

## PHOSPHATE ROCK

(Data in thousand metric tons unless otherwise noted)

**Domestic Production and Use:** Phosphate rock ore was mined by five firms at 10 mines in four States and processed into an estimated 27.6 million tons of marketable product valued at \$2.2 billion, f.o.b. mine. Florida and North Carolina accounted for about 80% of total domestic output; the remainder was produced in Idaho and Utah. Marketable product refers to beneficiated phosphate rock with phosphorus pentoxide (P<sub>2</sub>O<sub>5</sub>) 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. Approximately 45% of the wet-process phosphoric acid produced was exported in the form of upgraded granular diammonium and monoammonium phosphate fertilizer, and merchant-grade phosphoric acid. The balance of the phosphate rock mined was for the manufacture of elemental phosphorus, which was used to produce phosphorus compounds for a variety of industrial applications.

<b>Salient Statistics—United States:</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015<sup>e</sup></b>
Production, marketable	28,100	30,100	31,200	25,300	27,600
Used by producers	28,600	27,300	28,800	26,700	26,500
Imports for consumption	3,750	3,570	3,170	2,390	1,900
Consumption, apparent <sup>1</sup>	32,000	30,400	31,300	29,100	28,300
Price, average value, dollars per ton, f.o.b. mine <sup>2</sup>	96.64	102.54	91.11	78.59	80.00
Stocks, producer, yearend	4,580	6,700	9,000	5,880	6,500
Employment, mine and beneficiation plant, number <sup>e</sup>	2,260	2,230	2,170	2,100	2,050
Net import reliance <sup>3</sup> as a percentage of apparent consumption	15	5	3	18	4

**Recycling:** None.

**Import Sources (2011–14):** Morocco, 64%; and Peru, 36%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–15</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:** U.S. production of phosphate rock was estimated to have increased in 2015 over that of 2014; however, consumption of phosphate rock was estimated to have decreased owing to lower phosphoric acid production. World production of phosphate rock increased in 2015, with most of the increases taking place in the Middle East and South America. U.S. imports of phosphate rock were lower because of the closure of a phosphoric acid plant in Mississippi that used phosphate rock from Morocco. Two phosphoric acid plants in the United States have closed permanently since late 2014; the plant in Mississippi was shut down after the owner declared bankruptcy and the other in northern Florida was closed because of company consolidation. The closures reduced U.S. annual phosphoric acid production capacity by 0.8 million tons, to 8.5 million tons.

Domestic phosphate rock production capacity remained at 32.7 million tons. A company based in Canada that was developing a new underground mine in southeastern Idaho curtailed permitting activities from January to September 2015 because of financial constraints. The company expected to complete the permitting process in 2016, with production of about 0.9 million tons per year commencing after 2017. No other increases in production capacities were expected, because all new mines planned in the United States would be replacements for existing mines.

World phosphate rock production was expected to increase incrementally from 223 million tons in 2015 to 255 million tons in 2019. The leading areas of growth were planned in Africa and the Middle East. In Morocco, mine production capacity was expected to double owing to expansion of existing mines and development of a new mining complex. Phosphate-processing plants are planned to triple in capacity by 2018 through construction of new facilities. In Saudi Arabia, a new 5.3-million-ton phosphate mining and processing complex was under construction with completion expected by late 2016.

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Other phosphate rock projects that were planned to begin operating by 2019 were in Algeria, Australia, Brazil, China, Egypt, Jordan, Kazakhstan, Peru, Russia, and Tunisia. Offshore mining projects in Namibia have been delayed until after 2019, owing to a moratorium on offshore mining from October 2013 through March 2015 to study the possible effects to the fishing industry. After the moratorium expired, no significant progress had been made in resolving the issue. An environmental assessment had not been completed and the Namibian Government has not issued any mining licenses. About 10 other projects throughout Africa were in various stages of development in 2015, but none were expected to begin production until after 2020.

World consumption of P<sub>2</sub>O<sub>5</sub> contained in fertilizers and industrial uses was projected to increase gradually from 43.7 million tons in 2015 to 48.2 million tons in 2019.

**World Mine Production and Reserves:** Reserves in Brazil, Egypt, and India were revised based on information from official Government sources. Reserves for Canada were moved to "Other countries" because no phosphate rock was produced in Canada in 2014 and 2015.

	Mine production		Reserves <sup>4</sup>
	2014	2015 <sup>e</sup>	
United States	25,300	27,600	1,100,000
Algeria	1,500	1,200	2,200,000
Australia	2,600	2,600	1,000,000
Brazil	6,040	6,700	320,000
China <sup>5</sup>	100,000	100,000	3,700,000
Egypt	5,500	5,500	1,200,000
India	1,110	1,100	65,000
Iraq	200	200	430,000
Israel	3,360	3,300	130,000
Jordan	7,140	7,500	1,300,000
Kazakhstan	1,600	1,600	260,000
Mexico	1,700	1,700	30,000
Morocco and Western Sahara	30,000	30,000	50,000,000
Peru	3,800	4,000	820,000
Russia	11,000	12,500	1,300,000
Saudi Arabia	3,000	3,300	960,000
Senegal	900	1,000	50,000
South Africa	2,160	2,200	1,500,000
Syria	1,230	750	1,800,000
Togo	1,200	1,000	30,000
Tunisia	3,780	4,000	100,000
Vietnam	2,700	2,700	30,000
Other countries	2,370	2,600	380,000
World total (rounded)	218,000	223,000	69,000,000

**World Resources:** Some world reserves were reported only in terms of ore and grade. Phosphate rock resources occur principally as sedimentary marine phosphorites. The largest sedimentary deposits are found in northern Africa, China, the Middle East, 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.

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

<sup>e</sup>Estimated.

<sup>1</sup>Defined as phosphate rock sold or used + imports.

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

<sup>3</sup>Defined as imports – exports + adjustments for industry stock changes.

<sup>4</sup>See [Appendix C](#) for resource/reserve definitions and information concerning data sources.

<sup>5</sup>Production data for large mines only.