Chapter 2. Measuring a Physical Contaminant

Lesson 2. Sources of sediment: Part I

Overview: Contaminants that can affect the quality of or usefulness of water for various uses can be categorized as either chemical, physical or biological. Generally, the most troublesome physical contaminant is sediment: silt, sand, organic debris. As you will see, not only does the presence of sediment affect the drinking quality of water, it can affect other uses of water. To understand and appreciate the significance of physical contaminant such as sediment, we need to know not only how to define and measure it, but also how to prevent it and how to clean up water affected by it. The ideas taught in this lesson should give you a better understanding of sediment as a contaminant.

Purpose: The purpose of this lesson/activity is to introduce students to the idea of physical contaminants in water, help them understand the significance of such contaminants, teach them how to measure or quantify sediment, and illustrate how to deal with sediment.

Ideas Taught:

- Sediment does not normally occur in ground water systems; the two primary sources of sediment in surface water systems are 1) land surface erosion or runoff, and 2) stream bank and stream bottom scouring.

Materials Needed:

- A cookie sheet or pie tins (cookie sheets work best)
- About two cups of fine textured soil or potting soil
- A clean liquid dish soap squirt bottle full of water
- A large plastic cup or bucket, about 1/2 full of clean water
- A large funnel
- A large plastic cup with several holes in the bottom and full of washed sand or clean, fine gravel
- About 2/3 cup of water in a glass
- 1/4 cup of fine textured soil or potting soil

Procedure:

1. ___ Lay the cookie sheet or pie tin flat on a table. Spread the two cups of soil as evenly as possible over the tray and then place the tray at a a slightly

tilted angle, with one corner about two inches off the table and the diagonal corner on the table. A couple of chalkboard erasers work well for this.

2. ___ Place the tray so that the lowest corner of the cookie sheet is just beyond the edge of the table.

3. ___ Let the students see the water in the bucket and ask them if they think the water is clean. Ask if they would be willing to drink the water.

4. ___ Put the funnel in the bucket and place it immediately under the lowest corner of the tray, so that any water running off the tray will go into the funnel and then into the cup or bucket.

5. ___ Using the plastic squirt bottle, apply a steady (but not too forceful) stream of water across the highest side of the cookie sheet.

6. ___ Observes what happens. You should see a very good example of erosion and sediment movement.

7. ___ After the water has stopped running off the sheet, pick up the bucket with the eroded soil in it.

8. ___ Explain to the class that this is an example of sediment, and that what they just saw was the process of surface erosion adding sediment to a water system.

9. ___ Ask them how many students would be willing to take a drink of the water now.

10. ___ Pick up the plastic cup full of washed sand. Explain that this represents the earth and the soil mantle or layer that lays over the top of a groundwater aquifer (completely saturated soil particles, rocks, and gravel are filled with water. We can get this water with wells.)

11. ___ Using the squirt bottle, squirt enough clean water on top of the plastic cup so that you get water running out the bottom.

12. ___ Ask the class what they think of the quality of the water coming out the bottom. Comment that there is no sediment in the water.

13. ___ Take 2/3 cup of water and add 1/4 cup of fine textured soil to the water and mix it up.

14. ___ Now pour the mixture over the top of the sand in the cup.
15. ___ After it has settled, use the squirt bottle to again apply water to the top of the sand column. Be sure to catch the water that drains out of the bottom of the cup.

15. ___ Hold the drainage water up and ask the students what has happened. Ask them what effect the soil has had on the sediment movement. Ask them if they can see why ground water usually does not contain sediment and why we often find it easier, less expensive, and more convenient to use ground water than surface water.

Lesson Learned: ***Ground water systems are usually protected from either sediment or bacteriological/biological contamination. the soil surface over the top of ground water acts like a giant filtering and trapping system. This trapping and filtering system has limited capacity, especially regarding chemical contaminants.***

The lesson above was adapted from "*What is Water Quality? A Resource Guide for 4-H Leaders and Teachers*," 80 pages of activities and experiments related to water quality. ($5.00) Order from the Montana 4-H Program at Montana State University-Bozeman. Phone 406-994-3501.