Name: _____

Date: _____

Observing and Measuring Turbidity

How does turbidity impact water quality? Why is it important to know about Total Suspended Solids? What are the best ways to manage soil erosion and control sediment and turbidity?

Do ... the activity

Measuring Turbidity using a Turbidity Tube

Turbidity is the cloudiness of the water caused by soil particles suspended in a sample of water.

1. Pour your 1-quart rainbox runoff sample into the Turbidity tube.
2. One student should look down the tube to monitor the water and a partner should slowly release the water from the spout at the bottom, keeping his or her fingers on the clamp.
3. When the student looking down the tube first glimpses the secchi marker (the black and white disk) at the bottom, he or she should indicate to their partner to clamp the spout and stop the release of water.
4. Correlate the level of water with the amount of turbidity by reading the measurements on the side of the tube.
5. Each group should record its turbidity levels on the Rainbox Throwdown Lab Sheet as well as on the chalkboard.

TSS Measurement Lab

Total Suspended Solids (TSS) is a measure of the total amount of suspended particulates in a given water volume (typically measured in mg/L). TSS is measured by analyzing a known volume of sediment-laden water and pouring it through a pre-weighed filter. The filter is then dried at 105 degrees Celsius and then weighed again. By subtracting the weight of the filter with the sediment from the weight of the filter alone you will obtain the weight of the sediment alone. You then have the amount of sediment (mg) in a known volume of water (L).

1. Carefully measure out a known volume of sediment-laden water from the rainbox test water samples.
2. Stir the whole sample vigorously before pouring off a subsample of 1 oz (30ml) for TSS measurement. This will ensure that the sediment is evenly distributed throughout the water column, and preserve the integrity of the sample.
3. Measure the volume of the subsample.
4. Weigh a small conical shaped coffee filter.

5. Drain the subsample through the filter, then place the filter in an oven, toaster oven, or somewhere the sample can completely dry.
6. Once it is completely dried, weigh the filter. Calculate the TSS (mg/L) of the sample and log the data in the Rainbox Throwdown Lab Sheet.

Turbidity Control: PAM Lab

The only way to control these fine particles responsible for turbidity is through chemical treatment. These chemical treatments are flocculants that bind soil particles together until they fall out of suspension. They range from mineral based-flocculants like alum, which is a metallic hydroxide with a polymeric structure, to polyacrylamides (PAM). In order for PAM to be effective, it needs to be introduced to the runoff at a point of high flow velocity. To understand how PAM works:

1. Use your remaining 8 oz runoff samples from the Rainbox Throwdown. Shake the jar for 10 seconds to ensure thorough mixing. (Alternatively, measure a teaspoon of soil and mix with 250ml of water in a small clear container with a lid (like a mason jar).
2. Add a pinch (8 to 10 granules) of the granular PAM to the sediment mixture and shake again, ensuring that the PAM has adequate mixing time.
3. Be careful not to add too much of the PAM as it will quickly form a gel inside your container and waste some of the product.
4. If the PAM is suitable for the soil you will begin to instantly see flocs forming, sediment settling out of the suspension, and the water clearing.
5. If the PAM is not appropriate for the particular soil nothing will happen. In this case, try another type of PAM if it is available or a different soil.
6. This experiment can be expanded by using more than one soil and PAM. Rank the effectiveness of the PAMs on these individual soils by charting the results on the board.

Talking it over: Turbidity and PAM

Share... what you did

What were the measurement results of the turbidity and TSS labs. Which group had the lowest results? The highest? What do these results mean? Did you expect these results? What did you do to get the results that you did? What ways would you improve your rainbox? Which group is the winner? Why would PAM be useful as a turbidity control practice?

Reflect... on the results

Why is it important to be able to make accurate measurements? Why does gathering data for an experiment matter? Did your PAM work? What if it didn't work? What does this mean to the science process?

Generalize... to your community

What can you do with your turbidity and TSS measurements that might matter to your community? Have you observed turbidity in your local creeks? What ways might you make a difference?

Apply … to your community

Can you think of ways you might be able to take the information you learned and apply it to a problem in your neighborhood? Why is this important? What resources will you draw on?