Jack Pine Pop Cones

N°. 59

JUNIOR

Science | Language Arts

LESSON SUMMARY

To help students develop an understanding of fire as an agent of renewal in the natural world.

FORESTS ONTARIO

Focus on Forests

Activity Information

Grade Level: Junior

Estimated Duration: Three class periods (2 for classwork and testing/research, 1 for preparing report)

Materials: Picture(s) of a Jack pine and its needles from a tree identification book
Jack pine cones* (optional)
Moderate heat source, such as a toaster oven or hot plate (optional)
**Jack pine cones can be easily collected at any time of the year because they are serotinous (requiring extreme heat to open). Try to find cones that are brown in colour.*

Setting: Indoors (Note: only undertake this activity indoors if it can be done safely, otherwise please see the 'Alternative Resources' section)

Key Vocabulary: Jack pine, adaption, serotinous, fire, regeneration

Curriculum Links:

Grade 4-6 Science (STEM Investigation and Communication Skills)

A1.1 Use a scientific research process and associated skills to conduct investigations.
A1.2 Use a scientific experimentation process and associated skills to conduct investigations.

Grade 4 Science (Habitats and Communities)

B2.6 Describe structural adaptations of a variety of plants and animals and how these adaptations allow the organism to survive in specific habitats.

Grade 6 Science (Biodiversity)

B2.5 Describe interrelationships within species, between species, and between species and their natural environment, and explain how these interrelationships sustain biodiversity.

Grade 4-6 Language (Creating Texts)

D2.1 Draft texts of various forms and genres, including narrative, persuasive, and informational texts, using a variety of media, tools and strategies.

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Teacher Background

Jack Pine is one of the major boreal species of the Canadian forest, found from Newfoundland to the Rocky Mountains. They can be seen clinging to rocky outcrops or stony slopes, but their preferred site is deep, sandy soil where stands of trees of the same age and size are common. This dry environment is subject to relatively frequent fires, and Jack Pines have evolved an ingenious adaptation. Unlike the cones of most species that open to shed seed as soon as they are fully ripened, most of the cones on a Jack Pine remain on the tree while full of seeds, waiting for the right moment.

The right moment occurs when temperatures reach the range of 50°C, as would happen in a wildland fire. After the fire passes, the cones pop open, seeds fall to the ground, and regeneration is accomplished. This usually occurs within a couple of weeks following a fire, before any other species has a chance to become established. These fire-adapted cones are known as serotinous, or "late" in opening, and only open when exposed to high heat.

A few cones on most trees open in the fall as they ripen, so that an old stand will have a fringe of younger trees on the edges and in openings, but the bulk of a Jack Pine will be of one age, dating its origin from a fire in the past and prepared to take advantage of the next one.

Activity

Step 1 Pass the Jack Pine cones around and lead the class in a discussion of what cones are and what their function is in the life of the tree. Students should also be familiarized with Jack Pine as a major boreal species most commonly found in dry, sandy areas.

Step 2 Invite the class to suggest methods for removing the seeds from their cones so that they may be planted as a class project. Divide the class into groups to undertake the methods suggested. You will likely want to keep journals as a means of developing skills with the scientific method. The first entry will be to name the extraction method that their group undertook. Following that should be a detailed outline of the procedure they plan to use, including equipment required and who is responsible for obtaining it.

A description of what actually happened should be included, detailing variations from the plan and what caused them. The journals should recount the successful procedure. If drying in an oven is suggested, you will have the challenge of helping the children sort out two variables.

Step 3 The best method for opening the cones is a demonstration, toasting them like marshmallows over a hot plate or camp stove*. The children can see the cone scales peel back and the seeds fall out. A toaster oven can be used.

If you do not have access to Jack Pine cones in your area, or it is unsafe to use a hot plate, stove or toaster, please refer to the **Alternative Resources section.*

Step 4 Lead the class in a discussion of how Jack Pine cones might be opened in nature.

Step 5 Individually, or in small groups, have students prepare a report outlining the seed release method they research or tested and their findings. Results can be presented to class if time allows.

Alternative Resources

The resources or space required to safely heat up a Jack Pine cone to the temperature at which it opens (50°C or higher) may not be available to every school that conducts this lesson plan. To work around this, the teacher should utilize online resources to show what would happen during the experiment.

Students can be directed to look up images of a Jack Pine pinecone before a wildland fire has occurred, and then the following photos can be used to reference the differences post-fire occurrence. There are also many great videos demonstrating this activity on YouTube.

Evaluation

The focus of this assignment is the gathering of data and information. As such, the following marking rubric was created for students and focuses mainly on the level to which the information was researched, its accuracy, and detail, with an optional evaluation metric if they presented their findings to their peers.

	4	3	2	1
Accuracy	The information given is well articulated and highly accurate.	The information given is articulate and accurate.	Some information given is articulate and accurate.	Little to no information is articulate and accurate.
Detail	Gives a highly detailed outline of research and/or experimentation process. Correct use of scientific terminology.	Gives a detailed outline of research and/or experimentation process. Mostly correct use of scientific terminology.	Gives a somewhat detailed outline of research and/or experimentation process. Somewhat correct use of scientific terminology.	Does not provide a detailed outline of the research and/or experimentation process. Uses little to no scientific terminology.
Oral Presentation (optional)	Presents report and expresses ideas orally very effectively	Presents report orally effectively.	Presents report orally with some effectiveness.	Presents report orally with limited effectiveness.

Closed or sealed Jack Pine cones.

Photo Credit: Isabelle Chenard – Aviation, Forest Fire and Emergency Services (2019).

Jack Pine cones after heat exposure.

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