Activity: Determining Water Quality Using a Turbidity Tube
Turbidity tubes are used to measure the clarity of water samples. Turbidity can be measured by examining the cloudiness of water and is an important component of determining water quality.

Practice(s): Planning and Carrying Out Investigations **Crosscutting Concept(s):** Cause and Effect: Mechanism and Explanation **Disciplinary Core Idea:** ESS3.C: Human Impacts on Earth Systems; ETS1.A: Defining and Delimiting Engineering Problems

Materials

- 4 foot clear fluorescent light tube guard
- Rubber bands
- PVC cap to fit tube guard
- Permanent marker
- Yardstick or other measuring tape
- Scissors
- Small water container
- Water samples for testing
- Towels
- Glue (optional)

Procedure
Safety Note: Use caution when handling sharp objects such as scissors.

A. Construct a turbidity tube.

1. Using a permanent marker, draw a secchi disk on the inside surface of the PVC cap as shown in Fig. 5.1. More information about secchi disks can be found on the secchi disk app at http://www.secchidisk.org/

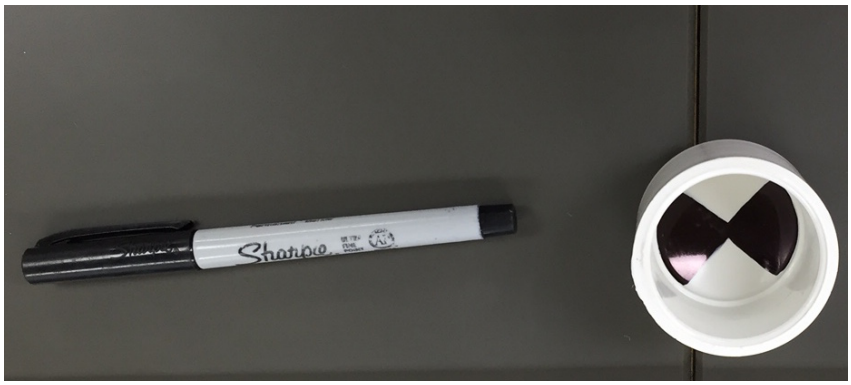

Image by Anuschka Faucci

Fig. 5.1. A secchi disk is a circle that is divided into quarters and used to measure water turbidity. The secchi disk can be drawn on the inside of the PVC cap using a permanent marker.

2. Use yardstick and scissors to remove an eleven-inch section from one end of the fluorescent light tube guard.

3. Place the cut end of the fluorescent light tube guard into the PVC cap so that it fits snugly. You can glue the cap onto the light tube to secure it.

4. Use rubber bands to secure the yardstick to each end of the fluorescent light tube guard. Place the zero mark on the yardstick at the end of the tube from the bottom of the PVC cap as shown in Fig. 5.2.

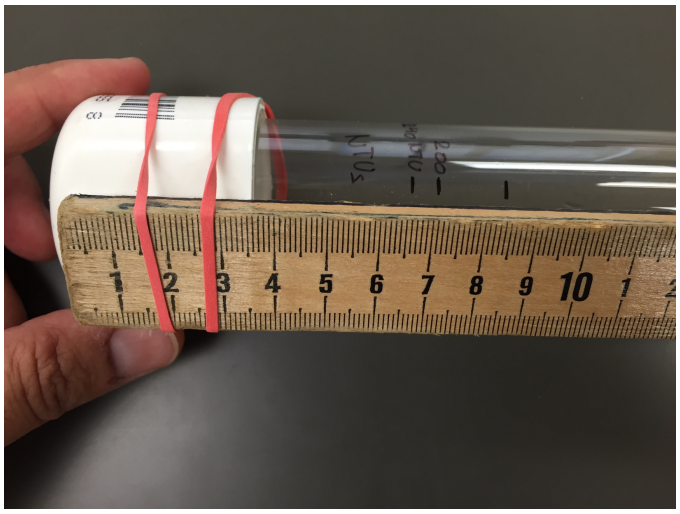

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Fig. 5.2. Use rubber bands to secure the yardstick to the turbidity tube for accurate measurement.

5. Use Table 5.1. to mark the fluorescent light tube guard using a permanent marker. Each ruler measurement in centimeters corresponds to a turbidity measurement in nephelometric turbidity units (NTUs).

6. Mark each centimeter mark with the corresponding NTU measurement on your turbidity tube, so that turbidity can be determined. Your turbidity tube should be notated like the one in Fig. 5.3.

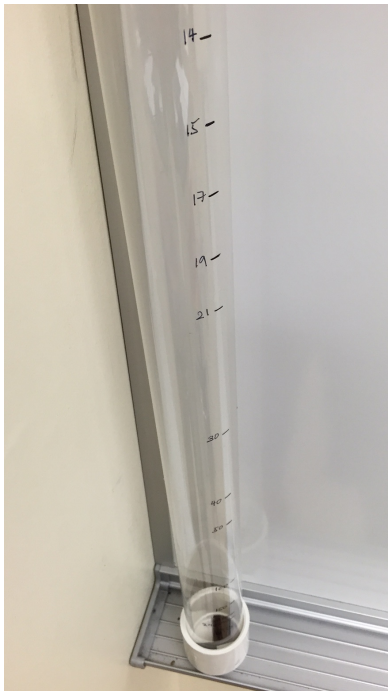

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Fig. 5.3. Completed turbidity tube with measurements in NTUs.

Table 5.1. Centimeters to NTU conversion table

Centimeter Measurement	NTUs
6.7	240
7.3	200
8.9	150
11.5	100
17.9	50
20.4	40
25.5	30
33.1	21
35.6	19
38.2	17
40.7	15
43.3	14
45.8	13
48.3	12
50.9	11
53.4	10
85.4	5

B. Using a turbidity tube to measure water quality.

1. Use the small water container to pour your water sample into the top of the turbidity tube.

2. Rinse the turbidity tube with the water sample and pour it out.

3. Stand next to your turbidity tube so that your shadow blocks direct sunlight.

4. Stand over the top of the turbidity tube so that you are able to see the secchi disk at the bottom. Slowly pour the water sample into the tube until the secchi disk becomes difficult to see.

5. Continue to pour water slowly until you are no longer able to see the secchi disk pattern on the bottom of your turbidity tube.

6. Record the turbidity measurement indicated by the water level on the side of your turbidity tube. Repeat for additional water samples.

For more information on how light reflection in the water can affect turbidity, visit http://misclab.umeoce.maine.edu/research/HydroColor.php and download the app.

Activity Questions

1. Was there a difference in turbidity among your samples?

2. Explain how turbidity can be used as an indicator for water quality.

3. What types of chemical or environmental factors can influence water turbidity?

4. Do you think that water temperature plays a role in turbidity? Explain the reasoning for your answer.

5. How do you think salinity will affect turbidity? Do you predict that saltwater or freshwater will have a higher turbidity level? Why?

6. Do you think their regions that have higher or lower turbidity levels on average? Where do you think these regions are located? Why?