

THE MINERAL INDUSTRY OF WISCONSIN

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

In 1998, the preliminary estimated value¹ of nonfuel mineral production for Wisconsin was \$296 million, according to the U.S. Geological Survey (USGS). This was a decrease of about 17% from that of 1997,² and followed a 9.6% decrease in 1997 from that of 1996.

Crushed stone and construction sand and gravel were, by value, Wisconsin's leading nonfuel minerals in 1998, accounting for about 37% and almost 35%, respectively, of the State's total nonfuel mineral value. In 1998, the most significant portion of the State's decrease in value resulted from the cessation of copper and gold production following the 1997 closing of the Flambeau Mine, Rusk County. Other mineral commodities showing a decrease in value included construction sand and gravel, crushed stone, and dimension stone. Lime and silica stone showed small increases, while gemstones and peat values were unchanged. Similar to that of 1998, substantial decreases in the production and values of copper and gold in 1997 accounted for the majority of Wisconsin's decrease that year. Additionally, in 1997, increases occurred in the values of crushed stone, construction sand and gravel, lime, industrial sand and gravel, and silica stone (descending order of magnitude of change); decreases occurred in dimension stone, peat, silver, and gemstones (table 1).

Based on USGS estimates of quantities of minerals produced in the 50 States for 1998, Wisconsin rose to third² from fourth in dimension stone, while it remained second of 3 States that produce silica stone and fifth in industrial sand and gravel. Additionally, the State was a significant producer of construction sand and gravel, crushed stone, and lime.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on 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 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. Construction sand and gravel and crushed stone 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 <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 <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

(WGNHS).³ Regulatory review of the proposed underground zinc-copper Crandon Mine project in Forest County continued in 1998, a year highlighted by a significant change in the ownership of the proposed project and subsequent mine-design evaluations and changes that followed. In January, Rio Algom Ltd. announced it had purchased the project's 50% interest of Exxon Coal and Minerals Co. for \$17.5 million. A new company, Nicolet Minerals Co., was formed to replace the Crandon Mining Co. and to carry forward permitting activities with the State and Federal Governments. In March, Nicolet Minerals announced plans to conduct a series of tests to evaluate possible mine-design changes to address certain environmental concerns related to the proposed mine.

In December, as a result of Nicolet's tests and evaluations, the company announced major changes in the mining plan. Grout emplacement would be used while mining the ore to reduce groundwater flow into the mine workings. Reduced mine inflow, in turn, would allow the use of advanced water treatment technologies, such as reverse osmosis, which require a low volume of water for effective treatment. The reduced groundwater flow also will decrease the mining operation's effect on the elevation of the existing watertable. In addition, plans for a 38-mile water discharge pipeline were abandoned. Under the original expectations of water flow into the mine, the pipeline would have been needed for disposal of treated wastewater into the Wisconsin River. The company decided to use groundwater infiltration cells for disposing of excess treated mine wastewater. Another major change in the proposed mining project is that sulfide-bearing materials, such as pyrite, will be removed from the proposed tailings, thereby reducing the size of the tailings management area and the acid-generation potential of the tailings.

Review of the Nicolet Minerals' Crandon Mine project is expected to take between 2 and 3 years after the company has completed filing all of its amended permit applications and other environmental impact report studies documenting the company's assessment of potential environmental and socioeconomic impacts.

In the industrial minerals industry, crushed stone and construction sand and gravel producers reported that overall it was a good year, one of significant activity. Of particular note, was the production and sales of railroad ballast from the central Wisconsin granite area. As well as being produced as crushed stone, dimension stone was also produced from the State's sandstone, dolomite, and granite resources. The granite dimension stone industry remained strong in 1998; some producers invested capital into the modernization of their production and cutting facilities. Some dimension stone products that were produced included countertop material, tile, and surface plates, in addition to the more traditional

³Thomas J. Evans, Geologist, authored the text of mineral industry information submitted by the WGNHS.

production, such as that of monuments. Silica sand producers reported an active year for foundry and hydrofrac sand.

