



School District 47

Outdoor & Ecological Learning

www.outdoors.sd47.bc.ca

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Forests in Focus

Cells, Plant Systems, and the Temperate Rainforest



A Field Experience Curriculum for Grade 5 Students

Curricular Workshops at the Powell Lake Outdoor Learning Center

A Tool for School District 47 Teachers

*Created in Partnership with Wild BC (Habitat Conservation Trust Foundation) and the
Powell Lake Outdoor Learning Center (2014)*



**Powell Lake
OUTDOOR
LEARNING CENTRE**

Forests in Focus

Aligned with

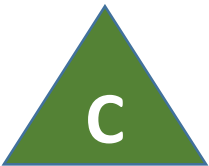




Workshop Background

This curriculum will provide learners with an experiential opportunity to make connections between themselves and the Temperate Rainforest. Through sensory-rich, direct experience, students will explore of the cellular structures of trees, and will learn to identify the layers of the Temperate Forest and to recognize components therein. Students will be exposed to some rudimentary soil science as well as the basics of photosynthesis.

Curriculum Connections: BC's Education Plan

The table below lists all relevant curriculum connections between *Forests in Focus* and BC's Education Plan. As *Forests in Focus* is designed as a series of lessons to be delivered cohesively during one outdoor field experience, all Big Ideas are addressed in the holistic delivery of this entire workshop curriculum and are therefore listed together below.

CORE COMPETANCIES		
		
Communication	Thinking	Personal & Social
Area of Learning: SCIENCE		
Big Ideas Multicellular organisms have organ systems that enable them to survive and interact with their environment. Humans use earth materials as natural resources.		
Area of Learning: LANGUAGE ARTS		
Big Ideas Language and text can be a source of creativity and joy. Exploring text and story helps us understand ourselves and make connections to others and to the world. Using language in creative and playful ways helps us understand how language works.		
Area of Learning: ARTS EDUCATION		
Big Ideas Engaging in creative expression and experience expands peoples' sense of identity and belonging.		
Area of Learning: MATHEMATICS		
Big Ideas We can describe, measure, and compare spatial relationships. Numbers represent and describes quantity.		
Area of Learning: PHYSICAL AND HEALTH EDUCATION		
Big Ideas Daily physical activity enables us to practice skillful movement and helps us develop personal fitness.		
SOCIAL STUDIES		
Big ideas Natural resources continue to shape the economy and identity of different regions of Canada.		

Forests in Focus

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Forests in Focus

Grab-and-Go Bin Checklist

IMPORTANT: Students should bring their Nature Journals and a Personal Pencil with them on this field experience. School clipboards would also be handy for this outing.



Activity 1: Build a Tree

- Tarpaulin
- Laminated Cell Diagram of Xylem and Phloem
- Douglas-fir bark beetle head



Activity 2 : Living in Layers

Introduction

- 2 Posters: 'What is in a Temperate Rainforest?' & 'Animals of the Temperate Rainforest'
- Identification Key for Poster/Wildlife
- Laminated 'Read Me' Page

Part 1

- Class set Paper
- 8 Laminated 'Fold it' instructions Handout
- 4 Laminated Banana Slug & Pages (for the keeners)
- 8 Magnifiers

Part 2

- 8 elastic rope
- 8 blindfolds



Activity 3 : Hike and Think

- Rainforest Character Charade prompts
- Paper and pencil for personalized charade prompts
- Laminated 'Guided Imagery Story : You are a Tree'



Activity 4 : Digging Deeper

- pH kit (test tube, de-ionized water, baggies for collection, Ph test tablets)
- soil thermometer

A set for each group of students

- 10 Laminated Soil Profile Worksheets
- 10 Digging Deeper Data Collection sheets
- 10 Trowels
- 10 Rulers

Extra for students who want this:

- Towel for wiping hands
- Hand-Sanitizer for cleaning hands



Activity 5: Forests in Focus Debrief

- A Set of Six Animals from the Temperate Rainforest

The Rainbow Coloured Circles:

A quick visual reference representing the order of activities (Red, Orange, Yellow, Green, Blue, etc.).

