

Studying Succession



Grades: 5-8, Biology, Environmental Systems

TEKS:

5: 1A-G, 3A-C, 5A & D & F-G, 11, 12A & C

6: 1A-G, 3A-C, 5A & D & F-G, 11B, 12A

7: 1A-G, 3A-C, 5A & D & F-G

8: 1A-G, 3A-C, 5A & D & F-G, 12B-C

BIO: 1A-G, 3A-C, 4A, 13D

ES: 1A-G, 3A-C, 4A, 5A, 9A & C, 11B

Topics:

Biodiversity

Biotic (living)/Abiotic (nonliving)

Habitats and Ecosystems

Succession

Wildlife

Methodologies:

Critical Thinking

Poster/Visual Aid

Research

Setting: Classroom

Activity Time: two 45-60 minute periods

Additional Subjects: ELAR, Social Studies

Objective:

Students will discover how succession contributes to the sustainability of an ecosystem, including its wildlife. They will identify and compare primary and secondary successional events and determine how succession affects plant and animal habitats.

Materials:

Provided

Succession 101

Venn Diagram

Venn Diagram Key

Not Provided

Pencils

Markers

Per Group

Large or legal-size paper

Internet

Vocabulary:

abiotic, biodiversity, biotic, climax community, conservation, intermediate species, pioneer species, succession



Studying Succession

Background:

Without succession, Earth would lack a variety of life or biodiversity. Ecosystems are constantly changing, and some changes occur so slowly that they are hardly noticed. This gradual change of organisms within an ecosystem is a natural process, known as succession. As growth occurs, plant species are replaced by others and a stable ecosystem, including wildlife, slowly emerges. As an ecosystem goes through successional changes from an older stage to a younger stage and vice versa, the habitat will adapt to support specific populations of living things. Successional processes occur in all ecosystems on Earth, greatly influencing plant and animal survival.

There are two types of succession; primary and secondary succession. These stages are alike in some ways and different in others, but they are both very important and can be broken down into stages. More information can be found on the *Succession 101* document.

Activity Preparation:

- Make copies of the Venn diagram and *Succession 101* document for each student

Procedure:

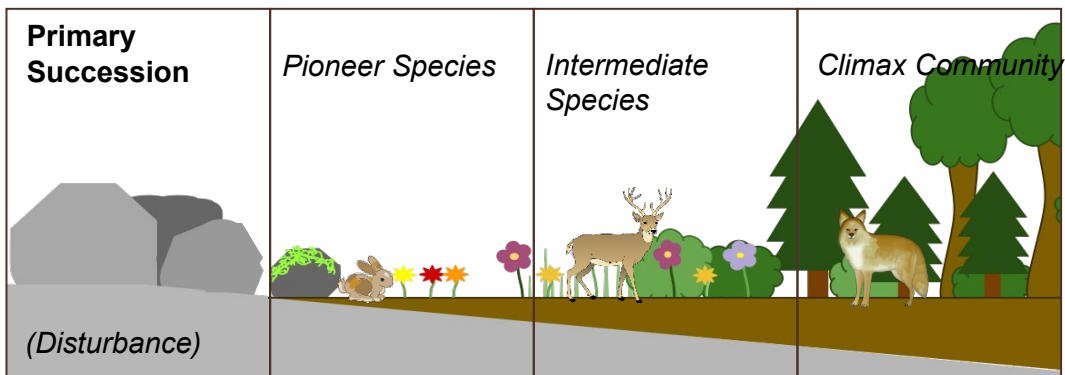
Discussion

1. Students can be grouped for this activity, as it may aid discussion.
2. Provide each student with the *Succession 101* document or project it on the screen and solicit volunteers to read it aloud to the class. After reading it, discuss the changes that take place during successional events. Point out how each successional stage has characteristics, and how they can be interchanged by natural disturbances or through human activity.
3. Provide every student with the Venn diagram. Instruct students to use the Venn diagram to compare and contrast succession by stating at least two or more facts for each of the three categories. Alternatively, display a Venn diagram on the board and have students add content as a class.
4. When complete, ask the following questions to check for understanding. Allow students to refer to the *Succession 101* document or to their Venn diagram if needed.
 - Write the following words or groups of words on the board. *shrubs, lichens, grass, slow-growing trees (oaks), solid bare rock, fast-growing trees (pines)*
 - Who can identify the correct order from the beginning to the end during a succession event? *key - solid bare rock, lichens, grass, shrubs, fast-growing trees (pines), slow-growing trees (oaks)*
 - What types of organisms are pioneer species in primary succession? *Lichens, algae, and moss can be present during primary succession.*
 - Why are lichens, algae, or moss important to primary succession? *They release chemicals on the bare rock, producing small particles of soil. When they die, they decompose, adding nutrients to the soil.*
 - During secondary succession, what organisms make up pioneer species? *Grass and weeds make up pioneer species during secondary succession.*

