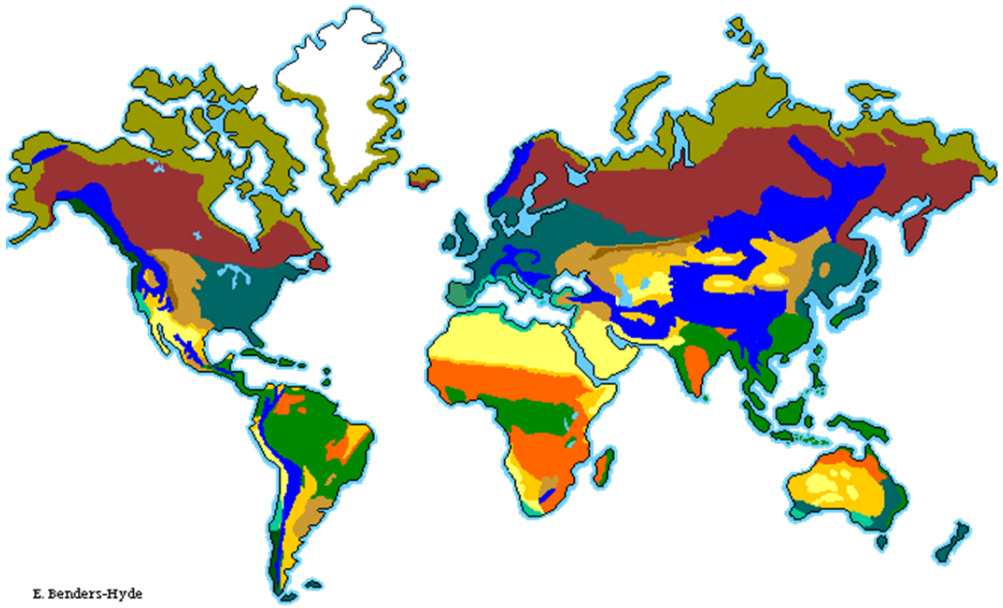
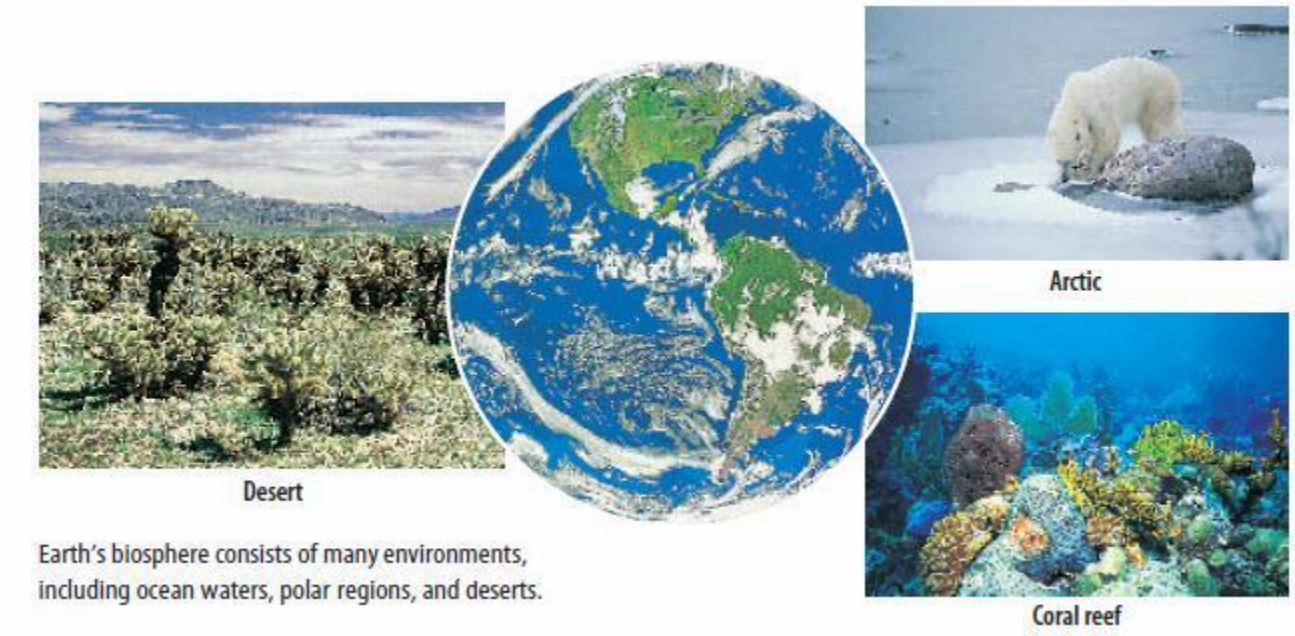
Living Earth



