It has two mines, Stillwater and East Boulder, located south of Interstate 90 between Big Timber and Columbus. Its smelter, base-metal refinery, warehouses, and corporate offices are located in Columbus.

Stillwater's East Boulder project, located south of Big Timber, felt the strongest impact from a more than \$500 per ounce drop in palladium prices. Commodity analysts have indicated the price reduction reflected the softening economy, an expected reduction in the demand for new vehicles, and lower palladium loading in catalytic converters. The company's response was to terminate some external development contracts at both mines, but primarily at East Boulder, resulting indirectly in eliminating nearly 300 miners. Some of those casualties were hired back to complete mine development that had been previously contracted.

Current development stands at 2,043 m of footwall lateral and two 4,880-m crosscuts to the ore body. The company

has completed the mill and pond. Development is focusing on ramps that will allow current production to expand from 320 to 450 metric tons per day (t/d) to 900 t/d. The mill was designed for 2,700 t/d, but will not expand to that volume in the near future. The conveyor haulage system to the surface is not complete; rail haulage will continue as the ore transport method.

The Stillwater Mine will maintain production at the current 2,300 t/d. External development contracts have been curtailed—if not eliminated. Annual production is about 3.1 metric tons of platinum-group metals (PGM). The company had problems with the paste-fill system early in 2001 but installed duplicate pipelines to eliminate future problems. Although it experienced three fatalities during the year, the company indicated its overall safety record was greatly improved.

At Columbus, the copper circuit was completed at the base-metal refinery and a second converter was completed in the smelter. The company also recycles automotive catalytic converters in the smelter. The feasibility of underground development is being looked at very closely.

Exploration activity in Montana continued to be depressed with no major-company activity. The few existing programs are privately funded, focused on precious metals, and quite limited in scope.

North of Butte, O.T. Mining Corp. conducted an extensive exploration program on and around the Ruby Mine. Early in the year, the company flew a geophysical survey of the area and followed that with soil grids for a mobile-metal-ion geochemical survey. In the fall, it completed a reverse-circulation drilling program in breccia zones and soil-indicated targets. The company expected to complete this phase with deep diamond drilling in the spring.

Idaho Consolidated Metals Corp. continued exploration of chromite zones and geophysical targets in the Stillwater Complex. The objective was to find PGM-bearing zones overlooked by Stillwater Mining Co. Much of the diamond drilling was focused on geophysical targets near Absarokee. Results were rumored to have been disappointing, and drilling was terminated prior to completion.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1999		2000		2001 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, bentonite	W	W	W	W	185	10,600
Gemstones	NA	294	NA	267	NA	267
Gold 3/ kilograms	7,540	82,800	9,310	83,800	W	W
Lead 3/ metric tons	7,950	7,660	W	W	W	W
Palladium 3/ kilograms	9,800	114,000	10,300	228,000	12,000	177,000
Platinum 3/ do.	2,920	35,600	3,110	69,200	3,600	52,800
Sand and gravel, construction	12,000	50,700	9,950	40,600	11,000	45,600
Stone:						
Crushed	3,480 r/	13,400 r/	3,070	12,600	3,200	13,600
Dimension metric tons	9,500	1,440	W	W	W	W
Zinc 3/ do.	22,200	26,100	16,400 r/	20,200 r/	24,000 e/	23,800 e/
Combined values of cement [masonry (2000-01), portland], clays [bentonite(1999-2000), common], copper (1999-2000), garnet (industrial), iron ore [usable (1999)], lime, molybdenum concentrates, (1999-2000), peat, silver, talc and values indicated by symbol W	XX	183,000 r/	XX	139,000 r/	XX	179,000
Total	XX	515,000 r/	XX	594,000 r/	XX	503,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; values included with "Combined values" data. 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.

3/ Recoverable content of ores, etc.