- Why are stages of succession important to wildlife? *The characteristics of each stage must be able to meet their basic needs. For example, in primary succession, a mammal or bird could not survive on the pioneer species of lichens, fungus, or moss.*
 - Explain why a climax community is more sustainable and diverse than a community with pioneer species alone? *The climax community has a variety of living organisms with longer life spans, such as tall, hardy trees, grasses, and shrubs, growing in nutrient-rich soil. The pioneer species, which includes lichens, weeds, and grasses, have shorter life spans. Their remains create nutrient-rich soil for the stable climax community organisms.*
5. Define stewardship as the responsible planning and management of resources such as land, water, and animals. Ask the following questions.
- Suppose your family has a garden that is not maintained for many months. What species is most likely to grow first? *Weeds and grasses will likely be the first species to grow.*
 - What can you do for your garden to display an act of stewardship?
 - What stewardship actions can you do as nature caretakers at school or in your community, including both biotic and abiotic things?

Activity

1. Provide each student with a piece of legal-size copy paper.
2. Students will illustrate a sequence of ecosystem changes occurring during stages of a succession event.
3. Before illustrating, students need to prepare their paper by dividing it into 4 sections, similar to the images in the Succession 101 document. With the page in a landscape orientation, students will fold their paper in half two times so it creates 4 uniform sections. See example.



4. Students may use the Internet to discover animals that best fit each stage of succession. Illustrations must contain the following:
 - Title (either primary or secondary succession)
 - The first section will indicate a disturbance caused by nature or through human activity.
 - Stages titled with pioneer species, intermediate species, and climax community, depicting phases of growth.
 - Plant species in the appropriate stage of succession that is relative to their succession type.
 - Wildlife that is relative to the appropriate stages.

Wrap-up

1. When complete, allow time for students to present and explain their work to the class.
2. Ask students to think about how often they notice abandoned or neglected lawns or parks, within their own community, caused by an interruption in mowing and general maintenance. Is this an example of primary or secondary succession? Why or why not? *It is secondary because the soil must be present in the secondary. If the grass had once been mowed, the soil was present.*
3. How can succession affect animal habitats and microhabitats within your community, including both biotic and abiotic things? *As interactions between living and nonliving things occur, organisms might be forced to compete to meet basic needs for survival. They depend upon water, temperature ranges, ample space, and soil to provide food.*

Extension

Students may research a natural disaster that resulted in succession, such as Mount St. Helen's after its major eruption in 1980. Other possible events, such as the forest fires in California or Australia, tsunamis, or human activity can be researched as well as any other successional events that have occurred.

Have students research the effects of succession and the variation in biotic and abiotic factors in different biomes.

Succession 101

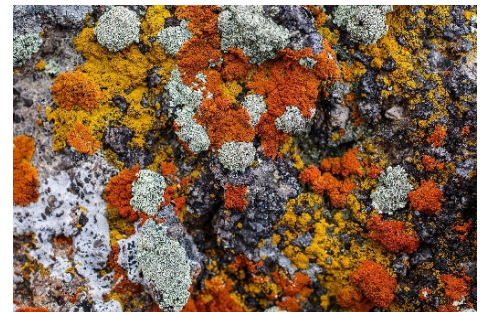
Without succession, Earth would lack a variety of life or biodiversity. Ecosystems are constantly changing, and most changes occur so slowly they that are hardly noticed. This gradual change of organisms within an ecosystem is a natural process, known as succession. As growth occurs, plant species are replaced by others, and a stable ecosystem, including wildlife, slowly emerges. As an ecosystem goes through successional changes the habitat will adapt to support specific populations of living (biotic) things. Successional processes occur in all ecosystems on Earth, greatly influencing plant and animal survival.

There are two types of succession: primary and secondary succession. These stages are alike in some ways and different in others, but they are both very important and can be broken down into stages.

Primary succession is the result of a catastrophic event such as a volcanic eruption or glacial movement, leaving nothing behind but exposed rock, with no presence of biotic factors or living things. Over time, life forms will begin to inhabit the barren area. For example, primary succession may be the result of an ecosystem slowly developing on bare rock or a sand dune. It can last for a period of a thousand years or longer. The events that occur during primary succession are better understood by breaking them down into stages.