The Wisconsin Department of Transportation held a demonstration project on the use of recycled materials in roadbase. Foundry sand, pottery cull, and mixed glass were waste products that were evaluated for recycle use as roadbase. Recycled materials in transportation applications, however, are not expected to provide a significant portion of material used in the near future.

While 1998 was a year marked by significant legislative and policy activity for metallic mining, very limited leasing and exploration activity took place for metallic mineral resources. Exploration activity consisted of the construction of one drill hole on a previously known discovery. Sharpe Resources Corp. constructed a deep, near vertical hole on the Bend deposit in the Chequamegon National Forest near Perkinstown in Taylor County. Metallic mineral leasing activity appears to have been extremely limited, as well. The WGNHS assessed that the decline in leasing and exploration activity in the State represented industry investment in exploration being focused in other areas of the United States and North America (Canada and Mexico), as well as industry adopting a “wait-and-see” attitude with respect to the permitting activities currently underway for Nicolet Minerals’ proposed mine near Crandon.

Legislation and Government Activities

Legislative activity in 1998 featured the passage of State Senate Bill 3, the so-called mining moratorium bill. Signed by the State Governor on April 22, the bill imposes a requirement that a mining applicant submit documentation regarding the successful operation and reclamation of mines having a net acid-generating potential. The new law, despite its common characterization, does not impose a moratorium on metal mining operations in Wisconsin, but does create an additional condition that must be met by an applicant seeking a mining permit. Other legislative activity in 1998 included the acceptance of new administrative rules, adopted by the Wisconsin Department of Natural Resources (DNR), which create a more uniform approach to groundwater regulation among all regulated activities within the State. Previously, groundwater protection rules that applied to metal mining operations differed to some degree from the broader groundwater law that had been adopted for other operations. Also proposed in 1998, were administrative rules creating an irrevocable trust fund for metal mines permitted in Wisconsin. This so-called “Mine Disaster Fund” is intended to provide for a significant sum of money to pay for mitigation of unforeseen disasters associated with mining many years in the future. The amount of money placed in the interest-bearing account would be determined following testimony submitted by all parties at a “Master Hearing.” This proposal, submitted for review by the Legislature, remains controversial because it does not set a minimum fee that must be included in the fund, but instead relies on the funding level and schedule for accumulation of the fund in the irrevocable trust being determined by the administrative law judge, based on testimony submitted, at the Master Hearing.

The Wisconsin Science Advisory Council met several times during the year. Created by a 1997 gubernatorial executive order, the five-member council of independent scientists is directed to evaluate the technologies proposed for use in preventing environmental degradation by a mining applicant. The council will make recommendations to the Secretary of the State’s DNR regarding the status of such technology in general and the application of such technology for a specific mine proposal. The Council has been reviewing Nicolet Minerals’ plans for its proposed mine near Crandon.

On the local level, Nashville, Forest County, rescinded a mineral lease agreement that it had signed with Exxon in 1975 and assigned to Crandon Mining Co. in 1993. Reasons provided included the town’s assertions that Exxon ceased mineral development activities for more than 180 days and thereby abrogated the lease agreement, that the lease agreement essentially conveyed public property to a private entity without requiring that the property be put to public use, and that the town board originally signing the agreement in 1975 did so illegally. The mineral lease agreement relates to rights to minerals beneath the town road near the Crandon ore body. In May, a Circuit Court judge ruled that the local agreements signed by the Towns of Nashville and Lincoln, the City of Crandon, and Forest County remain in effect. A private individual and the Wisconsin Resource Protection Council had sought to have the agreements nullified, but the judge ruled that the agreements were “valid and legal contracts, negotiated in good faith.”

Mine Reclamation

Immediately following the 1997 closing of the Flambeau Mine, located just south of Ladysmith in Rusk County, the Flambeau Mining Co. began a reclamation program. The program most notably included filling the 32-acre pit created from the extraction of copper and gold ore from the volcanogenic massive-sulfide deposit. In 1998, Flambeau approached the Wisconsin DNR for permission to modify the approved reclamation plan to accommodate local interest in retaining the mine buildings for subsequent use in a small, industrial park development. The company also requested plan changes involving fencing, electrical service, and location of restored wetlands. Some local citizens, concerned with various aspects of the proposed changes, objected. An informal informational meeting was held in Ladysmith to determine whether the modifications requested might make a formal contested-case hearing necessary. Fortunately, a consensus was reached on the scope and nature of the proposed modifications and the reclamation plan was amended with the permission approval of the DNR without the need to hold the formal hearing. Subsequently, the pit was filled, the site was reshaped and revegetated with local plant species, and at the end of 1998 wetlands were undergoing restoration.

