# Minerals in My State

**GRADE LEVEL: 6-12**

**INTRODUCTION**

There is significant concern over the large quantity of minerals and products made from minerals that must be imported each year into the United States (US). Domestic minerals (minerals available within the US) can be extremely challenging to mine. Issues such as economic viability, national and state regulations, community opposition, etc. creates challenges in both starting and operating mines in the US. The US is reliant on imports for many critical minerals. This illustrates how important it is to understand how minerals are used, and where they come from, not only in our everyday lives, but also in the crucial defense, healthcare, and technology of the US.

NOTE: Mineral commodities are produced in all 50 states. Reference 1 shows in alphabetic order the top five mineral commodities produced (by value) in each state. Additional minerals are produced in most states. “Mineral commodities" include minerals that are mined as well as products like lime and cement that are not mined but are manufactured from minerals. The USGS 2022 Critical Minerals List contains minerals and elements without any details about how they are mined or produced.

**LEARNING OUTCOMES**

Students will learn about mineral commodities mined or produced in their home state. Students will assess whether any minerals found in their state have been deemed “critical minerals,” and whether these minerals are used for US defense, economy, health, etc. Students will consider the importance of minerals in their everyday lives, now and in the future, in relation to the availability of critical minerals.

**MATERIALS NEEDED**

Copies of the Minerals in My State worksheet, Reference 1 and 2, and other background information from this activity.
Internet access for research.

**PROCEDURE**

1. Complete the Minerals in my State Worksheet.

**DISCUSSION**

1. Discuss and compare the findings on your worksheet with classmates.

2. Discuss the critical mineral that you researched. What do you think is the most important use of that mineral and why?

3. Which of the uses of minerals are most important to you personally? What about to your family and friends? Which are most important to the country as a whole? Does the importance placed on the mineral change depending on the reference it is important to (personal, friends/family, country, healthcare, lifestyle, etc.).

4. Based on your research and that of your classmates, does the US need to rely on mineral imports or can the US supply its own mineral needs?

5. What if the minerals for these important uses were not available?

6. What are the options for obtaining the critical minerals needed for the US now and in the future? What are the difficulties/challenges with each of these options?

# Minerals in My State Worksheet

My state is:

The information source for principal nonfuel mineral commodities mined or produced in my state is:
REFERENCE 1, source for information in Reference 1 is the U.S. Geological Survey, 2023, Mineral commodity summaries 2023: U.S. Geological Survey, 210 p., https://doi.org/10.3133/mcs2023. Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2022, p. 10

Principal nonfuel mineral commodities by value (REFERENCE 1) mined or produced in my state are:

Select one of these mineral commodities and research where it is mined or produced in your state. The mineral commodity selected is:

Where is that mineral commodity mined or produced in my state?

List the source(s) of information for where the selected mineral commodity is mined or produced in your state:

What other minerals are found in your state, whether mined or not?

List the source(s) for information about other minerals found in your state:

Review the Critical Minerals List in REFERENCE 2 and circle any of the minerals you've listed above that are found in your state. It may help to alphabetize your list of minerals to help with comparing to the table. Pick one of these, or if there are none in your state, any one from the list, and conduct further research into their importance.

# REFERENCE 1

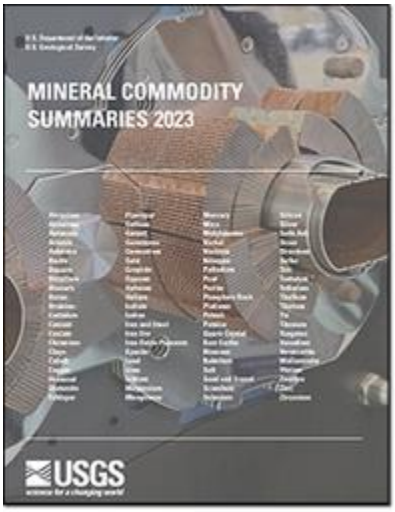
## Principal Nonfuel Mineral Commodity Production in Individual U.S. States in 2022 by Value

