

Does **CLEAR** Water mean **HEALTHY** Water?

TEACHER



Activity Overview

Water clarity is a good indicator of how healthy aquatic habitats are. It affects the ability of fish to find food, the growth of aquatic plants, the amount of oxygen in the water, and its temperature.

Students test their local aquatic site to determine its water clarity. They measure its turbidity, which is an indication of the cloudiness in the water. They collect a water sample from a local aquatic site and measure its turbidity using a Turbidity Sensor connected to a TI CBL 2™ or Vernier LabPro, and a TI-73 Explorer™. They repeat the experiment to obtain a second turbidity reading and find the average value.

Conclusion: High turbidity (greater than 5 NTU) indicates poor water clarity, which may have negative impact on animals and plants. Low turbidity (less than 5 NTU) indicates good water clarity.

This activity is part of a series of activities to help students determine the water quality of a local aquatic site.



Activity at a Glance

Grade: 4-9
Subject: Science
Category: Life Science, Earth Science
Topic: Living Things, Plants, Animals, Ecology, Photosynthesis, Water Quality, Erosion, Deposition

Time required

- One 45-minute periods

Level of complexity

- Low

Materials*

- TI-73 Explorer™
- TI CBL 2™ or Vernier LabPro
- TI-73 DataMate
- Turbidity Sensor
- Sampling bottle with lid
- Empty turbidity cuvette (comes with sensor)
- Turbidity standard (StableCal® Formazin Standard 100 NTU) (comes with sensor)
- Distilled water
- Soft, lint-free cloth or tissue



Turbidity Sensor

* This activity has been written for the TI-73 Explorer™ but you can easily substitute the TI-83 or TI-83 Plus. Also see Appendix A for steps on how to transfer DataMate to your graphing device and how to use DataMate for data collection.

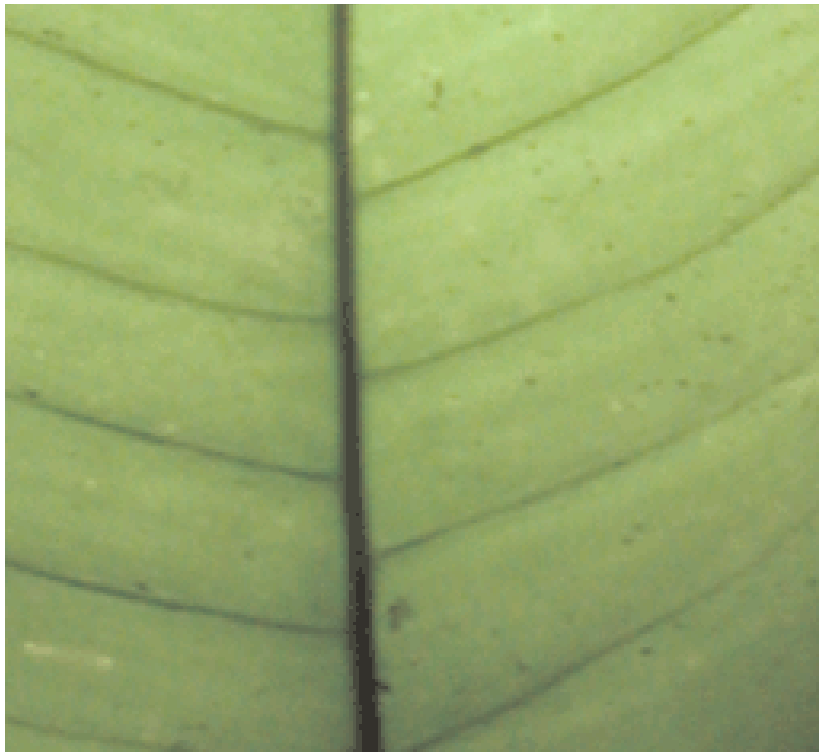
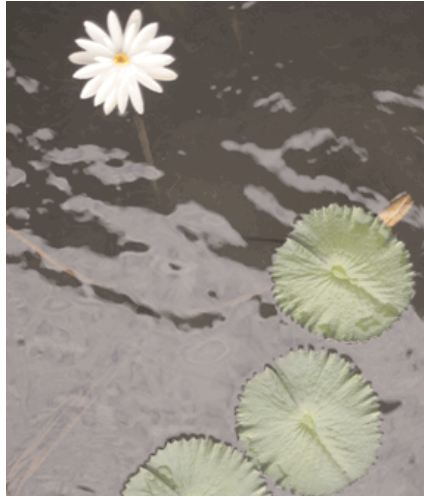


Adapted from "Experiment 3 — Turbidity," *Water Quality with Calculators*, written by Johnson, Robyn L., Holman, Scott, and Holmquist, Dan D., published by **Vernier Software & Technology**, 2002.