- Stage 1 – Lichens, pictured on the right, are unique organisms, or living (biotic) things, that are formed through a symbiotic relationship between algae and fungus. Known as a **pioneer species**, they grow on bare rock. They release chemicals to break down the rock as they grow, producing small particles of soil. When they die, they decompose, adding nutrients to the soil.
 - Moss or other small plants may begin to grow once a bit of soil is present. They thrive and help to produce more soil, as they die and decompose.
 - Animals may drop seeds over the newly formed soil, or seeds are distributed by wind. When enough soil is present, weeds, fast-growing grasses, and wildflowers will begin to grow. Then as they die and decompose, they also become part of the soil.
- Stage 2 - As the soil becomes plentiful and nutrient rich, longer-living (biotic) shrubs and fast-growing trees begin to grow, known as **intermediate species**. Pine trees, pictured to the right, will be the first trees to grow in these areas because they grow fast and have less need for water and soil nutrients.

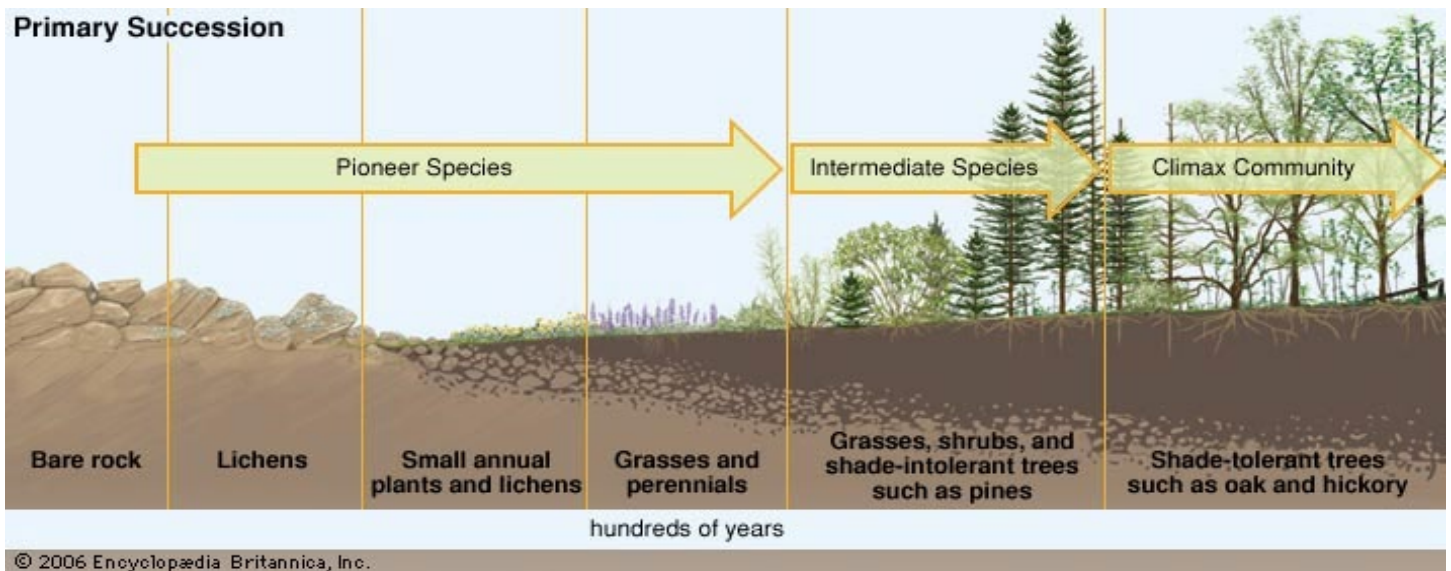


- Stage 3 - Larger trees will replace pine trees. As the other trees grow much taller, the pine trees no longer receive enough sunlight and they will die. Over time, a mature forest is formed known as the **climax community**, as seen on the right.



As plants change, it is important to remember that animals will also be influenced by successional changes. In addition, as an area changes from a younger stage to an older more established stage, or returns to a younger stage, animal habitats will also change. Therefore, animals are also associated with the stage of succession. For example, there are few animals that can survive on lichens and mosses, so squirrels and other mammals would not live in ecosystems in the first stage of succession. Once an ecosystem has progressed to include grasses, it will be a more suitable habitat for other species of wildlife such as insects, birds, spiders, and smaller mammals such as mice, rabbits, and voles.

