

Processes of the Water Cycle

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CHAPTER

1

Processes of the Water Cycle

Learning Objectives

- Describe reservoirs of the water cycle.
- Describe the processes that carry water between reservoirs.



Where have these water molecules been?

Did you ever wonder where the water molecules you drink came from? Were some of the molecules trapped in a glacier? Flowing along the bottom of the ocean? Up high in a thundercloud? Maybe a water molecule that you drink today once quenched the thirst of a dinosaur. It's all entirely possible.

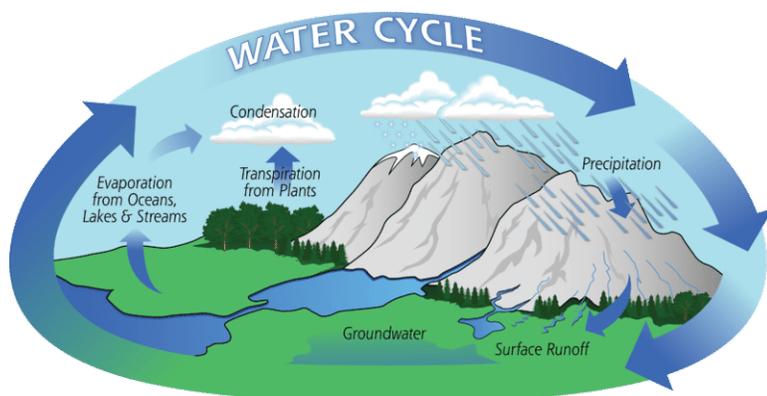
The Water Cycle

The **water cycle** (**Figure 1.1**) is the movement of water through the oceans, atmosphere, land, and living things. The water cycle is powered by energy from the Sun.

Water keeps cycling. The water cycle repeats over and over again. Each water molecule has probably been around for billions of years. That's because Earth's water is constantly recycled.

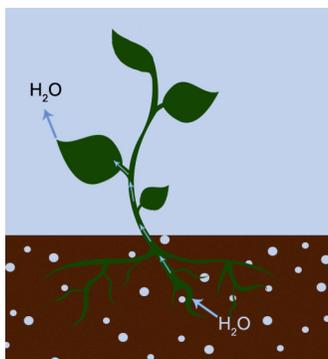
Processes in the Water Cycle

Water keeps changing state as it goes through the water cycle. This means that it can be a solid, liquid, or gas. How does water change state? How does it keep moving through the cycle? As seen above (**Figure 1.1**), several processes are involved.

**FIGURE 1.1**

The water cycle has no beginning or end. Water just keeps moving along.

- **Evaporation** changes liquid water to water vapor. Energy from the Sun causes water to evaporate. Most evaporation is from the oceans because they cover so much area. The water vapor rises into the atmosphere.
- **Transpiration** is like evaporation because it changes liquid water to water vapor. In transpiration, plants release water vapor through their leaves (**Figure 1.2**). This water vapor rises into the atmosphere.

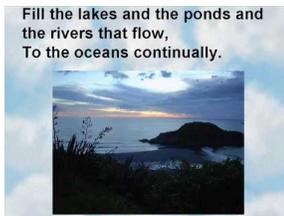
**FIGURE 1.2**

Liquid water is taken up by plant roots. The plant releases water vapor into the atmosphere. This is transpiration.

- **Condensation** changes water vapor to liquid water. As air rises higher into the atmosphere, it cools. Cool air can hold less water vapor than warm air. So some of the water vapor condenses into water droplets. Water droplets may form clouds. Below is an example of condensation (**Figure 1.3**).
- **Precipitation** is water that falls from clouds to Earth's surface. Water droplets in clouds fall to Earth when they become too large to stay aloft. The water falls as rain if the air is warm. If the air is cold, the water may freeze and fall as snow, sleet, or hail. Most precipitation falls into the oceans. Some falls on land.
- **Runoff** is precipitation that flows over the surface of the land. This water may travel to a river, lake, or ocean. Runoff may pick up fertilizer and other pollutants and deliver them to a water body. In this way, runoff may pollute bodies of water.
- **Infiltration** is the process by which water soaks into the ground. Some of the water may seep deep underground. Some may stay in the soil, where plants can absorb it with their roots.

**FIGURE 1.3**

A bottle that comes out of the refrigerator is cold. It cools the air near the bottle. Cooler air can hold less water so water vapor condenses onto the bottle.

**MEDIA**

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Science Friday: Forecasting the Meltdown: The Aerial Snow Observatory

75% of Southern California's water supply comes from the snowpack in the Sierra Nevada Mountain Range. This video by Science Friday explains how NASA uses specialized instrumentation in the Airborne Snow Observatory to carefully measure the water content.

**MEDIA**

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Summary

- The water cycle recognizes all of the reservoirs of water. It also describes the processes that carry water between the reservoirs.
- Water changes state by evaporation, condensation, and sublimation.
- Plants release water through their leaves by transpiration.

Review

1. What is transpiration?

2. How are evaporation and condensation the same? How are they different?
3. What is the role of the major reservoirs in the water cycle?

References

1. Courtesy of NASA/Atmospheric Infrared Sounder. [Diagram of the water cycle](#) . CC BY 2.0
2. Zappy's. [Plant drawing up water and releasing water vapor through transpiration](#) . CC BY-NC 3.0
3. Beatrice Murch (Flickr:blmurch). [Condensation on a cold bottle](#) . CC BY 2.0