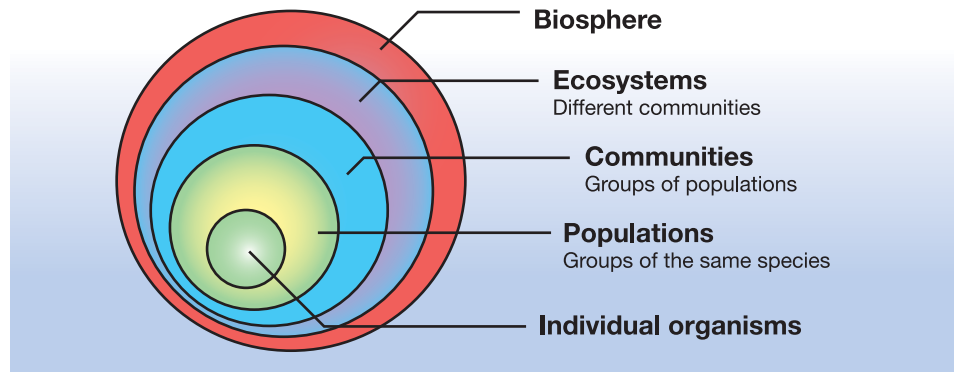


15.1 Ecosystems and Energy

Did anyone ever ask you the question: “Where do you get your energy?” Energy enters our world from the Sun—but how does the Sun’s energy become your energy? Read this section to find out.

What is an ecosystem?

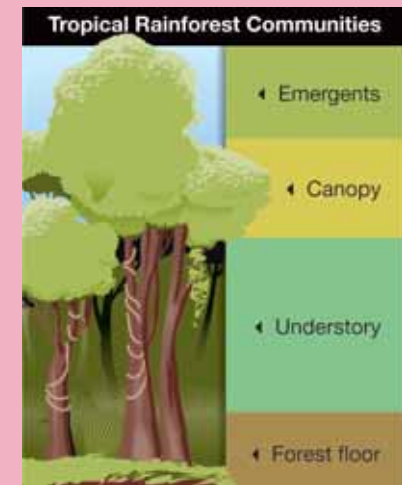
Organizing living things Individual living things can be grouped into higher levels of organization. Living things of the same type are grouped into *populations*. Populations of different types of living things are grouped into *communities*. Different communities form *ecosystems*, which make up the *biosphere*.



Ecosystems A tropical rainforest is an example of an ecosystem. An **ecosystem** is made up of a group of living things and their physical surroundings. A tropical rainforest ecosystem is made up of the plants and animals that live there, plus nonliving things like soil, air, water, sunlight, and nutrients. The living and nonliving parts of an ecosystem work together like a team.

! CHALLENGE

Research, list, and describe at least two populations that make up each of the four tropical rainforest communities.



ã VOCABULARY

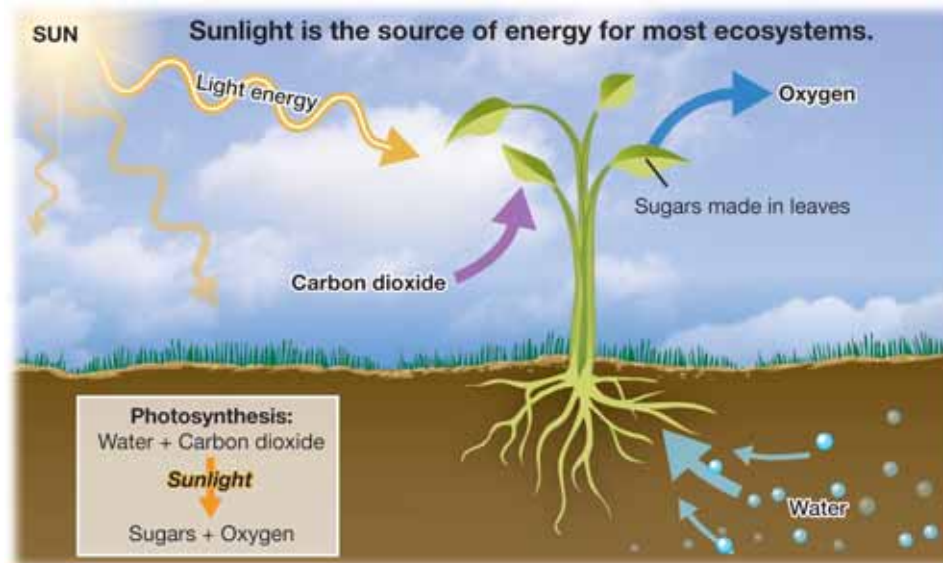
ecosystem - a group of living things and their physical surroundings.



Photosynthesis and energy

Sunlight Sunlight is almost always the first type of energy to enter an ecosystem. How is energy from the Sun useful to an ecosystem? You may already know that some living things, like plants, are able to capture the energy from sunlight (Figure 15.1). When another living thing in an ecosystem eats a plant, it is gaining energy that came first from the Sun.