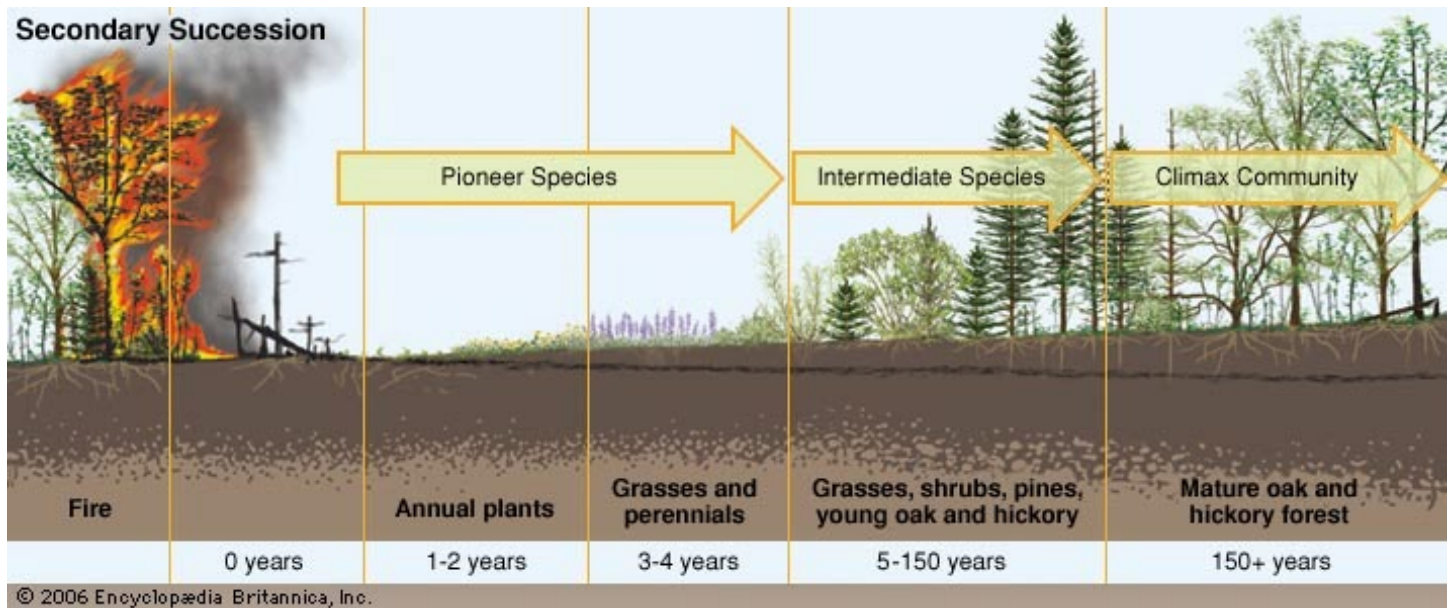
As shrubs develop, other animals are attracted to the area because they use shrubs for shelter. With the introduction of trees, squirrels, deer, bears, turkeys, and other birds may be present. This community is made up of plants and animals that have completely reached their potential and the successional process over hundreds of years comes to an end. Once a community has reached its climax, the ecosystem may remain balanced for a very long time, provided there are no major events of disturbance. During primary succession, as seen below, climax communities may be threatened by natural events, such as floods, forest fires, tornadoes, or earthquakes. Additionally, human activity can become a threat due to the construction of roads and cities, farming, deforestation, or clear-cutting. If any of these events occur, primary succession may end. When one of the previously mentioned events occurs, secondary succession will begin.



Secondary succession occurs over a period of 50-200 years, happening much more quickly than primary succession, and must begin in a place where **soil** is present. As previously mentioned, the process of regrowth begins following a disturbance in an area where life previously existed. As with primary succession, it also occurs in stages. As ecosystems become more stable, a larger variety of species will exist in an area. Basically, the difference that exists between primary and secondary succession is the time in years for each ecosystem to replenish itself, the causes for each, and whether or not there is a presence of soil.

- Stage 1 – Soil is present, with seeds, so weeds and grasses, known as **pioneer species**, can grow.
- Stage 2 – Shrubs and fast-growing pine trees, known as **intermediate species**, begin to grow.
- Stage 3 – Slow-growing larger trees replace pine trees and are much taller, making up the **climax community**. Eventually, a stable community is re-established with soil containing an abundance of nutrients.

