

THE MINERAL INDUSTRY OF MINNESOTA

Minnesota climbed in rank from eighth to fourth among the 50 States in total nonfuel mineral production value¹ in 1996, according to the U.S. Geological Survey (USGS). The State's increase in rank was primarily the result of the increased production of iron ore. The estimated total nonfuel mineral value for the State in 1996 was almost \$1.8 billion, a 19% increase from that of 1995. This followed about a 13% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 5% of the U.S. total nonfuel mineral production value.

Changes in Minnesota's total nonfuel mineral value, increases in 1992 and 1994-96 and a small drop in 1993, resulted mostly from the changes in iron ore shipments, although production of construction sand and gravel and crushed stone also contributed. In 1996, iron ore accounted for more than 88% of the State's nonfuel mineral value, while construction sand and gravel and crushed stone accounted for about 6% and 3%, respectively. In 1996, Minnesota returned to the level of ranking it held throughout most of the 1980-90 period when the State always ranked between second and sixth nationally in nonfuel mineral production value. During the early 1990's, iron ore prices and related production were lower. Compared with 1995, all other nonfuel mineral values (*See table 1*) increased in 1996 except for small decreases that occurred in industrial sand and gravel and both common and kaolin clays.

Compared to USGS estimates of quantities produced in the other 49 States in 1996, Minnesota remained first in the Nation in iron ore and fifth in the production of peat. Additionally, the State produced significant quantities of construction sand and gravel, crushed stone, industrial sand and gravel, and dimension stone.

The following narrative information was provided by the Minnesota Department of Natural Resources' Minerals Division (MDNRMD).² Minnesota continued to lead the nation in the production of taconite, a low-grade iron ore.

The State's seven taconite plants produced pellets for steel mills as iron ore consumption remained strong. The ownership of Eveleth Mines was restructured. Oglebay Norton Co. will no longer be the managing agent as of 1997. A new company was formed, the Minnesota Iron and Steel Co., to pursue the development of direct reduced iron (DRI) on the Mesabi Range. The company studied the feasibility of building a pellet plant and DRI facility at the former site of Butler Taconite near Nashauk.

Minnesota Iron and Steel planned to sell taconite pellets to integrated steel producers and DRI to mini-mills that make steel from scrap.

Legislation passed in 1996 authorized the Minnesota Pollution Control Agency to issue permits for disposition of fine tailings from taconite processing facilities into taconite mine pits. Companies applying for a permit must demonstrate through an environmental impact statement (EIS) and risk assessment that deposition will not pose an unreasonable risk of pollution or degradation of groundwater.

About 800,000 hectares of State-owned mineral rights are available by application for metallic minerals leasing. Mineral rights were offered at public sale in 1995-96, but were not bid upon. At yearend there were 72 State metallic minerals leases in effect covering 12,300 hectares, with the leased lands located in Aitkin, Beltrami, Carlton, Crow Wing, Itasca, Koochiching, Lake of the Woods, Roseau, St. Louis, and Todd Counties. Cominco American Inc. held the largest number of State leases.

An EIS was completed for expanding the peat operations of the Hawkes Co. in Marshall County. MDNRMD believed it to be the first EIS in the nation completed for a peat operation. The operation was for the production of reed-sedge peat, and the property will be reclaimed as wetlands.

In cooperation with a number of mineral industry representatives, an ore deposit model for high-grade copper, gold, and platinum-group metals footwall mineralization was developed for the Duluth Complex. In central Minnesota, diamond drilling has revealed alteration of Proterozoic volcanic rocks of lode gold signature. Metallic minerals exploration data and maps for Carlton County have been compiled into a data format to make the information more accessible to exploration companies and amenable to new digital applications.

MDNRMD reported new aggregate resources needed to be identified in the State to address highway and development needs and for other land use planning. An aggregate potential map for eastern Clay County was completed in a digital format with an interactive digital database. New sites for testing have been identified in Cook County.

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 1996 USGS mineral production data published in this chapter are estimated as of February 1997. Estimates for construction sand and gravel and crushed stone are periodically updated. To obtain the most recent information please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call

USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>

²Kathy A. Lewis, Mineral Leasing Manager, authored the text of State mineral industry information provided by the MDNRMD. She may be contacted at the same address and telephone and fax number as Mr. Brice.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

| Mineral | 1994 | | 1995 | | 1996 p/ | |
|---|-----------|------------------|-----------|------------------|-----------|------------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Clays | W | W | 48 | W | 11 3/ | W |
| Gemstones | NA | 26 | NA | 26 | NA | W |
| Iron ore (usable) | 43,300 | 1,160,000 | 47,000 | 1,310,000 | 47,000 | 1,590,000 |
| Peat | 37 | 3,010 | 24 4/ | 2,070 4/ | 27 4/ | 2,240 4/ |
| Sand and gravel (construction) | 29,500 | 90,000 | 31,900 | 99,400 | 32,600 | 104,000 |
| Stone: | | | | | | |
| Crushed | 10,900 | 47,100 | 11,300 5/ | 47,400 5/ | 12,000 5/ | 52,200 5/ |
| Dimension metric tons | 16,900 5/ | W | 26,900 | 11,100 | 29,600 | 11,100 |
| Combined value of clays (common, kaolin), lime, sand and gravel (industrial), stone [crushed quartzite and traprock (1995-96), dimension dolomite and granite (1994)], and values indicated by symbol W | XX | 44,900 | XX | 40,400 | XX | 39,500 |
| Total | XX | 1,340,000 | XX | 1,510,000 | XX | 1,800,000 |