6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

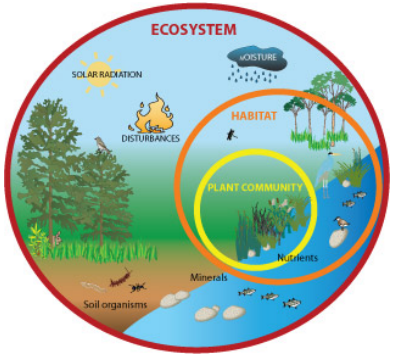
The Biosphere



Earth's biosphere consists of many environments, including ocean waters, polar regions, and deserts.

What makes Earth different from other planets in the solar system? One difference is Earth's abundance of living organisms. The part of Earth that supports life is the **biosphere**. The biosphere includes the top portion of Earth's crust, all the waters that cover Earth's surface, and the atmosphere that surrounds Earth.

Life on Earth



The amount of energy that reaches Earth from the Sun helps make the temperature just right for **life**.

An **ecosystem** consists of all the organisms living in an area, as well as the nonliving parts of that environment. Bison, grass, birds, and insects are living organisms of this prairie ecosystem. Water, temperature, sunlight, soil, and air are nonliving features of this prairie ecosystem. **Ecology** is the study of interactions that occur among organisms and their environments. **Ecologists** are scientists who study these interactions.

Populations

A **population** is made up of all organisms of the same species that live in an area at the same time. For example, all the bison in a prairie ecosystem are one population.

A **community** is all the populations of all species living in an ecosystem. The prairie community is made of populations of bison, grasshoppers, cowbirds, and all other species in the prairie ecosystem.

The living world is arranged in several levels of organization.

Organism - A living thing.

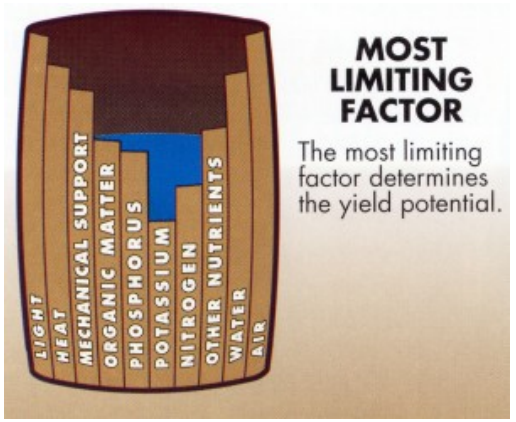
Population - All the members of one species in a particular area.

Community - All the populations of all species living in a particular area.

Ecosystem - The community of organisms that live in a particular area along with their nonliving surroundings.

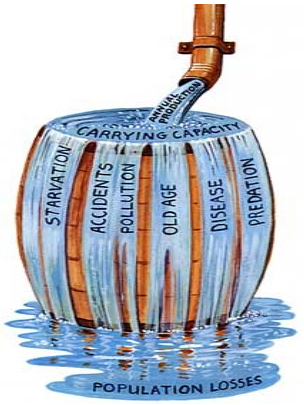
Species - A group of organisms that are physically similar and can mate with each other and produce offspring that can also mate and reproduce.

Limiting Factors

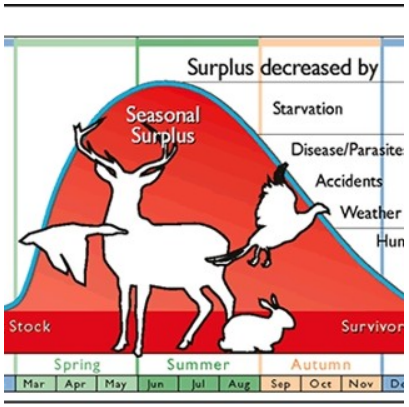


In any ecosystem, the availability of food, water, living space, mates, nesting sites, and other resources is often limited. A **limiting factor** is anything that restricts the number of individuals in a population. Limiting factors include living and nonliving features of the ecosystem.

