

Chapter 5 How Ecosystems Work

Section 2: The Cycling of Materials

Preview

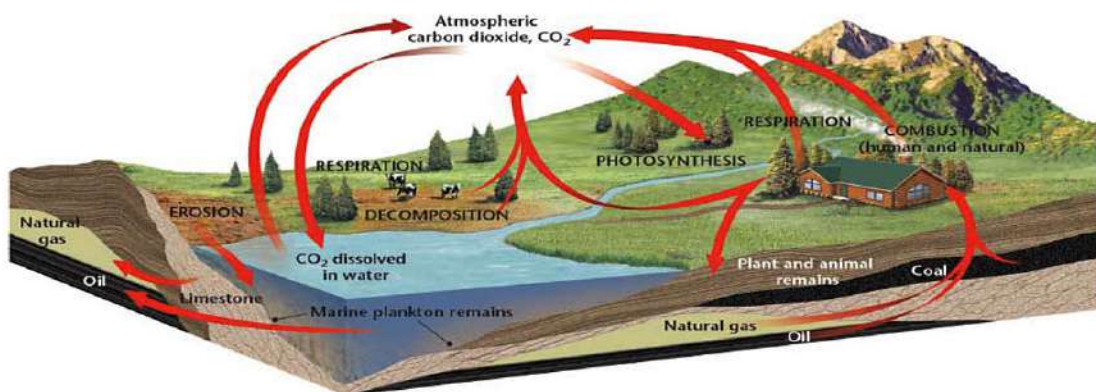
- Objectives
- The Carbon Cycle
- How Humans Affect the Carbon Cycle
- The Nitrogen Cycle
- Decomposers and the Nitrogen Cycle
- The Phosphorus Cycle
- Fertilizers and the Nitrogen and Phosphorus Cycles
- Acid Precipitation

Objectives

- List the three stages of the carbon cycle.
- Describe where fossil fuels are located.
- Identify one way that humans are affecting the carbon cycle.
- List the tree stages of the nitrogen cycle.
- Describe the role that nitrogen-fixing bacteria play in the nitrogen cycle.
- Explain how the excess use of fertilizer can affect the nitrogen and phosphorus cycles.

The Carbon Cycle

- The carbon cycle is the movement of carbon from the nonliving environment into living things and back
- Carbon is the essential component of proteins, fats, and carbohydrates, which make up all organisms.



The Carbon Cycle cont.

- Carbon exists in air, water, and living organisms.
- Producers convert carbon dioxide in the atmosphere into carbohydrates during photosynthesis.

- **Consumers obtain carbon from the carbohydrates in the producers they eat.**
- **During cellular respiration, some of the carbon is released back into the atmosphere as carbon dioxide.**
- **Some carbon is stored in limestone, forming one of the largest “carbon sinks” on Earth.**
- **Carbon stored in the bodies of organisms as fat, oils, or other molecules, may be released into the soil or air when the organisms dies.**
- **These molecules may form deposits of coal, oil, or natural gas, which are known as fossil fuels.**
- **Fossil fuels store carbon left over from bodies of organisms that dies millions of years ago.**

How Humans Affect the Carbon Cycle

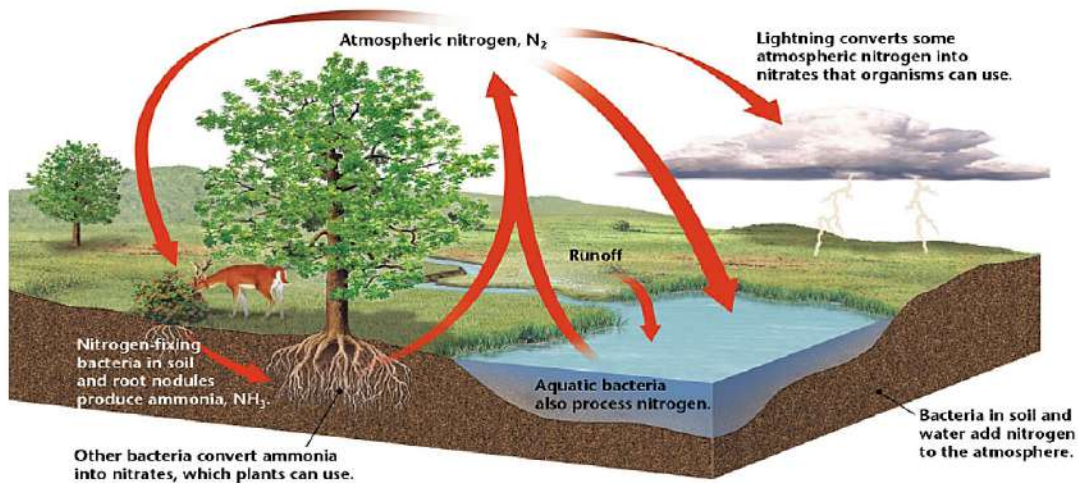
- **Humans burn fossil fuels, releasing carbon into the atmosphere.**
- **The carbon returns to the atmosphere as carbon dioxide.**
- **Increased levels of carbon dioxide may contribute to global warming.**
- **Global warming is an increase in the temperature of the Earth.**

