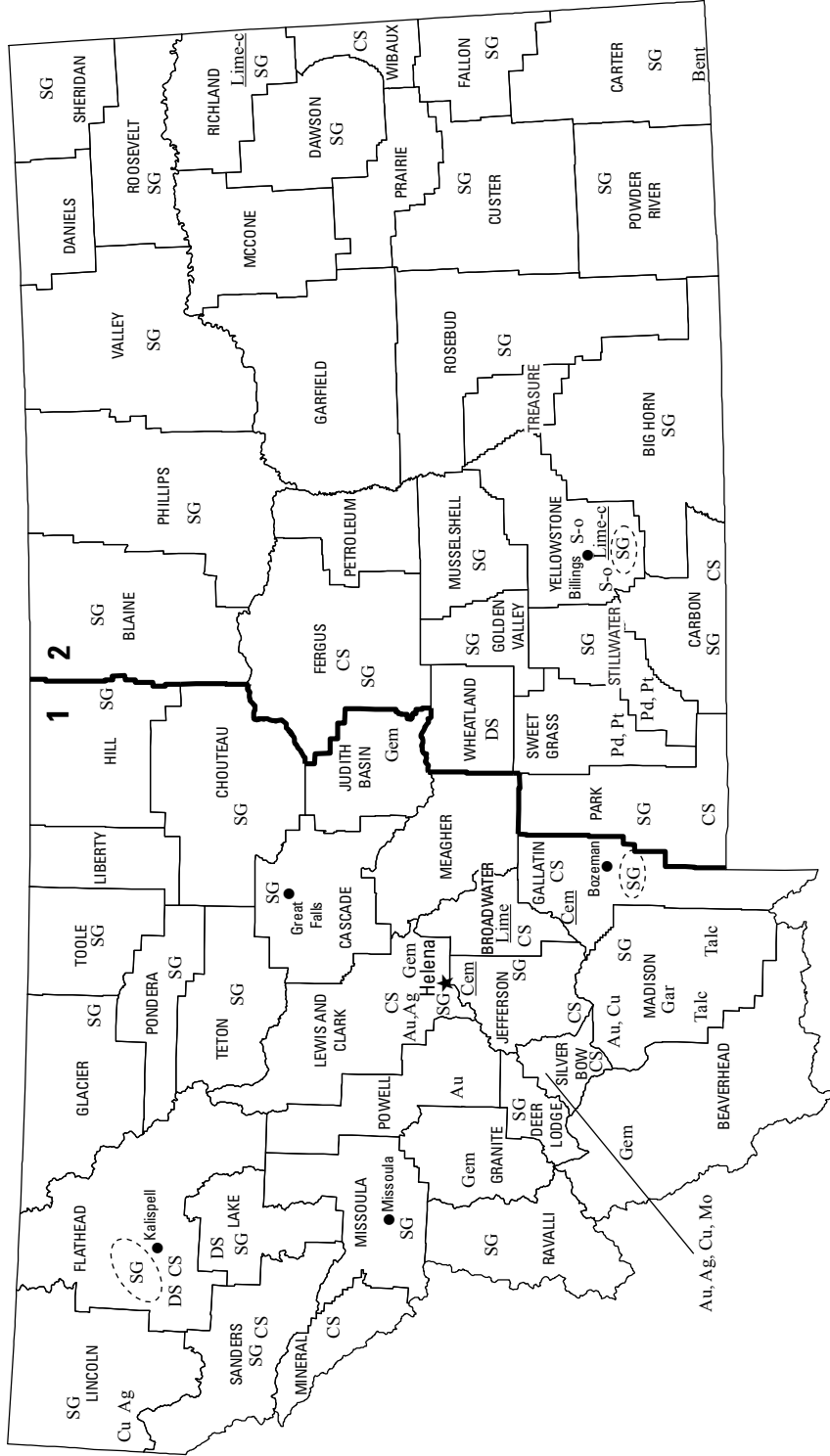




2010–2011 Minerals Yearbook

MONTANA

MONTANA



LEGEND

- County boundary
- ★ Capital
- City
- Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Principal producing areas)

