



# Timely Changes

**Grade:** 6

**Subject Areas:**  
Life Science, Earth Science,  
Social Science

**Skills:** observing,  
predicting, classifying,  
communicating, inferring

**Duration:** 1-2 hours

**Connections:**  
ecology, forestry, geology,  
natural resource planning

## Vocabulary

community

succession

primary succession

pioneer species

niche

humus

secondary succession

climax community

ecosystem

adaptation

fire suppression

chaparral

## Objective:

Students will be introduced to succession in a variety of habitats and how different stages influence different types of plants and animals.

## Materials

- labels for warm up activity (agree, disagree, and undecided)
- pictures of different stages of succession (copies for each group)
- pictures of succession to show the class (use an overhead or projector)
- examples of plants and animals that live in different stages of succession (optional)

## Standards

### Strands: Excellence in Environmental Education Guidelines

#### Strand 1 — Questioning and Analysis: E) Organizing information:

Learners are able to classify and order data, and to organize and display information in ways that help analysis and interpretation.

#### Strand 2 — Env. Processes and Systems: 2.2 The Living Environment:

**C) Systems and connections:** Learners understand major kinds of interactions among organisms or populations of organisms. **2.4**

#### Environment and Society: A) Human/environment interactions:

Learners understand that human caused changes have consequences for the immediate environment as well as for other places and future times.

#### Strand 3 — Skills for Understanding and Addressing Environmental

##### Issues: 3.1 Skills for Analyzing and Investigating Environmental

**Issues: B) Sorting out the consequences of issues:** Learners are able to apply their knowledge of ecological and human processes and systems to identify the consequences of specific environmental issues.

### California State Educational Standards:

**Life Sciences (Ecology) 5c.** Students know populations of organisms can be categorized by the functions they serve in an ecosystem.

**5d.** Students know different kinds of organisms may play similar ecological roles in similar biomes.

**5e.** Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

**Investigation and Experimentation: 7g.** Students will interpret events by sequence and time from natural phenomena.

# Background

## New Colonies

One May morning in the year 1980, Mount St. Helens erupted violently spewing out huge clouds of gas and pulverized rock with energy equaling five hundred atomic bombs. Nearby forests were scorched as temperatures approached nearly 650° F or 350°C. The powerful shock wave snapped tree trunks as if they were matchsticks and laid them down in ghostly fields of gray ash. Snow and ice melted quickly, mixing with mud and turning into a fast moving mudflow reaching speeds of 100 mph. In this one instant, the landscape on the north side of this active Cascade volcano was transformed. This life altering event has given scientists a window into how forest communities recover over time after a drastic change occurs.

An ecological **community** is a group of interacting populations living in the same place. Not all changes to a community are as drastic as the eruption of Mount St. Helens. More common occurrences are fire, floods, landslides and human alterations. Changes in the composition of species in a community over time is called succession. There are two types of succession: primary and secondary. Secondary is the more common of the two.

Certain places on Mount St. Helens were deeply covered by pumice, a type of lava rock, creating pumice fields several feet thick. After a disturbance like this, no life survives. Here primary succession will begin to take place. **Primary succession** occurs when ecological communities first establish themselves in an area devoid of life.

Volcanic eruptions and deglaciation (melting of glaciers) are two natural ways primary succession may begin. During primary succession, **pioneer species** are the first to arrive. These are species that can grow without soil like mosses and lichens. Once pioneer species become established, they slowly alter the landscape in ways that provide new niches for other organisms to survive. A **niche**

is how an organism survives in its environment.

**Secondary succession** is the sequence of changes in an ecological community following a disturbance whereby some species have survived. Secondary succession can happen through natural events or human actions. A forest fire, a mowed lawn or a landslide are all examples of

## Local Connection

### Chaparral—A unique landscape

One of the dominant plant communities covering much of the foothills of California is often overlooked –it is called chaparral. Chaparral comes from the Spanish word “chaparro” denoting a thicket of shrubby evergreen oaks. A Mediterranean climate of moist, moderate winters and hot, dry summers is the overriding environmental factor in the ecology of this landscape. California chaparral covers much of the state especially throughout the hillsides of southern California. One of its defining characteristics is “hard-leaf” vegetation also known as sclerophyllous. Leaves that are sclerophyllous have many ways of conserving water including a tough waxy coating and thick cell walls.

