

Dynamic Nature of Ecosystems

Reflect

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



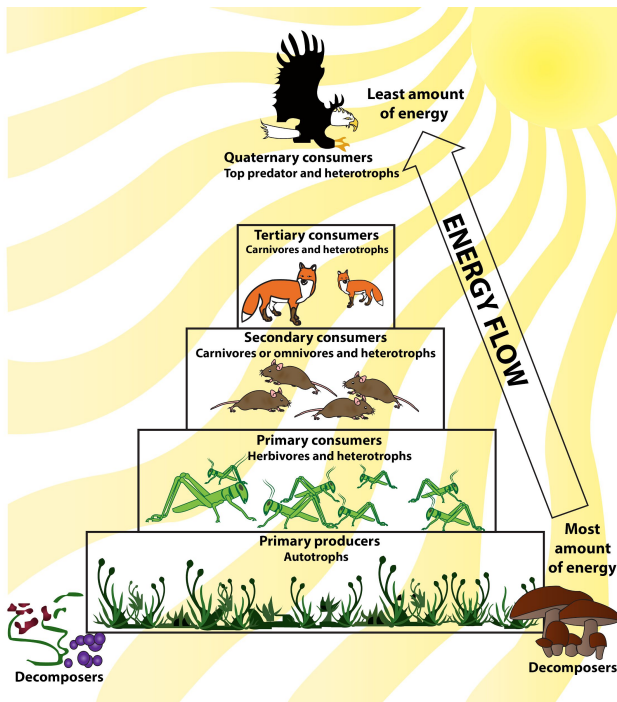
An **ecosystem** consists of all the living and nonliving things in a particular area. Look again at the rainforest picture. You can see a lot of **biotic**, or living, things, but you can also see **abiotic**, or nonliving, things. Some biotic examples are the trees, ferns, and moss; some abiotic examples 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 the abiotic factors of an ecosystem, 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.



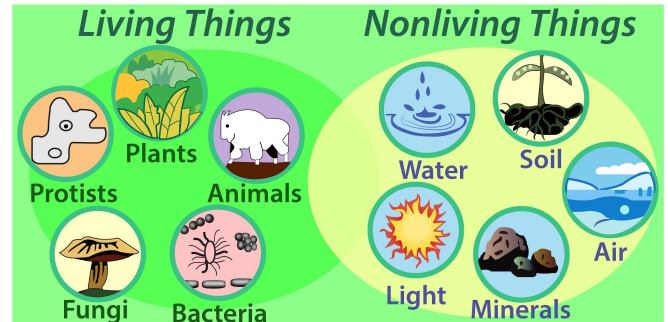
Look at the deciduous forest ecosystem depicted in an energy pyramid on the left. What do you think would happen to the ecosystem if the foxes were removed? Would the population of mice increase or decrease? What about the bald eagles—would their population increase or decrease? Without foxes to hunt mice, the population of mice would increase. On the other hand, without foxes to prey on, the eagle population would begin to decline. 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 of its populations.

Dynamic Nature of Ecosystems

Reflect

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.

Ecological Succession: Gradual Change in Biotic and Abiotic Components of an Ecosystem



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 after a decade?

Ecological Succession

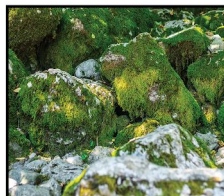
The species that make up an ecosystem change over time. In the untended park pictured above, weeds have replaced cultivated plants. Other plants may eventually replace these weeds. This process is called succession.

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



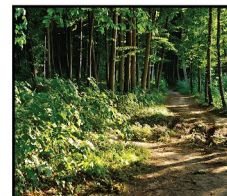
Bare rock is exposed due to some type of **disturbance**, such as a retreating glacier or volcanic eruption. **No soil is present.**



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



Pioneer species die and decay, providing soil and nutrients for other plant species, such as 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**.

Look Out!

Disrupting an Ecosystem

Ecosystem disruptions may be natural catastrophic events such as heavy rainfall, floods, drought, forest fires, tornadoes, and hurricanes; or geologic events such as volcanic eruptions, tsunamis, and earthquakes. Man-made disruptions like oil spills, pollution, and construction can also disrupt ecosystems. Changes to the physical or biological components in an ecosystem can directly affect the populations of living things.



Natural Disruptions

Wildfires

Wildfires can last for days and have some of the longest lasting effects of any natural disruption (they're second only to lava flows). Wildfires can push out and kill animals while leaving nothing for the survivors to return to. In some cases, only soil and seeds remain and will take decades for the ecosystem to become a climax community.



Hurricanes

Hurricanes can cause severe effects despite staying in an area for only a few hours. Hurricanes can cause flooding and heavy winds that can knock down or break even the strongest trees. At the coast, a storm surge can cause massive flooding and wash away beaches and coastal ecosystems.



Floods

Flooding is a short-term event whose effects on the environment can last months or even years. After the heavy rains and flood waters subside, animals can return fairly quickly, but it may take some time for plant life to recover. Soil erosion can cause plants with shallow root systems to wash away or trees to tip over.



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Man-Made Disruptions

Oil Spills

Accidents involving oil tankers or oil rigs sometimes occur, leading to widespread contamination. It can be years before the oil is no longer be visible in the environment. The effect during the first weeks can be devastating to wildlife, and without human cleanup efforts, it would take years to recover.

Construction

Roads, buildings, parking lots, and dams are some of the man-made things that can destroy and affect parts of an ecosystem. If maintained, parking lots destroy plant life and soil forever. Dams can block or limit the flow of water for the environment downstream.

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?



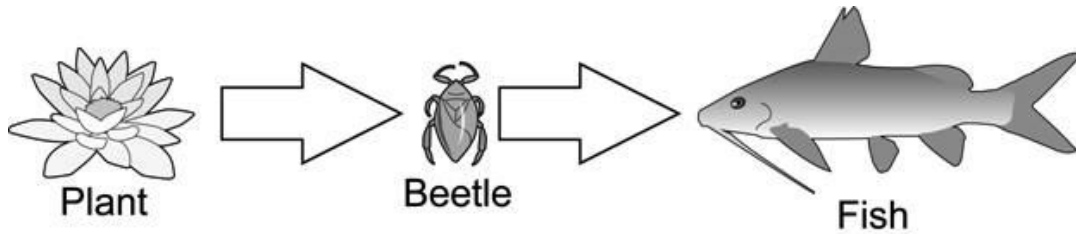
Once an ecosystem is disturbed, do you think it can ever recover and return to its original balance? Absolutely—ecosystems are amazingly resilient! Consider the pictures above. Both the tornado and the volcanic explosion have killed many organisms. Over time, the plants and animals will begin to return.

Unfortunately, people sometimes cause disasters as well. In April 2010, the oil rig Deepwater Horizon exploded, sending millions of gallons of oil into the Gulf of Mexico. This oil spill is the worst man-made ecological disaster to have 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?



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. Plant population would increase; fish population would increase.
- B. Plant population would decrease; fish population would increase.
- C. Plant population would stay the same; fish population would decrease.
- D. Plant population would increase; 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, and then in the space below, describe all the changes that would occur to the ecosystem if that certain population became extinct.