- Ag Silver
- Au Gold
- Bent Bentonite
- Cem Cement plant
- CS Crushed stone
- Cu Copper
- DS Dimension stone
- Gar Garnet
- Gem Gemstones
- Lime-c Lime plant - captive
- Lime Lime plant
- Mo Molybdenum
- Pd Palladium
- Pt Platinum
- S-o Sulfur (oil)
- SG Construction sand and gravel
- Talc Talc
- Concentration of mineral operations



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 2011, Montana's nonfuel mineral production¹ was valued at \$1.44 billion, based upon annual U.S. Geological Survey (USGS) data. This was a \$306 million (27%) increase from the State's total production value of almost \$1.14 billion in 2010, which was a \$153 million (16%), increase from the State's total production value of \$983 million in 2009. In 2011, the State rose in rank to 15th from 18th among the 50 States in nonfuel mineral production value and accounted for 1.9% of the U.S. total production value of \$74.7 billion, up from 1.7% in 2010. On a per capita basis, Montana remained ranked fifth in 2011 and 2010 in the Nation in nonfuel mineral production with a value of \$1,440 in 2011, six times the national average of \$240.

Metals produced in Montana in 2011 included copper, gold, molybdenum concentrates, palladium, platinum, and silver. Metals constituted over 80% of the States' total nonfuel mineral production value in 2011. Production quantities of metals all decreased in 2010—copper by 1%, molybdenum concentrates by 3%, palladium by 8.1%, platinum by 9.8%, and silver by 14%. No gold was produced in 2010. Even with these decreases in production, the production values of copper, palladium, platinum, and silver increased; copper by 43%, palladium by 84%, platinum up 21%, and silver by 18%. Molybdenum concentrates were the only metal to decrease in production value in 2010, down by 3%. In 2011, the production of copper increased by 3%, palladium increased by 6.6%, platinum increased by 7.2%, and silver increased by 14%. Similarly, the production values of copper, palladium, platinum, and silver all increased in 2011, copper by 20%, palladium by 48%, platinum by 14%, and silver by nearly 100%. The production quantity and value of molybdenum concentrates both decreased by about 2% in 2011. As compared with 2009, gold production increased by 35% and the production value of gold increased by 120% in 2011 (values for copper, gold, molybdenum concentrates, and silver withheld—company proprietary data).

In 2011 and 2010, the State's leading industrial mineral commodities were, in descending order of production value, construction sand and gravel, portland cement, lime, crushed stone, and crude talc. Of these, construction sand and gravel was the only industrial mineral commodity to decrease in production quantity and value in 2010, decreasing by 1 million metric tons (Mt) (9.6%) and \$4 million, respectively; however, with increases in 2011, it came close to returning to 2009 levels. Talc

¹The 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 USGS mineral production data published in this chapter are those available as of May 2013. Data in this report are rounded to three significant digits and percentages are calculated from unrounded data. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at <http://minerals.usgs.gov/minerals>.

and crushed stone also increased in production value in 2011, with talc increasing by 15%, after an increase of more than 26% in 2010 (values withheld—company proprietary data). Overall, though, these five leading industrial minerals increased in value by less than 1% in 2011 from 2010, with only a slightly larger increase in 2010 from 2009. In 2010, the production value of lime increased by 7%, even with a slight decrease in lime production. In 2011, lime production decreased by 3% and the production value of lime decreased by 2%.

Of the remaining mineral commodities, bentonite and common clay decreased significantly in production value in 2010, followed by an increase in production quantity and value in 2011. In 2010, the production quantity of common clay decreased and its value also fell; however, in 2011, its production increased and its value rose by a larger amount.

The production quantity and value of portland cement both increased by 13% and 9%, respectively, in 2010, which was followed by a 3% decrease in portland cement production and a 7% decrease in production value in 2011. In 2011, the production of crude talc increased by 3%, which followed a 26% increase in 2010. In 2011, the production value of industrial garnet increased by 68%, although production remained unchanged. Lead, zinc, and cadmium in zinc concentrates, produced in 2009, were not reported in 2010 or 2011.