| State | Principal nonfuel mineral commodities listed alphabetically |
|---|---|
| Alabama | Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Alaska | Gold, lead, sand and gravel (construction), silver, zinc. |
| Arizona | Cement, copper, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed). |
| Arkansas | Bromine, cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| California | Boron minerals, cement, rare earths, sand and gravel (construction), stone (crushed). California also produces significant quantities of titanium mineral concentrates. |
| Colorado | Cement, gold, molybdenum mineral concentrates, sand and gravel (construction), stone (crushed). |
| Connecticut | Sand and gravel (construction), stone (crushed), stone (dimension). |
| Delaware | Magnesium compounds, sand and gravel (construction), stone (crushed). |
| Florida | Cement, clay (attapulgite and kaolin), phosphate rock, sand and gravel (construction), stone (crushed). Florida produces significant quantities of rare earths and titanium and zirconium mineral concentrates. |
| Georgia | Cement, clay (kaolin and montmorillonite), sand and gravel (construction), sand and gravel (industrial), stone (crushed). Georgia produces significant quantities of rare earths and titanium and zirconium mineral concentrates. |
| Hawaii | Sand and gravel (construction), stone (crushed). |
| Idaho | Lead, phosphate rock, sand and gravel (construction), silver, zinc. |
| Illinois | Cement, magnesium compounds, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Indiana | Cement, lime, sand and gravel (construction), stone (crushed), stone (dimension). |
| Iowa | Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Kansas | Cement, helium (Grade-A), salt, sand and gravel (construction), stone (crushed). |
| Kentucky | Cement, clay (common clay), lime, sand and gravel (construction), stone (crushed). |
| Louisiana | Clay (common clay), salt, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Maine | Cement, peat, sand and gravel (construction), stone (crushed), stone (dimension). |
| Maryland | Cement, sand and gravel (construction), stone (crushed), stone (dimension). |

| | |
|---|---|
| Massachusetts | Clay (common clay), lime, sand and gravel (construction), stone (crushed), stone (dimension). |
| Michigan | Cement, iron ore, magnesium compounds, nickel sulfide concentrates, salt. |
| Minnesota | Iron ore, sand and gravel (construction), sand and gravel (industrial), stone (crushed), stone (dimension). |
| Mississippi | Clay (ball clay, bentonite, common clay, montmorillonite), sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Missouri | Cement, lead, lime, sand and gravel (industrial), stone (crushed). |
| Montana | Copper, molybdenum mineral concentrates, palladium, platinum, sand and gravel (construction). |
| Nebraska | Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Nevada | Copper, diatomite, gold, and sand gravel (construction), stone (crushed). |
| New | Sand and gravel (construction), stone (crushed), stone (dimension). |
| New Jersey | Sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| New Mexico | Cement, copper, potash, sand and gravel (construction), stone (crushed). |
| New York | Cement, salt, sand and gravel (construction), stone (crushed), zinc. |
| North Carolina | Clay (common clay and fire clay), phosphate rock, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| North Dakota | Lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Ohio | Cement, lime, salt, sand and gravel (construction), stone (crushed). |
| Oklahoma | Cement, iodine, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Oregon | Cement, diatomite, pumice and pumicite, sand and gravel (construction), stone (crushed). |
| Pennsylvania | Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Rhode Island | Sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| South Carolina | Cement, gold, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| South Dakota | Cement, gold, lime, sand and gravel (construction), stone (crushed). |
| Tennessee | Cement, sand and gravel (construction), sand and gravel (industrial), stone (crushed), zinc. |
| Texas | Cement, lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| Utah | Copper, gold, potash, salt, sand and gravel (construction). |
| Vermont | Sand and gravel (construction), stone (crushed), stone (dimension), talc (crude). |

| | |
|---|---|
| Virginia | Cement, kyanite, lime, sand and gravel (construction), stone (crushed). |
| Washington | Cement, diatomite, sand and gravel (construction), sand and gravel (industrial), stone (crushed). |
| West Virginia | Cement, lime, salt, sand and gravel (industrial), stone (crushed). |
| Wisconsin | Lime, sand and gravel (construction), sand and gravel (industrial), stone (crushed), stone (dimension). |
| Wyoming | Cement, clay (bentonite and common clay), helium (Grade-A), sand and gravel (construction), soda ash. |

Source for above information: U.S. Geological Survey, 2023, Mineral commodity summaries 2023: U.S. Geological Survey, 210 p., https://doi.org/10.3133/mcs2023. Table 3.—Value of Nonfuel Mineral Production in the United States and Principal Nonfuel Mineral Commodities Produced in 2022, p. 10



