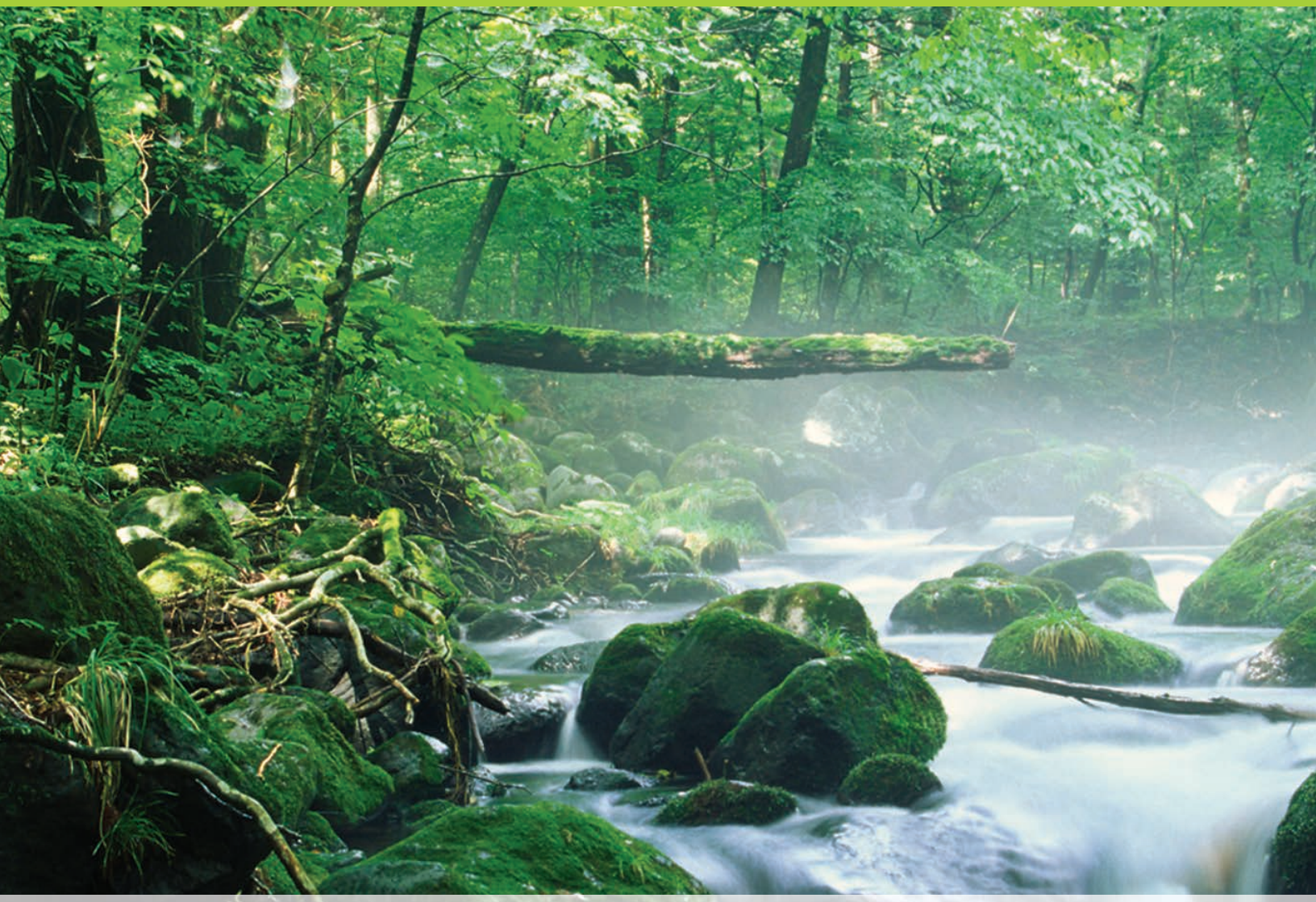
Change in Forest Ecosystems

Nº. 25

INTERMEDIATE

Social Studies



LESSON SUMMARY

To understand that change is an inherent part of the natural forest ecosystem by examining the importance of fire in natural regeneration of certain boreal tree species.

FORESTS ONTARIO

Focus on Forests

Activity Information

Estimated Duration: 1.5 to 2 hours, or over the year.

Materials: Several different types of cones (e.g. at least two each of hemlock, jack pine, scotch pine, white pine, and black spruce cones) collected in the summer or fall when cones are brown and beginning to open, one large beaker or other container, water, drying ovens, copies of experiment sheets (one per student or group of students).

Setting: Indoors

Key Vocabulary: Agents of change, colonize, pioneer community, succession.

