

Monitoring Monday – Let's look at pH

Join us each Monday as the Clean Water Team shares some resources on a water quality monitoring topic. Today we are looking at pH.

pH is a measure of how acidic or basic (alkaline) the water is (the term pH comes from the French: "puissance d'Hydrogène" which means the strength, or the power, of the hydrogen). It is a very important measurement concerning water quality.

The values of pH are determined value based on a defined scale, like temperature. These values refer to the negative log of the hydrogen ion concentration This means that pH of water is not a physical parameter that can be measured as a concentration or in a quantity. pH values are reported in "logarithmic units". Each number represents a 10-fold change in the acidity/basicness of the water. Water with a pH of five is ten times more acidic than water having a pH of six.

The lower the number, the more acidic the water is. pHs of less than 7 indicates that the water that has more free hydrogen ions is acidic. As water becomes more basic, the pH increases indicating that the water has more free hydroxyl ions. A pH of 7 is considered neutral.

Aquatic life has adapted to the natural pH levels in the bodies of water that they live in, so even slight changes in pH can have negative impacts on the health of the aquatic community. For example, moderate changes in pH can affect fish egg production, fish and insect gills, and amphibian populations. pH can also affect the solubility and toxicity of chemicals and heavy metals in the water. The majority of aquatic creatures prefer a pH range of 6.5-9.0, though some can live in water with pH levels outside of this range.

The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (phosphorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium, etc.). For example, in addition to affecting how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it. In the case of heavy metals, the degree to which they are soluble determines their toxicity. Metals tend to be more toxic at lower pH because they are more soluble.

In regard to drinking water, pH isn't a quality that falls under EPA regulation because it's considered an aesthetic quality of water. However, the agency recommends that municipal drinking water suppliers keep their water supply at a pH of 6.5 to 8.5.

Natural factors that can influence pH include but are not limited to decomposing needles of these trees add acidity to the soil and also influence the acidity of nearby streams, alkaline

groundwater connectivity, and photosynthesis. Some human influences may include acid rain, point source pollution, and mining draining.

Measuring pH is typically done one of two ways, with a pH meter or a color comparator. A typical pH meter consists of a measuring probe connected to an electronic meter that measures and displays the pH reading. Because the meter measures hydrogen ion activity rather than concentration, it is affected by temperature and by other ions in solution. The influence of temperature on pH is usually automatically adjusted for by the meter. Color comparators involve adding an indicator reagent to the sample that colors the sample water. Color intensity is proportional to pH of the sample. This color is then matched against a standard color chart to determine pH.

A pH test strip is a strip of litmus paper with which you can measure the pH value of a liquid. The substance in the paper causes the paper to show a different color at different acidities. Using the indicator scale with the different colors, one can determine how acidic or alkaline the liquid measured is.

Fact Sheet: Electrical Conductivity/Salinity Fact Sheet

www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3140en.pdf

English

www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3140sp.pdf

Español

How pH Meters Work

www.youtube.com/watch?v=PBTn4gTEbkU

This video is for informational purposes only and does not constitute an endorsement.

Information Paper: Acidity (pH) Measurement Principles and Methods

www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/314.pdf

pH

<https://www.epa.gov/caddis-vol2/ph>

pH and Water (USGS)

www.usgs.gov/special-topics/water-science-school/science/ph-and-water

pH in the Environment

www.water-research.net/Watershed/pH.htm

pH – Water on the Web

<https://waterontheweb.org/under/waterquality/ph.html>

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