

## Encyclopedic Entry

### ocean

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The ocean covers 70 percent of the [Earth's](#) surface. It contains about 1.35 billion cubic kilometers (324 million cubic miles) of water, which is about 97 percent of all the water on Earth. The ocean makes all life on Earth possible, and makes the planet appear blue when viewed from space. Earth is the only planet in our [solar system](#) that is definitely known to contain [liquid](#) water.

Although the ocean is one continuous body of water, oceanographers have divided it into four principal areas: the Pacific, Atlantic, Indian, and Arctic Oceans. The Atlantic, Indian, and Pacific Oceans merge into icy waters around Antarctica. Some oceanographers define this as a fifth ocean, most commonly called the Southern Ocean.

#### Climate

The ocean plays a vital role in climate and [weather](#). The sun's heat causes water to [evaporate](#), adding moisture to the air. The oceans provide most of this evaporated water. The water [vapor condenses](#) to form clouds, which release their moisture as rain or other kinds of [precipitation](#). All life on Earth depends on this process, called the [water cycle](#).

The [atmosphere](#) receives much of its heat from the ocean. As the sun warms the water, the ocean transfers heat to the atmosphere. In turn, the atmosphere distributes the heat around the globe.

Because water absorbs and loses heat more slowly than land masses, the ocean helps balance global temperatures by absorbing heat in the summer and releasing it in the winter. Without the ocean to help [regulate](#) global temperatures, the Earth's climate would be bitterly cold.

#### Ocean Formation

After the Earth began to form about 4.6 billion years ago, it gradually separated into layers of lighter and heavier rock. The lighter rock rose and formed the Earth's [crust](#). The heavier rock sank and formed the Earth's [core](#) and [mantle](#).

The ocean's water came from rocks inside the newly forming Earth. As the [molten](#) rocks cooled, they released water vapor and other gases. Eventually, the water vapor condensed and covered the crust with a [primitive](#) ocean. Today, hot gases from the Earth's interior continue to produce new water at the bottom of the ocean.

#### Ocean Floor

Scientists began mapping the ocean floor in the 1920s. They used instruments called [echo sounders](#), which

measure water depths using sound waves. Echo sounders use [sonar](#) technology. Sonar is an acronym for SOUNd Navigation And Ranging. The sonar showed that the ocean floor has dramatic physical features, including huge mountains, deep [canyons](#), steep [cliffs](#), and wide [plains](#).

The ocean's crust is a thin layer of volcanic rock called [basalt](#). The ocean floor is divided into several different areas. The first is the [continental shelf](#), the nearly flat, [underwater](#) extension of a continent. Continental shelves vary in width. They are usually wide along low-lying land, and narrow along mountainous coasts.

A shelf is covered in [sediment](#) from the nearby continent. Some of the sediment is deposited by rivers and trapped by features such as natural dams. Most sediment comes from the last [glacial period](#), or Ice Age, when the oceans receded and exposed the continental shelf. This sediment is called [relict sediment](#).

At the outer edge of the continental shelf, the land drops off sharply in what is called the [continental slope](#). The slope descends almost to the bottom of the ocean. Then it tapers off into a gentler slope known as the continental rise. The continental rise descends to the deep ocean floor, which is called the [abyssal plain](#).

Abyssal plains are broad, flat areas that lie at depths of about 4,000 meters to 6,000 meters (13,123 feet to 19,680 feet). Abyssal plains cover 30 percent of the ocean floor and are the flattest feature on Earth. They are covered by fine-grained sediment like clay and silt. Pelagic sediments, the remains of small ocean organisms, also drift down from upper layers of the ocean. Scattered across abyssal plains are abyssal hills and underwater volcanic peaks called seamounts.

Rising from the abyssal plains in each major ocean is a huge chain of mostly undersea mountains. Called the [mid-ocean ridge](#), the chain circles the Earth, stretching more than 64,000 kilometers (40,000 miles). Much of the mid-ocean ridge is split by a deep central [rift](#), or crack. Mid-ocean ridges mark the boundaries between tectonic plates. Molten rock from the Earth's interior wells up from the rift, building new seafloor in a process called [seafloor spreading](#). A major portion of the ridge runs down the middle of the Atlantic Ocean and is known as the Mid-Atlantic Ridge. It was not directly seen or explored until 1973.

Some areas of the ocean floor have deep, narrow depressions called ocean trenches. They are the deepest parts of the ocean. The deepest spot of all is the [Challenger Deep](#), which lies in the [Mariana Trench](#) in the Pacific Ocean near the island of Guam. Its true depth is not known, but the most accurate measurements put the Challenger Deep at 11,000 meters (36,198 feet) below the ocean's surface—that's more than 2,000 meters (6,000 feet) taller than Mount Everest, the Earth's highest point. The [pressure](#) in the Challenger Deep is about 8 tons per square inch.

## Ocean Life Zones

From the shoreline to the deepest seafloor, the ocean teems with life. The hundreds of thousands of [marine](#) species range from [microscopic algae](#) to the largest creature to have ever lived on Earth, the blue whale.

The ocean has five major life zones, each with organisms uniquely adapted to their specific marine [ecosystem](#).

The [epipelagic zone](#) (1) is the sunlit upper layer of the ocean. It reaches from the surface to about 200 meters (660 feet) deep. The epipelagic zone is also known as the photic or euphotic zone, and can exist in lakes as well as the ocean.

