

**Teacher Background**

Trees and Streams

Forestry policy is a highly controversial subject in Washington State; however, few people would argue that forests are extremely important for wild anadromous fish. Trees provide shelter from the sun. They offer streamside protection from predators. And, as this lesson seeks to illustrate, trees also reduce erosion by slowing down water movement and holding the soil with their root systems, insuring clean, clear water in forest streams.

Trees also are at the center of forest food webs. Young salmon are necessarily a part of these food webs. Leaf litter from trees provides food for both airborne and aquatic insects, upon which the salmon fry depend.

Older forests are complex environments which harbor a diversity of plants and animals and maintain delicate but fertile soils. Clearcutting, coupled with burning of wood waste is devastating to these animal and plant communities, and to forest soils. Forest management laws now provide some protection to salmon through provisions for buffer zones of standing timber along stream corridors. However, timber management still fails to account for the cumulative effects of massive timber harvests over large portions of a watershed. Over time, habitat for salmon and other forest wildlife is on the decline.

Your students will work in pairs for the activity, TREES AND STREAMS. Each pair will make and test two experimental watersheds for erosion characteristics. It is probably most practical to have them do all the work outside, both for access to the natural materials, and to keep the mess out of your classroom!



Lesson Plan

Trees and Streams

Student Objectives:

- Students will experiment with the effect of vegetation on erosion. They will create two experimental landscape models, one with and one without vegetation. The students will observe ways in which these two landscapes differ in susceptibility to erosion.
- Students will relate this experiment to the effects of clearcutting on watersheds.

Materials:

- One copy per student, TREES AND STREAMS
- 16 plastic paint-roller trays
- 8 small shovels, trowels, or large spoons
- A source of dirt or sand
- Some "instant" vegetation -- leaves, twigs, grass, etc.
- A watering can
- Graphics:
 - SOUTHERN OLYMPIC NATIONAL FOREST MAP
 - STREAM SEDIMENT LOADING OF BIG BEEF CREEK

Procedure:

1. Have the students read the first three paragraphs of the student text, TREES AND STREAMS. Stop there to introduce the activity.
2. Explain to your students that in each of the two paint trays they will make a miniature watershed landscape, one to represent a forest watershed and one to represent a clearcut watershed. Each watershed should have an identical stream through it. They can use sticks, leaves, pine needles, etc. to represent trees in their forest landscape. The clearcut should have no standing "trees."
3. After their landscapes are prepared and student observers ready, use the watering can to test the landscapes for erosion. You should attempt to make all watering episodes roughly identical in volume and force, while students note movement of soil and evidence of silt in the run-off.

LESSON PLAN

4. After the experiment, dump dirt and weeds in an appropriate place and clean up tools with a hose if you have access to one. Your students can then answer the remaining questions on their DATA SHEETS.
5. Besides just removing trees, logging brings other changes to a forest. Show your students the map, SOUTHERN OLYMPIC NATIONAL FOREST. Ask them to consider why there are so many more roads inside the national forest than outside.

If your students can't guess, explain that these are logging roads, cut for access to the timber. They are all primitive dirt roads. Timberland in the Skokomish watershed averages 4.5 miles of road per square mile, some of the highest levels in the entire state.

Show your students the graph, SEDIMENT LOADING OF BIG BEEF CREEK. Discuss the impact of road cuts on erosion, as demonstrated by these two graphs.

