



Succession in the Forest

Curriculum Connection

- *Grade 7 Science: Unit A: Interactions & Ecosystems* (STS & Knowledge Outcomes 1, 3)
- *Science 20: Unit D: Changes in Living Systems* (20-D1.2k, 20-D1.3k)
- *Biology 30: Unit D: Population & Community Dynamics* (30-D2.3k)

Objectives

- *Students will determine the main steps in the succession of the boreal forest from disturbance to climax community*
- *Students will analyze the effects of human and natural disturbance on the stages of succession*

Lesson/Activity Duration

- One class period

Materials Needed

- *Stages in Succession* student worksheet - download and print off one copy per student

Classroom Arrangement

- Small groups for Part 1
- Individual for Part 2

Background Information

Succession is the progression of an ecosystem from immediately after a disturbance (i.e. a forest fire) to a climax, or stable, community. Forest ecosystems are dynamic and may not always pass through the entire cycle before a natural or human disturbance comes through. Succession is a scientific model that is continually being studied and updated. For example, early theories of succession in an aspen poplar/white spruce/balsam fir forest suggested that white spruce and balsam fir seeds don't germinate until later in the successional cycle. Current research is suggesting that all species begin to grow right after disturbance, with spruce and balsam fir growing at very slow rates relative to aspen and other sun-loving species.

Important Vocabulary

- Primary succession – the progression of an ecosystem in an area that did not have organisms originally (i.e. areas exposed after deglaciation)
- Secondary succession – the progression of an ecosystem in an area that had organisms that were affected by a major disturbance (i.e. areas after flooding or fire)
- Shade tolerant – organisms or species that are able to grow even in areas where little sunlight reaches them
- Disturbance – something that causes great change in an ecosystem (i.e. disease or insect infestation, fire)
- Climax community – a stable, generally older stage in an ecosystem that changes very little until a major disturbance occurs
- Forest layers – vertical divisions in the forest: canopy (top layer – composed of dominant trees), sub-canopy (middle layer – composed of sub-dominant trees and tall shrubs), understory (ground layer – composed of ground-dwelling shrubs, wildflowers,

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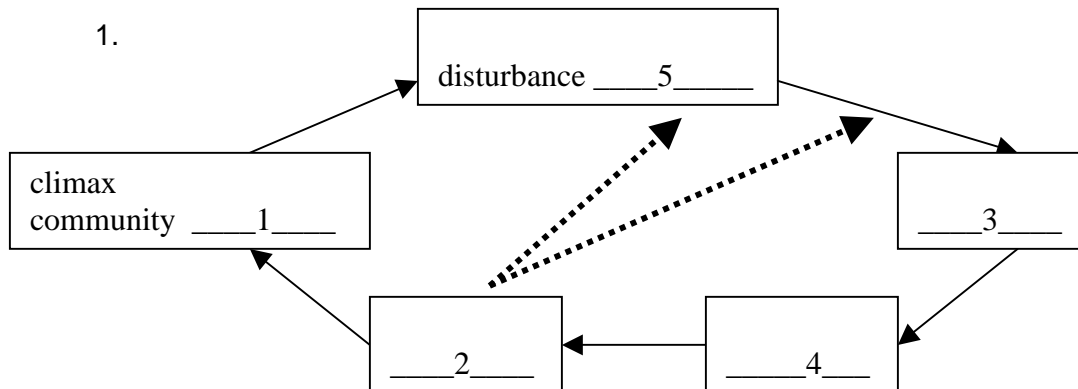
mosses, and decomposing matter), soil layers (sub-ground layer – composed of humus, decomposed matter, and mineral soil)

Procedure

- Hand out one copy of *Succession in the Forest* student worksheet to each student
- Review vocabulary listed above before starting
- Have students follow instructions on worksheet and work through questions.
- Discuss answers

For more information on Alberta-Pacific's forest / harvest planning, [click here](#).

Answer Key



2. (see broken arrows above) Students may decide that harvesting is similar to fire or other natural disturbance and place their arrow back at the start of the cycle. Other students may think that harvesting leaves behind more plant life than a fire does and will place their arrow somewhere between the first two stages.

3. Answers will vary, but the important part that students should understand is that each organism is adapted to certain conditions that may or may not be available at all times in the successional cycle. Some organisms are long-lived and individuals survive throughout the entire cycle, others are short-lived but individuals can adapt to many different conditions so the *species* is found throughout the entire cycle, and still others are short-lived and only adapted to one or two stages so the species is only found for portions of the cycle.