In 2011 and 2010, Montana continued to be the only State to produce primary palladium and platinum. The State continued to rank first in the production quantity of crude talc among the three producing States. In 2010, the State rose in rank to seventh from eighth in gemstone production and remained ranked seventh in 2011 (based on gemstone production value). In 2010, the State fell to third from second among 11 bentonite-clay-producing States, and to second from first among 3 industrial-garnet-producing States. Montana retained these rankings through 2011. The State fell to 18th from 16th in lime production in 2010 and then fell again to 19th in 2011 among 33 producing States. In 2011, the State fell to ninth from sixth among 11 silver-producing States. Montana remained ranked fifth in the production of molybdenum concentrates among seven producing States, and fifth in the production of copper among eight producing States in 2011 and 2010. The State ranked seventh in the production of gold in 2011 among 10 producing States.

The Montana Bureau of Mines and Geology² (MBMG) provided the narrative information that follows. Production and other data in the following text are those reported by the MBMG, based on its surveys and estimates. The data may differ from some production figures reported by the USGS.

²Robin B. McCulloch, Associate Research Mining Engineer, authored the text of the State mineral industry information provided by the Montana Bureau of Mines and Geology.

Industry Overview

In 2010, there was a lack of venture capital investment in mineral exploration in Montana, even with high commodity prices. In 2011, purchasing remained slow and capital projects were limited. Industrial mineral companies grew steadily through 2010 after the decline in 2008 and 2009, and were able to hire additional employees. Low housing construction through 2010 resulted in a surplus of portland cement, causing the temporary closure of local cement plants. High metal prices and demand had a positive effect on the State's metal mining industry. However, high energy, equipment, and steel costs led to lower than expected profits in 2010. Heavy winter snows and a late spring in 2011 led to spring floods taking place through July. Small metal operators, particularly placer mines, were affected by these floods, which washed out many access roads and caused some placers to be unworkable.

Mineral Exploration and Development

Metals

Gold.—Timberline Resources Corp. (Coeur d'Alene, ID) and Small Mines Development LLC (Boise, ID) continued to develop the Butte Highlands Joint Venture exploration project, 24 kilometers (km) (15 miles) south of Butte, Silver Bow County. In 2010, the companies drove a decline about 520 meters (m) [1,700 feet (ft)] and developed 240 m (800 ft) of workings for diamond drilling stations in the hanging wall and footwall. In July 2011, Timberline Resources reported the results of an 86-hole, 15,000-m (49,500-ft) underground diamond drilling program (Timberline Resources Corp., 2011b). The drilling focused on the upper portion of the Old Mill Block gold deposit, which had the dimensions of approximately 80 m along strike, 340 m down dip, and a mineralized thickness of 2 to 5 m (Timberline Resources Corp., 2011a).

Grant Hartford Corp. (Missoula, MT) continued to define the gold deposits at its mining claims in the historic Garnet mining district 80 km east of Missoula, MT. The Company drilled four core holes for an approximate total of 500 m, and 67 reverse circulation holes for an approximate total 10,600 m. Grant Hartford Corp. identified approximately 850,000 metric tons (t) of ore graded at 6.9 grams/metric ton (g/t) or about 6,000 kilograms (kg) of gold.

Near Marysville (Lewis and Clark County), RX Exploration drilled seven holes on narrow gold structures at the old Bald Butte mine in 2010. Initial drilling results were not as good as expected.

South of Cardwell, Mammoth Mining, LLC shipped the mill tailings from the Mammoth Mine mill. The waste material ranged in grade from 1.0 to 2.4 g/t gold. Although substantially lower in grade than desired, the operation provided an opportunity for old tailings to be removed, potential pollution to be averted, and a profit to be made. This type of mining operation utilizes resources already mined and lost from a time of limited mining technology.

West of Pony, Steel Resources Corp. shipped the dumps from the A & P Mine (Mineral Hill gold property) to the Golden Sunlight mill. Late in the year, they drove a 166-foot decline

drift into the A & P shear and sampled for future targets. A diamond drilling program from the surface is planned for the coming year.