There was relatively little progress in efforts to enact new administrative rules related to the reclamation of nonmetallic mineral mining operations; those rules proposed in government committee meetings were subsequently withdrawn pending further negotiations between legislative staff, committee members, and industry representatives.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

| Mineral | 1996 | | 1997 | | 1998 p/ | |
|--|----------|---------|----------|---------|----------|------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Gemstones | NA | 505 | NA | 5 | NA | 5 |
| Lime | 551 | 32,000 | 597 | 35,100 | 618 | 35,200 |
| Peat | W | W | 5 | 256 | 8 | 256 |
| Sand and gravel: | | | | | | |
| Construction | 32,600 | 105,000 | 33,500 | 110,000 | 30,600 | 103,000 |
| Industrial | 1,660 | 32,300 | 1,710 | 33,800 | 1,730 | 34,000 |
| Stone: | | | | | | |
| Crushed | 26,000 | 113,000 | 28,700 | 120,000 | 27,600 | 110,000 |
| Dimension metric tons | 143,000 | 16,600 | 100,000 | 13,100 | 101,000 | 12,800 |
| Combined values of other industrial minerals | XX | 96,800 | XX | 46,600 | XX | (3/) |
| Total | XX | 396,000 | XX | 358,000 | XX | 296,000 4/ |

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Value excluded to avoid disclosing company proprietary data.
4/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS BY KIND 1/

| Kind | 1996 | | | | 1997 | | | |
|-------------------------|--------------------|---------------------------------|-------------------|------------|--------------------|---------------------------------|-------------------|------------|
| | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value |
| Limestone 2/ | 162 r/ | 20,000 r/ | \$89,500 r/ | \$4.47 r/ | 151 | 20,800 | \$90,700 | \$4.36 |
| Dolomite | 8 r/ | 1,090 r/ | 4,530 r/ | 4.16 r/ | 10 | 1,560 | 6,570 | 4.20 |
| Granite | 6 | 1,350 | 2,690 | 2.00 | 7 | 2,210 | 4,790 | 2.17 |
| Traprock | 3 | 1,690 | 7,880 | 4.68 | 3 | 2,080 | 8,320 | 4.01 |
| Sandstone and quartzite | 4 | 1,890 | 8,290 | 4.39 | 4 | 2,070 | 9,300 | 4.50 |
| Total | XX | 26,000 | 113,000 | 4.34 | XX | 28,700 | 120,000 | 4.16 |

r/ Revised. XX Not applicable.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1997, BY USE 1/ 2/

| Use | Quantity (thousand metric tons) | Value (thousands) | Unit value |
|--|---------------------------------------|----------------------|---------------|
| <u>Coarse aggregate (+1 1/2 inch):</u> | | | |
| Riprap and jetty stone | 246 | \$1,460 | \$5.92 |
| Filter stone | 119 | 513 | 4.31 |
| Other coarse aggregate 3/ | 1,240 | 5,430 | 4.39 |
| <u>Coarse aggregate, graded:</u> | | | |
| Concrete aggregate, coarse | 940 | 4,450 | 4.73 |
| Bituminous aggregate, coarse | 349 | 1,710 | 4.90 |
| Bituminous surface-treatment aggregate | 137 | 340 | 2.48 |
| Railroad ballast | 15 | 77 | 5.13 |
| Other graded coarse aggregate | 163 | 759 | 4.66 |
| <u>Fine aggregate (-3/8 inch):</u> | | | |
| Stone sand, bituminous mix or seal | 24 | 91 | 3.79 |
| Screening, undesignated | 608 | 2,120 | 3.49 |
| Other fine aggregate 4/ | 22 | 86 | 3.91 |
| <u>Coarse and fine aggregates:</u> | | | |
| Graded road base or subbase | 7,540 | 29,800 | 3.95 |
| Unpaved road surfacing | 1,030 | 2,260 | 2.19 |
| Crusher run or fill or waste | 560 | 1,970 | 3.51 |
| Other coarse and fine aggregates 5/ | 837 | 3,400 | 4.07 |
| Other construction materials | 19 | 76 | 4.00 |
| <u>Agricultural:</u> | | | |
| Agricultural limestone | 425 | 3,340 | 7.87 |
| Other agricultural uses | 1 | 2 | 2.00 |
| Chemical and metallurgical: Lime manufacture | W | W | W |
| <u>Special:</u> | | | |
| Other fillers or extenders | 10 | 53 | 5.30 |
| Roofing granules | 274 | 302 | 1.10 |
| Other specified uses not listed | W | W | W |
| <u>Unspecified: 6/</u> | | | |
| Actual | 7,310 | 32,000 | 4.38 |
| Estimated | 6,640 | 28,500 | 4.29 |
| Total | 28,700 | 120,000 | 4.16 |