A limiting factor can affect more than one population in a community. Suppose a lack of rain limits plant growth in a meadow. Fewer plants produce fewer seeds. For seed-eating mice, this reduction in the food supply could become a limiting factor. A smaller mouse population could, in turn, become a limiting factor for the hawks and owls that feed on mice.



Carrying Capacity



A population of robins lives in a grove of trees in a park. Over several years, the number of robins increases and nesting space becomes scarce. Nesting space is a limiting factor that prevents the robin population from getting any larger. This ecosystem has reached its carrying capacity for robins. **Carrying capacity** is the largest number of individuals of one species that an ecosystem can support over time. If a population begins to exceed the environment's carrying capacity, some individuals will not have enough resources. They could die or be forced to move elsewhere.

Carrying Capacity

(Continued)

These deer might have moved into a residential area because a nearby forest's carrying capacity for deer has been reached.

Cycles in Nature

The Cycles of Matter

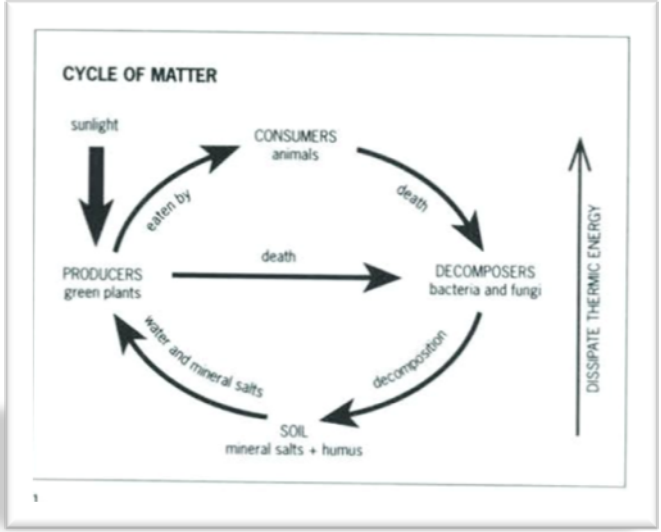
Imagine an aquarium containing water, fish, snails, plants, algae, and bacteria. The tank is sealed so that only light can enter. Food, water, and air cannot be added. Will the organisms in this environment survive?

Yes

Matter is a general term for the substance of which all physical objects are made.

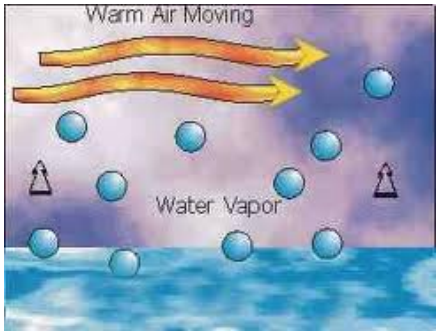
The Cycles of Matter

(Continued)

