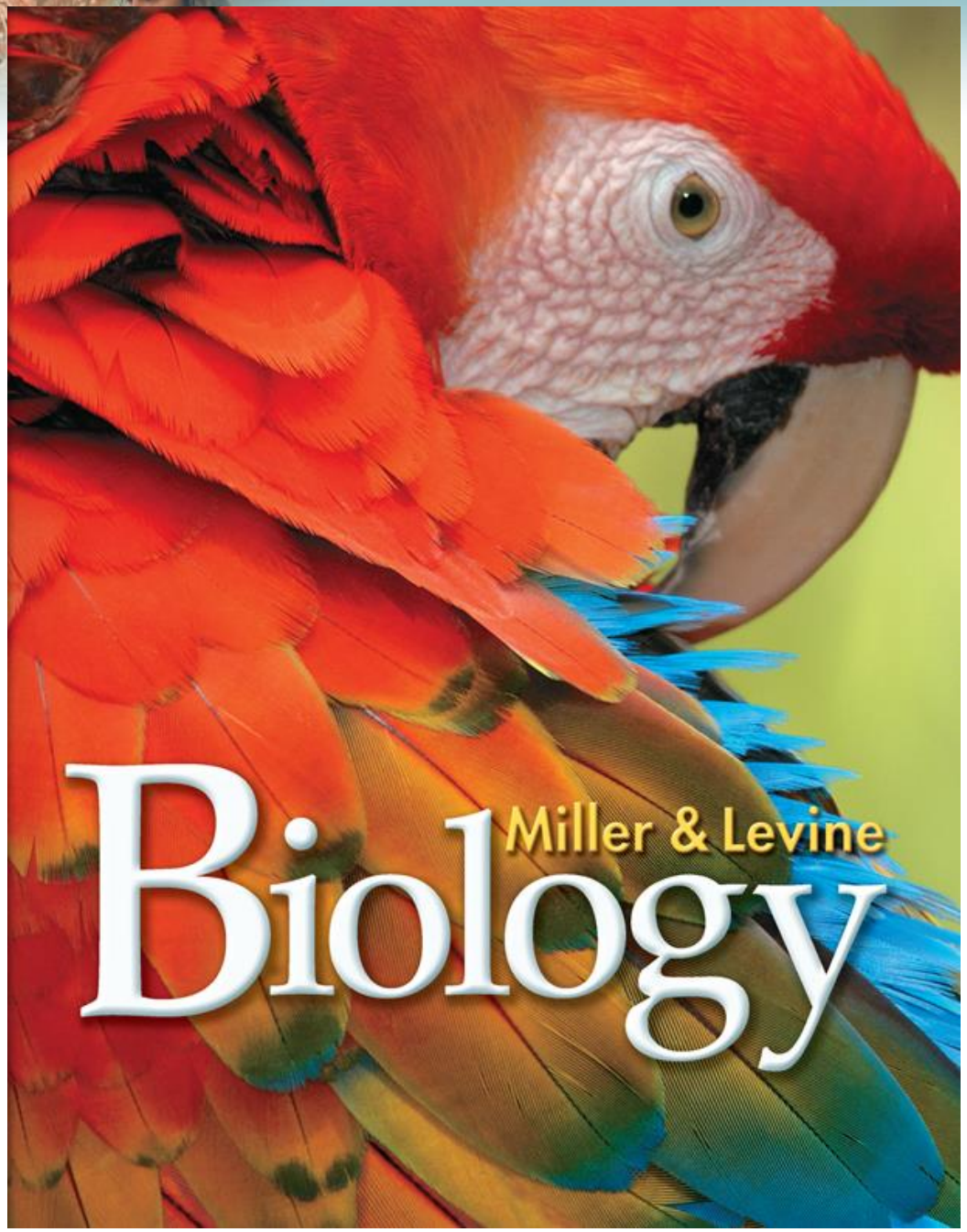


Lesson Overview

4.3 Succession

Primary and Secondary Succession

- How do communities change over time?