The sunlight in the epipelagic zone allows [photosynthesis](#) to occur. Photosynthesis is the process by which some organisms convert sunlight and [carbon dioxide](#) into energy and [oxygen](#). In the ocean, photosynthesis takes place in plants and algae. Plants such as seagrass are similar to land plants—they have roots, stems, and leaves. Algae is a type of aquatic organism that can photosynthesize sunlight. Large algae such as kelp are called [seaweed](#).

[Phytoplankton](#) also live in the epipelagic zone. Phytoplankton are microscopic organisms that include plants, algae, and bacteria. They are only visible when billions of them form algal blooms, and appear as green or blue splotches in the ocean.

Phytoplankton are a basis of the ocean [food web](#). Through photosynthesis, phytoplankton are responsible for almost half the oxygen released into the Earth's atmosphere. Animals such as [krill](#) (a type of shrimp), fish, and microscopic organisms called [zooplankton](#) all eat phytoplankton. In turn, these animals are eaten by whales, bigger fish, ocean birds, and human beings.

The next zone down, stretching to about 1,000 meters (3,300 feet) deep, is the [mesopelagic zone](#) (2). This zone is also known as the [twilight zone](#) because the light there is very dim. The lack of sunlight means there are no plants in the mesopelagic zone, but large fish and whales dive there to hunt prey. Fish in this zone are small and [luminous](#). One of the most common is the lanternfish, which has organs along its side that produce light.

Sometimes, animals from the mesopelagic zone (such as sperm whales and squid) dive into the [bathypelagic zone](#) (3), which reaches to about 4,000 meters (13,100 feet) deep. The bathypelagic zone is also known as the [midnight zone](#) because no light reaches it.

Animals that live in the bathypelagic zone are small, but they often have huge mouths, sharp teeth, and expandable stomachs that let them eat any food that comes along. Most of this food comes from the remains of plants and animals drifting down from upper [pelagic](#) zones. Many bathypelagic animals do not have eyes because they are unneeded in the dark. Because the pressure is so great and it is so difficult to find nutrients, fish in the bathypelagic zone move slowly and have strong gills to extract oxygen from the water.

The water at the bottom of the ocean, the [abyssopelagic zone](#) (4), is very salty and cold (2 degrees Celsius, or 35 degrees Fahrenheit). At depths up to 6,000 meters (19,700 feet), the pressure is very strong—11,000 pounds per square inch. This makes it impossible for most animals to live. Animals in this zone have bizarre adaptations to cope with their ecosystem. Many fish have jaws that look unhinged. The jaws allow them to drag their open mouth along the seafloor to find food, such as mussels, shrimp, and microscopic organisms.

Many of the animals in this zone, including squid and fish, are bioluminescent. Bioluminescent organisms produce light through chemical reactions in their bodies. A type of angler fish, for example, has a glowing growth extending in front of its huge, toothy mouth. When smaller fish are attracted to the light, the angler fish simply snaps its jaws to eat its prey.

The deepest ocean zone, found in trenches and canyons, is called the [hadalpelagic zone](#) (5). Few organisms live here. They include tiny [isopods](#), a type of [crustacean](#) related to crabs and shrimp.

Invertebrates such as sponges and sea cucumbers thrive in the abyssopelagic and hadalpelagic zones. Like many sea stars and jellyfish, these animals are almost entirely dependent on falling parts of dead or decaying plants and animals, called [marine detritus](#).

Not all bottom dwellers, however, depend on marine detritus. In 1977, oceanographers discovered a community of creatures on the ocean floor that feed on bacteria around openings called [hydrothermal](#) vents. These vents discharge superheated water enriched with minerals from the Earth's interior. The minerals nourish [unique](#) bacteria, which in turn nourish creatures such as crabs, clams, and tube worms.

## Ocean Currents

Currents are streams of water running through a larger body of water. Oceans, rivers, and streams have currents.

The ocean's [salinity](#) and [temperature](#) and the coast's geographic features determine an ocean [current's](#) behavior. The Earth's [rotation](#) and wind also influence ocean currents. Currents flowing near the surface transport heat from the [tropics](#) to the poles and move cooler water back toward the [Equator](#). This keeps the ocean from becoming extremely hot or cold.

Deep, cold currents transport oxygen to organisms throughout the ocean. They also carry rich supplies of nutrients that all living things need. The nutrients come from plankton and the remains of other organisms that drift down and [decay](#) on the ocean floor.

Along some coasts, winds and currents produce a phenomenon called [upwelling](#). As winds push surface water away from shore, deep currents of cold water rise to take its place. This upwelling of deep water brings up nutrients that nourish new growth of plankton, providing food for fish. Ocean food chains constantly [recycle](#) food and energy this way.

Some ocean currents are [enormous](#) and extremely powerful. One of the most powerful is the [Gulf Stream](#), a warm surface current that originates in the tropical Caribbean Sea and flows northeast along the eastern coast of the United States. The Gulf Stream measures up to 80 kilometers (50 miles) wide and is more than a kilometer (3,281 feet) deep.

Like other ocean currents, the Gulf Stream plays a major role in climate. As the current travels north, it transfers moisture from its warm tropical waters to the air above. Westerly, or prevailing, winds carry the warm, moist air to the British Isles and to [Scandinavia](#), causing them to have milder winters than they otherwise would experience at their northern latitudes. Northern parts of Norway are near the Arctic Circle but remain ice-free for most of the year because of the Gulf Stream.

The weather pattern known as [El Nino](#) includes a change to the Humboldt Current (also called the Peru Current) off the western coast of South America. In El Niño conditions, a current of warm surface water travels east along the Equator and prevents the normal upwelling of the cold, [nutrient-rich](#) Humboldt Current. El Niño, which can devastate the fisheries of Peru and Ecuador, occurs every two to seven years, usually in December.

