

## PHOSPHATE ROCK

(Data in thousand metric tons, marketable phosphate rock, unless otherwise specified)

**Domestic Production and Use:** In 2023, phosphate rock ore was mined by five companies at nine mines in four States and processed into an estimated 20 million tons of marketable product, valued at \$2 billion, free on board (f.o.b.) mine. Phosphate rock was produced in Florida, Idaho, North Carolina, and Utah. Marketable product refers to beneficiated phosphate rock with phosphorus pentoxide ( $P_2O_5$ ) content suitable for phosphoric acid or elemental phosphorus production. More than 95% of the phosphate rock mined in the United States was used to manufacture wet-process phosphoric acid and superphosphoric acid, which were used as intermediate feedstocks in the manufacture of granular and liquid ammonium phosphate fertilizers and animal feed supplements. About 25% of the wet-process phosphoric acid produced was exported in the form of upgraded granular diammonium phosphate (DAP), monoammonium phosphate (MAP) fertilizer, merchant-grade phosphoric acid, and other phosphate fertilizer products. The balance of the phosphate rock mined was for the manufacture of elemental phosphorus, which was used to produce phosphorus compounds for industrial applications, primarily glyphosate herbicide.

### **Salient Statistics—United States:**

|                                                                          | <b>2019</b> | <b>2020</b> | <b>2021</b> | <b>2022</b>         | <b>2023<sup>e</sup></b> |
|--------------------------------------------------------------------------|-------------|-------------|-------------|---------------------|-------------------------|
| Production, marketable                                                   | 23,300      | 23,500      | 21,600      | <sup>e</sup> 19,800 | 20,000                  |
| Sold or used by producers                                                | 23,400      | 22,600      | 21,900      | <sup>e</sup> 19,800 | 21,000                  |
| Imports for consumption                                                  | 2,140       | 2,520       | 2,460       | 2,500               | 2,600                   |
| Consumption, apparent <sup>1</sup>                                       | 25,500      | 25,100      | 24,400      | <sup>e</sup> 22,300 | 24,000                  |
| Price, average value, f.o.b. mine, <sup>2</sup> dollars per metric ton   | 67.90       | 75.50       | 82.40       | <sup>e</sup> 98     | 100                     |
| Stocks, producer, yearend                                                | 9,940       | 11,000      | 10,700      | <sup>e</sup> 10,600 | 10,000                  |
| Employment, mine and beneficiation plant, number <sup>e</sup>            | 1,900       | 1,800       | 2,000       | 1,900               | 1,900                   |
| Net import reliance <sup>3</sup> as a percentage of apparent consumption | 11          | 5           | 10          | 12                  | 14                      |

**Recycling:** None.

**Import Sources (2019–22):** Peru, 98%; and Morocco, 2%.

| <b>Tariff:</b> | <b>Item</b>                 | <b>Number</b> | <b>Normal Trade Relations<br/>12–31–23</b> |
|----------------|-----------------------------|---------------|--------------------------------------------|
|                | Natural calcium phosphates: |               |                                            |
|                | Unground                    | 2510.10.0000  | Free.                                      |
|                | Ground                      | 2510.20.0000  | Free.                                      |

**Depletion Allowance:** 14% (domestic and foreign).

**Government Stockpile:** None.

**Events, Trends, and Issues:** Domestic production, sales, imports, and consumption of phosphate rock all were estimated to have increased in 2023, owing to increased phosphoric acid and fertilizer production. Favorable weather conditions in the planting seasons helped to boost fertilizer consumption and reduce phosphate fertilizer stocks that had accumulated in 2022.

In 2023, a U.S. Federal judge canceled permits issued by the Bureau of Land Management (BLM) for construction of a new phosphate rock mine in Caribou County, ID. The judge ruled that the BLM failed to analyze the effects of the mine and associated infrastructure on the habitat of the greater sage grouse. The mine was intended to be a replacement for an existing mine and was planned to start production within the next decade. The two other mining companies in Idaho were not affected by the ruling and remained on schedule with development of new mines to replace their existing mines.

Global production of phosphate rock was estimated to have been lower in 2023 than that in 2022. World consumption of  $P_2O_5$  contained in fertilizers was estimated to have been 45.7 million tons in 2023 compared with 43.8 million tons in 2022. World consumption of  $P_2O_5$  in fertilizers was projected to increase to 50 million tons by 2027. The leading regions for growth were expected to be Asia and South America.

