

Focused Learning Lesson
Life Science
Grades 9-12
SE-H-A4

Overview:

Succession is the natural progression of change within an ecosystem over time. Students will review the definition of succession and recognize the basic differences between primary and secondary succession. The students will create “flip-books” to demonstrate the progression of change within an ecosystem.

Approximate Duration: 45 minutes

Benchmark:

SE-H-A4 understanding that change is a fundamental characteristic of every ecosystem and that ecosystems have varying capacities for change and recovery

SE GLE: 5. Examine and discuss the major stages of succession, describing the generalized sequential order of the types of plant species.

Benchmark:

SI-H-A2 designing and conducting scientific investigations

SI GLE: 2. Describe how investigations can be observation, description, literature survey, classification, or experimentation.

Objectives:

1. The students will describe the basic levels of succession
2. The students will differentiate between primary and secondary succession

Teacher Preparation:

- Review the definitions of succession, and give examples of both primary and secondary succession.
- Read through Attachment 1: Background Information
- Pre-cut the squares or allow students time to prepare.

Materials/Equipment:

- 20-25 two inch squares of paper (or use Post-it Notes pads)
- colored pencils
- stapler

Lesson Procedures:

Set or Opener:

Ask the students to close their eyes and visualize a forest after it has burned. Tell them to open their eyes and quickly record their description of what would happen to an ecosystem in the years following a forest fire. Their descriptions should include the basic details of ecological succession. If not, use guiding questions to elicit accurate information on succession. Next ask them how succession might proceed following a flood or lava flow at a coastal area?

Prior to the actual activity explain the following terms to students.

Succession: The natural changes and species replacement in communities of an ecosystem.

Primary succession begins in an area that is essentially lifeless, where there is no soil in a terrestrial ecosystem or no bottom sediment in an aquatic ecosystem. It is the colonization of barren land by organisms. (Examples are rocks exposed after a glacier movement, or cooled lava following a volcanic eruption)

Secondary succession is the sequence of changes that takes place after an existing community of organisms is disrupted. It begins in an area where the natural community of organisms has been disturbed, removed, or destroyed but the soil or bottom sediment remains. (Examples would include abandoned farmland, burned or cut forests, polluted ecosystems, and damage from floods or dams.)

Body of the Lesson:

1. The students will create small sketches of a pond going through the stages of succession, an island scene (starting with a lava flow), or a forest following a fire.
2. The first sketch should be a simple drawing of the beginning scene of the ecosystem.
3. They will create subsequent scenes showing gradual changes in the ecosystem. Trace the prior scene and make slight alterations to show the change, such as the grass a little taller, or the trees a little wider and taller.
4. The final scene should depict the mature or recovered ecosystem.
5. Allow students to use reference materials and textbooks to research succession and changes in an ecosystem that is recovering.
6. Instruct students to align all 20 scenes in reverse order and staple along the left hand side of the stack.
7. Upon completion, have students lift the pages, and release one at a time to watch the animated change in the ecosystem.
8. As time allows, have students share their flipbooks.

Closure:

Select an example of several types of succession in different ecosystems and have the students describe the changes through the years.

Attachments:

Attachment 1: Teacher Background

Assessment:

The teacher can assess student flipbooks using the following rubric. Explanations can be given orally or written to accompany the flipbooks.

Criteria	5	4	3	2	1-0
Explanation	All facts written/spoken about the pictured succession are accurate	Most of the facts written/spoken about the pictured succession are accurate	About half of the facts written/spoken about the pictured succession are accurate	Less than half of the facts written/spoken about the pictured succession are accurate	None/few of the facts written/spoken about the pictured succession are accurate
Graphics	All of the pictures accurately depict the succession of the ecosystem	Most of the pictures accurately depict the succession of the ecosystem	Half of the pictures accurately depict the succession of the ecosystem	Less than half of the pictures accurately depict the succession of the ecosystem	Few/None of the pictures accurately depict the succession of the ecosystem

References:

Johnson, G. & Raven, P. (2004). *Biology*. Austin, TX: Holt, Rinehart and Wilson.

Miller, G. (2002). *Living in the Environment*. Belmont, CA: Thomson Learning.

Restoring Earth Co.UK. *Ecological Succession*. (February, 2004)

http://www.restoringearth.co.uk/education/a-level/science/environmental_science/ecology/succession/succession.htm

Attachment 1

Teacher Background

Ecological Succession

Succession is a key topic to understanding conservation and biodiversity. Ecological succession is the process by which an ecosystem changes over time and results in the formation of a stable community. There are two types of ecological succession, primary and secondary.

Primary succession:

This process begins when succession is started by the formation of totally new land. New land may occur naturally or be caused by humans. *New land* is referring to a newly formed landmass such as a volcanic island. When first formed, the landmass consists of pure rocks. Plants (flora) cannot live here, and so no animal life (fauna) can live here. These islands are very inhospitable and are identified mostly by an almost total lack of soil.

Over a period of time, a thin layer of soil may form through the processes of weathering. Some bacteria and lichens may have already colonized the rocks by absorbing nutrients from the rocks. But it is not until the first weathering has formed the thin soil that succession really starts. At this point mosses and ferns are able to grow. These mosses and ferns dominate the area and the lichens die.

Many of these early plants are legumes, which help to fertilize the soil. Legumes contain nitrogen-fixing bacteria in their roots allowing them to inhabit soils that are low in nitrogen. Plants cannot live in soils that do not contain nitrogen because they require nitrogen to synthesize proteins. Legumes can live in such environments because the bacteria in their roots will allow them to use nitrogen from the air (once it has been fixed in the soil as nitrates). This gives them an advantage over plants without nitrogen-fixing bacteria (such as *Rhizobium*) in their roots. When the soil becomes more fertile and thicker, due to decaying organic matter (humus) and more weathering of the bedrock, other flora can colonize the area. As the plant life changes, so does the fauna/animals that live in the area.

Succession ends when a climax community is reached. A climax community is normally a forest ecosystem, as trees are the most efficient at using sunlight. However, areas that have too low or too high amounts of solar insulation may have different climax communities. They could be described as ecosystems that have reached the carrying capacity of their environment. The carrying capacity is the amount of life an ecosystem can sustain over time.

Secondary succession:

This is much the same as primary succession except it occurs when the current life forms are removed abruptly. This may be due to a natural disaster such as an earthquake, fire, or volcanic eruption, or by human effects such as deforestation and strip mining.

This time there is already soil present, and probably seeds also. This means the succession will happen more rapidly than primary succession. Windblown plants that are tolerant to high levels of sun and grow fast, called pioneer or fugitive species, will colonize the area. These will then be replaced by herbaceous plants, which will then be followed by bushes and trees if the ecosystem can support such flora.

Adapted from:

Restoring Earth Co.UK. *Ecological Succession*. (February, 2004)

http://www.restoringearth.co.uk/education/a-level/science/environmental_science/ecology/succession/succession.htm

Example of the sequence in flora succession:

bacteria and lichens → mosses → ferns → legumes → grasses →
bushes → trees

*Succession of fauna in an ecosystem is greatly dependent on the geographical location and the available flora of the area. Protists and insects usually appear early in succession.