Photosynthesis **Photosynthesis** happens when a plant uses the Sun's energy to turn water and carbon dioxide into useful molecules such as sugars and starches. A company that bottles orange juice once advertised that there is a little sunshine in every bottle. There is some scientific truth to that advertisement!



VOCABULARY

photosynthesis - the process plants use to make food from sunlight, water, and carbon dioxide.



Figure 15.1: Ferns can survive with very little sunlight. A cactus needs a lot of sunlight to grow.

Living parts of an ecosystem

Producers Most ecosystems get their energy first from sunlight. A **producer** is a living thing, like a plant, that can take the Sun's energy and store it as food. Another word for "produce" is *make*. Producers make their own food. Kapok and banana trees are common producers in a tropical rainforest ecosystem.

Consumers Other members of ecosystems cannot make their own food. A **consumer** must feed on other living things to get food and energy. Another word for "consume" is *eat*. Consumers eat other living things. A **herbivore** is a consumer that eats only plants. A **carnivore** is a consumer that eats only animals. A consumer that eats both plants and animals is called an **omnivore**. There are many consumers in a tropical rainforest ecosystem. Insects, caterpillars, and monkeys feed on the plants and trees. These herbivores are eaten by carnivores such as ocelots and pumas. What about you? Are you a herbivore, carnivore, or an omnivore?

Decomposers Producers and consumers in an ecosystem create waste and both eventually die. If waste and dead organisms are not somehow broken down, the nutrients they contain would not become available for other living organisms in that ecosystem. The waste would pile up and potentially harm living things. Imagine what it would be like in your neighborhood if the trash was not taken away—you would not be able to stay there for very long without getting sick. A **decomposer** is a living thing that consumes waste and dead organisms to get energy. "Decompose" means to *break down*. Decomposers break down material from waste and dead organisms, and the molecules are returned to the ecosystem. Fungi and bacteria are decomposers in many ecosystems (Figure 15.2). Decomposers are important and can be called *nature's recyclers*.

VOCABULARY

producer - a living thing that can make its own food.

consumer - a living thing that eats other living things for food and energy.

herbivore - a consumer that eats only plants.

carnivore - a consumer that eats only animals.

omnivore - a consumer that eats both plants and animals.

decomposer - a living thing that breaks down waste and dead things.

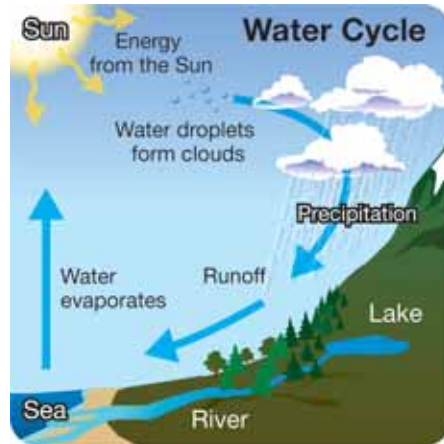


Figure 15.2: *Mushrooms are fungi that help decompose fallen branches and leaves on the forest floor.*



Nonliving parts of an ecosystem

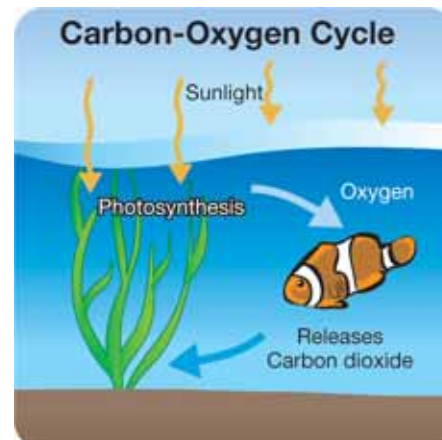
Water and sunlight



Living things need water and sunlight. The Sun is always there, but what about water? Water supply depends on the *water cycle*. Nature allows water to recycle so it can be used in many ecosystems. Look at the picture to the left. Where does the energy come from to make the water cycle work? That's right, the Sun is the source of energy.

Carbon and oxygen

Even though we can't see them, carbon and oxygen are important members of ecosystems. The Carbon-Oxygen cycle describes how the ecosystem uses these important elements. Carbon is present in both air and water as carbon dioxide gas. Oxygen is also a gas that is found in air and water. Producers take in carbon dioxide during the process of photosynthesis, and release oxygen. Consumers take in oxygen for their life processes and release carbon dioxide. When you breathe in, your body gets the oxygen it needs. When you breathe out, your body gets rid of carbon dioxide. This carbon dioxide is needed by producers in your ecosystem.



