Seed Forecasting

Nº. 92

PRIMARY/JUNIOR

Science

LESSON SUMMARY

Students will learn how to assess the potential quality of a seed crop and conduct tests to determine seed viability.

Activity Information

Grade: Primary/Junior

Estimated Duration: 1.5 hours

Materials: Activity 1: None.

Activity 2: Small bucket, water, acorns, maple keys or cones.

Setting: Indoors/Outdoors

Key Vocabulary: Seeds, cut test, potential, nut, acorn, tree, cones

Learning Goals:

- Students will become familiar with the process through which seeds are formed;
- Students know what signs to look for when assessing the health of a seed crop.

Curriculum Connections:

Grade 1

Science: NEEDS AND CHARACTERISTICS OF LIVING THINGS

2.3 investigate and compare the physical characteristics of a variety of plants and animals, including humans *(e.g., some plants produce flowers and some do not; most plants have roots; some animals have two legs, while others have four; all animals have sense organs).*

Grade 3

Science: UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN PLANTS

2.2 observe and compare the parts of a variety of plants (e.g., roots of grass, carrot, dandelion; stem of cactus, carnation, tree; leaves of geranium, spider plant, pine tree.

3.3 describe the changes that different plants undergo in their life cycles *(e.g., some plants grow from bulbs to flowers, and when the flowers die off the bulb produces little bulbs that will bloom the next year; some plants grow from germination of a seed to the production of a fruit containing seeds that are then scattered by humans, animals, or the wind so that new plants can grow).*

Science: UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN ANIMALS

3.3 describe ways in which living things, including humans, depend on air and water *(e.g., most animals, including humans breathe air to stay alive; wind generates energy, disperses seeds; all living things need to drink or absorb water to stay alive; water is used for washing and bathing, transportation, energy generation).*

Teacher Background

Seeds are produced through reproduction, when pollen from the male flower lands on the female flower and develops into a seed. Seed production does not always occur annually for trees. It is dependant on the biological characteristics of the species, as well as external conditions including weather, insects, disease and predation by birds and mammals. Intervals between good crop years follow a pattern and this is referred to as periodicity. Watching a tree to determine the potential of a seed production is referred to as seed forecasting. By watching trees and knowing the years in which trees let out high quantity and quality of seeds, it helps to more effectively plan seed collection for future tree planting.

Collecting seeds in good seed years has many advantages: cost of collection is lower, seeds will usually be of higher quality and will store better, lower proportion of seeds will have damage from insects, and it conserves high genetic diversity because good seed years have more trees contributing pollen.

In Ontario, planting tree (artificial regeneration) is an important part of the forest regeneration strategy. Collecting seeds, tracking those that germinate and compiling information about seed availability, location, type and quantity is an important component in Ontario's tree planting strategy. Planting native tree species that are well adapted to local conditions also helps to ensure that those planted trees thrive. The most effective way to ensure that species are well adapted to the area is to grow a tree from local seed.

Over the course of a year, look for different signs to determine the seed potential of a specific tree. In the spring it is important to look at the seeds and cones. The quantity of flowers on a tree in the spring may determine the quantity of seeds available in the fall. Deciduous trees can have female and male parts in the same flower (monoecious), or separate female and male flowers (dioecious). Conifer trees have male and female flowers that are separate on the same tree. For example, the top third of conifer trees have female flowers, whereas the lower third is where the make flowers can be found. This is because conifer trees are wind pollinated and the tops of trees are exposed to more wind than the bottom.

The timeline for flower and seed development differs for each tree species. For example, in the summer spruce buds begin to develop and continue into the fall. These buds become dormant over the winter, and the next spring their growth resumes and female flowers are pollinated. Once pollination has occurred, growth is rapid and the seed is mature by fall of the same year. In total it takes 17 months for spruce seeds to mature. This is different from pine trees that require another winter season of dormancy before seeds mature, requiring 27 months for pine seeds to mature. Many tree species in Canada go through a winter dormancy because the growing season is not long enough to establish seed in one season.

Watching seed production throughout the year, as well as doing seed tests, will help to determine the potential and quality of seeds. Once such seed test is the cutting test, where seeds or cones are cut open to see if their internal tissues are fully developed or damaged. In particular it is important to identify whether the seed embryo and endosperm (food storage) are intact and healthy. Look specifically for the "coconut meat" in which the inside of the seed will have a nice white core. If the colour inside of the seed is green or brown, then the seed is not healthy. You will notice when cones are cut in half that they begin to turn brown because they are exposed to oxygen. By analyzing the quality of some seeds, it helps to determine whether the seed of that tree is worth collecting to grow future trees.

For more information about seed collection visit www.forestsontario.ca

Activity #1 – Spring

Observing trees to determine seed production will differ depending on the time of the year. Spring time will require looking for different characteristics compared to the fall.

Step 1 Go on a walk through a local park or forest. Ask students to observe different trees for signs of flowering.

Step 2 Choose a tree and explain to students how flowers turn into future seeds. Have students compare flowering on different trees. Compare the flowers on deciduous trees versus coniferous.

Step 3 If you want to collect seeds from these trees in the fall, what would be some of the characteristics that you should be looking for? Have students explain what they think is important to look for in the spring time.

Step 4 Look at trees for signs of fruits (i.e. cones, acorns) and ask students to guess how these developed, and what happens to them over the winter.

Activity #2 – Autumn

The viability of a sample of seeds can indicate whether the tree is a good candidate to collect seed from. Viability is the ability of a seed to survive and potentially become a mature tree. Several tests can be done, including the float and cut tests. Float tests are useful for determining if seeds are full or empty. The following float test will work well on acorns. If acorns (or other net tree seeds) are not available, proceed to the cutting test using cones or maple keys.

Step 1 Fill a small bucket halfway with water. Add the acorns to the bucket, and stir the mixture.

Step 2 Ask students to observe what happens to the seeds. Some of the acorns are likely to float while others sink. Why would some acorns float?

Step 3 Take a sample of the acorns that floated and those that sank.

Step 4 Do a cut test on the acorns or the other trees seeds that are available. You may be required to cut the seeds for the students, carefully cut each seed in half to expose the inside. What does the inside of the acorns that floated look like? What about those that sank? Observe the contents of the cut seeds. Is there an embryo? Is there any sign of insect damage, and if so what does this mean for the seed?

Extensions

Have students make note of the weather on the day they are viewing trees. How do they think weather would have an influence on seed development (pollen dispersal)?