The Nitrogen Cycle

- **The nitrogen cycle is the process in which nitrogen circulates among the air, soil, water, plants, and animals in an ecosystem.**
- **All organisms need nitrogen to build proteins, which are used to build new cells.**
- **Nitrogen makes up 78 percent of the gases in the atmosphere.**
- **Nitrogen must be altered, or fixed, before organisms can use it.**
- **Only a few species of bacteria can fix atmospheric nitrogen into chemical compounds that can be used by other organisms.**
- **These bacteria are known as “nitrogen-fixing” bacteria.**
- **Nitrogen-fixing bacteria are bacteria that convert atmospheric nitrogen into ammonia.**

- These bacteria live within the roots of plants called legumes, which include beans, peas, and clover.
- The bacteria use sugar provided by the legumes to produce nitrogen containing compounds such as nitrates.
- Excess nitrogen fixed by the bacteria is released into the soil.

The Nitrogen Cycle cont.

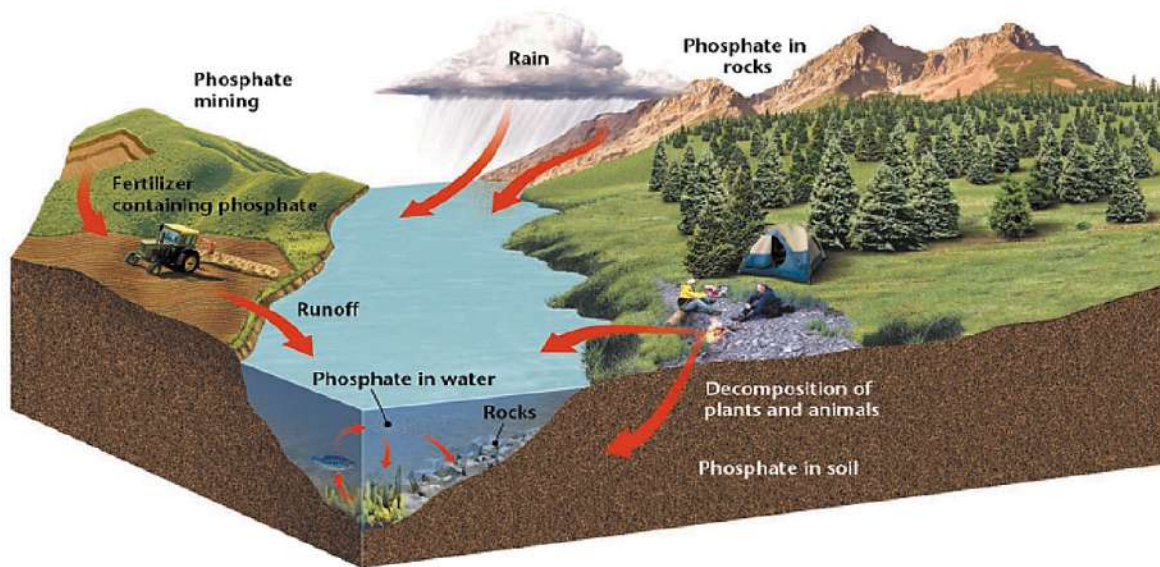


Decomposers and the Nitrogen Cycle

- Nitrogen stored within the bodies of living things is returned to the nitrogen cycle once those organisms die.
- Decomposers break down decaying plants and animals, as well as plant and animal wastes.
- After decomposers return nitrogen to the soil, bacteria transform a small amount of the nitrogen into nitrogen gas, which then returns to the atmosphere to complete the nitrogen cycle.

The Phosphorus Cycle

- Phosphorus is an element that is part of many molecules that make up the cells of living organisms.
- Plants get the phosphorus they need from soil and water, while animals get their phosphorus by eating plants or other animals that have eaten plants.
- The phosphorus cycle is the cyclic movement of phosphorus in different chemical forms from the environment to organisms and then back to the environment.



The Phosphorus Cycle cont.

- **Phosphorus may enter soil and water when rocks erode. Small amounts of phosphorus dissolve as phosphate, which moves into the soil.**
- **Plants absorb phosphates in the soil through their roots.**
- **Some phosphorus washes off the land and ends up in the ocean.**
- **Because many phosphate salts are not soluble in water, they sink to the bottom and accumulate as sediment.**

Fertilizers and the Nitrogen and Phosphorus Cycles

- **Fertilizers, which people use to stimulate and maximize plant growth, contain both nitrogen and phosphorus.**
- **Excessive amounts of fertilizer can enter terrestrial and aquatic ecosystems through runoff.**
- **Excess nitrogen and phosphorus can cause rapid growth of algae.**
- **Excess algae can deplete an aquatic ecosystem of important nutrients such as oxygen, on which fish and other aquatic organisms depend.**

Acid Precipitation

- **When fuel is burned, large amounts of nitric oxide is released into the atmosphere.**
- **In the air, nitric oxide can combine with oxygen and water vapor to form nitric acid.**
- **Dissolved in rain or snow, the nitric acid falls as acid precipitation.**