

How Clean is Your Water? [MC]

Adapted from Penn State College of Agricultural Sciences

Grades: 6-8

Time: 45 minutes to 1 hour

Goals: To learn through analysis how human activities can both positively and negatively affect water quality.

Objectives:

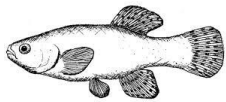
Students will be able to: properly conduct a water quality analysis; understand the techniques used to test a water sample for pH, dissolved oxygen, nitrates, phosphates, and turbidity; and draw conclusions about human effects on a body of water.

Materials:

- Water quality test kits (pre-ordered)
- Collection bottles
- Water thermometer
- Waste containers
- Tap water
- Non-latex gloves
- Clipboards
- Pencils
- Data collection worksheet (provided)

Procedures:

1. Pre-Activity (introduction): Prior to the activity, decide where you would like the class to conduct their water quality analysis. Most of the tests can be done in the classroom, but Dissolved Oxygen and Temperature need to be done on site. This lesson can be used as a supplement and continuation of marine chemistry or can be used to introduce anthropogenic effects on water systems. Begin by having two clear containers – one with water and one with vinegar – and ask the students which one they believe has the better quality water. If they were allowed to smell or taste these substances, they would right away be able to tell the difference, but because they are just looking at it, they cannot. Discuss that water chemistry is a good way to test water quality and have two volunteers test the pH of the water and the vinegar.
2. Activity: Once at the location of the chosen body of water, divide them into “water quality teams” and hand them each a test kit. Each team is responsible for testing both the tap water and other body of water with their test kit. Instructions for each test are included in each kit and students must follow them completely to get the most accurate results. Make sure they follow all safety rules by wearing protective gloves because the kits contain chemical reagents.



3. Post-Activity (review): Either on site or back in the classroom, have each “water quality team” discuss their results with the rest of the class. Elaborate on the probable causes for any nitrates or phosphates found in the water samples. Describe how human activities may have affected any of the test results. As an extension to this lesson, you can compare the quality of the water from the area you selected to the quality of water from a bottle of spring water.

Key Words:

Water cycle

Groundwater

Non-point source pollution

pH

Dissolved Oxygen

Precipitation

Storm drain

Watershed

Nitrates

Turbidity

Infiltration

Point-source pollution

Water quality

Phosphates

Anthropogenic

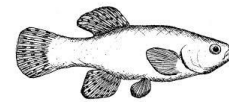
Background Information:

Most people see clear water and insist that it is clean and safe. What they do not realize is that not all clear water is healthy. In New Jersey, for example, some freshwater rivers, such as the Winding River or Cedar River, contain tannin, a natural chemical from pine forests that gives the rivers a tan or tea color, yet they are healthy ecosystems. For this reason, it is recommended that you test water for healthy consumption and use. This is often true of your tap water in most homes and why it is better to filter your water before drinking it.

There are several tests that determine the quality of your water. They include temperature, pH, dissolved oxygen, nitrates, phosphates, and turbidity. Dissolved oxygen and pH are considered the most important to test for since they can be limiting factors of species survival. Since oxygen is needed for respiration to occur, the amount of oxygen dissolved in water is directly proportional to respiration needs. Therefore, a decrease in dissolved oxygen will result in a decrease in aerobic respiration for aquatic species. pH is the number of hydrogen ions found in water and coincides with whether the water source is acidic or alkaline. The average tolerance for acidity is between 6.5 and 8.5 on a 14 point scale, where 14 is highly alkaline and 0 is extremely acidic. Some species can tolerate a pH level of 5.5, but most cannot.

Nitrates and phosphates are nutrients needed for plant growth. In an aquatic ecosystem, these nutrients, when in excess, can produce algal blooms and an overgrowth of phytoplankton. As more algae are produced, zooplankton and small organisms use energy and oxygen to consume their prey, depleting much of the oxygen in the water left for larger organisms to survive.

Turbidity is the amount of suspended particles found in water. It directly affects the water clarity and how much sunlight can penetrate the water column for plankton. Suspended particles can come from runoff and sedimentation, but considered to be anthropogenic, or caused by humans.



Water Quality Survey

Date: _____ Survey Team Name: _____

Survey Team Members: _____

Site Sample:

Temperature: _____ °C _____ °F

Test Kit used: _____

Test Results: _____

Is this result sufficient, stressful or fatal to most species? _____

Tap Water Sample:

Temperature: _____ °C _____ °F

Test Kit used: _____

Test Results: _____

Is this result sufficient, stressful or fatal to most species? _____