4. Alberta forest ecosystems are adapted to disturbance – the average fire cycle (the frequency that fire comes through) before human settlement was 80 to 120 years with it taking much longer than that to reach the climax community stage. Harvesting plans are based on a 100 year rotation, again shorter than the climax community stage, so it is not as common to find climax community forests or see the whole successional cycle in Alberta.



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5. Certain areas of provincial and national parks that haven't burned or had major disturbance in a couple of hundred years, patches of forest that fire has passed by (i.e. some wetland forests)
6. Succession of a forest in Alberta is on a much shorter timeline – rainforest succession can take thousands of years.

Stages in Succession

Name: _____

Succession is the progression of a forest from immediately after a disturbance (i.e. a forest fire) to a climax, or stable, community. It can most easily be pictured as a cycle or continuous circle. Read through the descriptions below of the typical stages in the succession of a boreal forest ecosystem. On the chart on the next page, put the five stages in order from disturbance to climax community.

The forest is filled with coniferous (evergreen) trees. White spruce is the dominant tree species, with shade-tolerant balsam fir also growing into the canopy layer of the forest. Although the understory layer is fairly shaded, habitat for wildlife can be abundant, with logs at various stages of decomposition, and some standing dead trees left for woodpeckers and other animals. Squirrels have an abundance of seeds in the coniferous cones and their main predator, the pine marten, is also present.

1

The shade-intolerant aspen and pine trees have developed into the mature canopy layer of the forest. Shade-tolerant shrubs and white spruce trees continue to grow in the sub-canopy along with herbs, mosses, and balsam fir seedlings in the understory. Nutrients are continually added to the soil as logs and early plants decompose and the rich variety of layers provide good habitat for a variety of animals from songbirds to porcupine to lynx.

2

Dead trees continue to break down and provide nutrients to the soil, while the tree seedlings established right after disturbance continue to grow. Aspen and pine trees, sun-loving species, take over, shading the grass, while raspberry, wild rose, and other shrubs grow, providing food for animals such as mice, snowshoe hare, deer, and black bear,

3

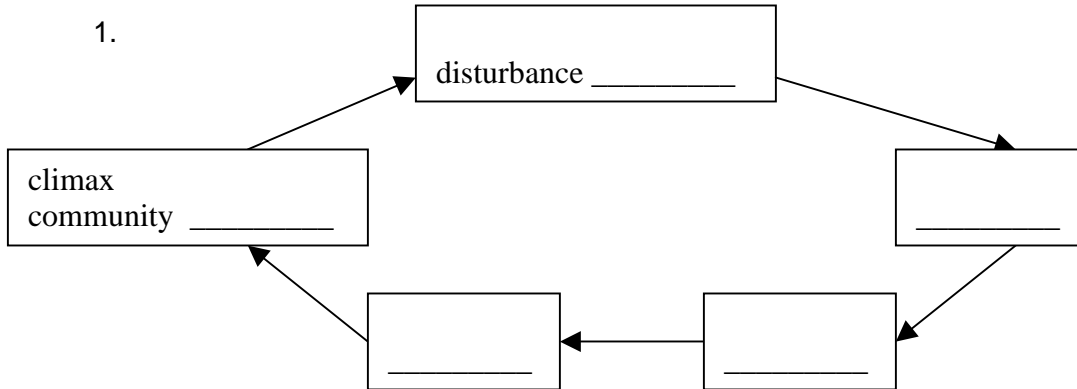
The aspen and pine trees begin to die from old age, making room for the smaller sub-canopy spruce to become to main canopy tree. The mosses, ferns, and other understory plants continue to grow slowly, with balsam fir seedlings growing into the sub-canopy layer of the forest. Animals dependent on more open, deciduous forests gradually move out in favor of those preferring older, coniferous-dominated forests.

4

Fire passes through the forest, burning vegetation, opening up the forest, and returning nutrients to the soil in the ash left behind. Seeds, either those left unburned or those that blow in from other areas, germinate, with grasses and other plants like fireweed coming up first. Sun-loving tree seedlings like aspen and pine also begin to grow. Dead trees begin to break down, providing habitat for everything from birds to insects.

5

1.



2. Draw an arrow on your chart to indicate what would happen to the succession of a forest if harvesting occurred midway through the life of the forest.

3. Pick one organism from the provided cards and describe its role in the succession of the forest. Include in your description:

- when it's first seen in the forest
- what happens to it over the life of the forest,
- why it is prominent at some times but not others.

4. How often do you think a forest ecosystem in Alberta goes through all of the stages of succession described above? Why do you think this is so? (hint – think about both natural and human disturbance in the forest)

5. Where in Alberta do you think you might be able to find areas of forest that are at the climax community stage?

6. Compare the succession of a forest in Alberta to the succession of a forest in a tropical rainforest.