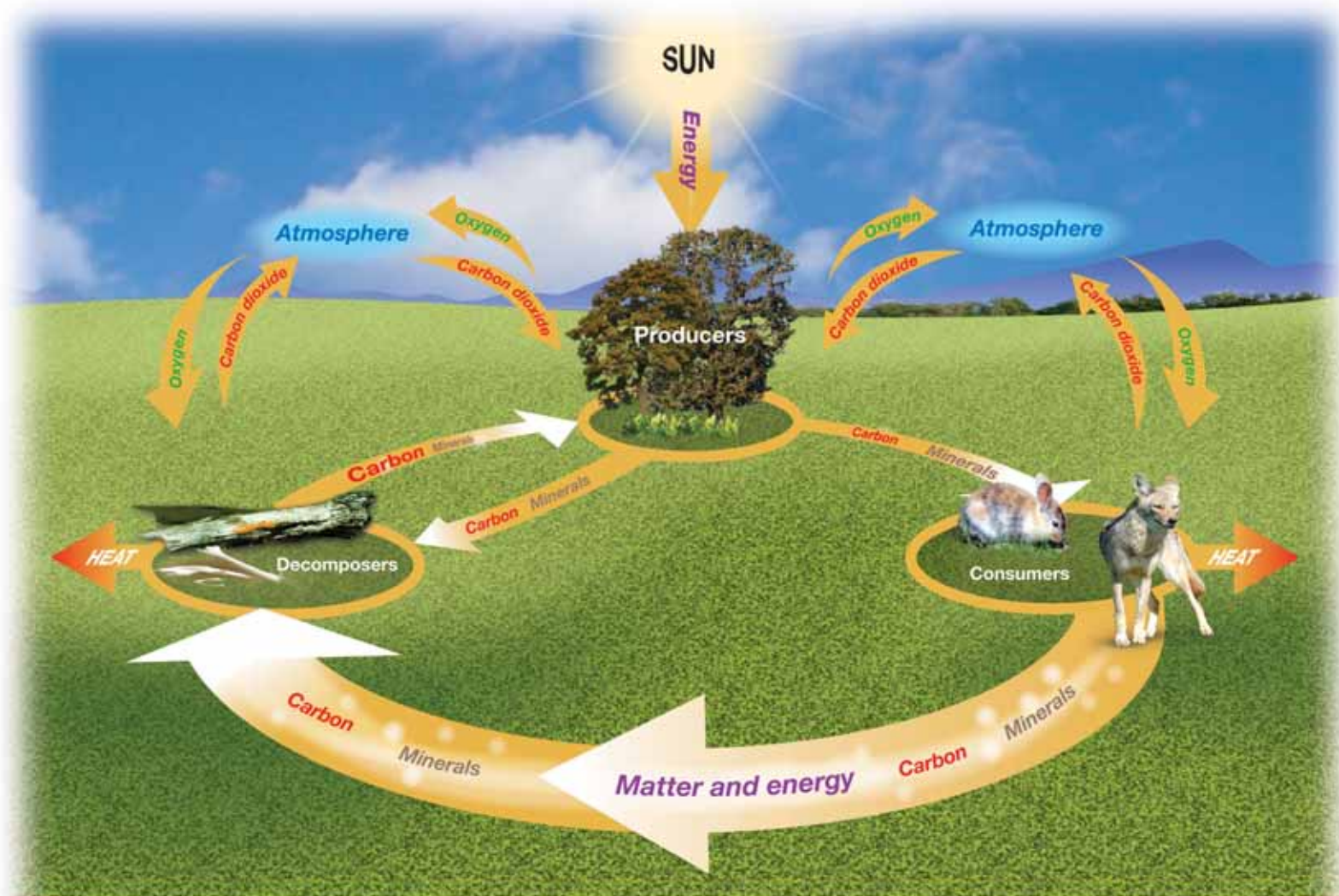
STUDY SKILLS

Understanding a cycle diagram

Refer to the water cycle diagram on this page to practice this study skill.

1. Place your finger on a part of the cycle. A cycle repeats over and over, so it does not matter where you begin.
2. Follow the arrows in the diagram while tracing your finger along the pathway.
3. Read each label and make sure you understand what happens during each step.
4. Refer to the diagram and write down a few sentences about what happens in the cycle from start to finish.

Living and nonliving parts of an ecosystem



Living and nonliving parts of an ecosystem are linked together by recycling matter and energy.



15.1 Section Review

1. What is an ecosystem?
2. Use the terms *producer*, *consumer*, and *decomposer* to label each member of the meadow ecosystem: grass, grasshopper, frog, snake, hawk, and fungus.
3. What process changes light energy into chemical energy (energy that can be used by organisms other than producers) in an ecosystem?
4. How are matter and nutrients cycled back into the ecosystem from which they came?
5. A _____ is the type of organism that undergoes photosynthesis, converting energy into a usable form of food for other organisms in an ecosystem.
6. What form of energy is lost by moving from producer to consumer to decomposer in an ecosystem?
 - a. light
 - b. heat
 - c. food energy
7. Research the term *chemosynthesis* on the Internet. After researching the term, explain what chemosynthesis is. Then provide an explanation for why the statement, “all living things require energy from the Sun” is ***not true***.
8. BONUS QUESTION: What is the name of the cactus pictured to the right?

MY JOURNAL



The Sonoran Desert covers about 120,000 square miles in southwestern Arizona, southeastern California, and parts of Mexico. Divide your journal page into two columns labeled *Producers* and *Consumers*. Do some research and list five different common producers and consumers in the Sonoran Desert.