- Ecosystems change over time, especially after disturbances, as some species die out and new species move in.

Primary and Secondary Succession

Ecological succession is a series of more-or-less predictable changes that occur in a community over time.

Ecosystems change over time, especially after disturbances, as some species die out and new species move in.

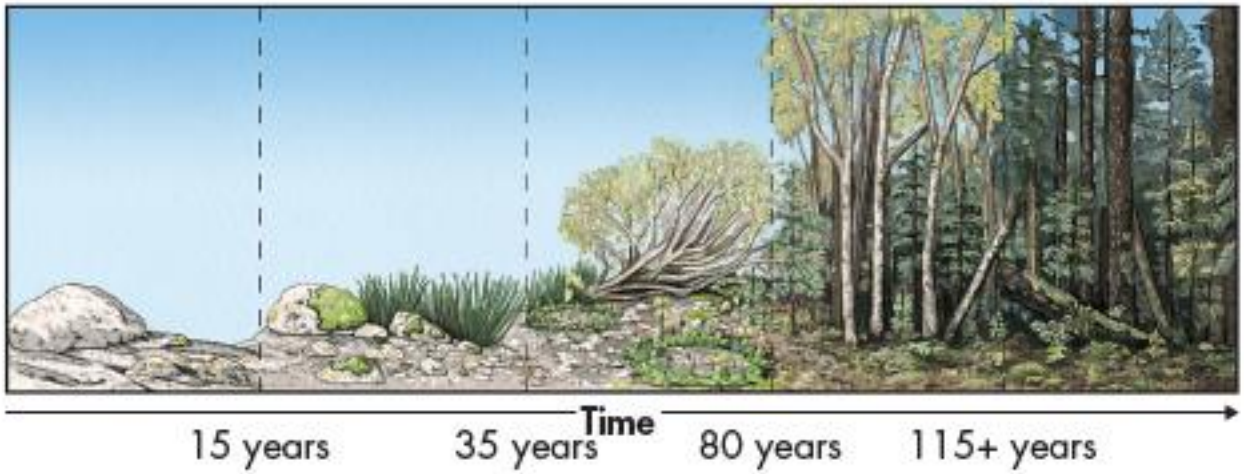
Over the course of succession, the number of different species present typically increases.

Primary Succession

Volcanic explosions can create new land or sterilize existing areas.

Retreating glaciers can have the same effect, leaving only exposed bare rock behind them.

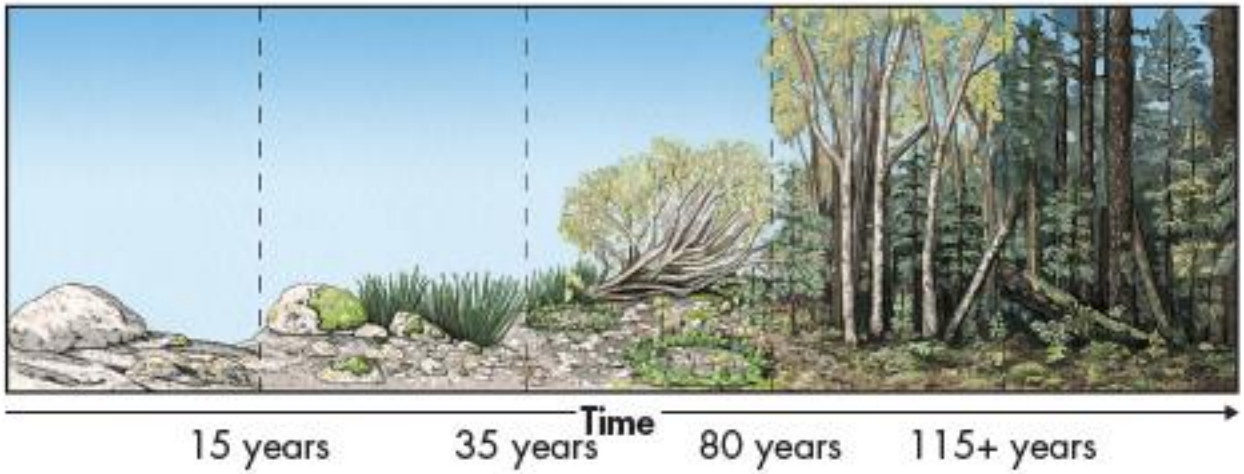
Succession that begins in an area with no remnants of an older community is called **primary succession.**



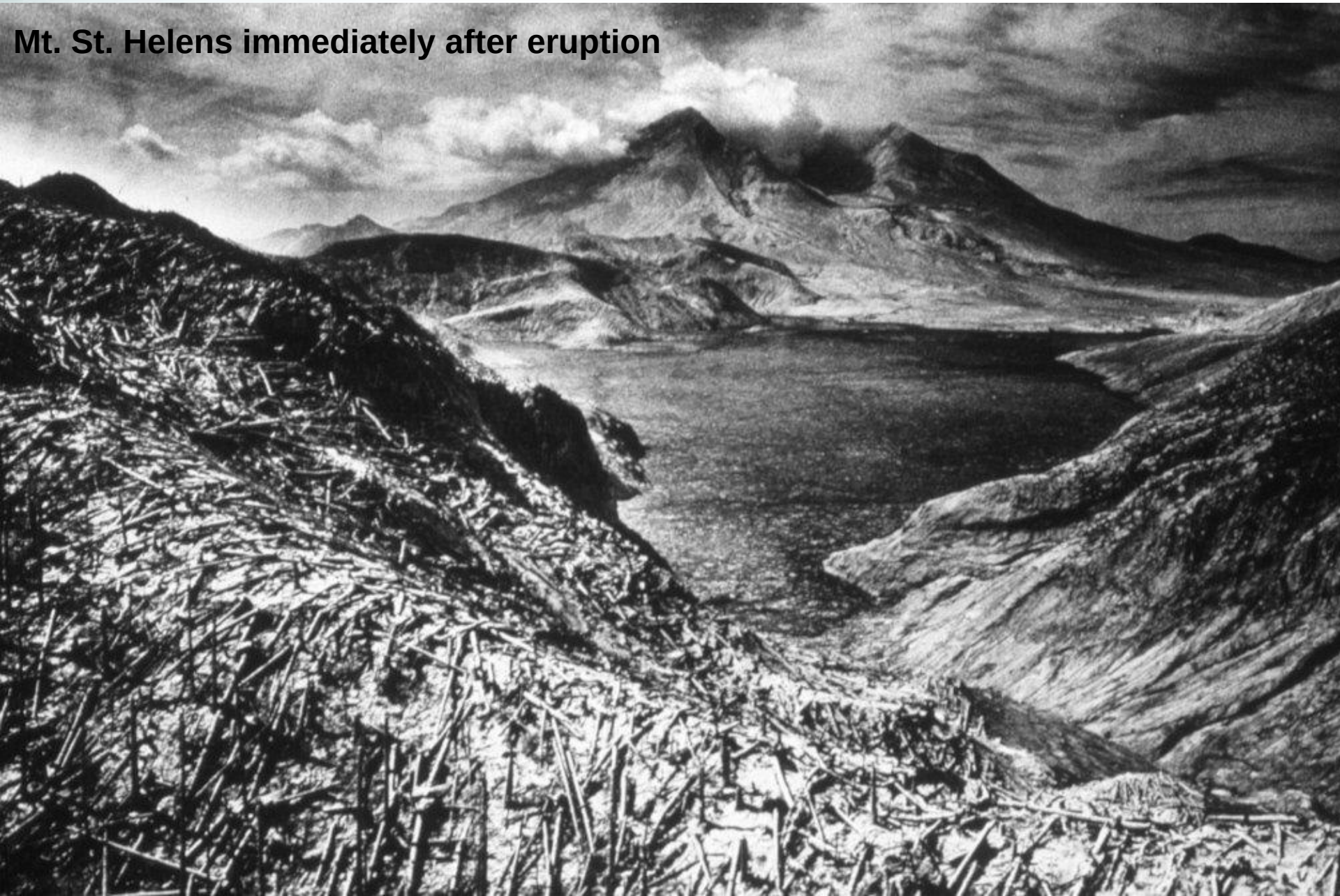
Primary Succession

For example, in Mount Saint Helens, Washington, an erupting volcano decimated all nearby living organisms.

Changes in this community will continue for centuries.




Mt. St. Helens immediately after eruption
USGS
Lake surface choked with debris

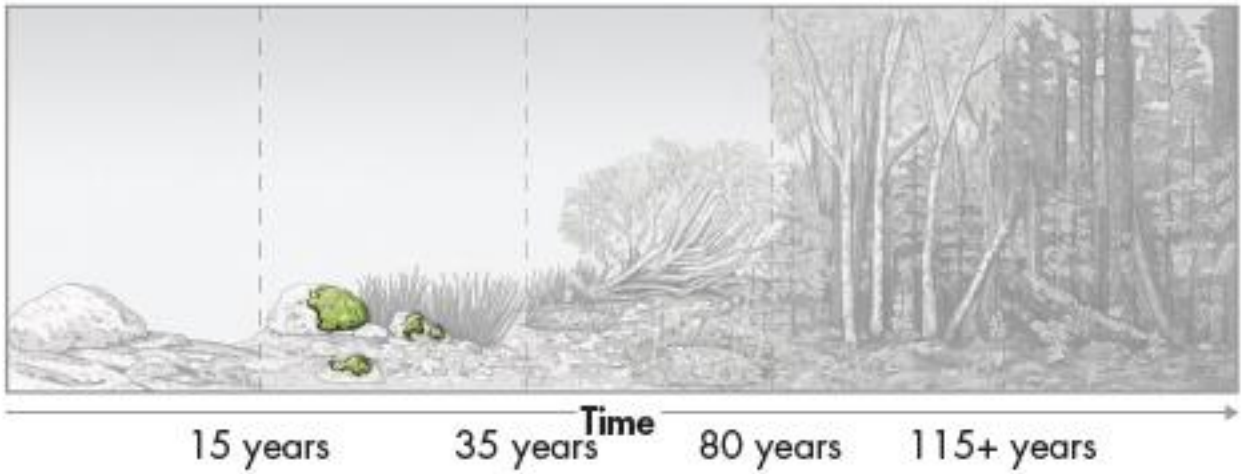


Mt. St. Helens immediately after eruption

Primary Succession

The first species to colonize barren areas are called **pioneer species.**

One ecological pioneer that grows on bare rock is lichen—a mutualistic symbiosis between a fungus and an alga.

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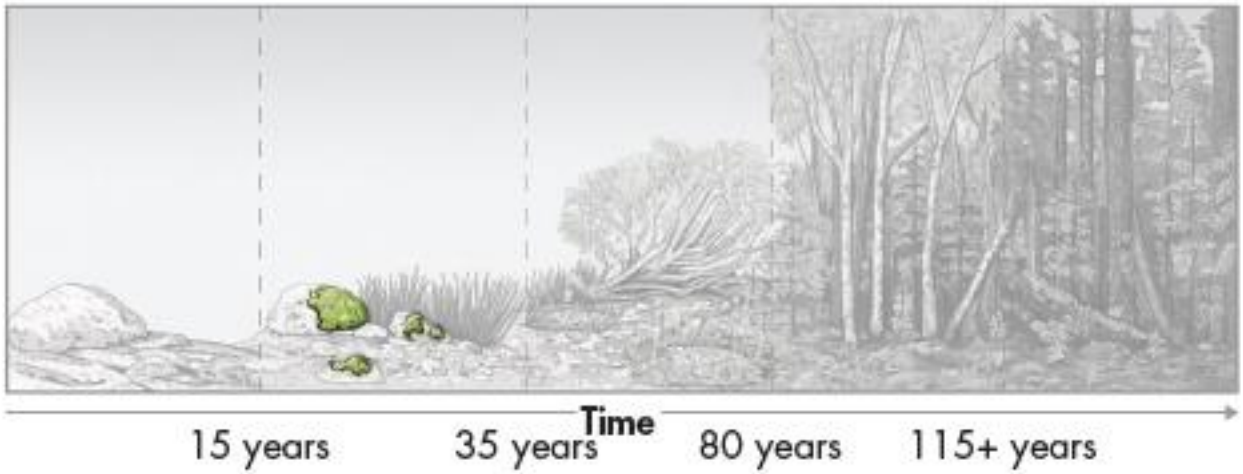
Primary Succession

Over time, lichens convert, or fix, atmospheric nitrogen into useful forms for other organisms, break down rock, and add organic material to form soil.

Certain grasses are also pioneer species.



Mt. St. Helens 15-35 years post eruption

Mt. St. Helens 15-35 years post eruption


Mt. St. Helens 15-35 years post eruption
USGS

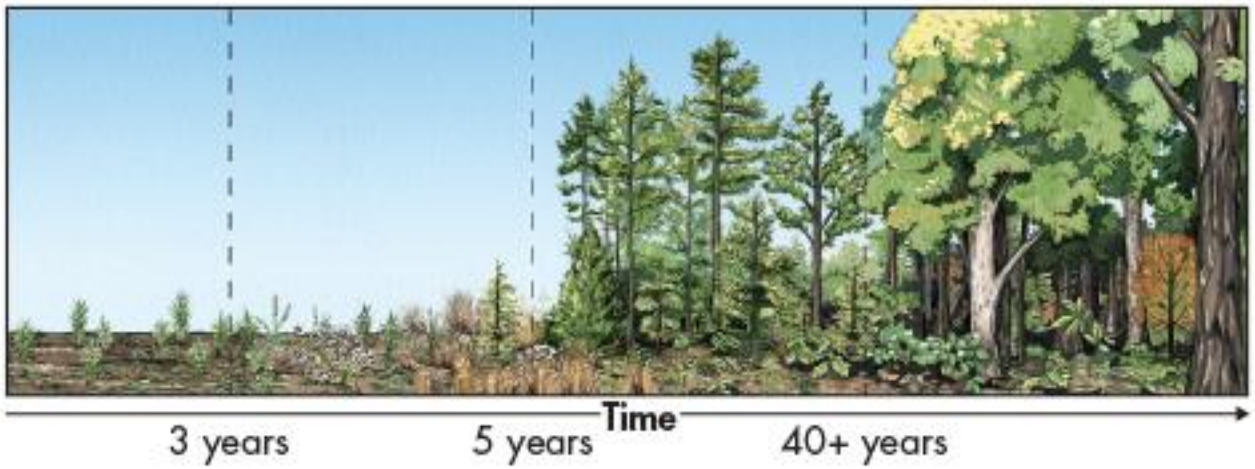

Mt. St. Helens 35-80 years post eruption


Mt. St. Helens 35-80 years post eruption

Secondary Succession

Sometimes, existing communities are not completely destroyed by disturbances. In these situations, **secondary succession** occurs.

Secondary succession proceeds faster than primary succession, in part because soil survives the disturbance. As a result, new and surviving vegetation can regrow rapidly.



Secondary Succession

Secondary succession often follows a wildfire, hurricane, or other natural disturbance.

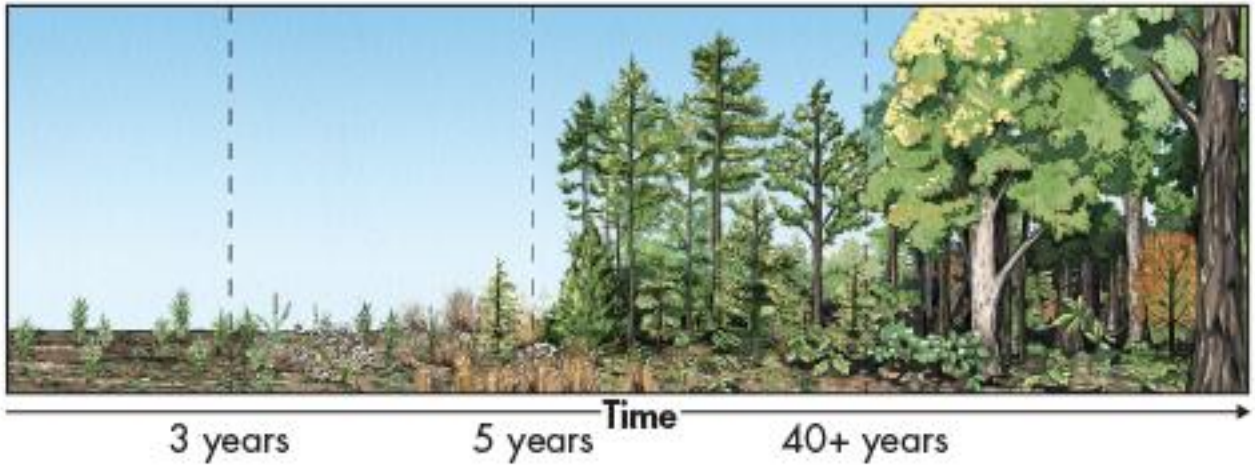
We think of these events as disasters, but many species are adapted to them. Although forest fires kill some trees, for example, other trees are spared, and fire can stimulate their seeds to germinate.

Secondary succession can also follow human activities like logging and farming.

Secondary Succession

This series shows secondary succession taking place in abandoned fields of the Carolinas' Piedmont.

Over the last century, these fields have passed through several stages and matured into oak forests. Changes will continue for years to come.



Why Succession Occurs

Every organism changes the environment it lives in.

One model of succession suggests that as one species alters its environment, other species find it easier to compete for resources and survive.

For example, as lichens add organic matter and form soil, mosses and other plants can colonize and grow.

As organic matter continues to accumulate, other species move in and change the environment further.

Over time, more and more species can find suitable niches and survive.

Climax Communities

- Do ecosystems return to “normal” following a disturbance?
- Secondary succession in healthy ecosystems following natural disturbances often reproduces the original climax community.
- Ecosystems may or may not recover from extensive human-caused disturbances.

Climax Communities

Ecologists used to think that succession in a given area always proceeds through the same stages to produce a specific and stable climax community.

Recent studies, however, have shown that succession doesn't always follow the same path, and that climax communities are not always uniform and stable.

Succession After Natural Disturbances

Secondary succession in healthy ecosystems following natural disturbances often reproduces the original climax community.

Healthy coral reefs and tropical rain forests often recover from storms, and healthy temperate forests and grasslands recover from wildfires.

Succession After Natural Disturbances

However, detailed studies show that some climax communities are not uniform.

Often, they have areas in varying stages of secondary succession following multiple disturbances that took place at different times.

Some climax communities are disturbed so often that they can't really be called stable.

Succession After Human-Caused Disturbances

Ecosystems may or may not recover from extensive human-caused disturbances.

Clearing and farming of tropical rain forests, for example, can change the microclimate and soil enough to prevent regrowth of the original community.

Studying Patterns of Succession

Ecologists study succession by comparing different cases and looking for similarities and differences.

Researchers who swarmed over Mount Saint Helens after it erupted in 1980 might also have studied Krakatau, for example.

Studying Patterns of Succession

On both Mount Saint Helens and Krakatau, primary succession proceeded through predictable stages.

The first plants and animals that arrived had seeds, spores, or adult stages that traveled over long distances.

Hardy pioneer species helped stabilize loose volcanic debris, enabling later species to take hold.

Historical studies in Krakatau and ongoing studies on Mount Saint Helens confirm that early stages of primary succession are slow, and that chance can play a large role in determining which species colonize at different times.