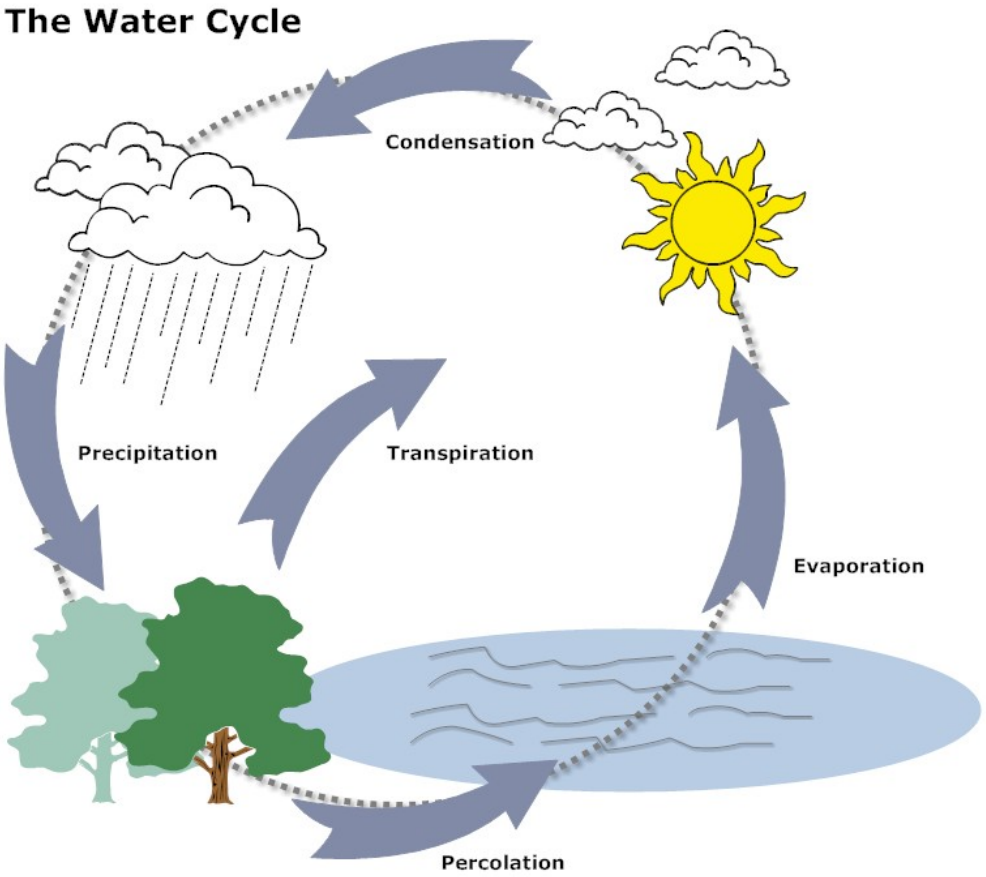


Through photosynthesis, plants and algae produce their own food. They also supply oxygen to the tank. Fish and snails take in oxygen and eat plants and algae. Wastes from fish and snails fertilize plants and algae. Organisms that die are decomposed by the bacteria. The organisms in this closed environment can survive because the materials are **recycled**. A constant supply of light energy is the only requirement. Earth's biosphere also contains a fixed amount of water, carbon, nitrogen, oxygen, and other materials required for life. These materials cycle through the environment and are reused by different organisms.

The Water Cycle



If you leave a glass of water on a sunny windowsill, the water will evaporate. **Evaporation** takes place when liquid water changes into water vapor, which is a gas, and enters the atmosphere. Water evaporates from the surfaces of lakes, streams, puddles, and oceans. Water vapor enters the atmosphere from plant leaves in a process known as **transpiration**. Animals release water vapor into the air when they exhale. Water also returns to the environment from animal wastes.



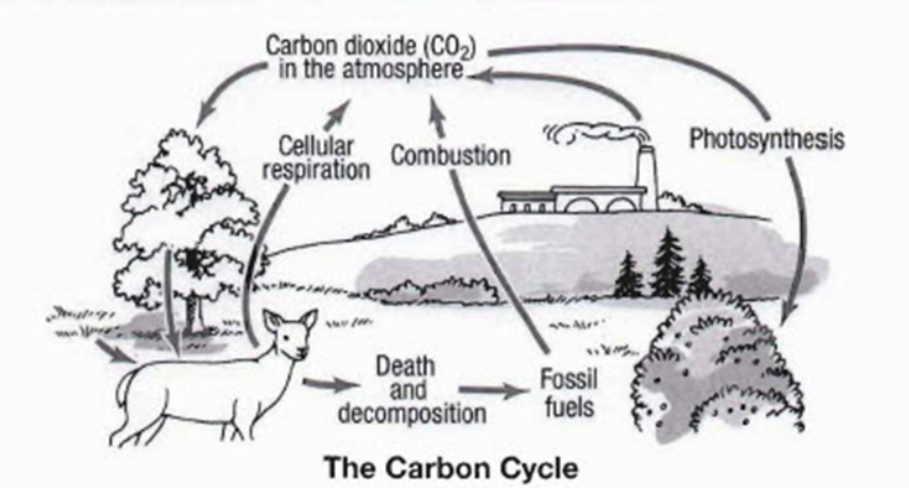
The water cycle involves evaporation, condensation, and precipitation. Water molecules can follow several pathways through the water cycle.

