

CLARITY AND TURBIDITY

OVERVIEW

Water clarity is affected by turbidity, which can block sunlight's ability to pass through water. Lack of sunlight caused by too much turbidity in water can have a detrimental affect on aquatic life.

OBJECTIVES

Following completion of this lesson, the students will be able to:

- Identify possible environmental complications that can be attributed to clarity and turbidity,
- Measure the clarity of a body of water.

GRADE LEVELS

4th -12th grades

NJCC STANDARDS

Science Indicators:

5.1: End of Grade 4: A2, B1, B2, End of Grade 8: A2, B2, B3;

5.3: End of Grade 4: A1, A2, B2, D1, End of Grade 8: A1; **5.4:** End of Grade 2: C2, End of Grade 4: B1; **5.5:** End of Grade 2: A2, B1, End of Grade 4: A3, B1, End of Grade 8: B1, B2, B3; **5.7:** End of Grade 2: A2, End of Grade 4: A1, A2, B2; **5.10:** End of Grade 2: A1, End of Grade 4: B1, End of Grade 6: A1, B1

Mathematics Indicators:

4.1: 2A1, 2A2, 2C1, 2C3, 4A1, 4A2, 4A3, 4C1, 4C2, 4C3, 6A1, 6A3, 6C1, 6C2, 6C3, 6C4, 8C1; **4.2:** 2D1, 2D2, 2D3, 2D4, 4D2, 4D4, 4D5, 4E1, 4E2, 4E3, 6D2, 6E1, 6E5, 8A5, 8D4, 8D5, 8E1, 12A4, 12B2;

4.3: 6C1; **4.5A:** 1, 2, 3, 4, 5; **4.5C:** 2, 3, 4, 6; **4.5D:** 1, 2, 3, 5; **4.5E** 1, 2; **4.5F:** 1, 2, 4, 5

MATERIALS

- Water sampling site.
- Secchi disk
- 3 or 4 - 100 ml graduated cylinders,
- Water to fill cylinders,
- Soil, clay, sand, rocks,
- Clock with second hand (optional).

PROCEDURES

Attach a secchi disk to a calibrated line, and lower the disk into the water until it just disappears out of sight. The depth (distance from the disk to the surface of the water is recorded in meters. The depth is recorded again and the average of the two readings is recorded as water "clarity."

If the secchi disk reaches bottom before disappearing, the secchi depth is greater than the water depth and cannot be accurately measured. When this occurs, a notation must be added to the clarity reading in your data.

BACKGROUND

Clarity indicates how deep light can penetrate into the water, and can be measured with a secchi disk at any site where the water is enough. Turbidity or cloudiness in water is caused by suspended solid matter, which limits sunlight's ability to pass through water. There are many possible sources of turbidity. Most people think primarily of sediment, stirred up from disturbed or eroded soil, as clouding the water. But

microscopic plankton, such as algae, can also contribute to high turbidity when their numbers are overabundant, usually due to excess nutrients and sunlight.

Turbidity blocks out the light needed by submerged aquatic vegetation (SAV's). Lack of SAV's decreases the amount of oxygen in water and leaves the water with less ability to support aquatic life. Turbidity also reduces visibility for fish that are sight breeders or egg layers, clogs gills of organisms not adapted to a certain levels of turbidity, smothers benthic creatures and eliminates habitat spaces. Suspended sediment can carry excess nutrients and pesticides throughout the water system. Suspended particles near the water surface absorb additional heat from sunlight, raising surface water temperature. Apparent water color, microscopic examination and stream walk observations can help determine the sources of turbidity.

Moderate levels of turbidity can indicate a healthy, well-functioning ecosystem in which plankton flourish at a reasonable level to form the foundation of the food web. High turbidity and low clarity is an indicator of either runoff from disturbed or eroded soil or blooms of microscopic organisms due to high nutrient inputs. Very clear water is not perfect either—open ocean and crystal clear tropical waters support only sparse plant and animal life.

VOCABULARY

Benthic - Bottom dwelling

Runoff - The portion of water from rain or melted snow that flows over the land that ultimately reaches streams, rivers, or ocean.

Secchi disk- a black and white disk attached to a calibrated line.

Turbidity- cloudiness, caused by suspended solid matter in the water.

Clarity- the measure of how deep light can penetrate through a body of water.

EXTENSIONS

Fill 3 or 4 100 ml cylinders with water. To each cylinder, add a different type of sediments, for example, sand rocks, clay, or soil. Mix well and time how long it takes for the sediment to settle down below a pre-determined point in the 100 ml cylinder. Discuss the effects the different types of suspended solids might have in the environment.

REFERENCES

Cliff Jacobson. 1991. Water, Water Everywhere - Water Quality Factors reference unit. Hach Chemical Company.

Gayla Campbell and Steve Wildberger. 1992. The Monitor's Handbook. LaMotte Chemical Company.

Internet Resources:

<http://clean-water.uwex.edu/wav/monitoring/turbidity/index.htm>

<http://www.iisgcp.org/wic/secchi.htm>

<http://www.qacps.k12.md.us/cms/sci/testclar.htm>

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