In Humboldt and Mendocino counties, chaparral is often found on south facing slopes and ridge tops. This shrubland is difficult to hike in without a trail because it makes dense thickets. Although of no commercial value, these dense thickets help protect hillsides from erosion and offer necessary shade for animals that live here.

An important factor determining the distribution of chaparral is the soil. It is usually found on soils that are porous and rocky. Sometimes these soils lack nutrients as in the case of serpentine soils.

There is ongoing debate about the influence of fire on chaparral. Often described as adapted to fire, hot fires or frequent fires can actually harm this unique landscape which helps define California.

disturbances leading to secondary succession. Along streams, alteration of the landscape naturally occurs in such a dynamic place. Where river bars build, small shrubs may take root. Small shrubs offer shade and may begin to develop soil. Over time, trees like alder and willow may eventually grow. Sometimes people try and keep secondary succession at a particular stage like a mowed lawn.

Classic models of succession show the intermediate stages leading to a predictable stable **climax community**. An old growth forest is an example of a climax community. In this case, it can take more than a century after a disturbance like logging or fire, for a stable climax community to be reached.

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## Constant Adaptation

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Today, scientists understand that many factors can influence succession, competition among plants being the main one. Depending on the net effect of changes to a community, not all of them will return to their original state. Therefore, the term climax community can be misleading because life is dynamic and ever changing. For instance, clearing an area increases soil temperature and decreases moisture. Logging compacts soil and can also decrease the amount of fungus in the soil. Trees that grow better in dry compacted soils like cedar might begin to dominate a forest previously dominated by Douglas fir after logging.

After the Mount St. Helens eruption, thirty years of succession have been well documented. In some of the devastated places, animals like gophers and snakes took refuge underground. As gophers tunneled their way up to the surface, they mixed ash with pre-existing soil and spread fungal spores in the process. Fungi provided the necessary environment for algae and lichens to take hold.

Ferns began to grow where wind blown soils were able to accumulate within cracks in the lava. Animals revisited places and eventually the soil began to collect **humus**, the top layer of soil composed of organic material. Humus allows soils to hold water and in these places seeds could begin to germinate. Slowly forbs, small herbaceous plants, and young shrubs began to grow. What first appeared as a barren wasteland, soon transformed itself into a colorful palette of varying types of vegetation. Once certain vegetation types grew back, the animals soon followed.

In the King Range National Conservation Area (NCA), there are no nearby active volcanoes threatening the area. However, logging, mowing and fire suppression can affect grasslands and forest ecosystems here. As ecosystems are altered, different communities of plants and animals exist. Some animals like pileated woodpeckers and fishers are dependent on large trees which offer large canopies and tree cavities to nest or hide in. Savannah sparrows and western meadow larks are two species of birds dependent on meadows for their survival. Plants and animals have special **adaptations** that allow them to survive.

Many ecological communities across the western states of America, especially in California, have adapted to fire over the ages and now depend on fire for successful distribution and reproduction. One such ecosystem is called **chaparral**. Chaparral habitats in the King Range frequently occur where moisture levels are low such as along ridge-tops and other dry sites. Here, plants that have adapted to fire are blue blossom, manzanita, and whitethorn. These shrubs provide much needed shade for many animals including frogs, lizards, snakes, birds, rabbits and coyotes. In order to maintain chaparral communities, periodic fires need to be set.

Without fire, another community is in jeopardy — grasslands. Grasslands slowly convert to forests without periodic burning. Fires maintain grasslands by killing young trees growing along their edges. Before modern times, fires occurred naturally and frequently. Some records show that on average fires occurred every five to eight years. Older trees have thick bark which protects them from most fires. Fire was used by Native Americans to manage certain landscapes like grasslands. Now days fire management programs are in place to implement controlled burns. In this regard, fires can be beneficial and an important influence in natural succession.

