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## GRADE 8 LESSON 16 SAMPLE



# The Cycling of Matter in Ecosystems

**Key Words** • decomposition • carbon cycle • water cycle • evaporation • transpiration • condensation  
• precipitation • groundwater • runoff

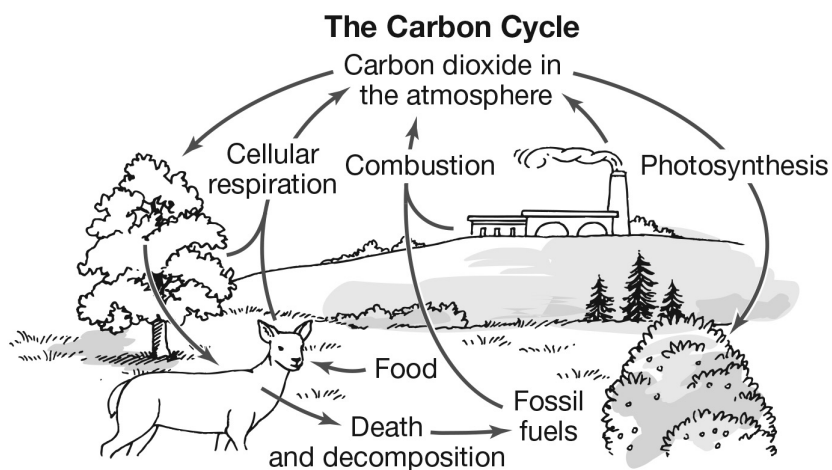
## Getting the Idea

Earth constantly receives energy from the sun. In contrast, the amount of matter on Earth does not change. Matter is recycled from organisms to the environment and back again. Earth's ecosystems cycle carbon and water. All organisms depend on these materials.

## The Carbon Cycle

Carbon is found in every living organism. Carbon is also found in the atmosphere, in gasoline, and in many kinds of rock. One common form of carbon is carbon dioxide. Recall that carbon dioxide is released into the air as a waste product of cellular respiration. In this process, cells break down sugar to get energy. In the opposite process of photosynthesis, producers such as plants use carbon dioxide from the air to make sugar.

The carbon stored in organisms cannot be reused until the organisms are eaten or decomposed. Bacteria and other decomposers break down dead organisms in a process called **decomposition**. Carbon dioxide is released into the atmosphere in this process. Carbon moves among the air, the ground, and plants and animals in the **carbon cycle**. The diagram below shows this cycle.

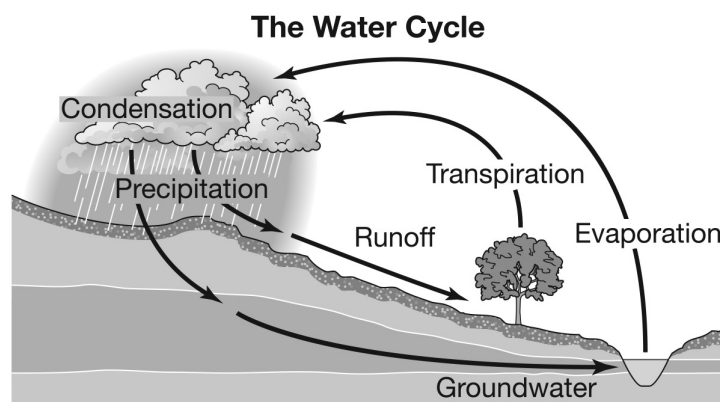


Combustion, or burning, is part of the carbon cycle. When wood or other organic material burns, it releases carbon dioxide. By burning coal and oil, people put large amounts of carbon dioxide into the atmosphere. Recall that coal and oil are fossil fuels. They developed from the remains of plants and animals that died millions of years ago. Carbon from those organisms is stored in the fossil fuel. When fossil fuels are burned, they release most of the carbon as carbon dioxide. Cars, buses, coal-burning power plants, and oil furnaces all affect Earth's carbon cycle. As you learned in Lesson 8, carbon dioxide from burning fossil fuels is also thought to contribute to climate change.

## The Water Cycle

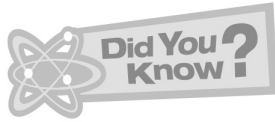
The **water cycle** is the continuous movement of water between Earth's surface and its atmosphere. In this cycle, water changes from one form to another. The sun is the source of energy that drives the water cycle. Heat from the sun causes evaporation of water from Earth's surface. **Evaporation** is a process by which a liquid changes to a gas. The sun warms water on Earth's surface. This includes the water in oceans, lakes, streams, rivers, and puddles. When heated, surface water evaporates and forms water vapor. The water vapor then becomes part of the atmosphere.

Another way water moves into the atmosphere involves plants. During the process of **transpiration**, water vapor is released through tiny openings in plant leaves. That water vapor then joins the water found in the atmosphere. Animals also add water vapor to the atmosphere when they breathe out or when perspiration evaporates. Water also evaporates from urine released by animals onto the ground.