**REFERENCE 2.**

**The 2022 U.S. Critical Minerals List (USGS 2023 plus additional details added in [] brackets)**

| Critical mineral | Applications |
|---|---|
| Aluminum | Metallurgy and many sectors of the economy. [transportation, packaging such as beverage cans, building construction, and electrical applications] |
| Antimony | Flame retardants and lead-acid batteries. |
| Arsenic | Semiconductors. |
| Barite | Hydrocarbon production. [oil and natural gas drilling] |
| Beryllium | Aerospace and defense. [metal alloys, machine components, gasoline pumps] |
| Bismuth | Medical, metallurgy [alloys], and atomic research. |
| Cerium | Catalytic converters, ceramics, glass, metallurgy, and polishing compounds. |
| Cesium | Research and development. |
| Chromium | Metallurgy. [stainless steel and superalloys] |
| Cobalt | Batteries and metallurgy. [superalloys and magnets] |
| *Copper | [Electrical wires, plumbing pipes, and integral in renewable energy production.] |
| Dysprosium | Data storage devices, lasers, and permanent magnets. |
| Erbium | Fiber optics, glass colorant, lasers, and optical amplifiers. |
| Europium | Nuclear control rods and phosphors. [phosphors produce light when exposed to certain types of energy] |
| Fluorspar | Cement, industrial chemical, and metallurgy. [processing metals and metal alloys] |
| Gadolinium | Medical imaging, metallurgy, and permanent magnets. [metal alloys] |
| Gallium | Integrated circuits and optical devices. [LEDs, transistors, alloys] |
| Germanium | Defense and fiber optics. [transistors; medical alloys; infrared equipment] |
| Graphite | Batteries, fuel cells, and lubricants. [industrial lubricant for machines; steel industry, brake linings] |
| Hafnium | Ceramics, nuclear control rods, and metallurgy. [superalloys] |
| Holmium | Lasers, nuclear control rods, and permanent magnets. |
| Indium | Liquid crystal displays. [alloys for safety devices and solders; transistors, photocells] |
| Iridium | Anode coatings for electrochemical processes and chemical catalysts. |
| Lanthanum | Batteries, catalysts, ceramics, glass, and metallurgy. [alloys] |
| Lithium | Batteries. [metal alloys, aluminum production, glass] |
| Lutetium | Cancer therapies, electronics, and medical imaging. |
| Magnesium | Metallurgy. [alloys, light-weight auto parts] |
| Manganese | Batteries and metallurgy. [essential to iron and steel production] |
| Neodymium | Catalysts, lasers, and permanent magnets. |
| Nickel | Batteries and metallurgy. [alnico magnets, stainless steel and related alloys] |
| Niobium | Metallurgy. [alloys, superconducting magnets] |

| | |
|---|---|
| Palladium | Catalytic converters and catalysts. |
| Platinum | Catalytic converters and catalysts. |
| Praseodymium | Aerospace alloys, batteries, ceramics, colorants, and permanent magnets. |
| Rhodium | Catalytic converters, catalysts, and electrical components. |
| Rubidium | Research and development. [medial and electronic applications] |
| Ruthenium | Catalysts, electronic components, and computer chips. |
| Samarium | Cancer treatments, nuclear, and permanent magnets. [neutron absorber in nuclear reactors] |
| Scandium | Ceramics, fuel cells, and metallurgy. [research, alloys, mercury vapor lamps] |
| Tantalum | Capacitors and metallurgy. [production of electronic components, alloys, medical devices] |
| Tellurium | Metallurgy, solar cells, and thermoelectric devices. [semiconductors, electronics, catalysts, steel and copper alloys] |
| Terbium | Fiber optics, lasers, permanent magnets, and solid state devices. |
| Thulium | Lasers and metallurgy. [portable x-ray machines, magnetic ceramics and alloys] |
| Tin | Metallurgy. [alloys (solder, pewter, bronze), coating steel cans] |
| Titanium | Metallurgy and pigments. [light, strong alloys; anti-corrosion coatings, sunscreen] |
| Tungsten | Metallurgy. [superalloys] |
| Vanadium | Batteries, catalysts, and metallurgy. [strong alloys] |
| Ytterbium | Catalysts, lasers, metallurgy, and scintillators [which absorb radiation and reemit it as light]. [alloys, portable x-ray machines] |
| Yttrium | Catalysts, ceramics, lasers, metallurgy, and phosphors [which admit light when exposed to radiation]. [alloys, catalysts, surgical needles] |
| Zinc | Metallurgy. [alloy—brass; anti-rust coatings; batteries] |
| Zirconium | Metallurgy and nuclear. [steel alloys, superconductor magnets; nuclear reactor lining] |

1The 2022 Final List of Critical Minerals published February 24, 2022 by U.S. Geological Survey (87 FR 10381).

Source: U.S. Geological Survey, 2023, Mineral commodity summaries 2023: U.S. Geological Survey, 210 p., https://doi.org/10.3133/mcs2023. Table 4.— The 2022 U.S. Critical Minerals List, p. 17.

Content that is added to the USGS's original list above to provide more information is in [] brackets.

*Copper has also been discussed as a "critical mineral," so copper has been added to the above chart. https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf