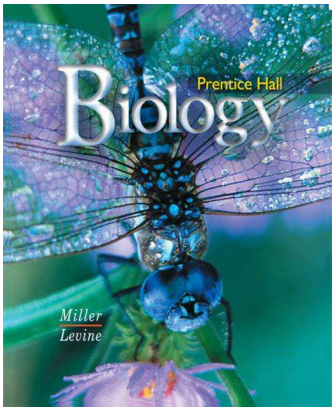


4-2 What Shapes an Ecosystem?

Biotic and Abiotic Factors

Ecosystems are influenced by a combination of biological and physical factors.

The biological influences on organisms within an ecosystem are called **biotic factors**.

Biotic factors include all the living things with which an organism might interact.

Physical, or nonliving, factors that shape ecosystems are called **abiotic factors**.

Abiotic factors include:

- temperature
- precipitation
- humidity
- wind
- nutrient availability
- soil type
- sunlight

How do biotic and abiotic factors influence an ecosystem?

Biotic and abiotic factors determine the survival and growth of an organism and the productivity of the ecosystem in which the organism lives.

The area where an organism lives is called its **habitat**. A habitat includes both biotic and abiotic factors.

The Niche

A **niche** is the full range of physical and biological conditions in which an organism lives and the way in which the organism uses those conditions.

The range of temperatures that an organism needs to survive and its place in the food web are part of its niche.

The combination of biotic and abiotic factors in an ecosystem often determines the number of different niches in that ecosystem.

No two species can share the same niche in the same habitat.

Different species can occupy niches that are very similar.

What interactions occur within communities?

Community Interactions

When organisms live together in ecological communities, they interact constantly.

Community interactions, such as competition, predation, and various forms of symbiosis, can affect an ecosystem.

Competition

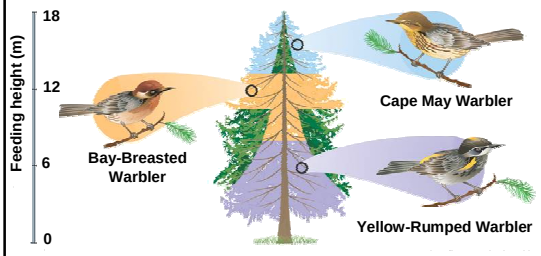
Competition occurs when organisms of the same or different species attempt to use an ecological resource in the same place at the same time.

A **resource** is any necessity of life, such as water, nutrients, light, food, or space.

Direct competition in nature often results in a winner and a loser—with the losing organism failing to survive.

The **competitive exclusion principle** states that no two species can occupy the same niche in the same habitat at the same time.

The distribution of these warblers avoids direct competition, because each species feeds in a different part of the tree.



Predation

An interaction in which one organism captures and feeds on another organism is called **predation**.

The organism that does the killing and eating is called the predator, and the food organism is the prey.

Symbiosis

Any relationship in which two species live closely together is called **symbiosis**.

Symbiotic relationships include:

- mutualism
- commensalism
- parasitism

Mutualism: both species benefit from the relationship.

Commensalism: one member of the association benefits and the other is neither helped nor harmed.

Parasitism: one organism lives on or inside another organism and harms it.

What is ecological succession?

Ecological Succession

Ecosystems are constantly changing in response to natural and human disturbances.

As an ecosystem changes, older inhabitants gradually die out and new organisms move in, causing further changes in the community.

This series of predictable changes that occurs in a community over time is called **ecological succession**.

Sometimes, an ecosystem changes in response to an abrupt disturbance.

At other times, change occurs as a more gradual response to natural fluctuations in the environment.

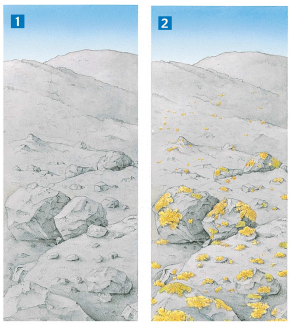
Primary Succession

On land, succession that occurs on surfaces where no soil exists is called **primary succession**. For example, primary succession occurs on rock surfaces formed after volcanoes erupt.