Polymetallic Projects.—TintinaGold Resources Inc. (Vancouver, British Columbia, Canada) continued drilling holes at the Sheep Creek property 16 km north of White Sulfur Springs, Meagher County. In the 1980s and early 1990s, Cominco American Inc. and BHP/Utah International explored the sedimentary-hosted massive sulfide mineralization (copper-cobalt) in the lower part of the Precambrian Belt Supergroup at the Sheep Creek property. TintinaGold performed verification drilling at the property in September 2010 to determine if the historic drilling performed by Cominco was acceptable for use in calculation of an inferred resource (TintinaGold Resources Inc., 2010).

In 2011, TrinitaGold Resources staked additional claims on Federal lands and entered into additional mining lease agreements, renaming the expanded Sheep Creek Property the Black Butte Copper Property. Early in 2011, the company released an NI 43-101-compliant inferred resource estimate of 7 Mt of ore grading 2.36% Cu, 0.12% Co, and 12.3 g/t Ag, containing 166,000 t (366 million pounds) of Cu, for the Johnny Lee deposit (formerly Upper Copper Zone at Strawberry Butte), based on historic drilling by Cominco and BHP. In August 2010, the company completed drilling on the Lower Copper Zone at Strawberry Butte and in August 2011 released a NI 43-101-compliant inferred resource estimate of 2.46 Mt of ore grading 4.71% Cu, 0.05% Co, and 5.1 g/t Ag containing 116,000 t (256 million pounds) of Cu. The company started on a preliminary economic assessment focused solely on the Johnny Lee deposit, and was working on expanding its scope (TintinaGold Resources Inc., 2011).

Revett Minerals, Inc. continued to permit the Rock Creek Mine, a world-class stratiform copper-silver deposit under the Cabinet Mountains near Noxon. This project has the record for the longest mining permitting period in Montana, as it started in 1983. The company is working on a supplemental environmental impact statement (EIS) to update sections of the original EIS.

Mines Management, Inc. continued to work through the repermitting of the Montanore Mine (Lincoln County). The supplementary draft environmental impact statement was made available for public review in 2011. The company was continuing to maintain the water levels until permitting was completed. The operations are located southeast of Libby at the upper portion of the Libby Creek drainage. The Montanore Project contains a strata-bound silver-copper deposit in the northern extension of the Coeur d'Alene silver district. The company states that technical reports describing the deposit and a preliminary economic assessment have been produced in conformance with NI 43-101 (Mines Management, Inc., 2012, p. 4).

Starfield Resources has a substantial land package in the Stillwater Complex near Nye (Stillwater County). They did not initiate exploration after buying out Nevoro but had anticipated exploration in 2011.

Near Boulder (Jefferson County), the Montana Tunnels Mine operated by Montana Tunnels Mining, Inc., a subsidiary of

Elkhorn Goldfields, LLC, continued to seek funding. Permits were in hand but venture capital was limited in 2010, and the mine continued in standby mode in 2011. The operation was still waiting for funding for the “M” pit development. Operations were manned by a skeleton crew until financing could be secured.

The Golden Dream Mine (Elkhorn Goldfields, LLC) commenced development late in 2011. Final permits were granted by the Montana Department of Environmental Quality (DEQ) and the bond was posted. The company prepared their portal and drove the decline to 192.6 m (632 ft). A 61-m crosscut was driven to the oxide ore body before excessive water was encountered, preventing further development. The mine was placed on standby mode while building a dewatering system and treatment plant.

Commodity Review

Metals

Copper and Silver.—Northwest of Missoula, near Libby, Revett Minerals, Inc. reported that the Troy Mine maintained steady production in 2010 and performed quite well in 2011. As a stratiform copper-silver deposit, exploration has continued to identify new reserves in the lower quartzite beds below the original discovery. A decline was completed to the “C” bed in 2010, and development of the “C” bed increased grade while new reserves were identified in the “I” beds. During the year, the company upgraded the tailings pond and replaced some equipment. The more challenging situation arose when they could not secure rail cars to ship concentrates to the smelter.