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Global phosphate production capacity, in terms of  $P_2O_5$  content, was projected to increase to 69.1 million tons by 2027 compared with 63.6 million tons in 2023. Capacity expansions to phosphate rock production that were expected to be completed by 2026 were ongoing in Brazil, Kazakhstan, Mexico, Morocco, and Russia. Significant new mining projects that were planned to be completed after 2027 were under development in Australia, Canada, Congo (Brazzaville), Guinea-Bissau, and Senegal. The new mines in Australia and Canada were planned to be primarily used to supply the manufacturing of lithium-iron-phosphate battery cathode active material.

**World Mine Production and Reserves:** Reserves for China, India, Russia, and Turkey were revised based on Government reports. Reserves for South Africa were revised based on company reports.

|                       | Mine production     |                   | Reserves <sup>4</sup>  |
|-----------------------|---------------------|-------------------|------------------------|
|                       | 2022                | 2023 <sup>e</sup> |                        |
| United States         | <sup>e</sup> 19,800 | 20,000            | 1,000,000              |
| Algeria               | <sup>e</sup> 1,800  | 1,800             | 2,200,000              |
| Australia             | <sup>e</sup> 2,500  | 2,500             | <sup>5</sup> 1,100,000 |
| Brazil                | <sup>e</sup> 6,200  | 5,300             | 1,600,000              |
| China <sup>6</sup>    | <sup>e</sup> 93,000 | 90,000            | 3,800,000              |
| Egypt                 | <sup>e</sup> 5,000  | 4,800             | 2,800,000              |
| Finland               | 923                 | 950               | 1,000,000              |
| India                 | <sup>e</sup> 1,740  | 1,500             | 31,000                 |
| Israel                | 2,170               | 2,500             | 60,000                 |
| Jordan                | 11,300              | 12,000            | 1,000,000              |
| Kazakhstan            | <sup>e</sup> 1,500  | 2,000             | 260,000                |
| Mexico                | 442                 | 500               | 30,000                 |
| Morocco               | 39,000              | 35,000            | 50,000,000             |
| Peru                  | 4,200               | 4,200             | 210,000                |
| Russia                | <sup>e</sup> 14,000 | 14,000            | 2,400,000              |
| Saudi Arabia          | <sup>e</sup> 9,000  | 8,500             | 1,400,000              |
| Senegal               | <sup>e</sup> 2,600  | 2,500             | 50,000                 |
| South Africa          | 1,990               | 1,600             | 1,500,000              |
| Syria                 | <sup>e</sup> 1,100  | 800               | 250,000                |
| Togo                  | <sup>e</sup> 1,500  | 1,500             | 30,000                 |
| Tunisia               | 3,560               | 3,600             | 2,500,000              |
| Turkey                | <sup>e</sup> 900    | 800               | 71,000                 |
| Uzbekistan            | <sup>e</sup> 900    | 900               | 100,000                |
| Vietnam               | <sup>e</sup> 2,000  | 2,000             | 30,000                 |
| Other countries       | 750                 | 800               | 800,000                |
| World total (rounded) | 228,000             | 220,000           | 74,000,000             |

**World Resources:**<sup>4</sup> Some world reserves were reported only in terms of ore tonnage and grade. Phosphate rock resources occur principally as sedimentary marine phosphorites. The largest sedimentary deposits are found in northern Africa, the Middle East, China, and the United States. Significant igneous occurrences are found in Brazil, Canada, Finland, Russia, and South Africa. Large phosphate resources have been identified on the continental shelves and on seamounts in the Atlantic Ocean and the Pacific Ocean. World resources of phosphate rock are more than 300 billion tons. There are no imminent shortages of phosphate rock.

**Substitutes:** There are no substitutes for phosphorus in agriculture.

<sup>e</sup>Estimated.

<sup>1</sup>Defined as phosphate rock sold or used by producers + imports. U.S. producers stopped exporting phosphate rock in 2003.

<sup>2</sup>Marketable phosphate rock, weighted value, all grades.

<sup>3</sup>Defined as imports ± adjustments for industry stock changes.

<sup>4</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>5</sup>For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 120 million tons.

<sup>6</sup>Production data for large mines only, as reported by the National Bureau of Statistics of China.