Once in the atmosphere, water vapor rises and cools. Then condensation occurs. **Condensation** is the process by which a gas changes to a liquid. Water vapor that has evaporated into the atmosphere condenses to form droplets of water. These water droplets are very tiny—much smaller than raindrops. The droplets condense around tiny solid particles in the atmosphere, such as dust or smoke, and clouds form. Droplets may join together to form much heavier raindrops, which fall from clouds as precipitation.

**Precipitation** is water that falls to Earth's surface in the form of rain, snow, sleet, or hail. As precipitation falls, several things can happen. The water can remain on Earth's surface in a solid or liquid form. Water can also sink into soil or cracks in rocks, where it collects and flows underground. Water located below Earth's surface is called **groundwater**.

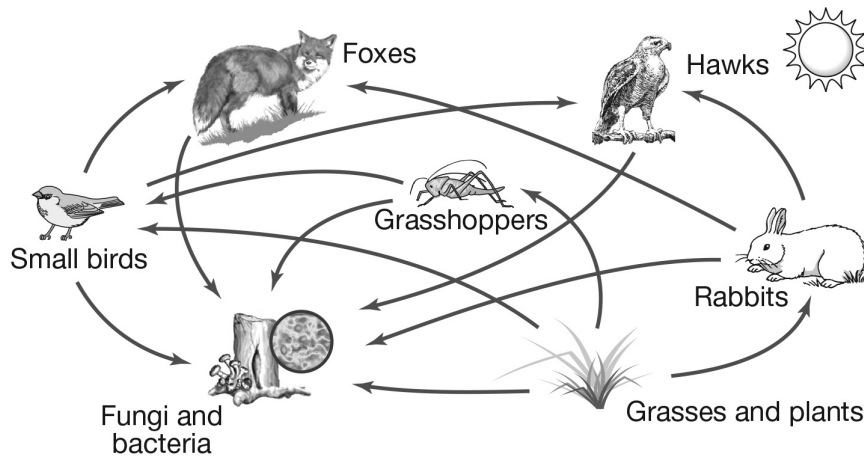


The world's rainiest place is **Mount Waialeale, Kauai, Hawaii**. During an average year, only 15 days are dry.

Precipitation can become surface water by falling directly into bodies of water. It can also become **runoff**, or water that flows over the land without sinking into the ground. Gravity causes runoff and groundwater to flow downhill and eventually into streams, rivers, lakes, and oceans. When this surface water warms up and evaporates, the cycle begins all over again.

### Focus on Inquiry

Review the food web shown below.



How does carbon move from the grasses and plants to the rabbits, grasshoppers, and small birds?  
How does carbon reach the hawks?

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How do fungi and bacteria move carbon through the carbon cycle?

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What role do the grasses and plants have in the water cycle?

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## Lesson Review

1. Which of these is one role of plants in the carbon cycle?
  - A. Plants take in oxygen and release carbon dioxide.
  - B. Plants take in carbon dioxide and pass it on directly to animals.
  - C. Plants take in carbon dioxide released by other organisms.
  - D. Plants use carbon dioxide directly as food.
2. Which term describes the process by which bacteria break down dead organisms and carbon dioxide is released into the atmosphere?
  - A. reproduction
  - B. decomposition
  - C. evaporation
  - D. transpiration
3. What role does evaporation play in the water cycle?
  - A. It heats surface water.
  - B. It causes precipitation to form as rain, snow, hail, or sleet.
  - C. It moves water from Earth's surface into the atmosphere.
  - D. It moves water from Earth's surface into underground areas.
4. Which is the process by which water vapor changes to liquid water?
  - A. transpiration
  - B. precipitation
  - C. runoff
  - D. condensation





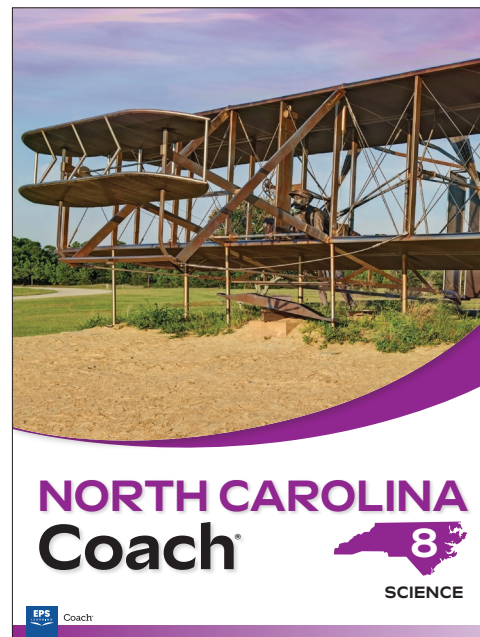


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