Copper, Gold, and Silver.—In 2010, Barrick Gold Corp. (Toronto, Ontario, Canada) requested an amendment to the operating permit for its Golden Sunlight Mine, 55 km east of Butte, Silver Bow County, which the Montana DEQ approved in November. The amendment allowed the company to mine a gold deposit adjacent to the crushing circuit at the mill. The pit, referred to as the East Area Pit, covered approximately 10 hectares (25 acres) (Bryon, 2010). In 2011, Barrick completed mining the East Area Pit and completed the prestrip of the main pit at the Golden Sunlight Mine. Production at the main pit resumed mid-November 2011 and the company expected that operations would continue through 2015. Through 2010 and 2011, Barrick worked toward obtaining ISO-compliant standards 14001 (environmental) for its Golden Sunlight Mine, and in 2011, the mine was certified under the International Cyanide Management Code (Barrick Gold Corp., 2012, p. 22).

Copper, Silver, and Molybdenum.—In Butte (Silver Bow County), Montana Resources maintained steady production at the Continental Pit, the largest mining operation in Montana, while enjoying elevated copper and silver prices. In 2010, molybdenum prices fluctuated but were still sound. Although the company did not purchase any production equipment, they continued their 3-year program of upgrading the control system within the mill. In 2010, they initiated a reserve expansion drilling program on the pit limits that was expected to continue over the next 3 years.

In 2011, the company maintained production of about 51,000 t/d and were one of the lowest cost producers in North America. During the year, the company purchased ancillary

replacement equipment, such as dozers and cranes, but made no major changes. On the eastern mine boundary, some portions of the waste rock dumps were regraded and top-soil was added in preparation for final reclamation. Results of their exploration drilling program beneath dumps on the south have substantially increased their reserve base. An additional year is planned for further work. The company reported increased costs for diesel and grinding media. Tire costs had stabilized and tire availability had steadily improved.

Gold and Copper.—West of Silver Star (Madison County), Coronado Resources maintained production for many months of high-grade copper ore and gold ore that could be directly shipped to a smelter. In the fall of 2010, the copper grade declined and operations closed until milling problems with pyrite suppression could be worked out. In 2011, the company continued campaign mining a copper-gold skarn at a rate of 500 tons per month. It purchased a mucker and a 15-ton truck and took over the mining of the deposit from its contractors. The lower grade copper ore was shipped to the Contact Mill in Philipsburg for enrichment and metallurgical testing, while the gold ore was shipped to the Golden Sunlight (owned by Barrick Gold Corp.) mill. The company was trying to develop a reserve definition drilling program to further their operations.

Gold and Silver.—In 2010, RX Exploration Inc. (Toronto, Ontario, Canada) began limited production and initial metallurgical bulk tests at the Drumlummon Mine, 40 km northwest of Helena, Lewis and Clark County, with initial mill recoveries at 92% gold and 87% silver. The company continued to explore many epithermal veins within its property. Drill holes intersected the D-block mineralization within a range of 2.4 to 6.7 m (8 to 22 ft) with assays ranging from 9.69 g/t to 28.63 g/t gold and 56.51 g/t to 250.34 g/t silver. Drill holes intersected the Charley vein within a range of 0.6 to 4.3 m with assays ranging from 7.53 g/t to 76.37 g/t gold and 215.75 g/t to 3,106 g/t silver (RX Exploration, 2010).

In 2011, RX Exploration completed development at the Drumlummon Mine to facilitate production. The external decline was completed and connected to the internal decline on the Charley vein, providing a necessary secondary escape way. Production has been steady at 270 metric tons per day (t/d) to 320 t/d with grades of 10 g/t gold plus silver to bring the equivalent to 14 g/t gold. While completing the assessment of the Charley vein, production was confined to ancillary veins and from the old stopes. Company employment in Montana was between 125 and 130 personnel, including the regional exploration office.

Gold Placer.—The Golden Rule Mining Company mined placer remnants at Pioneer in the Gold Creek drainage near Garrison (Powell County) with only a temporary closure in 2011. Utilizing two trommels, the company processed the remaining resources under dragline spoil piles. As the company rapidly expanded to the 5-acre limit, the company applied for an operating permit. Besides gold, they produced an impressive number of stulls from drift mining from earlier years. This deposit, a Tertiary placer overlain by glacial outwash, had been the first discovery of gold in Montana in 1852.