The paths of ocean currents are partially determined by the Earth's rotation. This is known as the [Coriolis effect](#). It causes large systems, such as winds and ocean currents that would normally move in a straight line, to veer to the right in the [northern hemisphere](#) and to the left in the [southern hemisphere](#).

## People and the Ocean

For thousands of years, people have depended on the ocean as a source of food and as a [route](#) for [trade](#) and [exploration](#). Today, people continue to travel on the ocean and rely on the resources it contains.

Nations continue to negotiate how to determine the extent of their [territory](#) beyond the coast. The United Nations' Law of the Sea [treaty](#) established exclusive economic zones (EEZs), extending 200 nautical miles (230 miles) beyond a nation's coastline. Even though some countries have not signed or ratified the treaty (including the U.S.), it is regarded as standard.

Russia has proposed extending its EEZ beyond 200 nautical miles because two mid-ocean ridges, the Lomonosov and Medeleev Ridges, are extensions of the continental shelf belonging to Russia. This territory includes the North [Pole](#). Russian explorers in a [submersible](#) vehicle planted a metal Russian flag on the disputed territory in 2007.

Through the centuries, people have sailed the ocean on trade routes. Today, ships still carry most of the world's [freight](#), particularly bulky goods such as machinery, grain, and [oil](#).

Ocean ports are areas of [commerce](#) and culture. Water and land transportation meet there, and so do people of different professions: businesspeople who [import](#) and [export](#) goods and services; dockworkers who load and unload [cargo](#); and ships' crews. Ports also have a high concentration of migrants and immigrants with a wide variety of [ethnicities](#), nationalities, languages, and religions.

Important ports in the U.S. are New York/New Jersey and New Orleans. The busiest ports around the world include the [Port](#) of Shanghai in China and the Port of Rotterdam in the Netherlands. Ocean ports are also important for a nation's armed forces. Some ports are used exclusively for [military](#) purposes, although most share space with [commercial](#) businesses. "The sun never sets on the British Empire" is a phrase used to explain the scope of the empire of [Great Britain](#), mostly in the 19th century. Although based on the small European island nation of Great Britain, British military sea power extended its empire from Africa to the Americas, Asia and Australia.

Scientists and other experts hope the ocean will be used more widely as a source of [renewable energy](#). Some countries have already harnessed the energy of ocean waves, temperature, currents, or tides to power turbines and generate electricity.

One source of renewable energy are generators that are powered by tidal streams or ocean currents. They convert the movement of currents into energy. Ocean current generators have not been developed on a large scale, but are working in some places in Ireland and Norway. Some conservationists criticize the impact the large constructions have on the marine environment.

Another source of renewable energy is [ocean thermal energy conversion](#) (OTEC). It uses the difference in temperature between the warm surface water and cold deep water to run an engine. OTEC facilities exist in places with significant differences in ocean depth: Japan, India and the U.S. state of Hawaii, for instance.

An emerging source of renewable energy is [salinity gradient power](#), also known as osmotic power. It is an energy source that uses the power of fresh water entering into salt water. This technology is still being developed, but it has potential in [delta](#) areas where fresh river water is constantly interacting with the ocean.

## Fishing

Fishers catch more than 90 million tons of seafood each year, including more than 100 species of fish and [shellfish](#). Millions of people, from professional fishers to business owners like restaurant owners and boat builders, depend on fisheries for their [livelihood](#). Fishing can be classified in two ways. In subsistence fishing, fishers use their catch to help meet the nutritional needs of their families or communities. In [commercial fishing](#), fishers sell their catch for money, goods or services. Popular subsistence and commercial fish are tuna, cod, and shrimp.

Ocean fishing is also a popular recreational sport. [Sport fishing](#) can be competitive or noncompetitive. In sport fishing tournaments, individuals or teams compete for prizes based on the size of a particular species caught in a specific time period. Both competitive and noncompetitive sport fishers need licenses to fish, and may or may not keep the caught fish. Increasingly, sport fishers practice [catch-and-release](#) fishing, where a fish is caught, measured, weighed, and often recorded on film before being released back to the ocean. Popular [game fish](#) (fish caught for sport) are tuna and marlin.

[Whaling](#) is a type of fishing that involves the harvesting of whales and dolphins. It has declined in popularity since the 19th century but is still a way of life for many cultures, such as those in Scandinavia, Japan, Canada, and the Caribbean.

The ocean offers a wealth of fishing and whaling resources, but these resources are threatened. People have harvested so much fish and marine life for food and other products that some species have disappeared.

During the 1800s and early 1900s, whalers killed thousands of whales for whale oil (wax made from boiled [blubber](#)) and [ivory](#) (whales' teeth). Some species, including the blue whale and the right whale, were hunted nearly to [extinction](#). Many species are still endangered today.

In the 1960s and 1970s, catches of important food fish, such as herring in the North Sea and anchovies in the Pacific, began to drop off dramatically. Governments took notice of overfishing—harvesting more fish than the ecosystem can [replenish](#). Fishers were forced to go farther out to sea to find fish, putting them at risk. (Deep-sea fishing is one of the most dangerous jobs in the world.) Now, they use advanced equipment, such as electronic fish finders and large gill nets or trawling nets, to catch more fish. This means there are far fewer fish to reproduce and replenish the supply.

In 1992, the collapse, or disappearance, of cod in Canada's Newfoundland Grand Banks put 40,000 fishers out of work. A ban was placed on cod fishing, and to this day, neither the cod nor the fisheries have recovered.