Does **CLEAR** Water mean **HEALTHY** Water ?

Concept Background

- High levels of turbidity for a short period of time are less of a problem than lower levels for a long period of time.
- When turbidity is above 5 NTU you can see the cloudiness in the water.
- The standard turbidity for drinking water is between 0.5 NTU and 1.0 NTU.
- Erosion, waste, plankton and algae, and aquatic animals are some of the factors that affect the clarity of water. Water clarity is also affected by weather.
- Humans are often responsible for poor water clarity in aquatic sites. Waste discharge increases turbidity and threatens aquatic life.
- Poor water clarity increases the temperature of the water, which results to low levels of dissolved oxygen. Low oxygen levels affect animal behavior, animal and plant growth, and reproduction and may even cause death.



TEACHER

National Education Standards

Content Standard A: Science As Inquiry. Students should learn about scientific inquiry and develop the abilities necessary to do it.

Content Standard B: Physical Science. Students should develop an understanding of properties and changes in matter, motions and forces, and the transfer of energy.


Science Standard C: Life Science Students should develop an understanding about the structure and function of living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and the diversity and adaptations of organisms.

English Language Arts Standard 3. Students should apply strategies to comprehend, interpret, evaluate, and appreciate text.



Does **CLEAR** Water mean **HEALTHY** Water ?

Classroom Management Tips

- This test can be conducted on site or in the lab.
 - Preferably take on-site measurements. If this is not possible collect the water sample from the aquatic site and store in an ice chest.
- 
- Obtain the water sample from below the surface of the water and as far away from shore as is safe. If suitable areas of the stream appear to be unreachable, samplers consisting of a rod and container can be constructed for collection.
 - Scratches or fingerprints on the outside of the cuvette, air bubbles on the inside of the cuvette, or the orientation of the cuvette in the slot, can alter the turbidity reading.
- You may consider setting up the sensor and TI-73 Explorer™ for data collection in advance (see *Preparation, steps 1 - 4.*)
 - This activity works well with students working in groups or as a data collection station at the aquatic site
 - Encourage students to answer the questions in Observations and Conclusions in a *Journal*.
 - Create your own student questions for use on your student's TI graphing devices using the Texas Instruments StudyCard applications. For more information, go to <http://education.ti.com/us/product/apps/studycards/screensources.html>

Observations & Conclusions

A. What observations did you make at your aquatic site? (weather, description and type of site, signs and condition of animal life, signs and condition of vegetation, signs of pollution)

Answers will vary.

B. Compare your turbidity levels with your observations. Based on your observations and the information provided in the research article, identify the factors that influenced your turbidity levels.

Aquatic sites with good water quality have turbidity levels below 5 NTU. If turbidity is above 5 NTU students may be able to see the cloudiness in the water. Factors may include, pollution, runoff, waste discharge, presence of plankton and algae, aquatic animals feeding at the bottom of the aquatic site, rainfall, lack of vegetation at the bank of the site, and more.

C. Find examples of watersheds (local or outside of your area) that are affected by turbidity levels. Describe efforts that are being done to maintain or change turbidity levels.

Answers will vary.

TEACHER

Vocabulary

Dissolved Oxygen The amount of oxygen dissolved in water. It is usually measured in milligrams per liter (mg/L).

Ecosystem A group of organisms together with its environment, seen as a unit.

Habitat The environment where a particular plant or animal is normally found.

Photosynthesis The process by which plants harness the energy of the sun to make food. In photosynthesis, plants absorb carbon dioxide (CO₂) and give off oxygen (O₂). Thus, there is an overall accumulation of carbon (C) in the plant.

Plankton A small freely floating group of organisms (plants and animals).

Sediment. Solid material that is washed into rivers, streams and lakes by winds and storms.

Turbidity A measure of "how cloudy the water is." It is usually measured in Nephelometric Turbidity Units (NTU).

Watershed An area of land that delivers runoff water, sediment, and dissolved substances to surface water bodies, such as rivers or lakes. All watersheds consist of boundaries, a basin and collection areas.