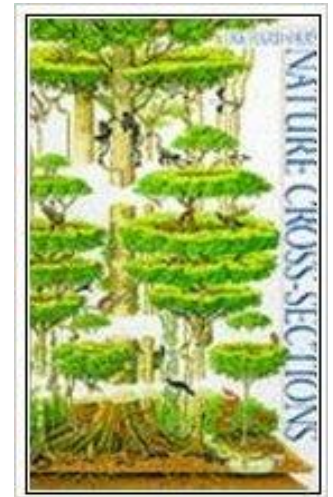
CLASSROOM BEGINNINGS

Richard Orr's Nature Cross Sections

This Scholastic Classic illustrates the interconnectedness of 12 different ecosystems in colourful detail. It opens eyes to the idea that there is more going on than we see at the surface.

Sierra Club Posters: These Posters are available in the *Grade 5 Forests in Focus Bin*.

1. Show the **Posters 1 and 2 “What is in the Temperate Rainforest?”** and **‘Animals of the Temperate Rainforest’** Have the class look at the posters for one minute.
2. Have students say something they noticed in the posters. Refer to the identification keys page 1 and 2 of the Appendix to this manual.
3. Hand out the **‘Read Me’** pages to some students and have them read the forest facts to the class.
4. Refer to the posters to connect to the readings.



Inquiry Framework (IF)

Inquiry gives students the opportunity to explore their own curiosities in the context of formal education. The Inquiry Framework below can be applied to a discrete subject or it be applied interdisciplinary. It be used at the beginning of unit or lesson, in the middle, or at the conclusion of a unit or lesson. The framework below can be modelled first by the teacher, with questions directed at students. Thereafter, once students understand the difference between the leveled questions, they can be given the opportunity to ask Level 1, Level 2, and Level 3 questions in response to a specific activity or lesson.

Level 1 Question: Ask a question that you can answer.

Level 2 Question: Ask a question that is on the edge of your awareness or understanding, but that you still can answer upon some reflection or consideration.

Level 3 Question: Ask a question that is beyond your current understanding, one which opens up a new realm of what is possible. *The important thing is to give students the necessary time to follow-up on and / or research their Level 3 questions.*

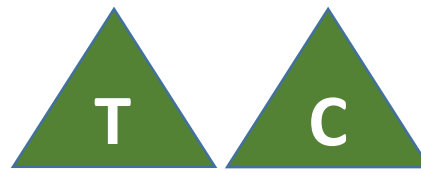
Source: Adapted from Wes Gietz and Ryan Barfoot

The Nature Journal

Encourage students to record something in a Nature Journal each time their out in nature. Spend some time listening and smelling, and ask students to draw the sound or smell, or to use words to describe it. Students can record the changes of a plant or tree through the seasons, or they can illustrate something they would like to remember from each nature experience. This can spark a lifelong appreciation for the natural world.

An important goal of teaching place-based awareness and life science is an appreciation and respect for the living world. Memorizing names from a worksheet is less likely to bring a child to that goal than spending time enjoying nature and noticing all the wonders of the natural world. When outside, encourage students to notice the big and small things in nature rather than memorizing names.

Forests in Focus Activity 1: Build a Tree



Indoor / Outdoor
15 Minutes

Purpose: To illustrate different parts and different cell functions in a tree.

Flow Learning: Awaken Enthusiasm

Location: Outdoor or indoor space

Bin Materials

- Tarpaulin
- Laminated Cell Diagram of Xylem and Phloem
- Douglas-fir bark beetle head

Procedure

1. Secretly ask a student to be a Douglas-fir beetle at the end of this activity. (The mask must be hidden until the end).
2. Lay the tarpaulin (tarp) out on flat ground and ask the students to sand around the outside edge.
3. Explain that here in the forest you are all going to build a tree made of humans.
4. Ask students what parts of a tree they know. Show them the Xylem and Phloem diagrams and imagine that every tree around them has cells moving water and nutrients up the tree and food (sugars) and water from the leaves down to the lower branches and roots.
5. Begin building the tree with the centre. Choose a volunteer as the heartwood, and have them stand in the tarp's center.
6. Continue to assign roles and position students as you discuss the other functions of the cells in the tree. Have the students use noises to illustrate their functions, as follows:

Heartwood: “Stand Strong” This is the centre of the tree. It is the darker part of a tree “cookie”. The role is to keep the tree up and reach for the sun.