To catch the dwindling numbers of fish, most fishers use [trawl](#) nets. They drag the nets along the seabed and across acres of ocean. These nets accidentally catch many small, young fish and mammals. Animals caught in fishing nets meant for other species are called [bycatch](#). The fishing industry and fisheries management agencies argue about how to address the problem of bycatch and overfishing. Those involved in the fishing industry do not want to lose their jobs, while conservationists want to maintain healthy levels of fish in the ocean.

A number of consumers are choosing to purchase [sustainable seafood](#). Sustainable seafood is harvested from sources (either wild or farmed) that do not deplete the natural ecosystem.

## Mining and Drilling

Many minerals come from the ocean. [Sea salt](#) is a [mineral](#) that has been used as a flavoring and preservative since ancient times. Sea salt has many additional minerals, such as calcium, that ordinary table salt lacks.

Hydrothermal vents often form seafloor massive sulfide (SMS) deposits, which contain precious metals. These SMS deposits sit on the ocean floor, sometimes in the deep ocean and sometimes closer to the surface. New techniques are being developed to mine the seafloor for valuable minerals such as copper, lead, nickel, gold, and silver. Mining companies employ thousands of people and provide goods and services for millions more.

Critics of undersea mining maintain that it disrupts the local [ecology](#). Organisms—corals, shrimp, mussels—that live on the seabed have their [habitat](#) disturbed, upsetting the [food chain](#). In addition, destruction of habitat threatens the viability of species that have a narrow [niche](#). Maui's dolphin, for instance, is a critically endangered species native to the waters of New Zealand's North Island. The numbers of Maui's dolphin are already reduced because of bycatch. Seabed mining threatens its habitat, putting it at further risk of extinction.

Oil is one of the most valuable resources taken from the ocean today. [Offshore](#) oil rigs pump [petroleum](#) from wells drilled into the continental shelf. About one-quarter of all oil and natural gas supplies now comes from offshore oil deposits around the world.

Offshore drilling requires complex [engineering](#). An oil platform can be constructed directly onto the ocean floor, or it can "float" above an anchor. Depending on how far out on the continental shelf an oil platform is located, workers may have to be flown in. Underwater, or subsea, facilities are complicated groups of drilling equipment connected to each other and a single [oil rig](#). Subsea production often requires remotely operated underwater vehicles (ROVs).

Some countries invest in offshore drilling for profit and to prevent reliance on oil from other regions. The Gulf of

Mexico near the U.S. states of Texas and Louisiana is heavily drilled. Several European countries, including the United Kingdom, Denmark, and the Netherlands, drill in the North Sea. Offshore drilling is a complicated and expensive program, however. There are a limited number of companies that have the knowledge and resources to work with local governments to set up offshore oil rigs. Most of these companies are based in Europe and North America, although they do business all over the world.

Some governments have banned offshore oil drilling. They cite safety and environmental concerns. There have been several accidents where the platform itself has exploded, at the cost of many lives. Offshore drilling also poses threats to the ocean ecosystem. Spills and leaks from oil rigs and oil tankers that transport the material seriously harm marine mammals and birds. Oil coats feathers, impairing birds' ability to maintain their body temperature and remain [buoyant](#) in the water. The fur of otters and seals are also coated, and oil entering the [digestive tract](#) of animals may damage their organs.

Offshore oil rigs also release metal cuttings, minute amounts of oil, and [drilling fluid](#) into the ocean every day. Drilling fluid is the liquid used with machinery to drill holes deep in the Earth. This liquid can contain pollutants such as [toxic](#) chemicals and heavy metals.

## [Pollution](#)

Most oil pollution does not come from oil spills, however. It comes from the [runoff](#) of pollutants into streams and rivers that flow into the ocean. Most runoff comes from individual consumers. Cars, buses, motorcycles, and even lawn mowers spill oil and grease on roads, streets, and highways. (Runoff is what makes busy roads shiny and sometimes slippery.) Storm drains or creeks wash the runoff into local waterways, which eventually flow into the ocean.

The largest U.S. oil spill in the ocean took place in Alaska in 1989, by the tanker [Exxon Valdez](#). The *Exxon Valdez* spilled at least 10 million gallons of oil into Prince William Sound. In comparison, American and Canadian consumers spill about 16 million gallons of oil runoff into the Atlantic and Pacific Oceans every year.

For centuries, people have used the ocean as a dumping ground for [sewage](#) and other wastes.

In the 21st century, the wastes include not only oil, but also chemical runoff from factories and [agriculture](#). These chemicals include nitrates and phosphates, which are often used as fertilizers. These chemicals encourage algae blooms. An algae bloom is an increase in algae and bacteria that threatens plants and other marine life. Algae blooms limit the amount of oxygen in a marine environment, leading to what are known as dead zones, where little life exists beneath the ocean's surface. Algae blooms can spread across hundreds or even thousands of miles.

Another source of pollution is plastics. Most ocean debris, or garbage, is [plastic](#) thrown out by consumers. Plastics such as water bottles, bags, six-pack rings, and packing material put marine life at risk. Sea animals are harmed by the plastic either by getting tangled in it or by eating it.

An example of marine pollution consisting mainly of plastics is the [Great Pacific Garbage Patch](#). The Great Pacific Garbage Patch is a floating dump in the North Pacific Ocean. It's about twice the size of Texas and probably contains about 100 million tons of debris. Most of this debris comes from the western coast of North America (the U.S. and Canada) and the eastern coast of Asia (Japan, China, Russia, North Korea, and South Korea). Because of ocean currents and weather patterns, the patch is a relatively stable formation and contains new and disintegrating debris. The smaller pieces of plastic debris are eaten by jellyfish or other organisms, and are then consumed by larger predators in the food web. These plastic chemicals may then enter a human's diet through fish or shellfish.