Teacher Background

To the casual visitor, the forest seems to be a very stable and unchanging part of the landscape. In fact, life in the forest is changing all the time. Certain factors, called agents of change, play a natural role in affecting life in the forest over time.

Most change is slow. Each year some trees die, while others germinate from seeds and eventually grow to maturity and then old age. Variations in the weather from year to year (especially in precipitation) affect the rate of growth and the species of trees that will grow in the forest. Some changes, such as an occasional fire or pest infestation, rapidly alter the forest's appearance.

Left to itself, a forest in northern Ontario goes through a cycle of growth that takes hundreds of years. Inevitably, during this long period, the forest is subjected to damage from such agents of change as wind and ice, animals, pests, disease, and fires. The older the forest is, the more vulnerable it is to these destructive forces. An old forest, with densely packed trees and dead, fallen timber, suffers more from both disease and fire. Eventually, such a stand will be consumed by fire, insects, or disease and the cycle of growth will begin again.

The cleared space left after a fire is soon colonized by the germinated seeds of many plants that thrive on the open, sunny areas. Grasses, fireweed, and various shrubs are usually the first to develop, but they are soon overtaken by fast-growing trees such as birch, poplar, and balsam fir. These trees are called the pioneer species, because they are the first to appear in a cleared area. They also thrive in full sunlight and grow rapidly, but they are short-lived. As they grow, they alter the open space and change the conditions of the environment, creating some shade, penetrating the soil with their roots, trapping the rainfall, and slowing the winds that blow through the once-open space. By transforming the area, they gradually eliminate the environment in which they themselves thrive and prepare the area for the invasion of the next plant community, made up of species that prefer the new conditions. This orderly sequence of events, in which first one group of plants (and animals) then another occupies the same area, is called succession.

Another common example of succession in the forest centres around the beaver pond. When a colony of beavers dam a stream, they create a flood that eventually kills the surrounding trees and forms an open pond in the forest. Plants that like damp conditions thrive around the margins of this new body of water. After some years, the shallow pond begins to dry out and the pond-edge plants, such as cattails and sedges, march inwards with the shrinkage edge of the water. As the old border of the pond grows drier, the cattails die and shrubs take over.

ACTIVITY

Activity #1

Step 1 Introduce the idea that change is a part of nature. Ask students to consider some of the changes that occur in a forest ecosystem over a period of time (seasonally and annually). Brainstorm a list of changes to trees that might result from changes in the populations of forest animals such as wolves, deer, squirrels, beavers, and leaf-eating insects. What changes might result from a series of years with heavy snowfall or with summer drought?

Step 2 Over the course of the term or school year, observe changes in plant life that are taking place on the school grounds or in a nearby forest or uncultivated area. If possible, define and enclose the area being studied with string. Have students design charts to record observations. On a bi-weekly basis (less in winter months), sketch or take photographs of the area. Make note of any changes and mount these comments with the photographs and sketches for display purposes. In particular, make note of changes in the types and numbers of plants and animals, especially insects, the rates of growth of vegetation, and the impact of animal and human presence.

Activity #2

Step 1 Ask the students to consider the following questions and have them devise ways to test their answers:

- Why do cones need to open?
- What causes cones to open?
- How can we test our ideas?
- What will happen if the cones don't open?
- Do all species act the same?
- We are told that jack pine depend on fire for regeneration. If this is true, what particular characteristics will jack pine cones have?
- Are there any other cones that have similar characteristics?

Step 2 Assist students in thinking through each step of their tests and encourage them to predict what might happen. Help them conduct their tests and reach conclusions. Have students design their own charts to record the data collected on this experiment. What information will they need (e.g. name of species, time in water/oven, change that occurred, time out of water, change that occurred)? Alternatively, have students conduct the experiments on Experiment Sheet #1 or #2 or use them as a model.

Notes

The length of the activities in this lesson varies from one or two class periods to over the course of the school year.

The focus on Activity #2 is on a relatively minute process of change – the conditions that change a tightly closed cone to an open one in order for it to release its seeds.

Collect cones in the late summer or early fall when they are brown and beginning to open. Discard cones that are damaged or discolored or appear to be diseased.

Extension

Write a story about the life cycle of a forest as written by a tree (e.g. describe how the tree grows up, how is competes with other vegetation, and how it is subject to serious damage by fire, insects, disease, browsing by animals, flooding and winter storms. Describe the wildlife that use the tree as habitat and gather or disperse the tree's seeds. What happens in the end?

Extra Activities

Describe the changes in the composition of wildlife as a forest evolves from one stage to another. Select a method (e.g. flow chart, essay, poster) to illustrate this.

Make a poster that has "Change in the Forest Ecosystem" as a theme. Develop a series of diagrams to illustrate forest succession. Select either a northern or a southern forest.