In some parts of the world, like the east coast of America, entire regions are undergoing succession. Here, virtually all of the hardwood forests were cut down and the woodlands are still growing back. Introduced species and major land clearing for agriculture have interfered with natural patterns of succession.

Changes to the landscapes around us are ongoing. These changes happen in a variety of habitats. By observing these changes and understanding how they influence ecosystems, people can learn about unique wildlife adaptations and can begin to implement better land management practices.

# Activity: Sorting Out Succession

## Preparation

Print and sort pictures ahead of time. Pictures should show various stages of succession for different ecosystems including a forest, a pond or lake, a river, and a meadow.

## Procedure

1. Explain to the students that they will be learning about how ecosystems respond to different changes. These changes can be natural events or human caused. First, have the entire class come up with examples of “natural” and “human” caused events that would disrupt an ecosystem. Write these two headings on the board, then ask for responses. Write examples under the appropriate heading.

2. Next, explain to the students that someone is going to read a passage and each person is going to have to agree, disagree or be undecided with the amount of prior knowledge they have. This process is similar to formulating a hypothesis—which is an educated guess. Divide the room into three sections: one for agree, one for disagree, and one for undecided. Place labels in these locations. Ask a volunteer to read each statement from the list provided. (see attached) After the first statement is read, have the students move to the location of their choice. Allow no more than 30 seconds for this to keep things moving. Encourage them to act independently of their friends and remind them it is okay to be wrong. Once everyone is in one of the three locations, read a supporting statement that

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gives additional information. Have the students move to a new location if the additional information changed their mind. Explain that humans are constantly learning new things about our environment. As new information unfolds, decision making may change too. After additional information has been given, discuss each concept further. Ask for additional information from the class. Perhaps students have personally observed a forest after a fire, a portion of lake that is more shallow than before, or a portion of river that has changed, for example.

3. After this exercise, introduce succession. Define primary succession, secondary succession, and climax community. Write these definitions on the board. An option is to have the students take notes or have them match the definition to the term provided. Show pictures of well known disturbances such as fires and the succession that follows. There are several options here. As pictures are shown to the class, have volunteers predict

- *When does primary succession take place?*
- *Which type of succession is more common: primary or secondary?*
- *Who can give an example of secondary succession?*
- *How can fires help certain ecosystems?*
- *What type of local ecosystem is reverting to forest because it isn't getting burned regularly? (grasslands)*
- *What will happen to a field or lawn if someone stops mowing it?*
- *What factors influence whether a portion of river will begin to dry up?*
- *Do the types of animals and plants stay the same in a changing environment?*
- *How might large trees versus small trees affect certain animals that live in a forest?*
- *If given time, what is the name given to a stable community like an old growth forest?*
- *What types of animals depend on a climax forest ecosystem?*

# Activity 1: Sorting Out Succession (cont.)

what type of disturbance occurred or what events might follow a particular disturbance. Continue to talk about plant and animal adaptations and how they respond to changes in an ecosystem. In changing environments, the types and abundances of different plants and animals change as well.

4. Next, if the students are not in

groups already, move them get into small groups. Pass out a set of several photographs or sketches to each group depicting different stages of succession (i.e. pioneer species, first stage, second stage and climax communities). In their groups, have students match various ecosystems and their successional events and/or have them place successional stages into

the proper sequence.

5. Go over the correct answers after giving 15-20 minutes for this exercise. Summarize succession by asking several follow up questions.

## Extensions

- Have students perform experiments growing plants under different levels of light.
- Observe succession of yeast grown in petri dishes as bacteria begins to use their byproduct: sugar.
- Take a field trip to a local park where students can compare and record old growth forest characteristics to forest that have been logged.
- Choreograph a drama or dance where factors of succession are expressed theatrically.
- Make a photographic bulletin board where students post pictures they have taken showing different stages of plant succession.
- Invite a resource manager that deals with controlled burning in our local area to talk in class.