Another source of pollution is carbon dioxide. The ocean absorbs most carbon dioxide from the atmosphere.

Carbon dioxide, which is necessary for life, is known as a [greenhouse gas](#) and traps [radiation](#) in the Earth's atmosphere. Carbon dioxide forms many acids, called carbonic acids, in the ocean. Ocean ecosystems have adapted to the presence of certain levels of carbonic acids, but the increase in carbon dioxide has led to an increase in ocean acids. This [ocean acidification](#) erodes the shells of animals such as clams, crabs, and corals.

## [Global Warming](#)

Global warming contributes to rising ocean temperatures and sea levels.

Warmer oceans radically alter the ecosystem. Global warming causes cold-water habitats to shrink, meaning there is less room for animals such as penguins, seals, or whales. Plankton, the base of the ocean food chain, thrives in cold water. Warming water means there will be less plankton available for marine life to eat.

Melting glaciers and ice sheets contribute to [sea level](#) rise. Rising sea levels threaten coastal ecosystems and property. River deltas and estuaries are put at risk for flooding. Coasts are more likely to suffer [erosion](#). Seawater more often contaminates sources of fresh water. All these consequences—flooding, erosion, water contamination—put low-lying island nations, such as the Maldives in the Indian Ocean, at high risk for disaster.

To find ways to protect the ocean from pollution and the effects of climate change, scientists from all over the world are cooperating in studies of ocean waters and marine life. They are also working together to control pollution and limit global warming. Many countries are working to reach agreements on how to manage and [harvest](#) ocean resources.

Although the ocean is vast, it is more easily polluted and damaged than people once thought. It requires care and protection as well as expert management. Only then can it continue to provide the many resources that living things—including people—need.

## VOCABULARY

Term	Part of Speech	Definition
<b>absorb</b>	<i>verb</i>	to soak up.
<b>abyssal plain</b>	<i>noun</i>	extensive, featureless region of the deep ocean floor.
<b>abyssopelagic zone</b>	<i>noun</i>	zone of the open ocean, starting at 3,962 meters (13,000 feet) below sea level.
<b>adaptation</b>	<i>noun</i>	a modification of an organism or its parts that makes it more fit for existence. An adaptation is passed from generation to generation.
<b>agriculture</b>	<i>noun</i>	the art and science of cultivating the land for growing crops (farming) or raising livestock (ranching).
<b>algae</b>	<i>plural noun</i>	(singular: alga) diverse group of aquatic organisms, the largest of which are seaweeds.
<b>algal bloom</b>	<i>noun</i>	the rapid increase of algae in an aquatic environment.
<b>atmosphere</b>	<i>noun</i>	layers of gases surrounding a planet or other celestial body.
<b>basalt</b>	<i>noun</i>	type of dark volcanic rock.
<b>bathypelagic zone</b>	<i>noun</i>	zone of the open ocean, starting at 914 meters (3,000 feet). Also known as the midnight or aphotic zone.



<b>bioluminescence</b>	<i>noun</i>	light emitted by living things through chemical reactions in their bodies.
<b>blubber</b>	<i>noun</i>	thick layer of fat under the skin of marine mammals.
<b>buoyant</b>	<i>adjective</i>	capable of floating.
<b>bycatch</b>	<i>noun</i>	fish or any other organisms accidentally caught in fishing gear.
<b>canyon</b>	<i>noun</i>	deep, narrow valley with steep sides.
<b>carbon dioxide</b>	<i>noun</i>	greenhouse gas produced by animals during respiration and used by plants during photosynthesis. Carbon dioxide is also the byproduct of burning fossil fuels.
<b>carbonic acid</b>	<i>noun</i>	chemical produced as carbon dioxide dissolves in water.
<b>cargo</b>	<i>noun</i>	goods carried by a ship, plane, or other vehicle.
<b>catch-and-release</b>	<i>adjective</i>	method of fishing where the fish is measured and sometimes tagged before being returned to its habitat.
<b>Challenger Deep</b>	<i>noun</i>	deepest measured point in the ocean (part of the Mariana Trench), about 11,000 meters (36,198 feet), located in the South Pacific Ocean.
<b>cliff</b>	<i>noun</i>	steep wall of rock, earth, or ice.
<b>climate</b>	<i>noun</i>	all weather conditions for a given location over a period of time.
<b>commerce</b>	<i>noun</i>	trade, or the exchange of goods and services.
<b>commercial</b>	<i>adjective</i>	having to do with the buying and selling of goods and services.
<b>commercial fishing</b>	<i>noun</i>	industry responsible for catching and selling fish.
<b>condense</b>	<i>verb</i>	to turn from gas to liquid.
<b>conservation</b>	<i>noun</i>	management of a natural resource to prevent exploitation, destruction, or neglect.
<b>consumer</b>	<i>noun</i>	person who uses a good or service.
<b>continental shelf</b>	<i>noun</i>	part of a continent that extends underwater to the deep-ocean floor.
<b>continental slope</b>	<i>noun</i>	the sometimes-steep descent of a continental shelf to the ocean floor.
<b>core</b>	<i>noun</i>	the extremely hot center of Earth, another planet, or a star.
<b>Coriolis effect</b>	<i>noun</i>	the result of Earth's rotation on weather patterns and ocean currents. The Coriolis effect makes storms swirl clockwise in the Southern hemisphere and counterclockwise in the Northern Hemisphere.
<b>crust</b>	<i>noun</i>	rocky outermost layer of Earth or other planet.
<b>crustacean</b>	<i>noun</i>	type of animal (an arthropod) with a hard shell and segmented body that usually lives in the water.
<b>current</b>	<i>noun</i>	steady, predictable flow of fluid within a larger body of that fluid.
<b>dead zone</b>	<i>noun</i>	area of low oxygen in a body of water.
<b>decay</b>	<i>verb</i>	to rot or decompose.
<b>delta</b>	<i>noun</i>	the flat, low-lying plain that sometimes forms at the mouth of a river from deposits of sediments.

