

Summary

This active lesson simulates the effects of natural disturbances on forest communities and explores both the good and bad impacts of those disturbances.

Activity information



Levels: Grades 4 and 7

Subject: Life Science: Habitats and Communities, Interactions Within Ecosystems; Drama

Estimated duration: One 60 minute class period for discussion, activity, and wrap up. Time may vary depending on class size.

Materials: bread tags, poker chips, cardboard squares or other small items that will represent life tokens; bucket (or box or something to collect life tokens); “costumes” for each disturbance.

Learning Outcomes

Students will:

- State a prediction and a hypothesis based on an observed pattern of events.
- Compile and display data, by hand or computer, in a variety of formats.
- Describe interactions between biotic and abiotic factors in an ecosystem.

Teacher Background

“Natural disturbances.” What does that mean to you? Those words most likely suggest things that disturb or damage the forest environment that occur naturally, without the help or assistance of people. In fact, it is difficult to walk through a forest anywhere in Canada and not see evidence of natural disturbances. Wind, disease, pests and fire are the four significant disturbances, although

there are even more which impact the vitality and vigour of a forest community.

Sustainable forest management also considers natural disturbances and forest managers must always be conscious of various disturbances when they manage their forests. In British Columbia, there has been an ongoing mountain pine beetle epidemic, so drastic that it has increased by 50 per cent over last year. It covers an area of more than 9 million hectares and the forest damage is widespread. (<http://www.mountainpinebeetle.com>)

Wind is a common factor, causing some trees to actually change their shape as they are buffeted and blown. The Group of Seven painters in Algonquin Park created spectacular paintings of white pine with their branches shaped by the forces of the wind. Wind can also take down trees that are already attacked by disease or forest pests.

Disease and pests have a significant impact on the forest environment. Dutch elm disease may have been our first introduction to a disturbance that can wreck havoc on Canadian forests. More recently, the Gypsy moth, bark beetles and other long horned beetles have been introduced into Canada by non-manufactured or untreated wood packaging materials. Canada’s “Least Wanted” forest pest list includes these and other pests that defoliate or otherwise infect forests, making them susceptible to fire.

Fire is a chemical reaction that includes air, heat and fuel. When all three are present in sufficient quantities, fire ignites. It can spread as a sub-surface fire in organic matter. A surface fire can spread through burning leaf litter, fallen branches and other ground-level fuels. Finally, a crown fire can burn across the tree tops, often becoming the most difficult to control.

Fire can destroy a forest. It can also revitalize a forest, bringing new growth and younger, more vigorous trees and new habitat for a wide variety of forest dwellers.

This activity will take your class outside and have them enact or model the effects of natural disturbances on forest ecosystems.

Teacher Preparation

This activity is one that can be carried out inside; however, it will be a lot more fun if you do it outside! The area can be any size – the larger the area, the more room for the students to move about comfortably. Consider using an area half the size of a soccer pitch. Use pylons, bean bags or something to mark out the boundaries of this forest community playing area. If you do this activity indoors, it can be in your classroom, but will be easier in a gym setting.

You will need to create approximately 500 “life tokens” – small items that will represent those things that trees need to survive: rain/water, shade, sunshine for photosynthesis, seed dispersal, etc. These can be pieces of paper or cardboard, plastic bread tabs, poker chips, coloured paper clips, or anything that can be easily carried but also cleaned up after the activity. If possible, make four different colours of life tokens. Each colour will represent deer/moose, wind, insects/disease or fire.

Procedure

Step 1

As a class, begin by discussing what a healthy forest community needs to survive: water, shelter, food, space. Discuss the different components of that community, and then focus in on their requirements: water for trees, photosynthesis, openings in the forest canopy for new growth, wind for seed dispersal, etc. Carry out a discussion about natural disturbances and their impacts on that healthy forest community. What are some of those disturbances, and what do they do to the forest? Has anyone heard of any natural disturbances in the news? Students may consider the following:

- wind damage
- insects

- disease
- browse by deer/moose, rabbits, etc.
- fire
- snow damage
- mushrooms
- soil compaction
- leaf litter



Disturbance	What happens to the forest community?
Deer/Moose (browse)	
Wind	
Insects/Disease	
Fire	

Explain that they need to identify the impacts of each of the disturbances. Have students predict what they think will happen in a forest ecosystem when each of the disturbances is introduced. Have them consider deer/moose, wind, insects and diseases and fire.

Use the chart above for students to copy and write down their predictions.

Step 2

Explain to your students that they will now be simulating a healthy forest ecosystem that will be visited by a series of natural disturbances. Divide the class in half, with the first half representing the forest community. Hand out 20 different coloured life tokens to each member of the forest. Explain to them that they will be representing individual trees that are growing in the forest. They need to find a place to grow and where they can be best protected.