Xylem: “Whee!” The xylem transports the water and nutrients up the tree to the leaves. In spring the water may travel up to 100 m/hour to the top of tall trees. When Xylem cells get old they will stop transporting water but will continue their supporting job as part of the heartwood. **4 or 5 Xylem students stand around the Heartwood.**

Roots: “Slurp.” Roots have two jobs: they anchor the tree in the ground and the feeder roots find water and mineral nutrients for the leaves to use. They are helped by *mycorrhizae*, tiny fungal threads that attach to the feeder roots and absorb nutrients and water very effectively. **4 or 5 Root students lie on their backs with their knees bent. The knees fit in between the Xylem students, if they have long hair spread it out and warn the others to be careful not to crush the root hairs.**

Leaves and Phloem: “Let’s Make Food.” Flutter, Flutter “Bring Food Down.” “Whoosh” The leaves make sugar using water, carbon dioxide, and sunlight. The phloem carries the food down the tree to feed the growing parts of the tree and to store the carbon in the trunk. **8 or 9 students will have the double role of leaves, holding their hands up and photosynthesizing, and then as phloem cells, bringing that food down to the roots. They should watch out for the roots as they stand around the Xylem.**

Bark: The Bark protects the tree from infections and insects. Dead phloem cells become bark. **The remaining students stand with their backs to the phloem and hold their fists together and elbows out.**

7. Have the students repeat their sounds in order. Heartwood, Roots, Xylem, Leaves and Phloem. Then signal the “Douglas-fir bark beetle” to come and try to penetrate the bark. The helper can try to tickle the bark with the proboscis.
8. Un-build the tree by asking the roots to stand up first and then ask the other students to go to the edge of the tarp again.

Conclusion/Debrief Questions

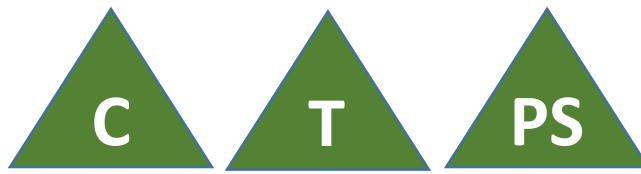
What part or function of the tree is the most important?

Which part of the tree stores carbon? Which part of the tree absorbs carbon from the atmosphere?

Source: Forests in Focus, BC Ministry of Forests, 1999, pp 24-29.

Compiled by Janet May & Karin Westland

Forests in Focus Activity 2: Living in Layers



45 Minutes
Outdoor

Purpose: To understand the vertical structure of a Temperate Rainforest.
To recognize some of the components of a forest.
To use adjectives to describe sensations experienced in the forest.

Flow Learning: Focus Attention, Direct Experience

Location: Forested Area

Bin Materials

Introduction

- Poster: 'What is in a Temperate Rainforest?' & 'Animals of the Temperate Rainforest'
- Identification Key for Poster/Wildlife
- Laminated 'Read Me' Page

Personal Learning Materials

- Hard cover Student Journals or Clip Boards
- Personal Pencils

Part 1

- Class set Paper
- 8 Laminated 'Fold it' instructions Handout
- 4 Laminated Banana Slug & Pages (for the keeners)
- 8 Magnifiers

Part 2

- 8 rope circles
- 8 blindfolds

Warm Up Discussion (This can be Done at School before Field Day)

Show the **Posters 1 and 2** "What is in the Temperate Rainforest?" , 'Animals of the Temperate Rainforest' Have the class look at the posters for one minute.

Have students say something they noticed in the posters. Refer to the identification keys page 1 and 2 of the Appendix to this manual.

Hand out the '**Read Me**' pages to some students and have them read the forest facts to the class.

Refer to the poster and the forest around to connect to the readings.

Preparation

Identify boundaries for this activity.

In one half of the area, ask a helper to place eight rope circles (stations) at least 5 metres apart, on different parts of the forest floor. Make the stations form a closed shape, so that students can move from one station to the next. Try to find different textures or plants for each station.

Activity

1. Put the class into pairs for this activity. Divide the paired-up class into two groups; Team Lichen and Team Fern, or another convenient grouping. There are two parts to this activity and both teams will have an opportunity to do both.
2. Establish a signal for when the teams will switch parts.
3. Team Lichen will start with part 1, but explain part 1 to the whole class.
4. Introduce or Review the **Rainforest Posters** and the "**Read Me**" forest facts. Point out obvious elements of the forest: Trees, Shrubs, Nurse Logs; and some more subtle ones: Lichens, Epiphytes, Fungi,
5. The teams will now look for the Big 4 ingredients and producers, consumers and decomposers in the forest. Outline Part 1: Fold the Layers, to the whole group, showing how to fold the pages.

Continued on the following page.