<b>digestive tract</b>	<i>noun</i>	the stomach and the intestines, organs in the digestive system responsible for breaking down food into nutrients and waste products. Also called the gastrointestinal or GI tract.
<b>disintegrate</b>	<i>verb</i>	to fall apart and disappear.
<b>distribute</b>	<i>verb</i>	to divide and spread out materials.
<b>drilling fluid</b>	<i>noun</i>	chemical liquid used with machinery to make deep holes in the Earth.
<b>Earth</b>	<i>noun</i>	our planet, the third from the Sun. The Earth is the only place in the known universe that supports life.
<b>echo sounder</b>	<i>noun</i>	device that measures the depth of water using sound pulses. Also called a sonic depth finder.
<b>ecology</b>	<i>noun</i>	branch of biology that studies the relationship between living organisms and their environment.
<b>ecosystem</b>	<i>noun</i>	community and interactions of living and nonliving things in an area.
<b>El Nino</b>	<i>noun</i>	irregular, recurring weather system that features a warm, eastern-flowing ocean current in the eastern Pacific Ocean.
<b>endanger</b>	<i>verb</i>	to put at risk.
<b>engineering</b>	<i>noun</i>	the art and science of building, maintaining, moving, and demolishing structures.
<b>enormous</b>	<i>adjective</i>	very large.
<b>enrich</b>	<i>verb</i>	to supply with valuable material.
<b>epipelagic zone</b>	<i>noun</i>	upper zone of the ocean. This zone goes down to approximately 183 meters (600 feet). Also called the euphotic or sunlit zone.
<b>Equator</b>	<i>noun</i>	imaginary line around the Earth, another planet, or star running east-west, 0 degrees latitude.
<b>erosion</b>	<i>noun</i>	act in which earth is worn away, often by water, wind, or ice.
<b>evaporate</b>	<i>verb</i>	to change from a liquid to a gas or vapor.
<b>exclusive economic zone (EEZ)</b>	<i>noun</i>	zone extending 200 nautical miles off a country's coast. A country has the right to explore and exploit the living and nonliving things in its EEZ.
<b>expand</b>	<i>verb</i>	to grow.
<b>exploration</b>	<i>noun</i>	study and investigation of unknown places, concepts, or issues.
<b>export</b>	<i>verb</i>	to transport goods to another place for trade.
<b>extinction</b>	<i>noun</i>	process of complete disappearance of a species from Earth.
<b>Exxon Valdez</b>	<i>noun</i>	oil tanker that hit a reef in Alaska's Prince William Sound and spilled 40.9 million liters (10.8 million gallons) of oil into the Pacific Ocean in 1989.
<b>fertilizer</b>	<i>noun</i>	nutrient-rich chemical substance (natural or manmade) applied to soil to encourage plant growth.
<b>fishery</b>	<i>noun</i>	industry or occupation of harvesting fish, either in the wild or through aquaculture.
<b>food chain</b>	<i>noun</i>	group of organisms linked in order of the food they eat, from producers to consumers, and from prey, predators, scavengers, and decomposers.

<b>food web</b>	<i>noun</i>	all related food chains in an ecosystem. Also called a food cycle.
<b>freight</b>	<i>noun</i>	goods transported by air, land, or sea for profit.
<b>game fish</b>	<i>noun</i>	species of fish caught for competition or recreation.
<b>gill net</b>	<i>noun</i>	effective type of fishing net that is suspended vertically in water by weights and floats. Fish are caught as they try to swim through.
<b>glacial period</b>	<i>noun</i>	time of long-term lowering of temperatures on Earth. Also known as an ice age.
<b>glacier</b>	<i>noun</i>	mass of ice that moves slowly over land.
<b>global warming</b>	<i>noun</i>	increase in the average temperature of the Earth's air and oceans.
<b>Great Britain</b>	<i>noun</i>	large island in Western Europe consisting of the countries of England, Scotland, and Wales.
<b>Great Pacific Garbage Patch</b>	<i>noun</i>	area of the North Pacific Ocean where currents have trapped huge amounts of debris, mostly plastics.
<b>greenhouse gas</b>	<i>noun</i>	gas in the atmosphere, such as carbon dioxide, methane, water vapor, and ozone, that absorbs solar heat reflected by the surface of the Earth, warming the atmosphere.
<b>Gulf Stream</b>	<i>noun</i>	warm current that starts in the Gulf of Mexico and travels along the eastern coast of the U.S. and Canada before crossing the North Atlantic Ocean.
<b>habitat</b>	<i>noun</i>	environment where an organism lives throughout the year or for shorter periods of time.
<b>hadalpelagic zone</b>	<i>noun</i>	deepest zone of the open ocean, starting at around 6,000 meters (20,000 feet).
<b>harness</b>	<i>verb</i>	to control or guide for a specific purpose.
<b>harvest</b>	<i>noun</i>	the gathering and collection of crops, including both plants and animals.
<b>heavy metal</b>	<i>noun</i>	chemical substance with a specific gravity of at least 5.0.
<b>hydrothermal</b>	<i>adjective</i>	related to hot water, especially water heated by the Earth's internal temperature.
<b>ice sheet</b>	<i>noun</i>	thick layer of glacial ice that covers a large area of land.
<b>import</b>	<i>noun</i>	good traded from another area.
<b>invertebrate</b>	<i>noun</i>	animal without a spine.
<b>isopod</b>	<i>noun</i>	type of bug (crustacean).
<b>ivory</b>	<i>noun</i>	hard, white substance that forms the teeth or tusks of some animals.
<b>krill</b>	<i>noun</i>	small marine crustacean, similar to shrimp.
<b>latitude</b>	<i>noun</i>	distance north or south of the Equator, measured in degrees.
<b>liquid</b>	<i>noun</i>	state of matter with no fixed shape and molecules that remain loosely bound with each other.
<b>livelihood</b>	<i>noun</i>	ability to economically support oneself.
<b>luminous</b>	<i>adjective</i>	glowing or radiant.
<b>mantle</b>	<i>noun</i>	middle layer of the Earth, made of mostly solid rock.