Then, divide the remaining students into four groups. Each group will represent a different natural disturbance. Explain that they will create disturbances to the healthy forest community one category at a time. Their role will be to enter the forest and take a life token from as many trees as possible. The role of each disturbance is described below:

Deer/Moose: Walk into the forest, tag a tree, and then take a life token. Then return to the gathering area and drop the token into a communal bucket. Then go back out and tag another tree.

Wind: Walk into the forest, tag a tree, and then take a life token. Then return to the gathering area, and drop the life token in a communal bucket. Then go back out and tag another tree! (Same as the deer/moose.)

Insects/disease: Walk into the forest, tag a tree, and then take two life tokens. Then return to the gathering area and drop the life tokens in a communal bucket. Then go back out and tag another tree!

Fire: Walk into the forest, tag a tree, take the life token, tag another tree, take a token, etc. Fire does not need to return to the communal bucket in between gathering tokens. Students need to collect a maximum of ten tokens.

Step 3

Select one volunteer who will be the Chief Forester. This student will be responsible for recording the number of life tokens taken from the trees in the forest.

Move students to where the activity will be played. Explain that they are to stay within

the boundaries of the forest community. Have the students playing “trees” enter the area.

NOTE: If any tree loses all its life tokens, it simply sits down to represent a dead and decaying tree remaining in the forest.

Step 4

Doing the Activity

When the students are ready to begin, send in the deer/moose. Give the deer/moose two minutes to collect life tokens (one at a time) and then stop the activity. Have a brief all-class discussion about the impact of deer/moose on a forest. What is that impact? Did any trees die? Why or why not?

Each tree tells the Chief Forester how many life tokens they lost to the disturbance. The

Chief Forester records this information on his or her tally sheet.

When discussions are completed for the deer/moose scenario, have forest community students go to the bucket and collect their original number of life tokens. Then have them return and prepare for the next disturbance.

NOTE: To make the next stage more interesting, the teacher can quietly select two student trees, and remove all but one of their life tokens. Make sure that the wind damage students do not know who these two trees are. They will simulate older, less strong or vigorous trees that could easily fall to wind impact. Have them stand on the edge of the boundary (the location in a forest that is most susceptible to wind damage).

Chief Forester Tally Sheet				
Tree (name of student)	Deer/Moose Browse	Wind	Insect/Disease	Fire

Send in the wind! Give the wind 1 minute to collect life tokens and then stop the activity. Have a quick all class discussion about the impact of wind on a forest. What is that impact? How did it compare to the deer/moose impact? Did many trees die? Why or why not?

Each tree tells the Chief Forester how many life tokens they lost to the disturbance. The Chief Forester records this information on his or her tally sheet.

When discussions are completed for the wind scenario, have the “trees” go to the bucket and collect their original number of life tokens. Then have them return and prepare for the next disturbance.

Send in the insects/disease! Give them two minutes to collect life tokens (two at a time) and then stop the activity. Have a quick all-class discussion about the impact of insects/disease on a forest. What is that impact? How did it compare to the deer/moose and wind impact? Did many trees die? Why or why not?

Each tree tells the Chief Forester how many life tokens they lost to the disturbance. The Chief Forester records this information on his or her tally sheet.

When discussions are completed for the insect/disease scenario, have “trees” collect their original number of life tokens and prepare for the next disturbance.

Finally, send in the fire! Give the fire three minutes to collect life tokens. When each fire student obtains ten tokens they need to place them in the communal bucket – because they have now been extinguished. As each tree dies, they are permitted to return to the bucket and obtain a life token to regenerate as a seedling.

The Chief Forester will record the number of life tokens lost to fire.

Have a quick all-class discussion about the impact of fire on a forest. What is that

impact? How did it compare to the deer/moose, wind and insect impact? Did many trees die? Why or why not? Why did new trees grow back?

Step 5

The Chief Forester will tally (with the help of the teacher and a calculator) and display each “tree’s” numbers – the number of life tokens lost due to each natural disturbance (for each individual tree). As a class, you can then carry on a discussion about which natural disturbance has the greater impact. Then return to the students’ Disturbance Prediction Chart, and compare their predictions with the actual outcomes of the activity.

For grade 7 – Each “tree” will partner with a student representing a natural disturbance to graph what happened to their life tokens during each natural disturbance. Based on their results, they will explain which natural disturbance has the greatest impact.



Extensions

- **Grade 4** – Students use natural disturbance data to prepare their own graphs to hand in to teacher.
- **Grade 7** – Using the data generated from their graphs, students will explain how natural disturbance affects forest biodiversity. They can create a poster, a PSA, a news report or other method of presentation.
- Students will select a particular forest pest and do a case study research project using the internet and other resource materials.
- Students can explore a recent forest fire in their region. They can visit the following web site about recent fire hotspots in Canada:

<http://atlas.gc.ca/site/english/maps/environment/forestfires/dailyhotspots2003>