TABLE 2  
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1999				2000			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	9	2,710	\$10,600	\$3.92	8	2,300	\$9,650	\$4.20
Granite	3	238	846	3.55	3	161	620	3.85
Sandstone and quartzite	4	W	W	W	4	W	W	W
Traprock	3	W	W	W	2	W	W	W
Miscellaneous stone	7 r/	184 r/	630 r/	3.42 r/	11	59	229	3.88
Total or average	XX	3,480 r/	13,400 r/	3.86 r/	XX	3,070	12,600	4.12

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  
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2000, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<b>Construction:</b>			
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	13	\$73	\$5.62
Filter stone	(3/)	(3/)	(3/)
Coarse aggregate, graded:			
Concrete aggregate, coarse	6	23	3.83
Railroad ballast	W	W	4.42
Fine aggregate (-3/8 inch), stone sand, bituminous mix or seal	W	W	3.86
Coarse and fine aggregates:			
Graded road base or subbase	W	W	4.04
Unpaved road surfacing	118	452	3.83
Other coarse and fine aggregates	16	58	3.63
Other construction materials	25	89	3.56
Agricultural, poultry grit and mineral food	W	W	17.75
<b>Chemical and metallurgical:</b>			
Cement manufacture	W	W	3.57
Lime manufacture	W	W	5.53
Sulfur oxide removal	197	816	4.14
Special, mine dusting or acid water treatment	W	W	10.00
Other miscellaneous uses and specified uses not listed	W	W	5.33
<b>Unspecified: 4/</b>			
Reported	46	180	3.91
Estimated	1,300	4,600	3.51
Total or average	1,340	4,730	3.52
Grand total or average	3,070	12,600	4.12

W Withheld to avoid disclosing company proprietary data; included in "Grand 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, and traprock.

3/ Less than 1/2 unit.

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

TABLE 4  
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2000, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	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 aggregate 5/	W	W	W	W	--	--
Other construction materials	25	89	--	--	--	--
Agricultural 6/	--	--	W	W	--	--
Chemical and metallurgical 7/	W	W	W	W	--	--
Special 8/	W	W	(9/)	W	--	--
Other miscellaneous uses 10/	W	W	--	--	--	--
Unspecified: 11/						
Reported	26	99	19	74	2	6
Estimated	670	2,400	630	2,200	--	--
Total	1,820	7,690	1,250	4,940	2	6

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 filter stone and riprap and jetty stone.

3/ Includes concrete aggregate (coarse) and railroad ballast.

4/ Includes stone sand (bituminous mix or seal).

5/ Includes graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes poultry grit and mineral food.

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

8/ Includes mine dusting or acid water treatment.

9/ Less than 1/2 unit.

10/ Includes other specified uses not listed.

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

TABLE 5  
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000,  
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,200	\$5,920	\$4.93
Plaster and gunite sands	4	18	4.50
Concrete products (blocks, bricks, pipe, decorative, etc.)	21	64	3.05
Asphaltic concrete aggregates and other bituminous mixtures	869	5,020	5.78
Road base and coverings	2,450	9,150	3.73
Road stabilization (lime)	15	24	1.60
Fill	445	989	2.22
Snow and ice control	140	603	4.31
Railroad ballast	25	188	7.52
Filtration	24	127	5.29
Other miscellaneous uses	140	749	5.35
Unspecified: 2/			
Reported	694	2,640	3.81
Estimated	3,900	15,000	3.86
Total or average	9,950	40,600	4.08

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 6  
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000, 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)	888	3,890	312	2,030	--	--
Plaster and gunitite sands	3	18	--	--	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)	20	64	--	--	--	--
Asphaltic concrete aggregates and road base materials 2/	2,320	9,440	1,020	4,760	--	--
Fill	408	892	38	97	--	--
Other miscellaneous uses 3/	309	1,570	20	100	--	--
Unspecified: 4/						
Reported	558	2,200	--	--	136	438
Estimated	3,000	11,000	940	3,800	--	--
Total	7,490	29,400	2,320	10,800	136	438

-- Zero.

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

2/ Includes road and other stabilization (lime).

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

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