<b>Mariana Trench</b>	<i>noun</i>	deepest place on Earth, located in the South Pacific Ocean at 11,000 meters (36,198 feet) at its deepest.
<b>marine</b>	<i>adjective</i>	having to do with the ocean.
<b>marine detritus</b>	<i>noun</i>	parts of dead or decaying plants or animals that drift to the seafloor.
<b>mesopelagic zone</b>	<i>noun</i>	zone of the open ocean, extending from about 183 to 914 meters (600 to 3,000 feet). Also known as the twilight or dysphotic zone.
<b>microscopic</b>	<i>adjective</i>	very small.
<b>midnight zone</b>	<i>noun</i>	zone of the open ocean, starting at about 914 meters (3,000 feet) deep. Also known as the bathypelagic or aphotic zone.
<b>mid-ocean ridge</b>	<i>noun</i>	underwater mountain range.
<b>military</b>	<i>noun</i>	armed forces.
<b>mineral</b>	<i>noun</i>	inorganic material that has a characteristic chemical composition and specific crystal structure.
<b>molten</b>	<i>adjective</i>	solid material turned to liquid by heat.
<b>nautical mile</b>	<i>noun</i>	unit of distance for sea or air travel, equal to 1,852 meters (6,076 feet).
<b>niche</b>	<i>noun</i>	role and space of a species within an ecosystem.
<b>nitrate</b>	<i>noun</i>	type of salt used as fertilizer. Excess nitrates can choke freshwater ecosystems.
<b>Northern Hemisphere</b>	<i>noun</i>	half of the Earth between the North Pole and the Equator.
<b>nutrient</b>	<i>noun</i>	substance an organism needs for energy, growth, and life.
<b>ocean acidification</b>	<i>noun</i>	decrease in the ocean's pH levels, caused primarily by increased carbon dioxide. Ocean acidification threatens corals and shellfish.
<b>oceanographer</b>	<i>noun</i>	person who studies the ocean.
<b>ocean thermal energy conversion</b>	<i>noun</i>	method of generating power by using the difference in temperature between the ocean's deep (cold) and the surface (warm) water.
<b>offshore</b>	<i>adjective</i>	having to do with facilities or resources located underwater, usually miles from the coast.
<b>oil</b>	<i>noun</i>	fossil fuel formed from the remains of marine plants and animals. Also known as petroleum or crude oil.
<b>oil rig</b>	<i>noun</i>	complex series of machinery and systems used to drill for oil on land.
<b>overfish</b>	<i>verb</i>	to harvest aquatic life to the point where species become rare in the area.
<b>oxygen</b>	<i>noun</i>	chemical element with the symbol O, whose gas form is 21% of the Earth's atmosphere.
<b>pelagic</b>	<i>adjective</i>	having to do with the open ocean.
<b>petroleum</b>	<i>noun</i>	fossil fuel formed from the remains of ancient organisms. Also called crude oil.
<b>phosphate</b>	<i>noun</i>	type of salt used as fertilizer. Excess phosphates can choke freshwater ecosystems.

<b>photosynthesis</b>	<i>noun</i>	process by which plants turn water, sunlight, and carbon dioxide into water, oxygen, and simple sugars.
<b>phytoplankton</b>	<i>noun</i>	microscopic organism that lives in the ocean and can produce its own food through photosynthesis.
<b>plain</b>	<i>noun</i>	flat, smooth area at a low elevation.
<b>plastic</b>	<i>noun</i>	chemical material that can be easily shaped when heated to a high temperature.
<b>plate tectonics</b>	<i>noun</i>	movement and interaction of the Earth's plates.
<b>pole</b>	<i>noun</i>	extreme north or south point of the Earth's axis.
<b>pollutant</b>	<i>noun</i>	chemical or other substance that harms a natural resource.
<b>pollution</b>	<i>noun</i>	introduction of harmful materials into the environment.
<b>port</b>	<i>noun</i>	place on a body of water where ships can tie up or dock and load and unload cargo.
<b>precipitation</b>	<i>noun</i>	all forms in which water falls to Earth from the atmosphere.
<b>predator</b>	<i>noun</i>	animal that hunts other animals for food.
<b>pressure</b>	<i>noun</i>	force pressed on an object by another object or condition, such as gravity.
<b>prey</b>	<i>noun</i>	animal that is hunted and eaten by other animals.
<b>primitive</b>	<i>adjective</i>	simple or crude.
<b>radiation</b>	<i>noun</i>	energy, emitted as waves or particles, radiating outward from a source.
<b>recede</b>	<i>verb</i>	to retreat or withdraw.
<b>recycle</b>	<i>verb</i>	to clean or process in order to make suitable for reuse.
<b>regulate</b>	<i>verb</i>	to determine and administer a set of rules for an activity.
<b>relict sediment</b>	<i>noun</i>	material on the continental shelf deposited during the last glacial period, when sea levels were lower.
<b>renewable energy</b>	<i>noun</i>	energy obtained from sources that are virtually inexhaustible and replenish naturally over small time scales relative to the human life span.
<b>replenish</b>	<i>verb</i>	to supply or refill.
<b>rift</b>	<i>noun</i>	break in the Earth's crust created by it spreading or splitting apart.
<b>rotation</b>	<i>noun</i>	object's complete turn around its own axis.
<b>route</b>	<i>noun</i>	path or way.
<b>runoff</b>	<i>noun</i>	overflow of fluid from a farm or industrial factory.
<b>salinity</b>	<i>noun</i>	saltiness.
<b>salinity gradient power</b>	<i>noun</i>	energy produced as freshwater interacts with salty ocean water.
<b>Scandinavia</b>	<i>noun</i>	region and name for some countries in Northern Europe: Iceland, Norway, Sweden, Finland, and Denmark.