Condensation & Precipitation

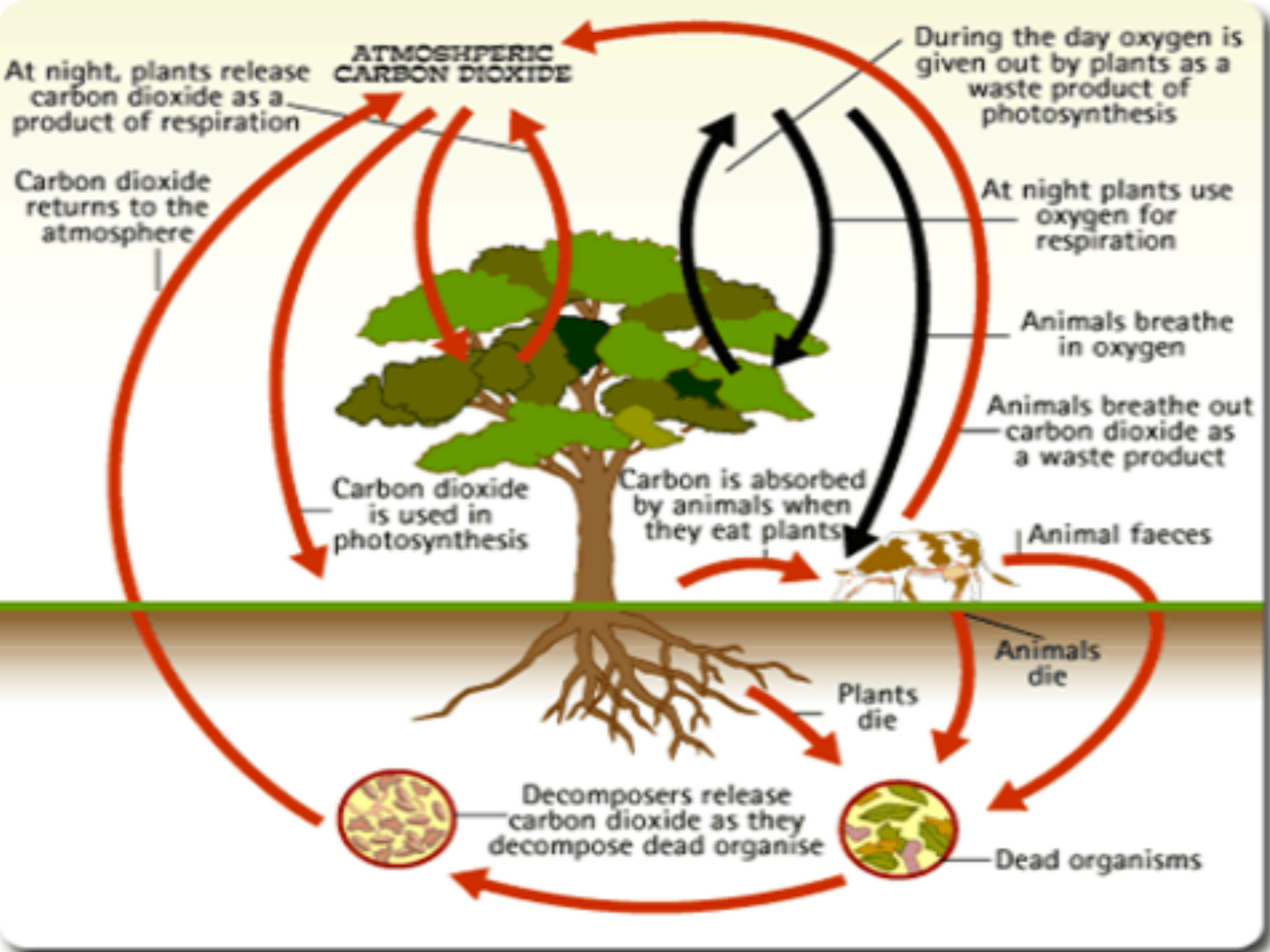
Water vapor that has been released into the atmosphere eventually comes into contact with colder air. The temperature of the water vapor drops. Over time, the water vapor cools enough to change back into liquid water. The process of changing from a gas to a liquid is called **condensation**. Water vapor condenses on particles of dust in the air, forming tiny droplets. At first, the droplets clump together to form clouds. When they become large and heavy enough, they fall to the ground as rain or other **precipitation**. The water cycle is a model that describes how water moves from the surface of Earth to the atmosphere and back to the surface again.