Platinum-Group Metals.—Near Columbus (Stillwater County), the Stillwater Mining Company initiated its “Blitz”

project at the Stillwater Mine to expand the reserve base. It worked on extending the 5000 and 5600 levels east 4,110 m (13,500 ft) in search of higher grades and production. The company expected to develop 8.6 Mt (9.5 million short tons) of resources grading 24.3 g/t (0.71 troy ounces per short ton) platinum-group metals (PGM). The project was expected to cost \$60 million. The emphasis shifted from production to development during the fourth quarter 2011, and produced 12,000 kg (386,900 troy ounces) of PGM for the year.

At the Stillwater smelter in Columbus, the company completed the second furnace. It also completed a new catalytic converter recycling and sample plant, which contains an automated x-ray system for assay of catalyst material. In 2011, production from recycling catalytic converters was up by 70%. Income from recycling has increased from \$11.5 million to \$18.8 million.

South of Big Timber, the company continued production at their East Boulder Mine. It initiated the Graham Creek project, which will advance the mine 2,400 m (7,900 ft) to the west where it will develop an additional ventilation raise. The company anticipated finding increased values and ore-zone thickness. They expected to develop 5.4 Mt (6 million short tons) of ore grading 14 g/t (0.41 troy ounces per short ton) PGM over the next 5 years. The project was expected to cost \$8 million. The company increased its labor force by 15 employees and completed both of its life-of-mine ore passes. Production at the mine had been sustained with ramp-and-fill and sublevel mining methods. The mine produced 4,070 kg (131,000 troy ounces) of PGM in 2011, a slight decrease from 2010. Operating costs were up from \$14.2 per gram (\$442 per troy ounce) PGM to \$15.3 per gram (\$475 per troy ounce) PGM owing to higher royalties and metal taxes, as well as labor and material cost increases.

Industrial Minerals

Cement.—In 2010, Holcim US Inc. (Bedford, MA; a subsidiary of Holcim Ltd., a Swiss company) modified the clinker cooler and crushing-screen circuits to increase energy efficiency at its Trident plant 8 km northeast of Three Forks, Gallatin County. Industrial consumption increased slightly in 2010, even with domestic building remaining slow throughout the year. In 2011, production remained steady at the Trident plant and production and transportation costs remained stable.

Garnet and Tungsten.—Ruby Valley Garnet, LLC (Alder, MT) exhausted the placer garnet reserves of its Red Wash alluvial deposit in Alder, Madison County. The company closed its plant in mid-2010 to redesign its existing mill to begin mining a lode garnet deposit and modified the plant with a crushing and grinding circuit. Ruby Valley sought capital to pay for the \$2 million to \$5 million cost of these modifications through 2011, which ended with the acquisition of the plant by USA Garnet (Alder, MT) (Garnet USA, 2014).

In 2010, Apex Abrasives Inc. (Missoula, MT) completed construction of the production circuit and modified its scheelite recovery circuit and drying circuit at its plant 14 km south of Melrose (Beaverhead County). In 2011, the company focused on marketing and establishing a distribution network for its

industrial garnet for use in water-jet cutting media, and for its byproduct scheelite.

Lime.—Near Townsend (Broadwater County), Graymont Western USA continued burnt lime production in a slowly improving market in 2010. The company reported challenging market conditions and intense competition, but prices were stable, and the company hired new employees. In 2011, the company reported steady production; the demand and prices rose a little. Energy costs were responsible for the increases. The company initiated some development on its southern claims and reported that a high-quality deposit was exposed.

Talc.—Barretts Minerals, Inc., a subsidiary of Specialty Minerals, Inc., produced talc from two mines near Dillon. Both the Regal and the Treasure Mines are open pit. The company had a profitable year in 2011; it increased personnel and experienced increased sales. The company has continued to expand its reserves with an active exploration program. The company added a mill at the plant south of Dillon. At the Regal Mine east of Dillon (Madison County), Barretts Minerals completed a new shop and facilities. At the Treasure Mine, the company received approval on a new water and discharge system. Exploration to expand the reserves has continued successfully. In general, demand has increased as has the workforce, but not to levels prior to 2008 and 2009. By producing more with fewer employees, Barretts Minerals broke a number of production records.

