CLOUDY WATERS

This lesson plan developed by:

Overview:

Water quality describes the condition of the water, usually with respect to its suitability for a particular purpose such as water for drinking, fishing, swimming or growing crops. Water quality is one of the most important factors of a healthy ecosystem. One parameter of water is turbidity, which is the cloudiness of the water caused by a variety of suspended particles that are generally invisible to the naked eye. It is similar to smoke in the air. The particles can be plankton, sewage, nutrients, sediment, clay, etc. These suspended particles can impact water clarity and the ability for light to penetrate the water. However, high turbidity levels do not necessarily indicate poor water quality, and low turbidity levels do not necessarily indicate good water quality.

Materials:

- 30 feet of non-stretch line
- Glue
- Scissors
- Ruler
- Black and red permanent markers
- 3 aluminum pie plates
- Black and white acrylic paint
- Paint brush
- 1 pound weight that can be tied securely

Set-up Prior to Activity:

1. Cut the sides of the pie plates off and glue the three circles together in one stack.
2. Paint the disk, alternating black and white for four equal quadrants (see image on next page). Set aside for drying.
3. Cut a hole through the plates and run the line through so that there is about a foot out the

Cloudy Waters (cont.)

bottom (black/white painted side is the top).
4. Tie a knot on the top and bottom of the disk, so the disk stays put.
5. Tie the weight off securely at the bottom of the line.
6. Mark the line. Start at the top-side of the disk and use the permanent marker to color a black line every 5 cm and a red line every 50 cm.

Duration:
1 hour and about 10 minutes for any subsequent measurements

Physical Activity:
Moderate

Background:
Water quality describes the condition of the water, usually with respect to its suitability for a particular purpose such as water for drinking, fishing, swimming or growing crops. Water quality is one of the most important factors of a healthy ecosystem. Clean water supports a diversity of plants and wildlife. Our actions on land and on the water affect the quality of our aquatic ecosystems.

Monitoring water quality is important in determining how a waterway is doing and to help protect our waters from pollution. Water quality can be measured by many different factors such as temperature, dissolved oxygen, salinity, turbidity, bacteria and nutrients.

What is turbidity?

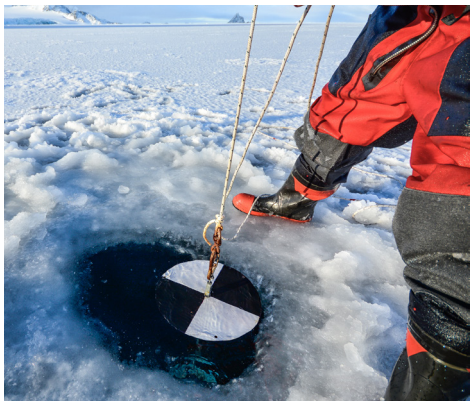
Turbidity is the cloudiness of the water caused by a variety of suspended particles that are generally invisible to the naked eye. It is similar to smoke in the air. The particles can be plankton, sewage, nutrients, sediment, clay, etc. These suspended particles can impact water clarity and the ability for light to penetrate the water.

Turbidity can increase because of sustained wind or currents mixing up the sediment or even rain carrying sediments to the waterway. Most of the time, high levels of turbidity comes from man-made sources, including runoff from agriculture, mining and eroded soils or blooms of microscopic plankton due to high nutrient inputs.

When turbidity is too high, so when the water is very cloudy, plants on the seafloor may have trouble getting enough light to survive, which can affect the local food web. Turbidity can also reduce visibility for fish that rely on their vision or even clog their gills.

Cloudy Waters (cont.)

How do you measure turbidity?



A Secchi Disk measures the turbidity of water by dropping a weighted black and white disk into the water and measuring how deep it goes before "disappearing."

This distance is called the Secchi Depth. A small Secchi Depth indicates a higher turbidity and cloudy water. A large Secchi Depth indicates a lower turbidity and clear water.

Activity:

Part 1: Introduction to Water Quality and Turbidity

1. Ask students the following questions to start a discussion about water quality:
   - What does water quality mean?
   - Why is monitoring water quality important?
   - How can humans impact water quality?
   - What is turbidity?
2. Show students the Secchi Disk and tell them they are going to use this piece of scientific equipment to measure turbidity, or water clarity, of their waterway. The contrasting black and white quadrants help you see the disk in the water. Ask the following questions:
   - Is the body of water cloudy or clear? Is that high turbidity or low turbidity?
   - If the water is cloudy, what do you think is causing the higher turbidity?
   - What have the weather conditions been over the past few days? Will that impact turbidity?

Part 2: Measure Turbidity

1. Write down the weather conditions over the past few days.
2. Choose a place that will be deep enough to measure, for example off a dock or side of a boat. When deploying the Secchi disk, try to test the water on the shady side of a dock or boat, so the sunlight doesn't obstruct your view.
3. To perform the measurement, slowly lower the disk down into the water until it disappears. You will be recording two depths. First when you can't see the disk anymore, you pinch the rope at the waterline.
4. Then pull the line up until you see the disk and pinch the rope at the waterline again.
5. Record your two measurements using the markings on the rope. The average of these two readings is the Secchi depth. Ideally, take and record measurements every few days.

Discussion:

If you have a deeper Secchi depth, the water is clear and less turbid. If you have a shallower Secchi depth, the water is more turbid and may look cloudy or dirty. You can measure turbidity at the same location over a period of time to see how different weather conditions impact water clarity.

Cloudy Waters (cont.)

Ask students the following questions:

- What conditions make the turbidity in water higher? Lower?
- Why is it important to record recent weather when taking the readings? Example, recent rain can carry sediment, pollutants and nutrients into the water, increasing turbidity.
- What are some things humans add to the water that will increase turbidity? Where do these things come from?
- What are some negative effects of increased turbidity?
- What can we do to improve the water quality of our waterways?

Additional Resources:

To learn more about the activity, check out our Measure Turbidity "how to" video.

Ocean Literacy Principles:

Ocean literacy is an understanding of the ocean's influence on us, and our impact on the ocean. There are seven Ocean Literacy Essential Principles that all people of our blue planet should have an opportunity to learn and understand. This activity touches upon the following Essential Principles:

1. The Earth has one big ocean with many features
2. The ocean and life in the ocean shape the features of Earth
5. The ocean supports a great diversity of life and ecosystems
6. The ocean is largely unexplored

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Weather and Turbidity Data Worksheet

Name of Location:_____

Date:_____ **Time:** _____

Describe the weather over the past few days:

_____

_____

_____

_____

Today's Weather Conditions:

Clear___ Cloudy___ Rainy___ Foggy___ Snow___ Stormy___ Other_____

Wind Direction from: N__ NE__ E__ SE__ S__ SW__ W__ NW__

Wind Strength: Light__ Moderate__ Strong__

Air Temperature: _____ F

Turbidity:

First Measurement: _____ cm

Second Measurement: _____ cm

Average: _____ cm Secchi Depth