The WATER Questions & Answers Book

Oceans

Groundwater & Aquifers

Glaciers & Sea Ice

Rivers, Lakes & Streams

Written by Anthony Klemm
smell of salt in the air and the sound of crashing waves have inspired the poet's pen for thousands of years. Millions of people flock to the oceans each summer for fun, relaxation, and excitement. Still, few realize that by visiting the ocean, they are standing on the edge of a vast, unexplored expanse.
The more we learn of the sea, the more we understand how our lives—from the air we breathe to the food we eat—are dependent on the health of our oceans. Although oceans cover more than 70 percent of our planet, less than 20 percent of the ocean floor has been mapped. We know more about the geography of Venus, Mars, and the Moon than we know about our own oceans. The ocean is truly the final frontier of exploration on the earth, and it’s exciting to imagine all the new discoveries we will uncover.
In 2005, the nuclear-powered submarine USS San Francisco struck an uncharted seamount, injuring most of the crew and severely damaging the front of the vessel. It’s hard to imagine why there remain large seamounts we still have not discovered despite all the advances in technology our world has enjoyed.

Satellites have given us a global picture of the shape of the seafloor, but there are limits to this technology that leave many seafloor features undetected. They are very good at detecting underwater mountain chains, such as the Mid-Ocean Ridge, but they have a hard time finding smaller objects. Satellites in space can only detect large ocean features, such as trenches and mountains that are, on average, over 8 kilometers (5 miles) wide. There are thousands of smaller seamounts that have not been discovered or explored.

For most of history, the only way to measure the depth of the ocean was by tying a weight to the end of a very long rope and dropping it over the side until it rested on the seafloor. That’s a slow and tiresome process! This method didn’t change until fairly recently, with the invention of modern sonar technology. Sonar systems on ships are potent tools that can create a high-resolution 3D picture of the ocean, but they also take a long time to cover a relatively small area. With the help of robot boats and uncrewed submersible vessels, a new era of ocean exploration is dawning, and the future looks bright.

Q: Why is most of the ocean still unmapped if satellites can detect large seamounts and ocean trenches?

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tiny spaces between the grains of sand beneath your feet may seem insignificant, but when put together, they can store billions of gallons of clean, fresh water for thousands of years.
There’s no sweeter sight in the world for a thirsty traveler than a lush oasis rising out of the hot, sandy desert. An oasis is created when a natural spring, fed by groundwater, flows up to the surface of the desert. Many ancient travelers planned their trips across the desert by going from oasis to oasis.

Q: What is fossil water, and is it okay to drink?

A: Although its name makes it sound as if it’s long past its expiration date, many people drink fossil water every day. Fossil water comes from ancient aquifers trapped deep underground, and it can be thousands of years old. Water from some of these aquifers is still safe to drink while other water has to be processed to remove contaminants, such as radioactive particles or unwanted minerals.

Q: How does an oasis form in the middle of a desert?

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Glaciers cover a tenth of all the earth’s land surface and collectively store almost 70 percent of the world’s fresh water. Beyond being important freshwater reservoirs, glaciers and sea ice serve as delicate links between the climate and many of Earth’s systems, such as changing sea levels and providing suitable habitats for many living creatures.
Q: What does the common phrase "the tip of the iceberg" mean?

A: Only around 10 percent of an iceberg is visible from the surface. That means the remaining 90 percent lies beneath the sea, obscured from view. When someone mentions the tip of the iceberg, it means he or she only sees a small part of a much bigger problem.
Q: Does melting sea ice cause the sea level to rise?

A: Sea ice, especially in the Arctic Ocean, plays a vital role in regulating the earth’s climate, but melting it would not directly contribute to sea-level rise in a significant way. Just like with a glass of ice water on a warm summer day, when the ice melts, the water level doesn’t rise. Since sea ice is already present in the ocean, melting it would be like the melting ice cube in your drink.

Melting sea ice could indirectly cause sea levels to rise in at least two ways. Since sea ice is white, it reflects almost 80 percent of the sun’s incoming rays. If there were less sea ice, more of the sun’s rays could be absorbed by the ocean as heat. Warmer oceans mean warmer average global temperatures, which would cause ice caps and glaciers to melt. Since glaciers are on land, not floating in the ocean, any discharge from glaciers would cause the sea to rise. In addition to accelerating the melting of land ice, a warming ocean causes seawater to expand. This thermal expansion also has a significant effect on global sea levels.
Rivers, lakes, and streams (collectively called “surface water” by scientists) are vital to sustaining our lives on Earth. Almost 80 percent of all fresh water we use comes from surface water. As dependent as we are on our rivers, lakes, and streams, it’s crucial that we protect these resources from overuse and pollution to ensure that we can enjoy them in the future.
Q: Can rivers reverse their direction and flow upstream?

A: Driven by gravity, rivers always flow downhill. However, certain events can temporarily reverse the flow of rivers. In 2012, sustained winds and storm surge from Hurricane Isaac caused the lower Mississippi River to flow in the opposite direction.