Compiled by Janet May & Karin Westland

Forests in Focus Activity 2: Living in Layers (continued)

Part 1: Canopy and Understory

1. Each pair of students in team Lichen will get a 'Fold the Layers' handout and two pieces of plain paper. Each person should fold his paper and follow the instructions on the 'Fold the Layers' handout.
2. Tell the students how long they have until the signal to switch activities.
3. Take Team Fern to where the hoop-stations are located and explain part 2 to them.

Part 2: Forest Floor

1. Students work with their partners. One student, the observer is blindfolded, and the other is the guide.
2. The guide will take the observer to one of the stations. Stress the importance of being a safe guide. The guide will hold onto the observer's shoulders determine the direction to the station. The guide will watch where the observer is walking and warn them of obstacles.
3. Assign a station to each pair, and describe how to move to the next station in clockwise direction.
4. The guide will move with them to the station and watch where the observer puts their feet.
5. At the station, the guide will ask what they can hear, what they can smell, what they can feel on the forest floor. Be sure to bend over and smell low down.
6. The observer should use descriptive adjectives to describe the sensations and the guide will record the experience in the observer's nature journal.
7. Once the observer has experienced smelling, feeling and listening, they can take off their blindfold and use adjectives to describe what they are seeing.
8. After five minutes, have the partners switch roles and move to the next station.
9. When each partner has had a chance to have both roles, signal for the Lichen and Fern teams to switch activities.
10. Give the "Fold the Layers" instructions and two pieces of paper to each pair in team Fern.
11. Explain Part 2 to Team Lichen.

Conclusion/Debrief

Ask students to identify the 4 big ingredients of the Temperate Rainforest. (Sunlight, Water, Air, Soil)

How does living in Layers help plants and animals to get enough of these ingredients to live?

Review some of the adjectives that students used to describe what they smelled and felt in the forest.

Incorporate Inquiry: Have students reflect by posing their own questions about their learning.

Invite students to ask a Level 1, Level 2, and Level 3 questions based on the above activity.

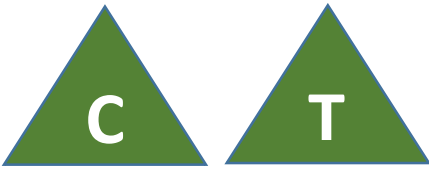
Level 1 Question: Ask a question that you can answer.

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Sources:

TRFic! A Temperate Rainforest Teacher's guidebook and Poster Kit, Susan Gage, Sierra Club of BC, 1993, p 9.
Forests in Focus, BC Ministry of Forests, 1999, pp 4 -7 and 15-17



Purpose: To consolidate Temperate Rainforest concepts: Components of Rainforest, Photosynthesis, Xylem and Phloem, Decomposition.

Flow Learning: Direct Experience, Reflection

Location: In a place where class can sit and see each other in the forest along the Sunshine Coast Trail, or at Haywire Bay Campground

Bin Materials

- Rainforest Character Charade prompts
- Paper and pencil for personalized charade prompts
- Laminated 'Guided Imagery Story : You are a Tree'

Procedure

While on a hike, either of these activities can be done as a break, when a suitable area is found. Guided Imagery is a good choice after physical exertion.

Activity 1: Charades

Ask a student to choose one of the Temperate Rainforest Character Cards and act out that character without words. Other students raise their hands if they have a guess.

Even Better, create your own prompts based on the discussion of the day, or get a student to do this.

Activity 2: Guided Imagery

Get the students to find a comfortable place to sit or crouch while listening to a story. They may want to close their eyes to help them imagine, or look up at the forest canopy.

Tell the students

"A tree is like a Lego structure. It is made of many cells and those cells are made of molecules, like individual Lego pieces. After it dies it is broken up into the original molecules which can be re-used and built into another tree.

"You are going to imagine that you are a tree. You will listen to a story about your life as a tree. You can find a comfortable position now, you may lie down. It will be easier to imaging yourself as a tree if you close your eyes as you listen to my words....

'You are a tree.

You are tall and majestic.

Your branches reach toward the summer sky.

Your top is in the canopy far above the forest floor.

You hold up your leaves to soak up the rays of the sun. It is warm and the breeze playfully tickles your leaves making your branches sway gently.

The water in your xylem cells surges up from your roots, and the cytoplasm in your leaves uses warm sunshine to make food. Phloem cells carry the food down your main stem to the lower branches. You can feel your branches growing longer and your trunk getting wider.

