

# Introduction to Water Quality Testing

Lesson 8

## Objectives

The student will be able to do the following:

- Recall and define types of pollution (nitrate, phosphate, turbidity, coliform)
- Recall and define other water quality parameters (pH, dissolved oxygen)
- Become familiar with the water quality tests

## Materials

- Water quality testing materials, separated per group.
- Directions for each test for each group
- Cups and Styrofoam plates

## Background

This unit builds on the introduction to water pollution. Students will use the water quality tests to determine if there is any pollution in tap water, to become familiar with using the water quality tests.

## Advance Preparation

For each of distribution, it is best to have all tubes and tests separated for each group. For 5 groups, tests can be separated into the materials for dissolved oxygen, nitrate, phosphate, pH, turbidity, and coliform.

Each group should have a copy of the directions for their corresponding test.

For the coliform test, a few cups of water should be left standing over night to allow any excess chlorine to evaporate.

## Procedure

1. Start with a very short review.
  - a. What is pollution? Pollution can be any materials (or things – such as energy) that are added to the environment that HURT the environment.
  - b. Why do we care about pollution? – Animals, plants, and people can get sick or die
  - c. Where can be find pollution? – Air, Water, Land
  - d. How does pollution get into the stream? – Directly, indirectly
  - e. Remember the 8 kinds of pollution from the previous lesson:
    - i. Dirt,
    - ii. Too many nutrients (fertilizer),
    - iii. Too many nutrients (soaps),
    - iv. Oil/gasoline,
    - v. Bacteria,
    - vi. Heat,
    - vii. Pesticides/chemicals

2. Talk about which ones you can test. Testing for oil/gasoline and pesticides/chemicals are difficult, so we will test for the other things.
3. Explain that we will test for
  - a. Oxygen
    - i. Animals and plants that live in water need oxygen in the water to survive. Some types of pollution – like too many bacteria – and some types of invasive species – like invasive plants and fish – can use up too much oxygen
  - b. Too many nutrients from fertilizer
    - i. This is called Nitrate
  - c. Too many nutrients from soap
    - i. This is called Phosphate
  - d. Dirt/Sediment
    - i. This is called Turbidity
  - e. To see if there is any acid (from trash) or soap in the water
    - i. pH is a measure of whether the water is acidic (like a lemon or vinegar) or basic (like when the water has soap in it and you can't get it off your hands). pH can be used to tell us indirectly what is in the water. For instance, acid can come from a lot of types of trash or chemical pollution. Bases can come from fertilizers.
  - f. Bacteria
    - i. This is called Coliform
4. Explain that we will practice using these tests with tap water before we go outside to test the stream for these. Make some hypotheses – what do they think will be in the water? For tap water, there should be no nitrate, phosphate, turbidity, or bacteria. pH should be around 7 and oxygen should be good to excellent.
5. Break students into groups and distribute each test kit.
6. Have each group fill up a cup of water from the drinking fountain.
7. Start by having each group do the same test – e.g. if there are enough pH tests, have each group do a pH test together, with the teacher leading. If there are enough cups, do the initial pH test with water from the sink (so that it is different from water from the fountain).
8. After this, allow each group to do their test, using water from the drinking fountain.
9. Tests will range between 5 and 10 minute each.
10. If students are restless while waiting for their tests to develop, they can start a coliform test (if there are enough).
11. Students will each come to the teacher for assistance in interpreting the results. Use the booklet and the table on page 32-33 to determine the water quality rank for the water.
12. When all students are finished, have each group report their results. Write these on the board. Compare the results to the hypotheses.
13. As a group you can start a coliform test. These tests must be set aside out of direct sunlight, and the results read after 48 hours.

# Oxygen in the Water (Dissolved Oxygen)

- Everything needs oxygen to survive – even animals in the water.
- This tests checks to see if there is enough oxygen in the water.
- Lots of bacteria or rotting plants can cause oxygen to be too low.

## Directions:

1. Fill a cup with water
2. Put the thermometer in the water and hold it there for one minute.
3. **Write down the temperature here:** \_\_\_\_\_
4. Fill the small tube up with water
5. Drop in two of the test tabs into the tube
6. Cover the tube
7. Mix the tube until the tablets have disappeared. This will take 4 minutes.
8. Wait 5 minutes until the water in the tube changes color.
9. **Write down the color here:** \_\_\_\_\_
10. Compare the color in the tube to the color on the sheet.
11. **Write down the number here:** \_\_\_\_\_
12. Ask the teacher to help you figure out what percent of oxygen is in the water.
13. **Write down the number here:** \_\_\_\_\_
14. **Write down the Water Quality Rank here:** \_\_\_\_\_
15. When you are done, and the teacher says, pour out the water into the sink.

