

Dynamic Nature of Ecosystems

Reflect

Look at the image of the rain forest to the right. What makes up its ecosystem? Is it just the living things, or do the nonliving things count as well?



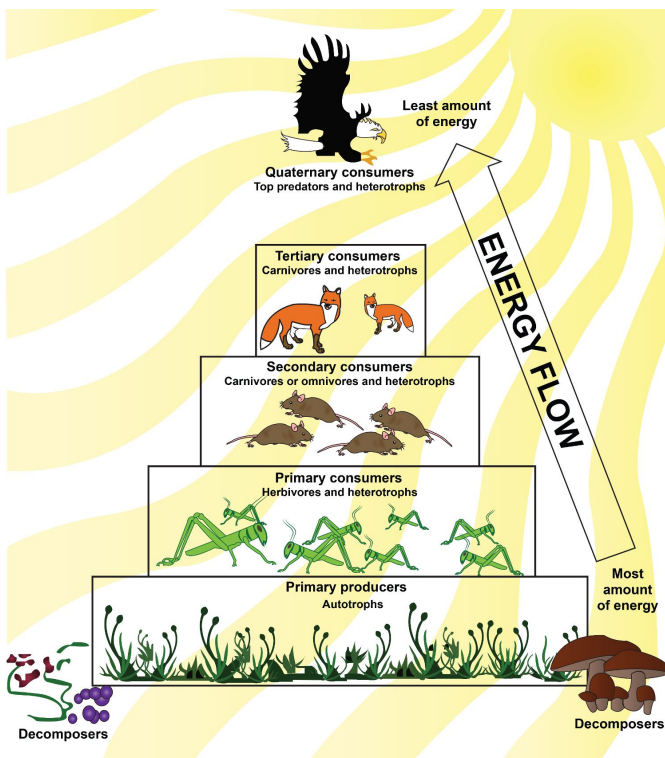
An *ecosystem* consists of all the living and nonliving things in a particular area. Look again at the rain forest picture. You can see a lot of *biotic*, or living, things, but you can also see *abiotic* or nonliving, things. Some biotic examples are the trees, ferns, and moss; some abiotic examples are the soil and stones. What other organisms would you expect to find in this ecosystem that you cannot see in this picture?

It is important to note that an ecosystem's abiotic factors, such as temperature, wind, and annual precipitation type and amount, may not be visible.

What Do You Think?

Do ecosystems always stay the same?

Because ecosystems consist of living things that can change, it makes sense that the ecosystem itself can change over time. For example, if a certain population experiences a significant transformation, it will affect the entire ecosystem.

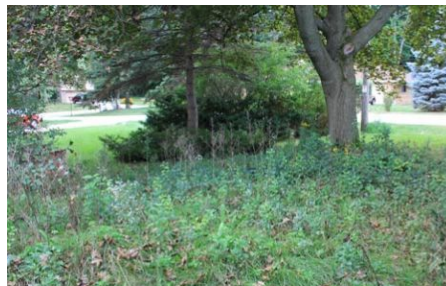
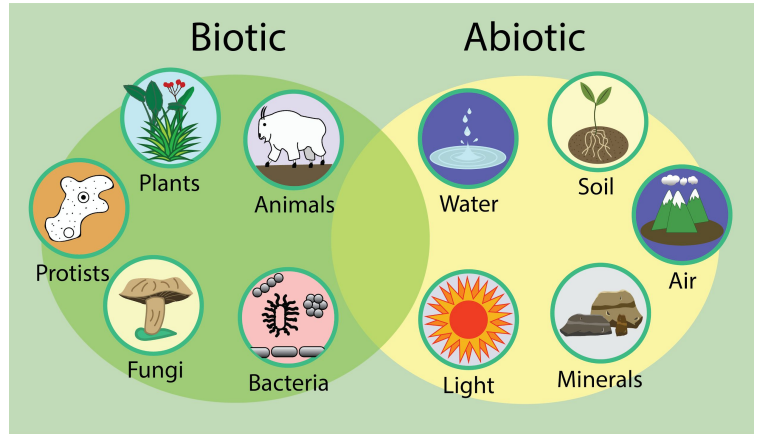


Look at the deciduous forest ecosystem depicted in an energy pyramid on the left. What do you think would happen to the ecosystem if the foxes were removed? Would the population of mice increase or decrease? What about the bald eagles? Would their population increase or decrease? Without foxes to hunt mice, the population of mice would increase. On the other hand, without foxes to prey on, the eagle population would begin to decline. Now look further down the energy pyramid. Do you think the absence of the fox would have any impact on the insect population? What about on the plant population? Any change in a biological component of an ecosystem can lead to shifts in all its populations.

