

## Water on Earth Unit Parent Guide

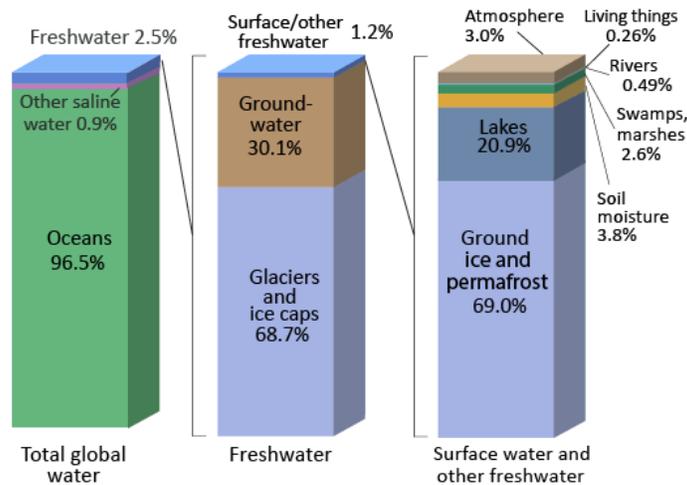
### The Water Cycle

Most of Earth's water is in its oceans and seas, and only 3% of Earth's water is fresh water. Most fresh water is frozen in glaciers and in the North and South Pole ice caps. The water on Earth's surface is called the *hydrosphere*. Water is constantly moving between the hydrosphere and the atmosphere through a process called the *water cycle*, as follows.

- The Sun heats up water from the hydrosphere, causing the liquid water to turn into a gas and enter the atmosphere through a process called *evaporation*.
- As the water vapor rises in the atmosphere, it cools off and changes back into a liquid. This process is called *condensation*.
- As the condensation collects high in the atmosphere, it forms *clouds*. A cloud is a collection of water droplets.
- As the water droplets grow, they become precipitation and fall back to Earth as rain or snow. The precipitation is collected in Earth's hydrosphere, which begins the water cycle again.

### Water Distribution on Earth

#### Where is Earth's Water?



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*.  
NOTE: Numbers are rounded, so percent summations may not add to 100.

### The Oceans

Altogether, the oceans cover approximately 70 percent of Earth's surface area. Earth is the only planet in the solar system that contains substantial amounts of water. Earth's five oceans are named the Pacific, Atlantic, Indian, Antarctic, and Arctic. When scientists refer to the salinity of the ocean, they are referring to the amount of all dissolved solids in the water, including trace elements and minerals, not just salts. Gases, such as oxygen and carbon dioxide, are also dissolved in the ocean and can move back and forth between the water and the air.

## **Currents**

Oceans are constantly moving in enormous “rivers” called currents. These currents circulate throughout Earth’s oceans like the blood that moves through our body. Even though the oceans are broken up by continental landmasses, a drop of ocean water could travel from one end of the Earth to the other over time. Ocean water is mixed by the currents into one huge planetary ocean.

There are two basic types of ocean currents: surface currents and density currents.

- Surface currents are wind-driven currents.
- Density currents flow in the deep water of the ocean below the surface currents, and are caused by differences in temperature and salinity from one location to another.

## **Tides**

Although wind plays a major role in ocean motion, it is not the predominant cause of tides.

Tides are caused by two factors:

- the gravitational pull of the Moon and Sun, and
- the inertia of water in the oceans.

The combination of gravity and inertia are responsible for the creation of two major tidal bulges on the Earth.

- gravity, which creates a bulge of water on the side of the Earth facing the Moon, and
- inertia of the oceans’ mass, creates a bulge on the side of the Earth facing away from the Moon.

Most coastal areas, with some exceptions along the coast of Alaska and the Gulf of Mexico, experience two high tides and two low tides every lunar day.

## **Waves**

Waves moving through the ocean carry the energy of the wind, but the ocean water does not move along with the wave. As the energy of a wave moves toward the shore, the particles of water move up and down in a complete cycle. Only the energy of the wave moves forward. A wave is simply a pulse of energy that moves from one particle of water to the next. Most waves are formed by the wind blowing across the surface of the water. The harder and longer the wind blows, the higher the wave. Waves are also caused by movements of the Earth’s crust, such as earthquakes on the ocean floor. Seismic sea waves or tsunamis are set in motion by earthquakes, underwater volcanic eruptions, or underwater landslides.