

# How Changes Occur Naturally in Ecosystems

Textbook pages 108–121

## Before You Read

How do you think mature forests, such as the temperate rainforests of coastal British Columbia, change over time? Write your answer on the lines below.

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### Create an Outline

Create an outline highlighting the typical changes that occur in an ecosystem undergoing primary succession.

### How do organisms adapt to change?

In **natural selection**, the best-adapted members of a species survive to reproduce. These individuals may pass favourable characteristics on to their offspring. As abiotic and biotic components of their environment change, **adaptive radiation** may result. This term describes the change from a common ancestor into a number of different species that “radiate out” to inhabit different niches. For example, 13 species of finches that fill different niches on the Galapagos Islands are thought to have developed from a single species from mainland South America. ✓

### Reading Check

1. What is adaptive radiation?

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### How do ecosystems change over time?

**Ecological succession** refers to changes that take place over time in the types of organisms that live in an area. There are two types of ecological succession:

1. Primary succession: **Primary succession** occurs in areas where no soil exists, such as following glaciation or a lava flow. Wind and rain carry spores of lichens to these areas. Lichens obtain nutrients by secreting chemicals that break down rock. As lichens decay, they add organic matter to the developing soil. The first organisms to survive and reproduce in an area are called **pioneer species**. They are adapted to grow in harsh, nutrient-poor conditions. In time, often over hundreds of years, the weathering of rocks and decay of pioneer species cause soil formation. The abiotic conditions of the ecosystem continue to change as new species of plants and animals colonize the area, each competing for nutrients, moisture, and sunlight. More niches are created and biodiversity increases.

Eventually, primary succession leads to the development of mature **climax communities**, such as a boreal forest or grassland.

- 2. Secondary succession: Small disturbances, such a fire, often occur in ecosystems. **Secondary succession**—succession that occurs as a result of a disturbance to an area that already has soil and was once the home of living organisms—occurs as a result. It proceeds much faster than primary succession since micro-organisms, insects, seeds, and nutrients still exist in the soil. ✓

**How do natural events affect ecosystems?**

Natural events can destroy habitats, reduce biodiversity, and cause regions to undergo succession. Some examples include:

- flooding: results in soil erosion, pollution, and disease when toxins or harmful bacteria from untreated sewage enter drinking water
- drought: plants and animals die due to lack of water
- insect infestations: often result in succession in forests because insects destroy older, weaker trees
- tsunamis: huge, rapidly moving ocean waves destroy habitats and salt water carried onto shore changes soil composition

✓ **Reading Check**

- 2. Describe the difference between primary and secondary succession.

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Use with textbook pages 108–117.

## Change in ecosystems

### Vocabulary

adaptive radiation	natural selection
climax community	pioneer species
drought	primary succession
ecological succession	secondary succession
flooding	tsunami
insect infestations	

Use terms in the vocabulary box to fill in the blanks. Use each term only once.

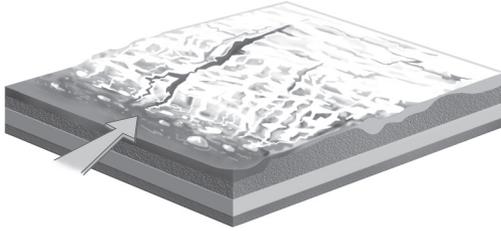
- In the process of \_\_\_\_\_, living organisms change as the abiotic and biotic components in their environment change.
- \_\_\_\_\_ describes the change from a common ancestor into a number of different species that “radiate out” to inhabit different niches.
- Scientists use the term \_\_\_\_\_ to refer to changes that take place over time in the types of organisms that live in an area.
- \_\_\_\_\_ occurs in an area where no soil exists, such as on bare rock.
- The lichens and others plants that are the first organisms to survive and reproduce in an area are known as \_\_\_\_\_.
- The process of primary succession leads to the development of a mature community, which is sometimes called a \_\_\_\_\_.
- \_\_\_\_\_ occurs as the result of a disturbance to an area that already has soil and was once the home of living organisms.
- \_\_\_\_\_ can result in soil erosion and soil pollution if toxic chemicals are present in floodwaters.
- \_\_\_\_\_ is a huge, rapidly moving ocean wave.
- \_\_\_\_\_ can result in crop failures and livestock deaths.
- \_\_\_\_\_, such as the mountain pine beetle in the forests of British Columbia, have a devastating effect on the forest canopy, and bird and mammal habitats.

Use with textbook pages 111-114.

## Primary and secondary succession

1.

Glacier Retreating



As a glacier retreats, the process of primary succession will occur. Describe the various stages that lead to the development of a mature community.

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2.

Results of Forest Fire



After a forest fire, not much is left except ash and burnt trees. Describe the sequence of events that will occur during secondary succession.

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Use with textbook pages 115–117.

## How natural events affect ecosystems

For each major event listed below, summarize the effects on their mature communities.

Natural event	Effects on mature community
Fire	<hr/> <hr/> <hr/> <hr/>
Flooding	<hr/> <hr/> <hr/> <hr/>
Tsunami	<hr/> <hr/> <hr/> <hr/>
Drought	<hr/> <hr/> <hr/> <hr/>
Insect infestation	<hr/> <hr/> <hr/> <hr/>

Use with textbook pages 108–117.

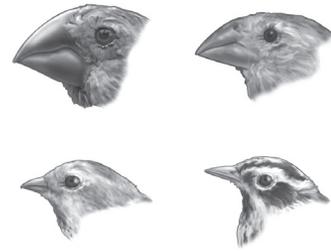
# How changes occur naturally in ecosystems

**Match each Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.**

Term	Descriptor
1. _____ adaptive radiation	<b>A.</b> a mature community that continues to change over time
2. _____ climax community	<b>B.</b> the development of a number of new species from a common ancestor
3. _____ ecological succession	<b>C.</b> organisms, such as lichens and other plants, that are the first to survive and reproduce in an area
4. _____ natural selection	<b>D.</b> changes that take place over time in the types of organisms that live in an area
5. _____ pioneer species	<b>E.</b> the process in which, over time, the best adapted members of a species will survive and reproduce

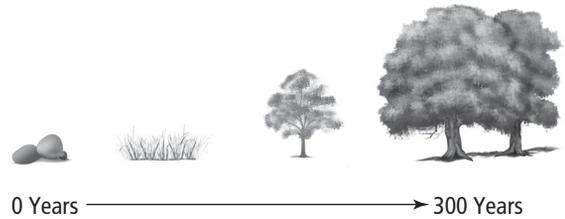
**Circle the letter of the best answer.**

6. The process that makes change possible in living things is
- A.** ecological succession
  - B.** primary succession
  - C.** natural selection
  - D.** adaptive radiation



7. Each of these finches from the Galapagos Islands has evolved different shapes and sizes of beaks. This is an example of:

- A.** primary succession
- B.** secondary succession
- C.** bioremediation
- D.** adaptive radiation



8. The diagram above represents which of the following:

- A.** adaptive radiation
- B.** climax community
- C.** ecological succession
- D.** natural succession

9. An example of a pioneer species would be

- A.** moss
- B.** lichen
- C.** deciduous trees
- D.** coniferous trees