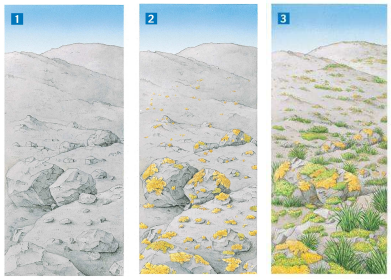
The first species to populate the area are called **pioneer species**.

In this example, a volcanic eruption has destroyed the previous ecosystem.

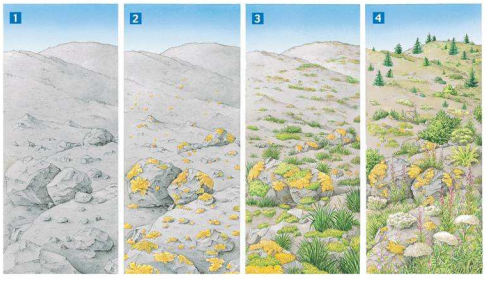
The first organisms to appear are lichens.



Mosses soon appear, and grasses take root in the thin layer of soil.



Eventually, tree seedlings and shrubs sprout among the plant community.



Secondary Succession

Components of an ecosystem can be changed by natural events, such as fires.

When the disturbance is over, community interactions tend to restore the ecosystem to its original condition through **secondary succession**.

Healthy ecosystems usually recover from natural disturbances, but may not recover from long-term, human-caused disturbances.

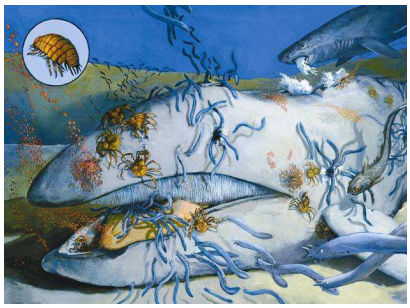
Succession in a Marine Ecosystem

Succession can occur in any ecosystem, even in the permanently dark, deep ocean.

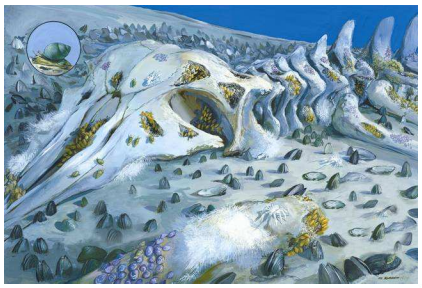
In 1987, scientists documented an unusual community of organisms living on the remains of a dead whale.

The community illustrates the stages in the succession of a whale-fall community.

Succession begins when a whale dies and sinks to the ocean floor.



Within a year, most of the whale's tissues have been eaten by scavengers and decomposers.



The decomposition of the whale's body enriches the surrounding sediments with nutrients.

When only the skeleton remains, heterotrophic bacteria decompose oils in the whale bones.

This releases compounds that serve as energy sources for chemosynthetic autotrophs.

The chemosynthetic bacteria support a diverse community of organisms.

4-2 Section QUIZ

Continue to:

Section QUIZ

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4-2 Section QUIZ

1 Which of the following is a biotic factor in a bullfrog's niche?

a. water

A b. a heron

c. climate

d. day length

4-2 Section QUIZ

2 An organism's niche is different from its habitat because

a. The niche does not include the place where the organism lives.

A b. the niche includes all the conditions under which the organism lives.

c. the niche includes only abiotic factors.

d. the niche includes only biotic factors.

4-2 Section QUIZ

3 The attempt by organisms of the same or different species to use a resource at the same time in the same place is called

A a. competition.

b. predation.

c. symbiosis.

d. cooperation.

4-2 Section QUIZ

4 An association between two species in which one species benefits and the other is neither helped nor harmed is called

a. symbiosis.

b. mutualism.

A c. commensalism.

d. parasitism.

4-2 Section QUIZ

5 When a volcano erupts and completely destroys an ecosystem, the first species to populate the area are usually

a. grasses and shrubs.

A b. pioneers such as lichens.

c. small plants such as mosses.

d. small animals such as rodents.

END OF SECTION