South of Ennis (Madison County), Rio Tinto Minerals, under the Luzenac Group, continued production at the Yellowstone Mine in 2010. Capital improvements in 2010 included completion of energy-efficiency upgrades in the ore-processing circuit. Demand increased modestly, in line with overall industry recovery. The company hired some staff in response to the recovery, since prices were steady. Rio Tinto had been interested in divestment of its talc business, and on August 1, 2011, the talc operations were purchased by Imerys, an international industrial minerals company. The new name was Imerys Talc, which was a division under the Performance and Filtration Minerals Group of Imerys. Local operations reported no changes in labor or reserves.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2009			2010			2011		
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
Gemstones, natural	NA	378	NA	515	NA	524			
Palladium ³	12,700	108,000	11,600	199,000	12,400	295,000			
Platinum ³	3,830	149,000	3,450	179,000	3,700	205,000			
Sand and gravel, construction	11,200	86,100 ^r	10,200	82,100	11,000	85,800			
Stone:									
Crushed	1,990	20,400	2,050	21,300	2,160	20,600			
Dimension	W	W	11	2,950	12	2,930			
Combined values of cadmium [by product from zinc concentrates (2009)], copper, gold (2009, 2011), lead (2009), molybdenum concentrates, silver, and zinc (2009)	XX	529,000	XX	556,000	XX	737,000			
Combined values of cement, clays (bentonite, common), garnet (industrial), lime, talc (crude) and value indicated by symbol W	XX	89,800	XX	94,800	XX	95,100			
Total	XX	983,000 ^r	XX	1,140,000	XX	1,440,000			

¹Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

²Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

³Data are rounded to no more than three significant digits; may not add to totals shown.

^rRecoverable content of ores.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED IN THE UNITED STATES, BY TYPE¹

Type	2009			2010			2011		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	
Limestone ²	9	1,570	\$16,600	\$10.56	7	1,610	\$16,900 ^r	\$10.46 ^r	
Granite	--	--	--	--	9	115	1,260	10.95	
Treaprock	--	--	--	--	1	99	1,100	11.02	
Sandstone and quartzite ³	3 ^r	9 ^r	122 ^r	13.76	3	9	130	14.05	
Volcanic cinder and scoria	--	--	--	--	2	21	211	9.83	
Miscellaneous stone	30 ^r	409 ^r	3,680 ^r	9.01	22 ^r	197 ^r	1,720 ^r	8.74 ^r	
Total or average	XX	1,990	20,400	10.25	XX	2,050 ^r	21,300 ^r	10.36 ^r	
					XX	2,160	20,600	9.51	

¹Revised. XX Not applicable. -- Zero.

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

³Includes limestone-dolomite reported with no distinction between the two kinds of stone.

^rIncludes sandstone-quartzite reported with no distinction between the two kinds of stone.

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2010, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Coarse aggregate, graded:		
Bituminous aggregate, coarse	21	771
Railroad ballast	W	W
Fine aggregate (-¾ inch), stone sand, concrete	18	80
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surface	69	412
Crusher run or fill or waste	3	5
Other construction materials	W	W
Agricultural, poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Flux stone	W	W
Sulfur oxide removal	W	W
Special, mining dusting acid water treatment	W	W
Unspecified:²		
Reported	340	4,430
Estimated	524	6,230
Total	2,050	21,300

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

¹Data are rounded to no more than three significant digits; 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 2011, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	47	568
Filter stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	9	80
Bituminous aggregate, coarse	21	770
Railroad ballast	W	W
Fine aggregate (-¾ inch), stone sane, concrete	18	83
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surface	W	W
Terrazzo and exposed aggregate	2	34
Crusher run or fill or waste	W	W
Unspecified and other construction materials	W	W
Agricultural, poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Flux stone	W	W
Sulfur oxide removal	W	W
Special, mining dusting or acid water treatment	W	W
Other miscellaneous uses and specified uses not listed	13	62
Unspecified: ²		
Reported	157	1,490
Estimated	721	6,860
Total	2,160	20,600

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

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

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

TABLE 5
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2010, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	10	21	W	W	--	--
Coarse aggregate, graded ³	21	772	W	W	--	--
Fine aggregate (-¾ inch) ⁴	18	80	--	--	--	--
Coarse and fine aggregates ⁵	66	382	11	91	--	--
Other construction materials	--	--	W	W	--	--
Agricultural ⁶	W	W	W	W	--	--
Chemical and metallurgical ⁷	W	W	W	W	--	--
Special ⁸	--	--	W	W	--	--
Unspecified: ⁹						
Reported	340	7,960	(10)	1	(10)	3
Estimated	514	6,160	9	73	--	--
Total ¹¹	1,420	15,400	606	5,860	(10)	3

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 macadam, riprap and jetty stone, filter stone, and other coarse aggregates.

³Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregates.

⁴Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.

⁵Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.

⁶Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁷Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.

⁸Includes mine dusting or acid water treatment, whiting or whitening substance, and other fillers or extenders.

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

¹⁰Less than ½ unit.

¹¹District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

TABLE 6
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2011, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	25	230	W	W	--	--
Coarse aggregate, graded ³	257	3,350	W	W	--	--
Fine aggregate (-¾ inch) ⁴	18	83	--	--	--	--
Coarse and fine aggregates ⁵	66	410	W	W	--	--
Other construction materials	W	W	W	W	--	--
Agricultural ⁶	--	--	W	W	--	--
Chemical and metallurgical ⁷	W	W	W	W	--	--
Special ⁸	--	--	W	W	--	--
Other miscellaneous uses and specified uses not listed ⁹	W	W	--	--	--	--
Unspecified: ¹⁰						
Reported	156	1,490	--	--	W	W
Estimated	683	6,490	38	368	--	--
Total	1,590	15,200	W	W	W	W

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 macadam, riprap and jetty stone, filter stone, and other coarse aggregates.

³Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregates.

⁴Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.

⁵Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.

⁶Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁷Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.

⁸Includes mine dusting or acid water treatment, whitening or whitening substance, and other fillers or extenders.

⁹Includes drain fields, waste material, lightweight aggregate (slate), pipe bedding, refractory stone (including ganister), and other miscellaneous uses.

¹⁰Reported and estimated production without a breakdown by end use.

TABLE 7
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2010,
BY MAJOR USE CATEGORY¹

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregate and concrete products	774	\$6,520	\$8.42
Asphaltic concrete aggregates and other bituminous mixtures	437	3,740	8.56
Road base and coverings ²	2,420	17,700	7.32
Fill	102	616	6.04
Snow and ice control	36	253	7.03
Other miscellaneous uses ³	62	826	13.32
Unspecified: ⁴			
Reported	1,570	13,100	8.33
Estimated	4,730	39,100	8.26
Total or average	10,200	82,100	8.08

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).

³Includes railroad ballast.

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

TABLE 8
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2011,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products ²	578	4,610	7.98
Asphaltic concrete aggregates and road base materials ³	3,070	22,900	7.46
Fill	305	2,450	8.03
Snow and ice control	51	408	8.00
Other miscellaneous uses ⁴	72	853	11.85
Unspecified: ⁵			
Reported	1,580	12,600	7.97
Estimated	5,350	42,000	7.85
Total or average	11,000	85,800	7.80

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

⁴Includes railroad ballast.

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

TABLE 9
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2010, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ²	640	5,570	134	949	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	60	497
Road base and coverings ³	1,860	14,000	507	3,350	54	419
Fill	66	484	36	132	--	--
Other miscellaneous uses ⁴	98	1,080	1	2	--	--
Unspecified: ⁵						
Reported	862	7,620	651	5,330	55	113
Estimated	3,580	29,600	1,150	9,490	--	--
Total ⁶	7,480	61,500	2,480	19,300	169	1,030

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- 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 railroad ballast, and snow and ice control.

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

⁶District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

TABLE 10
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2011, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ²	441	3,460	137	1,160	--	--
Asphaltic concrete aggregates and other bituminous mixtures ³	2,300	18,200	575	3,000	194	1,680
Fill	216	1,910	89	539	--	--
Other miscellaneous uses ⁴	123	1,260	2	2	--	--
Unspecified: ⁵						
Reported	973	7,940	600	4,630	2	15
Estimated	3,800	29,900	1,550	12,100	--	--
Total	7,860	62,700	2,950	21,400	196	1,690

-- Zero.

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

²Includes plaster and gunite sands.

³Includes road base and other stabilization (cement).

⁴Includes railroad ballast, and snow and ice control.

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