## References

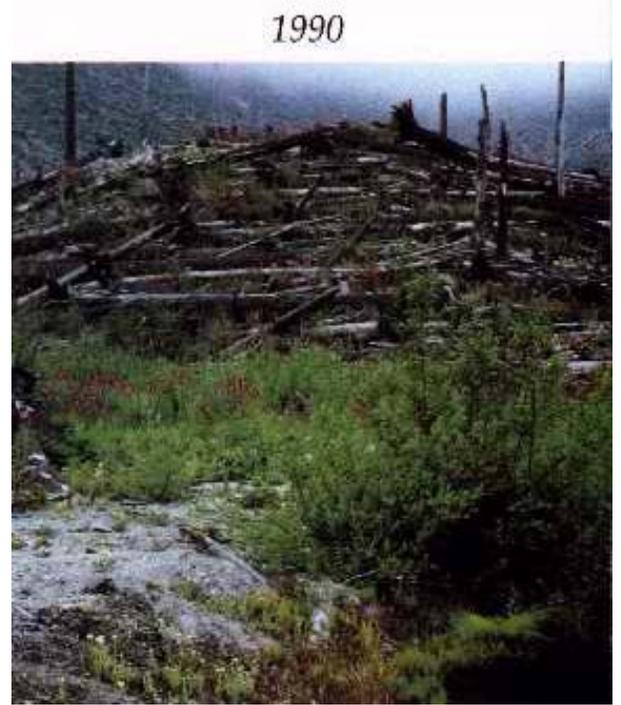
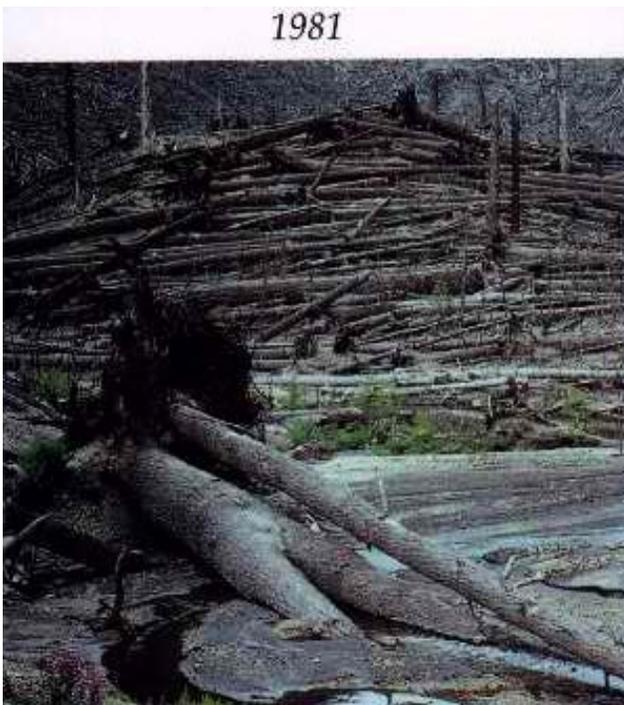
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*before eruption*



*after eruption*



*succession of a forest*

<http://www.olywa.net/radu/valerie/mshafter.html> Mt St Helens



*Good example of succession to show students.  
<http://www.swisseduc.ch>*



# True or False?

Have the students decide on: “true” or “false”

**1. Logged forests, if given enough time, will always grow back into old growth forests.**

*False.*

Logging can compact soils and reduce the amount of fungi in the soil.

**2. After a cleared meadow grows back, the first things to grow are small shrubs.**

*False.*

The type of vegetation that grows in an area depends on many things including amount of light and soil type.

**3. Slow moving water releases more sediment than fast moving water.**

*True.*

In summer, many places with the most sand and sediment are above stream of fallen logs.

**4. A lake can get filled in and over time can turn into a meadow.**

*True.*

Fallen trees and leaves often accumulate in ponds and lakes.

**5. All wildfires are bad and, therefore, should always be extinguished no matter where they happen.**

*False.*

Many plants have adapted to wildfires and some won't reproduce without fire.