

Water, Water Everywhere— Forestry and Runoff

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4.
- C. Environmental Issues and Investigation Skills: C.4.1, C.4.2, C.4.3, C.4.4, and C.4.5.
- D. Decision and Action Skill: D.4.2.
- E. Personal and Civic Responsibility: E.4.2.

Key Concepts/ Content

Students will:

- ✳️ Compare the rates of runoff down slopes with and without vegetation.
- ✳️ Contrast erosion of deforested soil with vegetation's effect to reduce erosion.

Teacher Background

This activity and the physical education extension are designed to simulate the effects of erosion and runoff on different land surfaces. It models the need for forests as buffers to prevent erosion and the siltification of our lakes, rivers, and streams. The unprotected soil will produce deeper erosion patterns, more runoff, and increased sediment than the soil protected by vegetation.

In an undisturbed landscape, sedimentation is a slow, naturally occurring process. However, human activities often speed it up. The result can be large amounts of sediment accumulating in lakes, streams, and wetlands that speed up the aging of lakes and bury fish spawning grounds and aquatic plants. These plants are a source of food and habitat for fish and other aquatic organisms. Suspended sediment can cloud the water, reducing the hunting success of sight-feeding fish; it can also damage the gills of some fish species, causing them to suffocate.

Wisconsin's Forestry Best Management Practices for Water Quality is a DNR program that promotes environmentally sound forestry practices. These practices minimize soil exposure and compaction in order to protect ground vegetation and the duff layer (the accumulation of needles, leaves, and decaying matter on the forest floor). The duff layer protects the deep, porous forest soil from the erosive force of raindrops and allows the rain to soak into the soil. As long as the duff layer remains in place and the soil is not compacted, forestland produces very little runoff.

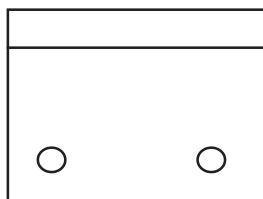
From 1995 to 1997, monitoring teams evaluated 295 timber sales across Wisconsin that were either on a wetland or within 200 feet of a stream, lake, or river. These sites, where timber had recently been harvested, were evaluated to see if the Best Management Practices (BMPs) had been applied and if they were effective. The results from this monitoring are very encouraging:

- BMPs were correctly applied 85 percent of the time where needed.
- When BMPs were applied where needed, 99 percent of the time there was no adverse impact to water quality.
- When BMPs were not applied where needed, 38 percent had no adverse impact, 57 percent had a minor impact, and 6 percent had a major impact.

Getting Ready

1. Visit website www.newforestsproject.com >Tree Education >Ecology & Trees
2. Teacher needs to manufacture tubs for activity prior to class.

(end view)



top

circles show location of drainage tubes for runoff collection

Drill (or cut) holes to receive drainage tubes. Cut tubes long enough to reach drain pans. Caulk in place with silicon or hot glue.

3. Gather sod, small trees or plants, leaf cover, sand, gravel, and topsoil to create landscapes. Ask students to bring materials, too.

Safety Issues



- ◆ Follow safety contract. (See Appendix)
- ◆ Watch for spillage on the floor. Clean up immediately so floor does not become slippery. (OR – conduct activity outside!)

Materials Needed

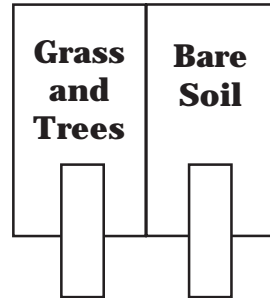
- ✿ Large plastic tubs to create models of hillside slope landscapes (wallpaper trays work well)
- ✿ 1” tubing for drains to simulate streams
- ✿ Silicon caulking or hot glue gun
- ✿ Gravel and sand to create a slope filling the tub
- ✿ Sod, small trees to cover half the slope
- ✿ Leaves and needles
- ✿ Bucket of water to simulate rainstorm
- ✿ 2 pans to simulate lakes
- ✿ Plastic tarp or newspapers
- ✿ Towels, etc. for cleanup
- ✿ Watering can

Procedures

This can be a teacher demonstration activity or students can work in small groups, depending on availability of materials and classroom setup. Optimally, students should create their own landscapes.

Students should record their observations in a journal throughout the process.

1. Fill the tubs and build in a slope with layers of gravel, sand, and topsoil covering entire tub.
2. Landscape one-half of tub with vegetation, covering slope from top to bottom. Leave the other side bare.



3. Pour water over top of slope as quickly and uniformly as possible. Using a watering can helps with this.
4. Collect runoff in drain pans.
5. Record observations.
6. Pour runoff water into clear jars and allow to settle overnight.
7. Record observations.
8. Share and analyze results.

Variations:

Create landscapes with strip plantings as buffers horizontally or diagonally instead of two vertical slopes to illustrate the differences in runoff, and record the observations.

Evidence of Student Understanding

1. Create a picture explaining “Water, Water Everywhere” and the concept of reducing erosion and runoff by planting trees and ground covers.
2. Journal entries

Extensions

Physical Education Activity – follow procedures for **Project WET Just Passing Through** (pp. 166-169). This is a whole body activity investigating “how vegetation affects the movement of water over land surfaces.”

**References/
Resources**

 *Project WET*. Montana State University. Bozeman, MT 59717, <http://www.montana.edu/wwwwet/>

 *Paddle to the Sea* . Holling Clancy Holling (Supplemental Curriculum Activities for Literature integration)