The Carbon Cycle

All living things are made up of carbon. The **carbon cycle** describes how carbon moves through the environment and living things. The carbon cycle begins with photosynthesis. During photosynthesis, plants use carbon dioxide from the air and energy from the sunlight to make their own food. The food that plants make is mainly sugars.



The Carbon Cycle


ATMOSHPERIC CARBON DIOXIDE
At night, plants release carbon dioxide as a product of respiration
During the day oxygen is given out by plants as a waste product of photosynthesis
Carbon dioxide returns to the atmosphere
At night plants use oxygen for respiration
Animals breathe in oxygen
Animals breathe out carbon dioxide as a waste product
Carbon dioxide is used in photosynthesis
Carbon is absorbed by animals when they eat plants
Animal faeces
Animals die
Plants die
Decomposers release carbon dioxide as they decompose dead organise
Dead organisms

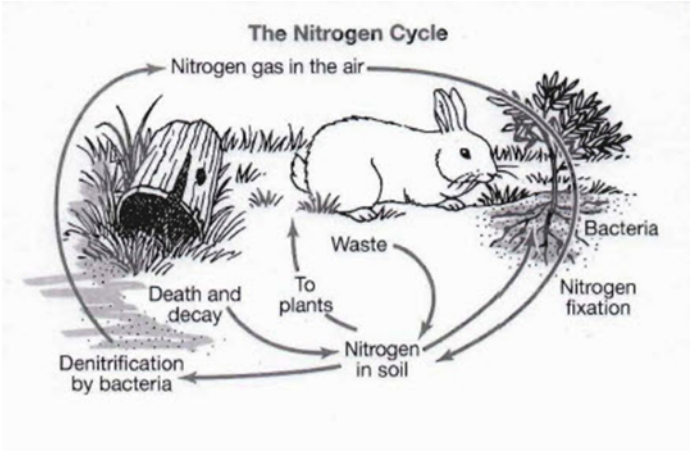
The Nitrogen Cycle

When you eat meat, fish, cereal, or vegetables, you are taking in the nutrients that your body needs to make proteins. Proteins are a part of your muscles and many cell structures.

Among other things, proteins are rich in the element **nitrogen**. You need nitrogen to make parts of your body, such as muscles, nerves, skin, bones, blood, and digestive juices.

Since air is **78** percent nitrogen, you might think that you do not need to eat protein to get nitrogen. However, animals and plants cannot use the nitrogen that is in the air. Animals get nitrogen by eating proteins. Plants get nitrogen by absorbing it from the soil. Some plants even get nitrogen with the help of a special group of bacteria.

The way nitrogen moves between the air, soil, plants, and animals is called the **nitrogen cycle**.



The Nitrogen Cycle

Nitrogen-Fixing Bacteria Some bacteria that grow on pea and bean roots give those plants the nitrogen they need. The bacteria turn nitrogen gas in the air to nitrogen-containing substances the plants can use to make their proteins.

Air Air is made up of about 78 percent nitrogen gas.

Bacteria Certain bacteria can use nitrogen from the air to make nitrogen-containing substances called *nitrites*. Other bacteria can turn nitrites into *nitrates*—another group of nitrogen-containing substances.

Plants Plants absorb nitrates dissolved in water through their roots. The nitrogen is then used by the plant to make proteins.

Decomposers When plants die, decomposers in the soil break down the plant proteins. One product is the nitrogen-containing substance ammonia. Soil bacteria change ammonia into nitrites.

Animals Animals eat plant proteins, or they eat other animals that eat plant proteins. Animal wastes contain nitrogen compounds.

Denitrifying Bacteria Some soil bacteria turn nitrates back into nitrogen gas.

Questions

1. The _____ includes the top portion of Earth's crust, all the waters that cover Earth's surface, and the atmosphere that surrounds Earth.

A. lithosphere

B. hydrosphere

C. biosphere

D. cryosphere

2. A _____ is made up of all organisms of the same species that live in an area at the same time.

A. organism

B. population

C. community

D. ecosystem

3. A _____ is anything that restricts the number of individuals in a population.

A. limiting factor

B. carrying capacity

C. community

D. producer

4. _____ is the largest number of individuals of one species that an ecosystem can support over time.

A. food chain

B. community

C. limiting factor

D. carrying capacity

The End!