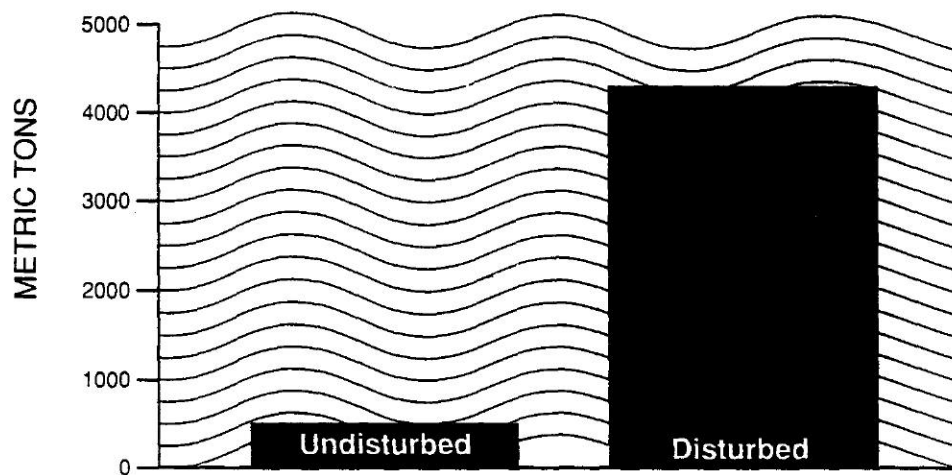
Ask the students for their ideas about what could be done to ease this land-use dilemma.

(They may suggest restricting the percent of acreage which can be converted to roads, and imposing severe limits in steeply sloping terrain.)

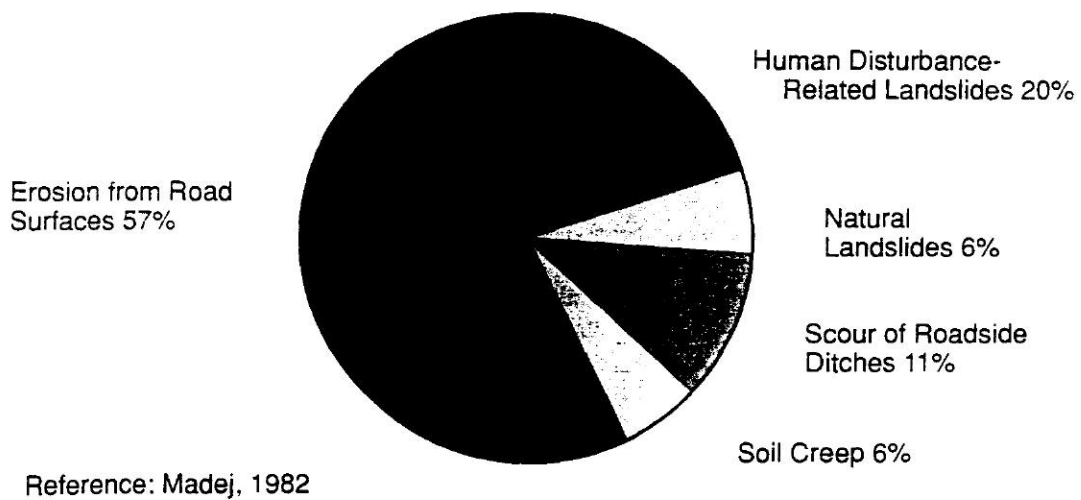
Answer Key:

1. Answers may vary.
2. Answers may vary.
3. Students will probably say their results demonstrate that erosion is associated with clearcutting.
4. Students will probably recognize that the greater the grade, the more serious the problem.
5. Silt and excess gravel can smother the eggs and young fish. It can reduce circulation around them, possibly causing oxygen starvation.
6. Trees help keep the water temperature low, which helps keep dissolved oxygen in the water high.
7. Trees help hold the soil, controlling erosion and siltation.
8. Removal of trees reduces the food supply of aquatic insects, which salmon fry eat.
9. lumber for building or remodeling houses, paper products: newspaper, paper plates, paper towels...
10. using wood and wood products frugally, and recycling paper products.

