Water Clarity

Calm, Deep Water

Accompanying Worksheet: W-W-01

Objectives: Students will construct and utilize a Secchi disk to determine the turbidity of a water source.

Considerations:

1. This protocol is best for ponds, slow rivers, etc. For shallower or fast-flowing sample sites such as creeks or streams, reference the Water Transparency: shallow, swift water protocol for the use of transparency tubes.
2. This protocol works best when the students are in groups of 3: one to operate the Secchi disk, one to take measurements, and a third to record and make notes.
3. If you choose, you can perform this protocol on one sampling occasion and analyze your results, perhaps as part of a site characterization. However, we believe it works best when many samples are taken throughout the year at a given site and the collective data are analyzed at the end of the study, allowing students to correlate water transparency with other factors such as rainfall.

Materials

Secchi Disk Construction:

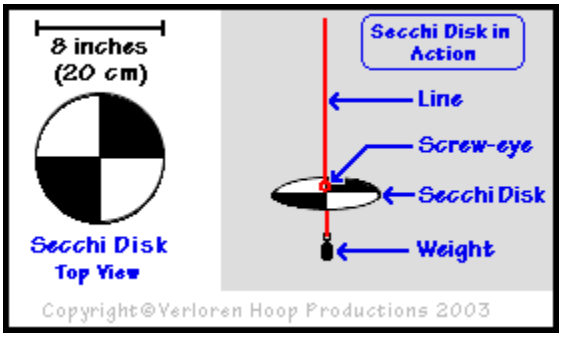
- Thin circular wooden disk, 20 cm diameter
- Waterproof paint (black and white)
- Rope or sturdy string (such as twine). Fishing line is also acceptable.
- Permanent marker
- Screw-eyes (2)
- Weights (we suggest a metal pipe. However, a mesh/cloth bag filled with rocks works as well)
- Measuring tape or meter stick

In the field

- Secchi disk
- Worksheet W-W-01
- Umbrella, posterboard, or other means of shading the site if the sample site is in direct sunlight
- Measuring tape or meter stick
- Clothespins (2)
- Thermometer

Instructions: Constructing the Secchi Disk

1. Divide the disk into quadrants, and paint alternating sections black and white, as seen right.
2. Attach the screw-eyes to the center of the disk, on both the top and bottom.
3. Tie the rope or line to the top screw-eye. The length of the line will vary depending on the depth of the water. If you are unsure, we suggest 5 meters.



4. Using the permanent marker, mark every 10 cm up from the disk, denoting 50 cm and 1 m points with thicker lines. If you are using fishing line or other thin, hard-to-mark rope, we suggest tying simple overhand knots every 20 cm instead.
5. Construct the weight. The simplest method is to use a length of metal pipe. Run the line down through the center of the pipe and back up along the outside. Tie a secure knot to keep the pipe in place.
    a. A low-cost alternative is to place a handful of gravel-sized rocks into a bag, close the bag securely, and tie the bag to the screw-eye. A mesh bag would work best, but you can also use plastic shopping bags (in which case we suggest double-bagging the rocks to reduce the odds of breaks).

Instructions: Data Collection

1. Place the thermometer in the water. Wait two minutes, and record the temperature.
2. Start by lowering the disk until it is flush with the surface of the water. If you can easily reach the water, consider this your starting point. If you cannot easily reach the water (perhaps you are on a dock or boat), you may need to create a reference point, such as the hip of an individual or post on a dock, to serve as your starting point. If this is the case, mark your starting point clearly with a clothespin.
3. Slowly lower the disk into the water at 10 cm intervals, until it is no longer visible.
4. When the disk is no longer visible, raise and lower it slightly to find the exact point where it disappears.
5. Mark this point on the line with a clothespin.
6. Measure the distance between the starting point and the point of disappearance, and record on the worksheet.
   ** If the disk is still visible when it reaches the bottom of the site, record the depth of the disk and mark it as: “greater than [depth] cm”
   **If the disk is still visible when the line runs out, mark it as: “greater than [length of line] cm”
7. Repeat the process twice more, using different members of the group as observers during each iteration.

Data Analysis:

Students will repeat the protocol on a monthly basis, recording temperature and water clarity. At the end of the cycle (we suggest at least 6 months), they will graph and analyze their data. They will see how the clarity changed over time and how factors such as temperature and rainfall affected the water. For Arizona sites, monthly rainfall data can be found at http://rainlog.org/usprn/html/main/maps.jsp.

Adapted from Globe Water Transparency Protocol:

http://www.globe.gov/documents/11865/354449/hydro_prot_transparency.pdf