A squirrel scampers up your bark and along one of your branches.

You feel so strong!

Continued on the following page.

Forest in Focus, Activity 3: Hike and Think / Charades and Guided Imagery (continued)

Activity 2: Guided Imagery (continued)

"Gradually the days get shorter, the air becomes cooler and cooler. It is now autumn and the birds begin to leave. There is less sunshine, and photosynthesis slows down. Xylem moves water more slowly up your main stem. Your branches stop growing and buds are set for winter.

"Rain is falling.

"The forest around you is dripping quietly, sending you to sleep.....sleep.....sleep.

"Suddenly you are awakened by the sensation of tingling up your stem. Xylem start to bring water and food to your buds. You feel your buds bulging with new life and they open up with fresh young leaves pushing outward, staining to feel the sunshine and spring air. Your roots stretch and suck up nutrients from the damp soil. Xylem delivers them to your body making you grow bigger and bigger.

"Now you have gone through the summer-fall-winter- spring seasons for over 200 years. You are growing old and tired. Your roots weaken and are no longer able to hold you steady in the soil. The wind catches you, tugs at your branches, you are no longer able to stand up against the forces. Down you topple. A loud crash echoes in the forest.

"You are lying on the forest floor.

"Shrubs, ferns and moss beneath you feel strange to your branches which were once in the sunny air above. Insects and salamanders crawl onto and under your bark. They nibble at you. Beetles bore holes into your trunk and fungus comes in, spreading it's tendrils throughout your body and pushing mushrooms out through your bark. Rain soaks into you making you soft and soggy.

"Oxygen surrounds each pore and molecule of you.

"Now you find yourself coming apart----breaking and crumbling into smaller and smaller pieces. Bacteria are using the bits and pieces of what is left of you to give them energy. The rain gently pushes you into the soil. You are no longer a tree. You are millions and millions of tiny parts sinking deeper into the earth.

"Suddenly you feel your scattered pieces being pulled upward! Up! Up! Up you go and your fell yourself being sucked up through tiny tubes of a new baby tree. You are becoming arranged into leaves and trunk and bark and branches of a new tree! And there are still pieces of your former self waiting in the soil, waiting to be put together again like Lego blocks into a new shape.

"You are always changing into new and different structures. You are hundreds of years old and are once again a fresh new life.

"You may open your eyes. Now you are yourself again."

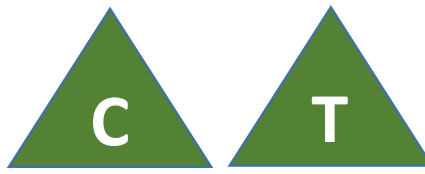
Conclusion/Debrief

Ask students what part of the guided imagery they liked best. Why?

Source: Forests in Focus, BC Ministry of Forests, 1999, p 87-88.

Compiled by Janet May & Karin Westland

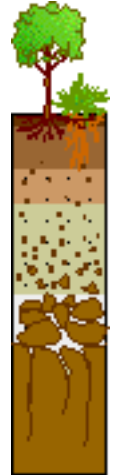
Forests in Focus Activity 4: Digging Deeper



Outdoor
45 Minutes

Background Definitions:

Soil is the naturally occurring unconsolidated material or organic material at the surface of the earth. Soil forming processes are an interaction between climate, living organisms, slope, and water content which act on soil and soil parent material. The **topsoil** in a soil profile supports most of the life in the forest. Bacteria and fungi break down proteins in dead plants and animals to release nitrogen and other nutrients essential for plant growth. Most BC forest soils are poor and any available nutrients are quickly absorbed and used by trees and other plants. **Organic matter** acts like a sponge in the soil, storing water. Moss and forest litter help to reduce erosion and slow down nutrient leaching. **Parent Material** is the solid material that is broken down through chemical and physical weathering to form unconsolidated mineral soil. About 95% of forest mineral soil comes from bedrock parent material.



Purpose:

This is an introduction to soil science in which students will identify the organic layers of soil in the forest and recognize features of the top mineral layer of soil,

Flow Learning: Direct Experience

Location: Forested area, preferably with few roots.

