Science Unit: *Temperate Forest*
Lesson 6: *Trees and Erosion*

School year:	2006/2007
Developed for:	Lord Selkirk Annex Elementary School, Vancouver School District
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Grade level:	Presented to grades 1 - 2; appropriate for grades 1-7 with age appropriate modifications
Duration of lesson:	1.25 hours
Notes:	This lesson is adapted from an idea given by University of British Columbia Senior Instructor, Carol Pollock

Objectives

1. Learn how trees protect the soil from erosion by rain.
2. Students will have practical experience of how to set up an experiment, obtain results and interpret those results.

Background Information

In BC, many forests are on hilly slopes. Trees are composed of trunk, roots, branches and leaves. Together, the branches and leaves form a canopy. The roots of trees penetrate the soil and enmesh it. Some clear-cut logging practices expose the soil to rain and erosion. This can lead to landslides. We need to be able to harvest trees since we use tree products in many ways. What we use trees for should be explored in the week before this experiment so the students have a sense of how much around them comes from trees. Can the trees be cut down to minimize soil erosion?

Experiment: Do trees affect soil erosion when it rains?

Vocabulary

Erosion	The removal or wearing away of soil or rock by wind, water, or other forces or processes.
Roots	The lowest part of a plant which anchors the plant into the ground.
Soil	The top layer of the earth's surface in which plants will grow. It contains organic matter, inorganic matter and living organisms.
Slope/elevation	The amount by which something is angled up or down.
Canopy	The upper part of the forest where a continuous cover of branches and leaves is formed collectively by the crowns of adjacent trees.
Logging	The work of cutting down forest trees for timber.

Materials

Each group of students will need the following

- 1 polystyrene ceiling tile approx 8.5x11inches (often available in building
- 2 or 3 spay bottles with water (rain)
- 1 ruler and 1 pencil

stores)

- 50-100 toothpicks (trees)
- 10-15 toothpicks with umbrellas (canopy)
- 2 blocks for elevation
- 1 tray to catch water and sand (cookie sheet)
- 1 cupful of silver sand,
- 1 tarp for table

In the Classroom

Introductory Discussion

1. The week before the experiment, discuss what we have around us that are made from trees or tree products. Why are trees important to us?

   For example: oxygen, wood (e.g. furniture, houses, toothpicks), paper, food (e.g. nuts, syrup, fruit) rubber, medicine (e.g. http://www.geocities.com/opossumsal/trees.html)

   Start a flip chart worksheet and over the week have the students look around their home and school. Have each student post their ideas on the page either as a word or a drawing for trees or tree products that they have found. No two should be the same.

2. On the day of the experiment, review the flipchart to ensure the need for trees in our everyday lives.

3. Discuss the basic parts of the tree. What part of the tree is in the soil? What is the job of the roots? Show how roots infiltrate soil to hold the tree upright. What would happen to the tree if the roots were removed? Discuss the need to cut down the trees with the need to preserve the soil on the hillside Show pictures of forests growing on hillsides followed by clear cut hillsides. Lead into landslides.

4. Review how to do a science experiment.

   - Make an observation and then ask a question OR start with a question: Do trees hold soil? Does soil stay on a steep slope that has no trees? Does the number of trees on the hillside affect the rate of erosion by rain?
   - Think about what will happen if we have no trees on the slope. Write down what you think will happen. This is your prediction.
   - Set up an experiment (trees on a slope and erosion), and treat everything the same way except for one thing--what you want to test (the effect of the number of trees on soil erosion in the rain). Test treatments will be areas of a large number of trees, small number of trees, trees with a canopy, no trees. Discuss why you only change one thing (a variable).
   - Make observations.
   - Collect data, record and examine results (think about why things happened the way they did).
   - Make conclusions and explain results (compare results to predictions to help you think deeper).

5. Safety guidelines.

   - This experiment involves toothpicks (which can hurt), water and sand. It can be messy. Tarps under a tray to catch the water and sand help to cut down the mess.

Science Activity/Experiment

Experiment Title: To investigate the effect of trees on soil erosion by rain on a hillside (you may wish to use “Trees and Erosion” with younger students)..

Purpose of Experiment: to compare the effect of the number of trees on a hillside and erosion of the soil by rain (for younger students, you could use “How do trees help keep the soil in place?”

Experimental Treatments:

Test treatment 1	Many trees
Test treatment 2	Trees with thick canopy
Test treatment 3	Few trees
Test treatment 4	No trees

Methods:
The week before the lesson, the students should look around their school and home and each one come up with a different thing made from trees or tree products. They should write or draw their findings and stick them to a poster or flipchart.
The day of the lesson:
Students will be divided into groups of 3-5 students per group. Students will set up their tile with the different numbers of toothpicks (trees) in different quadrants of a polystyrene tile as follows:

6. Students draw a line on the tile down middle and across middle of the tile making four quarters
    - Push the plain toothpicks into the one quarter of the tile to simulate a leafless forest
    - Push umbrella toothpicks into one quarter of tile (trees with canopy)
    - Put just a few toothpicks (small number of trees say 10-15) in the third quarter
    - Put no toothpicks in the last quarter
7. Place the “treed” tile on a tray. Spread a quantity of sand over the tile between toothpicks to cover the tile evenly.
8. Elevate the tile with a block at one end, leaning the tile on a tray to catch the water
9. Spray water (rain) onto slope with spray bottles
10. Record observations
11. Since the students will already have discussed the need for trees in our every day lives, the need to cut trees down will be established. The discussion should be how can we harvest the trees but keep the soil? Have the students put toothpicks across the slope in the quarter of the tile with few or no trees and see what happens.
12. What happens when the elevation of the slope is changed?

Closure Discussion

13. Review what happened in each quarter
14. Did changing the slope effect the erosion?
15. Did putting barriers across the slope effect the erosion?
16. Is there a good way to log a hillside to retain the soil?

References

17. . B.C. Ministry of Forests. 1999. Forests in Focus. ISBN 0-7726-3966-3

STUDENT WORKSHEET

1. QUESTION Do trees hold soil? Does soil stay on a steep slope that has no trees?	3. OBSERVATIONS What we saw.
2. PROCEDURE What we did. Draw the experiment	4. CONCLUSIONS What are the answers to the questions?