

The Water Cycle

Introduction

Earth's water is always moving and the **Water Cycle** (also known as the **Hydrologic Cycle**) describes this movement of water on, above, and below the surface of Earth. Since the water cycle is truly a "cycle," there is no beginning or end. Water changes states among [liquid](#), [vapor](#), and [ice](#) at different places in the cycle, and these changes are happening all over the world at the same time.

It's interesting to realize that water you may drink today has been on Earth for many millions of years and may have actually been used in the past to water a tree on the other side of the world, or maybe 100 years ago an elephant in Africa or a kangaroo in Australia drank the same water as you did today, or perhaps 300 years ago a King or Queen drank the same water, or a million years ago a dinosaur drank the same water as you. Who knows?

Here's another interesting fact - regardless of where water is in the **Water Cycle** or where on Earth it might be, the total amount of water on Earth remains constant over time. In other words, there has been the same amount of water on Earth for millions and millions of years.

The Water Cycle

The sun drives the **Water Cycle** with its heat energy. It heats water on the surface of Earth in the [oceans](#), [rivers](#), [streams](#), [lakes](#), and everywhere else (even [ice](#) and [snow](#)!!).

Basically, everywhere you see water it is being heated by the sun during the day and as it's heated, some of it [evaporates](#) as vapor into the air. [Evaporation](#) is the process that causes water to become [vapor](#) from water and soil on the surface of Earth, as well as from you and all animals. [Transpiration](#) is the process that causes water to evaporate from plants. Either way, it's [evaporation](#) and [transpiration](#) that allows water to rise as an invisible [vapor](#) into the air and up through the [atmosphere](#) to form [clouds](#).

Clouds are formed in the air when water [vapor](#) rises to a height where cooler temperatures in the [atmosphere](#) cause water [vapor](#) to [condense](#) back into [liquid](#) water droplets. As you can imagine, liquid water weighs a lot sitting inside something as light as a cloud, so as it forms, the cloud just can't hold it for long. [Condensation](#) can form [rain](#), and [snow](#), and [hail](#), to travel back to Earth. Under the right conditions, water can also fall back to Earth in the form of [fog](#) or [dew](#).

It's not only in [clouds](#) that you can see water [condense](#), of course. Just put cold water inside a glass on a warm day and you'll notice water forming on the outside of the glass. That's water [vapor](#) that was in the air and has cooled on the side of the glass to form liquid water. Cool air just cannot hold as much water [vapor](#) as warm air can.

When [rain](#), [snow](#) and [hail](#) fall back to Earth, they again flow into [oceans](#), [rivers](#), [streams](#), [lakes](#), [puddles](#) and everywhere else, or forms [snow](#) and [ice](#) during the winter and melts during the Spring. In addition, some [rain](#) water goes underground through the soil to form large underground "lakes" called [aquifers](#).

These processes where water rises (through [evaporation](#) and [transpiration](#)) into the air to form [clouds](#) and then falls back to Earth in the form of [rain](#), [snow](#), [hail](#), [fog](#) and [dew](#) is what we call the **Water Cycle**.

The Water Cycle Drawing

Looking at the **Water Cycle** Drawing, you'll notice some of the water drops have an arrow pointing up with an "E" inside and others have a "T." The "E" drops represent water going up into the air during **evaporation** and can be found near all the bodies of water and the soil. The "T" drops represent water going up into the air during **transpiration** and can be found near all the plants and trees; in addition, since **transpiration** includes water **vapor** going into the air from all living things, it also includes water **evaporating** from your skin, as well as the skin of all animals.

You'll also notice the **rain** drops have an "R" inside and an arrow pointing down. The **snowflakes** were too small to even draw arrows but you know that **snow** falls on the ground

Water that travels through the ground also has arrows pointing downward and will settle into underground storage areas sometimes called **aquifers**. This ground water can be accessed by digging (or drilling) a well down through the ground until you reach water.

Defined Words

Liquid – Liquid is the fluid phase of water and is made up of particles so loose that they deform (or flow) so they take up the form of any container that surrounds them. Liquid water usually exists between freezing temperatures (32 degrees Fahrenheit / 0 degrees Celsius), and boiling temperatures (212 degrees Fahrenheit / 100 degrees Celsius).

Vapor – Vapor is the gas phase of water produced from the evaporation and transpiration of liquid water. In the atmosphere, water vapor is continuously formed by evaporation/transpiration and removed by condensation (to form rain/snow/hail/fog/dew).