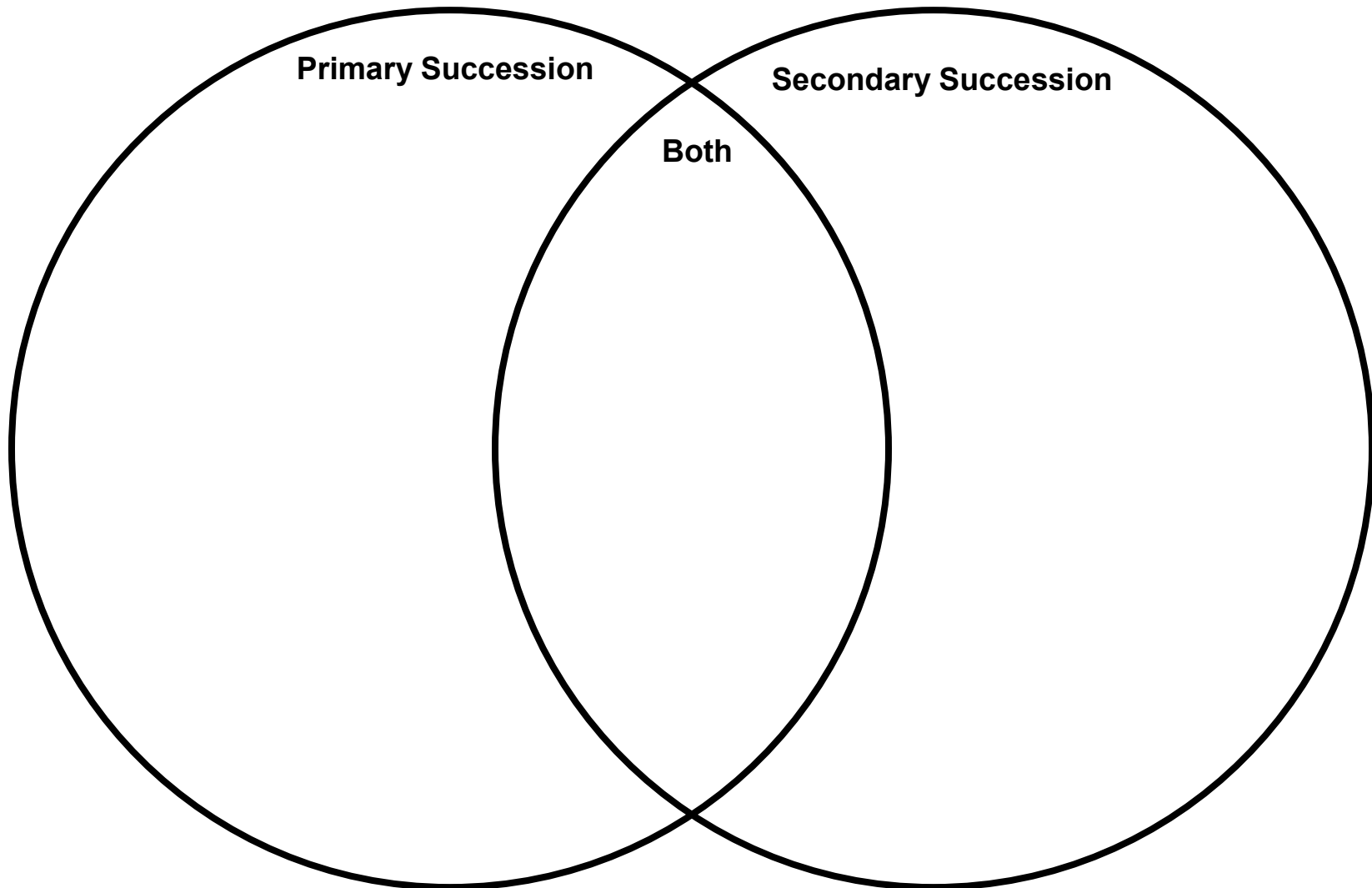
Primary and secondary succession are the same once **grass** has begun to grow. Ecosystem biodiversity is largely affected by successional changes, which may be interchanged through disturbances caused by natural events or through human activity. Ecosystems where succession is at an earlier stage have fewer thriving species.



Name _____ Date _____

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Using the *Succession 101* document, complete the Venn diagram to compare and contrast characteristics of successional events. Include at least two facts for each of the three categories.



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