

# pH Testing – Indoor Lesson

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**Grade** Fourth Grade (4<sup>th</sup>)

**Lesson** Fall indoor

**Time** 40 minutes

**Materials** *From home:*

- Various liquids to test pH (ie: lemon juice, white vinegar, water, bleach). You will use this liquid to fill test tubes for each group to test the pH with test strips. You will want enough filled test tubes for each group to have 1 of each sample. (*Note: Each test tube is color-coded, so match up the color and the same liquid for each group.*)

*Overheads:*

- “What does pH mean” (included in this document)
- “pH of Household Items”

*From yard or school grounds:*

- Soil (for demo of outdoor lesson)

*From the Portable:*

- Flipbooks for this lesson (includes the datasheet)
- One outdoor lesson bin – for demonstration of soil and water testing
- pH test strips
- Goggles for all students and leader
- Gloves for all students and leader

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## Objective:

Test the pH of stream water and the soil and determine if the pH level is viable for salmon and other wildlife to survive. Introduce students to the pH scale and the concept of acid and alkaline solutions and how this affects water quality and soil.

## Lesson:

1. Introduce yourself and talk about what salmon need in order to survive (eg. correct temperature, food, space, low pollution etc.). Introduce the concept of pH using the “What does pH mean” sheet.
  - a. The pH Scale ranges from 1 to 14. pH1 on the pH scale is very acidic and 14 on the pH scale is alkaline. pH of 7 is pure water and is considered to be neutral on the scale. Show the “pH of Household items” on the overhead.

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- b. **The importance of pH:** pH is a measure of how **acidic** or **alkaline** (basic) things are.

*SOIL:* When we measure the pH of soil, we actually measure the pH of the **soil solution**. The pH of the soil solution affects how much soil nutrients are available to plants. When soil is too acid or too alkaline, important nutrients like nitrogen, phosphorus, and potassium are not available to the plants. Most plants prefer neutral or slightly acidic soils in the pH range of pH 6.0 to 6.8, but some prefer a strongly acid soil (pH 4.0 to 5.0). In our watershed, certain plants prefer a slightly acidic soil (pH 5.0 to 6.5) with include holly, strawberries and evergreen trees and shrubs.

*WATER:* Water has an important chemical nature. We measure this chemical nature using the pH scale. Small changes in the acidity or alkalinity can have a big impact on plants and animals. Even if fish could survive changes in pH, insects on which they feed and plants cannot. The food chain can collapse in the pH goes beyond these narrow boundaries. By testing the pH of the water and soil in the watershed, we can determine whether it is a healthy ecosystem. (*NOTE: Refer to the “pH Value Scale” near the back of the Flip books to see how various pH levels affect aquatic life.*)

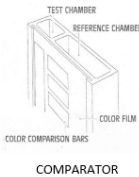
2. Begin the indoor experiment to test the pH of household items.
  - a. Talk about substances in the house that the students think are acidic and basic (alkali).
  - b. Divide students into groups of four. Pass out gloves and goggles to each student.
  - c. Pass out the test tubes (containing the different household liquids) and the pH test strips to each group. Explain that each test tube contains a different liquid. They should work together as a group to test each sample to determine what the pH is. Based on this (and using the “pH of Household Items” overhead), they can hypothesize what liquid is in each test tube.
  - d. Students **MUST** put on gloves and goggles before proceeding!
  - e. Instruct them to carefully open each test tube and dip the test strip into the liquid.
3. Once each group has completed their pH tests, discuss the findings as a class. Some questions to ask:
  - a. Which samples were an acid?
  - b. Which samples were alkaline?
  - c. Did any of you have a good solution for salmon to live in?
4. Tell the students that when they go on their outing in the watershed, we will be taking soil samples and water samples. Each test will be conducted at least two times. This is done to check the consistency of our work. Each student should have a chance to perform at least one of the tests. Explain that you are going to demonstrate how to test the pH of the soil and the water, just as they will in the watershed.
5. Put on gloves and goggles before proceeding!

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- Demonstrate using the pH Soil Tester. Detailed instructions are also in the bag with the test kit.

**INSTRUCTIONS for pH Soil test kit**

- Remove the cap from the comparator and take out the package of capsules.
- Use the shovel to take a soil sample. Ideally, the soil sample should be taken from about 2-3" below the surface. Place the soil sample in the paper cup. *Avoid touching soil with your hands.*
- Use the plastic spoon to fill the test chamber to the soil fill line with sample soil.
- TO BE COMPLETED BY A CHAPERONE:** Holding the capsule horizontally over the test chamber, carefully separate the two halves of the capsule and pour powder into the test chamber. You may find it easier to use the scissors to cut the capsule open.
- Using the dropper, add distilled water to water fill line.
- Fit the cap onto comparator, making sure it is seated properly and cap is on tightly. Shake thoroughly.
- Allow soil to settle and color to develop for 1-2 minutes.
- Compare the color of solution against pH chart. For best results, allow daylight (not direct sunlight) to illuminate the solution.



- Demonstrate using the water pH test kit. Detailed instructions are also in the bag with the pH test kit.

**INSTRUCTIONS for pH water test kit**

- Fill a clean test tube with 5 ml of water to be tested (to the line on the tube).
- Add 3 drops of Test Solution, holding dropper bottle upside down in a completely vertical position to assure uniformity of drops.
- Cap the test tube and invert tube to mix solution. Do not hold finger over open end of tube as this may affect the pH of the test solution.
- Determine the pH by comparing the color of the solution with those on the pH color chart. The tube should be viewed against a white background in a well-lit area.
- Note: The water for the pH test should be collected away from the stream bank and under water. The sample must be tested immediately as changes in temperature will change the pH reading.
- Record results on the "Stream pH results" in the Flip book.

- Discussion: Do you think the results are going to be consistent among groups? If not, why? When performing the pH tests in the watershed, the results may be inconsistent if the test tubes weren't cleaned, put too many drops of solution in the water pH test kit, contamination from touching soil sample, samples taken from different locations within the watershed, etc.
- Show the students the data collection pages in the Flipbooks. This is where they will be recording their results during the outdoor lesson.
- Remind the students of the date and time of their upcoming outing and remember to wear a coat, long pants, and boots.
- Please clean and return all of the materials to the portable.

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## What does pH mean?

pH is the measurement of Hydrogen and Hydroxide ions in a substance using a scale that goes from pH1-14. If there are many Hydrogen ions the pH will be lower (pH 1-6) and this substance is considered to be an acid.

The greater number of Hydroxide ions the higher the pH (pH 8-14) and this will be considered to be an alkaline. pH 7 is considered to be neutral.

So in summary the pH Scale ranges from 1 to 14. pH1 on the pH scale is very acidic and 14 on the pH scale is alkaline. pH7 is pure water and is considered to be neutral on the scale.

**Here is a chart showing some household items and their pH. Can you think of anymore?**