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Ecosystems are not built in a day. The dynamic, interdependent assemblages of species and environments that make up an ecosystem develop over many years through a process called *ecological succession*. Ecosystems have living (biotic) and nonliving (abiotic) components. The biotic and abiotic components of an ecosystem are interdependent, as each component changes the nature of the other interacting components.



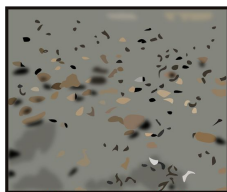
What would happen if a city park or a garden were left unattended, with no mowing, weeding, watering, or any other human interference? At first, weeds would grow and replace the cultivated plants that may have been present. What would this area look like after a month? What about after a year or a decade?

Ecological Succession

The species that make up an ecosystem change over time. In the park pictured above that is no longer tended, weeds have replaced cultivated plants. Other plants may eventually replace these weeds. This process is called succession.

When the process of succession begins in an area that is bare of living things, it is called *primary succession*. Primary succession is a slow process, because the area in which it is occurring is barren. The first organisms that are able to grow in such a location, called *pioneer species*, must be able to grow on bare rock.

Changes from a Pioneer to Climax Community



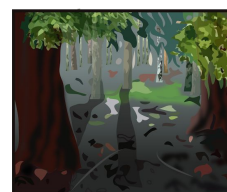
Bare rock is exposed due to some type of **disturbance** like a retreating glacier or volcanic eruption. **No soil is present.**



Pioneer species, like lichens and mosses, establish themselves on the rock substrate.



Pioneer species die and decay, providing soil and nutrients for other plant species like shrubs and small trees.



Small and large trees begin to grow, and the community reaches an **equilibrium** or balance. This results in a **climax community**.

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Look Out!

Ecosystem disruptions may be natural catastrophic events, such as heavy rainfall, floods, droughts, forest fires, tornadoes, and hurricanes. Geologic events such as volcanic eruptions, tsunamis, and earthquakes also disrupt ecosystems. Changes to the physical or biological components in an ecosystem can directly affect the populations of living things. The series of changes the ecosystem goes through after the area is disrupted or damaged is called secondary succession.



What Do You Think?

Disruptions to any physical component of an ecosystem can lead to population shifts as well. What do you think happened to the ecosystems in the pictures below? How do you think these changes affected the populations in each ecosystem?



Once an ecosystem is disturbed, do you think it can ever recover and return to its original balance? Absolutely—ecosystems are amazingly resilient! Consider the pictures above. Both the tornado and the volcanic explosion have killed many organisms. Over time, the plants and animals will begin to return.

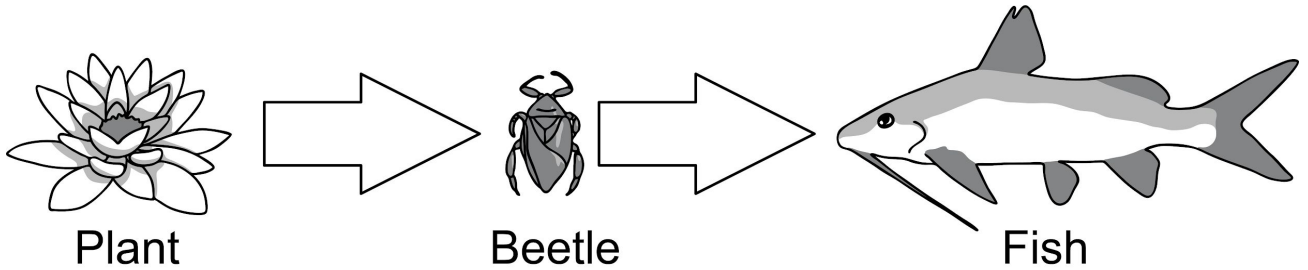
Unfortunately, people sometimes cause disasters as well. In April 2010, the oil tanker Deepwater Horizon exploded, sending millions of gallons of oil into the Gulf of Mexico. This oil spill is the worst man-made ecological disaster that has ever occurred. The Gulf Coast ecosystems are still recovering from this disaster. How do you think the Gulf Coast ecosystem has changed? How do you think it has exemplified resilience?



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Try Now

Take some time to brainstorm how removing the beetle from the food chain below would affect the marine ecosystem.



Circle what would most likely happen.

- A. The plant population would increase; the fish population would increase.
- B. The plant population would decrease; the fish population would increase.
- C. The plant population would stay the same; the fish population would decrease.
- D. The plant population would increase; the fish population would decrease.

Explain why you selected your answer.

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Below you will find a food web for a grassland ecosystem. Draw an X through one of the organisms. Then, in the space below, describe all the changes that would occur to the ecosystem if that certain population were to become extinct.