Ice - Ice is the solid form of water. Ice usually exists at and below freezing temperatures (32 degrees Fahrenheit / 0 degrees Celsius).

Ocean – An ocean is a major body of liquid water on Earth containing a high concentration of salt. Though described with different names, the oceans of Earth are a single interconnected body of salt water. Approximately $\frac{3}{4}$ (74% to be exact) of the Earth's surface is covered by ocean, and the oceans contain about 97% of all water on Earth.

Freshwater – If the oceans contain about 97% of all water on Earth, then the remaining 3% of water on Earth is called **freshwater** because it only contains small amounts of salt. 77% of this surface freshwater is stored as ice and 22% as groundwater and soil moisture (that adds up to 99% of all freshwater). The remaining freshwater, making up about 1% of the world total, is contained in **rivers**, **streams**, **lakes**, and everywhere you see water that is not salty (and therefore not in the ocean).

Rivers – Rivers are relatively large bodies of liquid freshwater (not saltwater) that flow often to the ocean or other large body of water. Often, smaller bodies of flowing water, called streams or brooks or creeks flow together to create rivers, but there is no general rule that defines what can be called a river. Rivers are important homes for fish and provide water for wildlife.

Streams – Streams are relatively narrow bodies of liquid freshwater (not saltwater) that flow. Other names for streams are **brooks** or **creeks**. Streams are also important homes for fish and provide water for wildlife.

Lakes – Lakes are relatively large bodies of liquid freshwater that generally do not flow. Small lakes are typically called **ponds** and smaller amounts of water are often called **pools**. Lakes, ponds and pools are also important homes for fish and provide water for wildlife. The smallest

amount of liquid water is called a **puddle**. **Puddles** are small amounts of liquid water often formed by rainstorms and generally considered to be small enough to step over or shallow enough to walk through.

Snow, Snowflakes – Snow is made of tiny ice particles, called snowflakes, that fall from clouds.

Evaporation, Evaporates – Evaporation is the reaction by which liquid water becomes an invisible gas or vapor. On Earth, liquid water evaporates when it is heated by the sun's energy and becomes vapor in the air. This vapor can eventually form clouds.

Transpiration – Transpiration is the evaporation of liquid water from plants, especially leaves but also stems, flowers and roots.

Atmosphere – The atmosphere is the layer of gases that surround Earth. One of the gases that is in Earth's atmosphere is called oxygen, which we use to breathe and carbon dioxide used by plants to create food through a process called photosynthesis. The atmosphere also protects living things on Earth from damage by blocking out excessive ultraviolet radiation from the sun.

Clouds – Clouds are visible masses of tiny liquid water droplets floating above the surface of the earth. The water droplets in clouds were formed by water vapor condensing into a liquid and joining together with other water droplets to form the cloud.

Condensation, Condense – Condensation is the reaction by which water vapor (as an invisible gas) becomes liquid water. Condensation commonly occurs when water vapor is cooled. This happens naturally in the atmosphere and is how clouds are formed.

Rain – Rain is made up of tiny droplets of liquid water formed by condensation of water vapor in the air into particles heavy enough to fall out of clouds. Rain is the primary source of **freshwater** for most areas on Earth and therefore essential for life on our planet.

Hail – Hail forms in clouds when the atmosphere is cold enough that liquid water becomes ice. In other words, hail is frozen droplets of water that would have fallen as rain if the droplets did not freeze inside the cloud.

Fog – Fog is a cloud in contact with the ground. Therefore, like all clouds, fog is a visible mass of tiny liquid water droplets formed by water vapor condensing into a liquid and joining together with other water droplets.

Dew – Dew is tiny droplets of liquid water that often appears on outside objects in the morning or evening hours. Dew is formed when an exposed surface cools and moisture in the air condenses on the surface faster than the water can evaporate, resulting in the formation of water droplets. If temperatures are low enough, dew will form into ice and it is then called frost.

Groundwater Infiltration and Storage – When it rains, water saturates the ground and migrates down through soil. This migration is called **groundwater infiltration** or **percolation**. Once water stops migrating down and sits underground, it is called **groundwater storage**. Another name for **groundwater storage** is **aquifer**. This underground water can be accessed by digging or drilling wells into the water layer and pumping the water up to the surface. Most **groundwater** or **aquifers** are below the ground, but when they come out the side of a hill, they are called **springs**.