## Too many nutrients (Nitrate)

- Too much nitrate is a type of pollution that can come from fertilizer.
- This tests checks to see if there is any nitrate in the water.
- Some nitrate is good for plants and animals, but too much nitrate can make people sick.

### Directions:

1. Fill a cup with water
2. Fill the test tube half way – to the 5 line.
3. Add one tablet.
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait 5 minutes until the water in the tube changes color.
7. Look on the card with the colors for the section on nitrate.
- 8. Write down the color here: \_\_\_\_\_**
9. Compare the color in the tube to the color on the sheet.
- 10. Write down the number here: \_\_\_\_\_**
11. Ask the teacher to help you figure out what the water quality is in the water.
- 12. Write down the Water Quality here: \_\_\_\_\_**
13. When you are done, and the teacher says, pour out the water into the sink.

## Water that is just right (pH)

- Some things are an “acid” – like lemon juice or vinegar. Some things are a “base” – like soaps. Water should be right in the middle – just right. The “pH” tells you if your water is too acidic or too basic, or if it is just right.
- This test tells you what the pH of your water is.
- pH can change depending on what is in the water. Too many soaps or fertilizers can cause the water to be too basic. Runoff from trash can cause the water to be too acidic.

### Directions:

1. Fill a cup with water
2. Fill the test tube almost all the way – to the 10 line.
3. Add one tablet.
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait a few minutes until the water in the tube changes color.
7. **Write down the color here:** \_\_\_\_\_
8. Compare the color in the tube to the color on the sheet.
9. **Write down the number here:** \_\_\_\_\_
10. Ask the teacher to help you figure out what the water quality is in the water.
11. **Write down the Water Quality here:** \_\_\_\_\_
12. When you are done, and the teacher says, pour out the water into the sink.

## Too many nutrients (Phosphate)

- Too much phosphate is a type of pollution that can come from soaps.
- This tests checks to see if there is any phosphate in the water.
- Some phosphate is good for plants and animals, but too much phosphate can make people sick.

### Directions:

1. Fill a cup with water
2. Fill the test tube almost all the way – to the 10 line.
3. Add one tablet.
4. Cover the tube well.
5. Mix the tube until the tablet has disappeared.
6. Wait 5 minutes until the water in the tube changes color.
7. Look on the card with the colors for the section on phosphate.
8. **Write down the color here:** \_\_\_\_\_
9. Compare the color in the tube to the color on the sheet.
10. **Write down the number here:** \_\_\_\_\_
11. Ask the teacher to help you figure out what the water quality is in the water.
12. **Write down the Water Quality here:** \_\_\_\_\_
13. When you are done, and the teacher says, pour out the water into the sink.

## Too much dirt (Turbidity)

- Dirt and sediment in the water can hide other pollution like bacteria.
- This tests checks to see how much dirt is in the water.
- Some dirt in water is natural and ok, but too much is a type of pollution.

### Directions:

1. Look on the outside of the white container for the “turbidity test fill line”
2. Fill the container up with water to the line
3. Look down into the container at the black and white circle.
4. Does the circle look very sharp (black and white)? Or is it a little bit gray?
5. **Write down the color here:** \_\_\_\_\_
6. Hold up the turbidity card next to the edge of the container. Compare the color of the tube in the card to the colors on the card. Choose the one that is closest to the color in the container.
7. **Write down the number here:** \_\_\_\_\_
8. Ask the teacher to help you figure out what the water quality is in the water.
9. **Write down the Water Quality here:** \_\_\_\_\_
10. When you are done, and the teacher says so, pour out the water into the sink and dry the container very well.

## Bacteria (Coliform)

- Bacteria can come from poop or from dead and decaying animals.
- This tests checks to see if there are any bacteria (coliform) in the water.
- There should not be any bacteria in the water. Bacteria can make you sick.

### Directions:

1. For tap water, fill a bag with tap water until the tablet disintegrates. If you have enough time, leave tap water out to sit overnight. Either process removes excess chlorine.
2. Using this water, fill a coliform test tube (with the tab in it) to the 10 mL line.
3. Cover the tube well.
4. Do not shake or mix the tube.
5. Label tubes (if using different samples).
6. Stand the tubes upright.
7. Leave the tubes somewhere safe for 48 hours (2 days)
8. After two days, look at the color of the tube.
9. **Write down the color here:** \_\_\_\_\_
10. Compare the color in the tube to the color on the sheet.
11. **Circle the word that is closest to the color in the tube:**  
**positive      negative**
12. Ask the teacher to help you figure out what the water quality is in the water.