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

1/ Includes dolomite, granite, limestone, limestone-dolomite, sandstone and quartzite, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes stone sand (concrete).

5/ Includes terrazzo and exposed aggregate.

6/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997,
BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

| Use | District 1 | | District 2 | | District 3 | | District 4 | |
|-----------------------------------|------------|--------|------------|--------|------------|--------|------------|--------|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| Construction aggregates: | | | | | | | | |
| Coarse aggregate (+1 1/2 inch) 3/ | 152 | 582 | 1,270 | 5,650 | 131 | 802 | W | W |
| Coarse aggregate, graded 4/ | 123 | 420 | 1,040 | 5,270 | 407 | 1,500 | -- | -- |
| Fine aggregate (-3/8 inch) 5/ | 135 | 496 | W | W | 247 | 769 | W | W |
| Coarse and fine aggregate 6/ | 3,770 | 16,000 | 2,090 | 8,250 | 2,410 | 8,030 | 1,230 | 2,450 |
| Other construction materials | -- | -- | -- | -- | 19 | 77 | -- | -- |
| Agricultural 7/ | 212 | 1,080 | W | W | W | W | -- | -- |
| Chemical and metallurgical 8/ | -- | -- | -- | -- | W | W | -- | -- |
| Special 9/ | 10 | 54 | -- | -- | W | W | -- | -- |
| Unspecified: 10/ | | | | | | | | |
| Actual | 511 | 2,510 | -- | -- | -- | -- | 2,410 | 8,440 |
| Estimated | 1,170 | 5,080 | 1,080 | 4,940 | 2,290 | 9,030 | 312 | 1,600 |
| Total | 6,080 | 26,200 | 5,860 | 26,600 | 5,740 | 21,200 | 3,950 | 12,500 |
| Use | District 5 | | District 6 | | District 8 | | | |
| | Quantity | Value | Quantity | Value | Quantity | Value | | |
| Construction aggregates: | | | | | | | | |
| Coarse aggregate (+1 1/2 inch) 3/ | W | W | -- | -- | W | W | | |
| Coarse aggregate, graded 4/ | W | W | -- | -- | W | W | | |
| Fine aggregate (-3/8 inch) 5/ | W | W | -- | -- | -- | -- | | |
| Coarse and fine aggregate 6/ | W | W | 21 | 106 | W | W | | |
| Other construction materials | -- | -- | -- | -- | -- | -- | | |
| Agricultural 7/ | W | W | 15 | 201 | 25 | 209 | | |
| Chemical and metallurgical 8/ | -- | -- | -- | -- | -- | -- | | |
| Special 9/ | -- | -- | -- | -- | -- | -- | | |
| Unspecified: 10/ | | | | | | | | |
| Actual | 3,320 | 15,800 | 957 | 4,580 | 116 | 623 | | |
| Estimated | 36 | 166 | 69 | 309 | 1,690 | 7,400 | | |
| Total | 3,950 | 18,800 | 1,060 | 5,190 | 2,100 | 9,210 | | |

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

1/ No crushed stone was produced in District 7.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

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

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesigned), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes lime manufacture.

9/ Includes other fillers or extenders and other specified uses not listed, and roofing granules.

10/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY MAJOR USE CATEGORY 1/

| Use | Quantity (thousand metric tons) | Value (thousands) | Value per ton |
|---|---------------------------------------|----------------------|------------------|
| Concrete aggregate (including concrete sand) | 7,950 | \$32,100 | \$4.04 |
| Plaster and gunite sands | 18 | 128 | 7.11 |
| Concrete products (blocks, bricks, pipe, decorative, etc.) | 249 | 1,350 | 5.43 |
| Asphaltic concrete aggregates and other bituminous mixtures | 2,260 | 8,090 | 3.57 |
| Road base and coverings 2/ | 6,920 | 17,700 | 2.56 |
| Fill | 858 | 1,970 | 2.30 |
| Snow and ice control | 173 | 575 | 3.32 |
| Roofing granules | 12 | 71 | 5.92 |
| Other miscellaneous uses 3/ | 141 | 659 | 4.67 |
| Unspecified: 4/ | | | |
| Actual | 7,880 | 26,600 | 3.38 |
| Estimated | 7,040 | 20,800 | 2.95 |
| Total or average | 33,500 | 110,000 | 3.28 |

1/ Data are rounded to three significant digits; may not add to totals shown.

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

3/ Includes filtration and railroad ballast.

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

TABLE 6
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
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 and concrete products 2/ | 1,430 | 5,810 | 4,520 | 18,400 | 1,140 | 4,550 |
| Asphaltic concrete aggregates and other bituminous mixtures | 665 | 3,520 | 240 | 915 | 704 | 1,590 |
| Road base and coverings 3/ | 747 | 2,550 | 2,750 | 6,670 | 1,080 | 2,490 |
| Fill | W | W | W | W | 141 | 253 |
| Snow and ice control | W | W | 25 | 90 | W | W |
| Other miscellaneous uses 4/ | W | W | 44 | 176 | W | W |
| Unspecified: 5/ | | | | | | |
| Actual | 1,590 | 5,690 | W | W | -- | -- |
| Estimated | 248 | 764 | 1,640 | 5,240 | 1,160 | 2,810 |
| Total | 4,920 | 19,200 | 14,200 | 47,700 | 4,240 | 11,800 |
| Use | District 4 | | District 5 | | District 6 | |
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Concrete aggregate and concrete products 2/ | 238 | 1,370 | W | W | 182 | 694 |
| Asphaltic concrete aggregates and other bituminous mixtures | W | W | W | W | 182 | 405 |
| Road base and coverings 3/ | 191 | 800 | -- | -- | 1,040 | 2,700 |
| Fill | W | W | W | W | 74 | 131 |
| Snow and ice control | 18 | 66 | 20 | 53 | W | W |
| Other miscellaneous uses 4/ | W | W | -- | -- | W | W |
| Unspecified: 5/ | | | | | | |
| Actual | W | W | W | W | -- | -- |
| Estimated | 378 | 1,130 | 66 | 214 | 1,730 | 5,770 |
| Total | 1,270 | 4,590 | 327 | 1,050 | 3,250 | 9,860 |
| Use | District 7 | | District 8 | | Unspecified districts 6/ | |
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Concrete aggregate and concrete products 2/ | W | W | 302 | 1,140 | 272 | 1,200 |
| Asphaltic concrete aggregates and other bituminous mixtures | 95 | 266 | 350 | 1,310 | -- | -- |
| Road base and coverings 3/ | 183 | 351 | 928 | 2,190 | -- | -- |
| Fill | -- | -- | 47 | 71 | -- | -- |
| Snow and ice control | W | W | W | W | -- | -- |
| Other miscellaneous uses 4/ | W | W | W | W | -- | -- |
| Unspecified: 5/ | | | | | | |
| Actual | -- | -- | -- | -- | 1,120 | 3,960 |
| Estimated | 893 | 2,460 | 935 | 2,380 | -- | -- |
| Total | 1,280 | 3,390 | 2,600 | 7,260 | 1,390 | 5,160 |

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

1/ Data are rounded to 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 roofing granules.

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

6/ Includes production within the State with no district reported.