Bin Materials

- pH kit (test tube, de-ionized water, baggies for collection, Ph test tablets)
 - soil thermometer
- A set for each group of students
- 10 Laminated Soil Profile Worksheets
 - 10 Digging Deeper Data Collection sheets
 - 10 Trowels
 - 10 Rulers

Personal Learning Materials

- Hard Cover Student Journals or Clip Boards
 - Personal Pencils
- Extra for students who want this:
- Towel for wiping hands
 - Hand-Sanitizer for cleaning hands

Warm Up Discussion

1. Review the Layers in the Temperate Rain Forest (Activity 2) and ask students which layer is missing in their diagram.
2. Ask students why this layer is important. What does it supply to the plants and animals? Is all soil the same?
3. How is soil made? From above, (organic matter decaying,) and from below, (rocks decaying). Soil is made in layers too.

Preparation: Identify boundaries for this activity.

Activity

1. Go over the Data Collection Sheet with the class. Use the compass to show the direction the slope (if any). They will be collecting data on the site, the organic (LFH) layer and the mineral soil.
2. Students can work in groups of three or four. Each group will receive a Data Collection Sheet a ruler and a trowel. The rest of the equipment will be shared. Groups can decide which members will collect which data.
3. For testing the pH, combine all soil samples in one bag and mix them to get an average for the site. The PH testing instructions are in the test box.

Conclusion/Debrief

Ask students what they found in the upper, organic layers of soil. Any animals or insects or fungi?

What is the relationship between the soil and the vegetation growing from it? How do they affect each other?

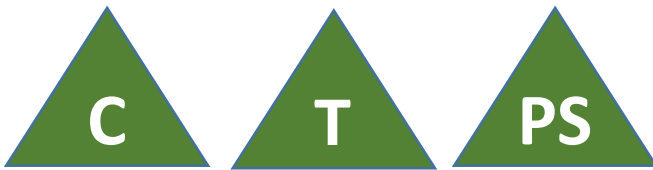
How do we use soil? (Sand and concrete, loam and gardening, clay for pottery.)

Source: Forests in Focus, BC Ministry of Forests, 1999, pp 62-68.

Compiled by Janet May & Karin Westland

Activity 5: Forests in Focus Debrief

Indoor/Outdoor
15 Minutes



Summary: This is a debriefing activity where students have an opportunity to share a special experience from their Outing. The basic concept of this activity is students choose an animal from the Temperate Rainforest as a metaphor for an experience they've had during their Outing.

Flow Learning: Share Inspiration

Location: Anywhere a circle can be made with your entire group.

Bin Materials: A Class Set of Temperate Rainforest Animal Figures

Procedure:

1. Invite the class to form a circle.
2. Place the animals in a pile in the middle of the circle.
3. Introduce each animal and possible framing around each one. This can be done by talking about some of the known characteristics of or associations with each animal. Try to encourage students to stay topical, however be sure they feel welcome to share experiences that reflect the physical nature of their outing.

For example:

Deer: Agile, nervous, quick I felt nervous and uncomfortable when... I like being active during ...	Owl: Wisdom (though ironic), sensory awareness, and stealth I learned so much through... It was amazing to listen to the ... I was surprised by...
Black Bear: Social, strong senses, and intelligent I enjoyed the opportunity to socialize with my friends when ... My senses were ignited when ... I've become much more knowledgeable about ...	Turtle: Calculated, adaptable, avoid confrontation, wise and long-lived I enjoyed thinking through... I felt like crawling in my shell ... We adapted well to the ...
Wolf: Stamina, perseverance, and intelligent Even though I was tired, I ... I really wanted to spend more time on ... I worked hard when ...	Raccoon: Smart, tough, tricksters and troublemakers It was funny when... I became stronger by ...

4. This activity can be modeled by the teacher going first.
5. Students select their animal, share their metaphor, and then return the animal to the middle.
6. The activity is complete when all students have had a turn.

Conclusion/Debrief

Students can always be encouraged to document their final reflection in their Nature Journal.

Classroom Extensions

Create your own Temperate Forest Mural. Have students contribute things they remember seeing, smelling, and hearing in the temperate forest and put each in the layer it occupies.

Internet-Based Activities

<http://soilweb.landfood.ubc.ca/labmodules/>

A site to introduce students to soil health. Lab modules text and video to outline things such as soil nutrients, compaction, and respiration and use

More Related *Forests in Focus* Activities

Indoors

The Three R's in the Forest (p 83)

Counting Birthdays (p 89)

Forest Food Webs (p 130)

More BC based Ecology resources at:

www.hctfeducation.ca at the Resource Room.

www.sierraclub.bc.ca/education/resources-tools