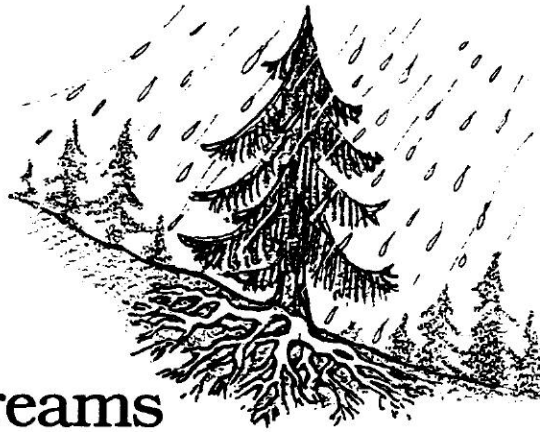
You might like to make your students aware that lumber is currently being cut for sale to countries like Japan to which the United States has built up a very large trade deficit. Because lumber is used to balance this deficit, buying foreign-made cars, audio equipment, and game computers also puts pressure on our forests.



ANNUAL STREAM SEDIMENT LOADING ESTIMATES
FOR DISTURBED AND UNDISTURBED AREAS
OF BIG BEEF CREEK WATERSHED



PERCENT OF SEDIMENT LOADING TO BIG BEEF CREEK
FROM VARIOUS EROSIONAL SOURCES



Trees and Streams

Hyak swims strongly up the South Fork. Although she has encountered many changes in the river, the human activity which has probably changed the river the most is further upstream still. The river is showing these changes down its entire length. Large loads of new gravel and silt have been washed into the river. The old riverbed has become so full of dirt, there's not always room for the water. Farms and homes along the river have been flooded again and again.

Look again at your SKOKOMISH WATERSHED AND LAND USE MAP. What is the main human activity taking place along the small streams on the west side of the map, streams which feed the South Fork?

Clearcutting is the most common practice in logging today. In clearcutting, all trees are removed from the harvested area. Could clearcutting be causing problems like these? The following experiment will help you find out!

Directions: Fill two paint trays with dirt or sand. Mold the dirt into two identical landscapes. Plant "trees" in one by pushing sticks, leaves and grass into the dirt. Label this tray "Plot A". Leave the second tray barren, and label it, "Plot B".

1. Predict what will happen to your two landscapes when the winter rains come. Which plot will probably experience more erosion?

Use a watering can to make it rain on your two watersheds.

2. What differences (if any) did you see in your landscapes after the rain?

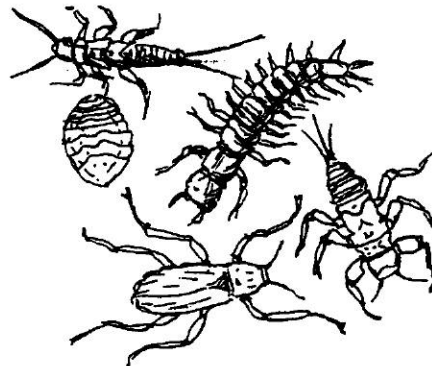
3. From the results of your experiment, what might be the effect on soil erosion in a region if all the trees are cleared?

4. Your experimental watersheds had relatively gentle slopes. How might slopes like the one below be differently affected?



- 5.** This river may also be carrying a heavy load of silt and gravel. What effect might this silt have on the nest Hyak will soon be building -- and on her baby fish?
- 6.** Trees are important to salmon in many ways. You learned about one way in the experiment, WARMING IT UP. What was it?
- 7.** You learned about a second way trees are important to salmon in this experiment, TREES AND STREAMS. What was that?

Here's one more way. Trees drop leaves and twigs in the water and along the stream banks. This makes food for water insects. Although spawning salmon like Hyak aren't interested in insects, her babies will be. In fact, they will eat large numbers of insects while they are in the river.



- 8.** What could removal of trees do to the supply of food for baby salmon?

Timber harvested in Washington is used to build homes, to make paper, and to sell to other countries. Many people in Washington make their livings cutting trees, milling lumber, making paper products, or in building with the wood available in the Pacific

- 9.** What are two items that you use which come from trees growing in places like the Skokomish watershed?
- a.**
 - b.**
- 10.** Cutting fewer trees alongside streams and in steep watersheds would improve stream water quality for salmon. What changes in your family's lifestyle would decrease the demand to cut these forests?

