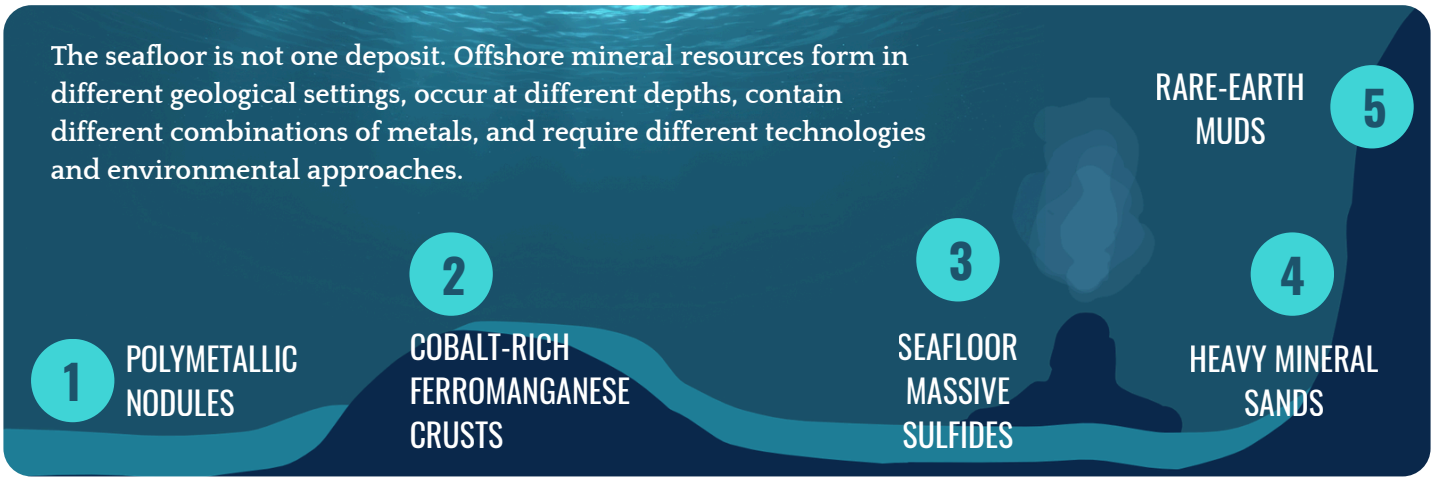
OCEAN MINERALS FORWARD »

Ocean Minerals 101

One Ocean. Multiple Resources. Dozens of Minerals.





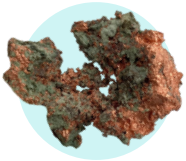
1 - POLYMETALLIC NODULES

Also known as **manganese nodules,** spherical, ranging from 2- 15 cm, found on the seafloor. Can contain nickel, copper, cobalt, manganese, rare earth elements, and possibly titanium, tellurium, and lithium. 3,500 - 6,000 meters deep. Occur on or near the top of soft abyssal-plain sediments.



2 - COBALT-RICH FERROMANGANESE CRUSTS

Also known as **polymetallic crusts,** layered encrustations forming on rocks, typically less than 25 cm thick. Can contain: manganese, cobalt, nickel, copper, rare earth elements, possibly tellurium, scandium, platinum. 400 - 7,000 meters deep. These can occur on the sides and summit of seamonts and ridges.



3 - SEAFLOOR MASSIVE SULFIDES

Also known as **polymetallic sulfide deposits,** they occur as chimneys, mounds, and accumulations below the seafloor. They form at oceanic spreading centers and in arcs and back-arcs and generally have seafloor footprints on the order of 100-1000 m. Can contain copper, zinc, gold, and potentially antimony, bismuth, gallium, tellurium, and germanium. 100 - 7,000 meters deep. These occor globally along active tectonic boundaries.



4 - HEAVY MINERAL SANDS

Also called **placor deposits,** these sedimentary deposits accumulate in sand, silt, and clay in coastal environments. Can contain: ilmenite, magnetite, rutile, monazite, zircon



5 - RARE-EARTH MUDS

Rare earth-rich muds are sediments containing valuable rare earth elements used in advanced electronics, defense systems, electric motors, and other critical technologies. While exploration and recovery technologies remain in early stages, rare earth muds represent a potential opportunity to diversify mineral supplies and strengthen U.S. national security.



WHY NODULES STAND OUT

Polymetallic nodules are discrete rocks that sit unattached on the abyssal plain. A single nodule resource can contain several minerals America needs at the same time – including manganese, nickel, copper, cobalt and rare earth elements.

The Scale of the Resource

Ocean minerals can add a significant new source of supply to a broader U.S. and allied mineral strategy.

~1 BILLION TONS ESTIMATED POLYMETALLIC NODULE RESOURCES IN U.S. DOMESTIC WATERS

A resource base containing multiple strategic metals in a single offshore deposit.

What could one billion tons mean?

300 YEARS OF MANGANESE
200 YEARS OF COBALT
100 YEARS OF NICKEL

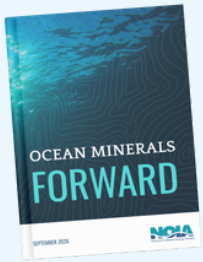
A Global Ressource Base

Nodule fields occur across multiple ocean basins. The Clarion-Clipperton Zone in the Pacific contains the densest known concentration, while U.S. and allied waters contain additional deposits being evaluated under national frameworks.

Adding to America's Mineral Strategy

Ocean minerals are not a replacement for terrestrial mining, recycling or allied supply. They can add another source at meaningful scale – diversifying where minerals come from and reducing dependence on any single deposit, operator or jurisdiction.





AMERICAN RESOURCES. AMERICAN INNOVATION. AMERICAN INDUSTRY.

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