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" 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/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MINNESOTA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995,
BY USE 3/

| Use | Quantity (thousand metric tons) | Value (thousands) | Unit value |
|--|---------------------------------------|----------------------|---------------|
| Coarse aggregate (+1 1/2 inch): | | | |
| Riprap and jetty stone | 132 | \$716 | \$5.42 |
| Filter stone | 8 | 58 | 7.25 |
| Coarse aggregate, graded: | | | |
| Concrete aggregate, coarse | 355 | 1,500 | 4.23 |
| Bituminous aggregate, coarse | 160 | 737 | 4.61 |
| Railroad ballast | 690 | 4,210 | 6.10 |
| Fine aggregate (-3/8 inch): Screening, undesignated 4/ | 159 | 776 | 4.88 |
| Coarse and fine aggregates: | | | |
| Graded road base or subbase | 1,370 | 4,300 | 3.13 |
| Unpaved road surfacing | 437 | 1,590 | 3.64 |
| Terrazzo and exposed aggregate | (5/) | (5/) | 2.97 |
| Crusher run or fill or waste | 365 | 430 | 1.18 |
| Agricultural: Agricultural limestone 6/ | 179 | 778 | 4.35 |
| Special: Asphalt fillers or extenders | (5/) | (5/) | 2.76 |
| Unspecified: 7/ | | | |
| Actual | 4,170 | 19,300 | 4.61 |
| Estimated | 2,870 | 11,900 | 4.14 |
| Total | 11,300 | 47,400 | 4.19 |

1/ To avoid disclosing company proprietary data; district tables were not produced for 1995.

2/ Includes dolomite, granite, and sandstone; excludes quartzite and traprock from State total to avoid disclosing company proprietary data.

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

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

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

6/ Includes poultry grit and mineral food.

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 1/

| Kind | 1994 | | | | 1995 | | | |
|-------------------------|--------------------------|---------------------------------------|----------------------|---------------|--------------------------|---------------------------------------|----------------------|---------------|
| | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value |
| Limestone | 49 | 7,670 | \$32,700 | \$4.26 | 30 | 7,500 | \$32,500 | \$4.33 |
| Granite | 4 | W | W | 4.64 | 5 | W | W | 4.63 |
| Dolomite | 4 | W | W | 3.02 | 5 | W | 2,420 | W |
| Sandstone and quartzite | 5 | W | W | 5.75 | 7 2/ | W | W | 4.27 2/ |
| Traprock | 6 r/ | W | W | 4.29 | (3/) | (3/) | (3/) | (3/) |
| Total | XX | 10,900 | 47,100 | 4.33 r/ | XX | 11,300 | 47,400 | 4.19 |

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

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

2/ Excludes quartzite from State total to avoid disclosing company proprietary data.

3/ Excludes traprock from State total to avoid disclosing company proprietary data.

TABLE 4
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY MAJOR USE CATEGORY 1/

| Use | Quantity (thousand metric tons) | Value (thousands) | Value per ton |
|---|---------------------------------------|----------------------|------------------|
| Concrete aggregate (including concrete sand) | 6,690 | \$27,200 | \$4.07 |
| Plaster and gunite sands | 146 | 807 | 5.53 |
| Concrete products (blocks, bricks, pipe, decorative, etc.) | 625 | 2,300 | 3.68 |
| Asphaltic concrete aggregates and other bituminous mixtures | 3,020 | 14,100 | 4.68 |
| Road base and coverings 2/ | 8,970 | 20,700 | 2.30 |
| Fill | 2,330 | 3,840 | 1.65 |
| Snow and ice control | 253 | 710 | 2.81 |
| Filtration | 26 | 202 | 7.77 |
| Other 3/ | 245 | 800 | 3.27 |
| Unspecified: 4/ | | | |
| Actual | 3,000 | 9,130 | 3.05 |
| Estimated | 6,610 | 19,600 | 2.97 |
| Total or average | 31,900 | 99,400 | 3.11 |

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 railroad ballast and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
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/ | 2,280 | 11,000 | 506 | 2,320 | 1,030 | 4,300 |
| Asphaltic-bituminous mixtures | 815 | 2,080 | 119 | 425 | 893 | 4,570 |
| Road base materials and fill 3/ | 1,560 | 3,160 | 1,230 | 2,700 | 3,630 | 7,180 |
| Other miscellaneous uses 4/ | 11 | 101 | 197 | 377 | 20 | 150 |
| Unspecified: 5/ | | | | | | |
| Actual | 131 | 245 | 356 | 829 | 2 | 9 |
| Estimated | 1,580 | 4,610 | 272 | 955 | 1,930 | 6,210 |
| Total | 6,380 | 21,200 | 2,680 | 7,610 | 7,510 | 22,400 |
| | District 4 | | District 5 | | District 6 | |
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Concrete aggregate and concrete products 2/ | 390 | 1,730 | 2,600 | 7,690 | 655 | 3,200 |
| Asphaltic-bituminous mixtures | 684 | 4,380 | 309 | 2,070 | 202 | 618 |
| Road base materials and fill 3/ | 1,590 | 3,740 | 2,870 | 6,640 | 679 | 1,790 |
| Other miscellaneous uses 4/ | 43 | 374 | -- | -- | -- | -- |
| Unspecified: 5/ | | | | | | |
| Actual | 309 | 968 | 1,950 | 6,370 | 244 | 703 |
| Estimated | 1,030 | 3,270 | 1,200 | 3,200 | 595 | 1,380 |
| Total | 4,040 | 14,500 | 8,930 | 26,000 | 2,370 | 7,690 |

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) and snow and ice control.

4/ Includes railroad ballast and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.