<b>seafloor massive sulfide (SMS) deposit</b>	<i>noun</i>	minerals that form from underwater hydrothermal vents.
<b>seafloor spreading</b>	<i>noun</i>	rift in underwater mountain range where new oceanic crust is formed.
<b>sea level</b>	<i>noun</i>	base level for measuring elevations. Sea level is determined by measurements taken over a 19-year cycle.
<b>sea level rise</b>	<i>noun</i>	increase in the average reach of the ocean. The current sea level rise is 1.8 millimeters (.07 inch) per year.
<b>sea salt</b>	<i>noun</i>	salt obtained from the evaporation of seawater.
<b>seaweed</b>	<i>noun</i>	marine algae. Seaweed can be composed of brown, green, or red algae, as well as "blue-green algae," which is actually bacteria.
<b>sediment</b>	<i>noun</i>	solid material transported and deposited by water, ice, and wind.
<b>sewage</b>	<i>noun</i>	liquid and solid waste material from homes and businesses.
<b>shellfish</b>	<i>noun</i>	any aquatic animal that has a shell.
<b>solar system</b>	<i>noun</i>	the sun and the planets, asteroids, comets, and other bodies that orbit around it.
<b>sonar</b>	<i>noun</i>	method of determining the presence and location of an object using sound waves (echolocation).
<b>sound wave</b>	<i>noun</i>	wave of air pressure producing sound.
<b>Southern Hemisphere</b>	<i>noun</i>	half of the Earth between the South Pole and the Equator.
<b>sport fishing</b>	<i>noun</i>	catching fish for competition or recreation.
<b>storm drain</b>	<i>noun</i>	system to empty streets of excess rainwater. Storm drains flow into local creeks, rivers, or seas.
<b>submersible</b>	<i>noun</i>	small submarine used for research and exploration.
<b>sustainable seafood</b>	<i>noun</i>	fish, shellfish, and other aquatic organisms harvested from fish farms or fisheries that can be maintained without damaging the ecosystem.
<b>tectonic plate</b>	<i>noun</i>	large, moveable segment of the Earth's crust.
<b>teem</b>	<i>verb</i>	to overflow or be full of.
<b>temperature</b>	<i>noun</i>	degree of hotness or coldness measured by a thermometer with a numerical scale.
<b>territory</b>	<i>noun</i>	land an animal, human, or government protects from intruders.
<b>tidal stream</b>	<i>noun</i>	an ocean current produced by the tide.
<b>toxic</b>	<i>adjective</i>	poisonous.
<b>trade</b>	<i>noun</i>	buying, selling, or exchanging of goods and services.
<b>trade route</b>	<i>noun</i>	path followed by merchants or explorers to exchange goods and services.
<b>trawl</b>	<i>verb</i>	to fish by dragging a large net along the bottom of the body of water.
<b>treaty</b>	<i>noun</i>	official agreement between groups of people.

<b>trench</b>	<i>noun</i>	long, deep depression, either natural or man-made.
<b>tropics</b>	<i>plural noun</i>	region generally located between the Tropic of Cancer (23 1/2 degrees north of the Equator) and the Tropic of Capricorn (23 1/2 degrees south of the Equator).
<b>twilight zone</b>	<i>noun</i>	middle zone of the open ocean. On average, this zone extends from about 200 to 1,000 meters (660 to 3,300 feet) deep. Also known as the dysphotic or mesopelagic zone.
<b>unique</b>	<i>adjective</i>	one of a kind.
<b>upwelling</b>	<i>noun</i>	process by which currents bring cold, nutrient-rich water to the ocean surface.
<b>vapor</b>	<i>noun</i>	visible liquid suspended in the air, such as fog.
<b>water cycle</b>	<i>noun</i>	movement of water between atmosphere, land, and ocean.
<b>weather</b>	<i>noun</i>	state of the atmosphere, including temperature, atmospheric pressure, wind, humidity, precipitation, and cloudiness.
<b>whaling</b>	<i>noun</i>	industry of hunting whales.
<b>zooplankton</b>	<i>noun, plural noun</i>	microscopic organism that lives in the ocean.

## For Further Exploration

### Articles & Profiles

- NOAA: An Oceanographer Studies the Ocean

### Images

- National Geographic: The Ocean—Photo Gallery: Polluted Oceans

### Websites

- NOAA: Ocean
- National Geographic Environment: The Ocean
- EPA: Oceans, Coasts, & Estuaries



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