ALKALINITY

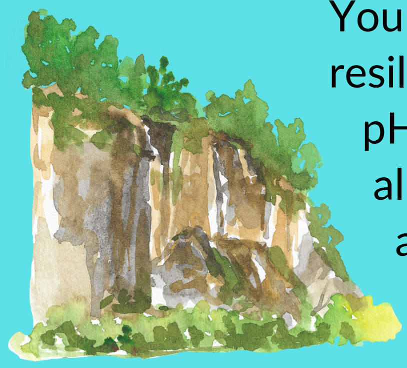
Community Science Institute
Partnering with Communities to Protect Water

WHAT IS ALKALINITY?

Alkalinity is related to pH, the measure of how basic or acidic a water sample is. In fact, sometimes the terms "alkaline" and "basic" are used interchangeably. But where pH measures the *balance of H^+ ions* in a solution, alkalinity can be defined as a solution's ability *to* resist changes, especially decreases, in pH.

Another way to think of this would be how much acid it takes to change a solution's pH. Different bodies of water will have different concentrations of compounds such as carbonates, bicarbonates (like baking soda), and hydroxide, which neutralize acid. It will take **more acid** to change the pH of a solution with a **higher content** of these compounds, meaning that solution has higher alkalinity.

WHY DO WE MEASURE ALKALINITY?



You can think of alkalinity as related to a lake or stream's resilience. Most organisms are not adapted to rapid shifts in pH, which can happen in response to pollution. The alkalinity, or buffering capacity, of a body of water tells us about its its vulnerability to pollution. Lakes and rivers with higher alkalinity will respond more slowly to pollution than those with lower alkalinity.

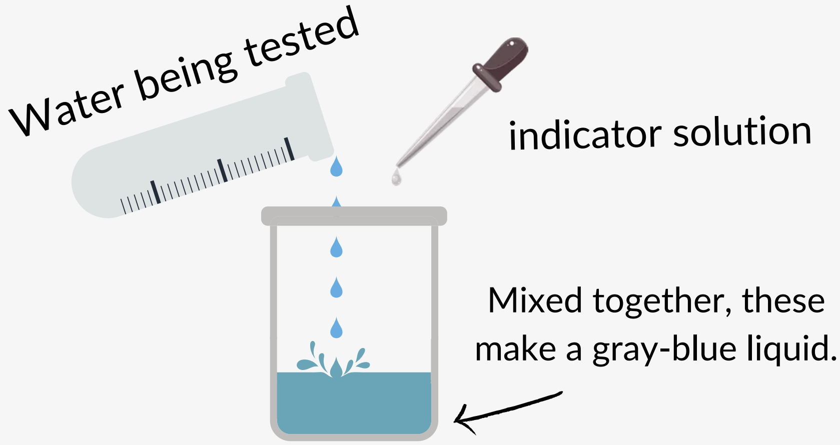
A lake or river's alkalinity is mostly impacted by the geology of the surrounding area. Geology impacts water from rain and snowmelt that makes its way into lakes and streams, called runoff. In areas like the Finger Lakes Region with rocks that contain carbonates (such as limestone), runoff picks up compounds like calcium carbonate ($CaCO_3$). These are the compounds in the water that neutralize acid, increasing the water's alkalinity and making it resistant to changes in pH. Areas with more igneous rocks such as granite tend to have lower alkalinity.

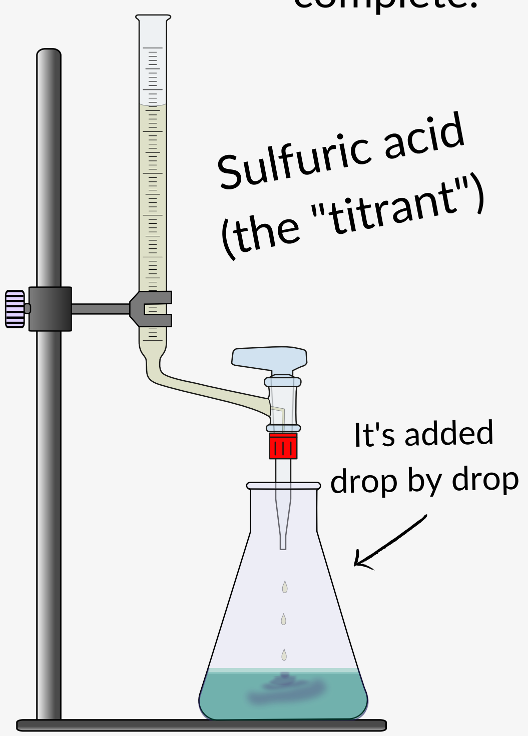
HOW DO WE MEASURE ALKALINITY?

At Community Science Institute, alkalinity is measured by adding an acid to the water sample being tested and seeing how much acid it takes to lower the water sample's pH.

First, a liquid solution (Bromocresol Green/Methyl Red) is added to the water sample being tested for alkalinity.

This solution is called an "indicator" because it will cause a visible change to our mixture when the test is complete.

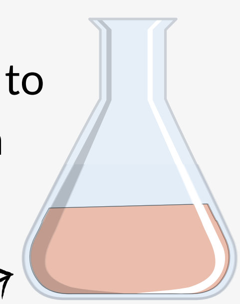




Next, sulfuric acid is added to the mixture drop by drop. Adding acid to the mixture will cause the solution's pH to decrease (remember: low pH = acidic, high pH = basic).

However, a solution with higher alkalinity will require more acid to decrease pH than a solution with lower alkalinity because of the acid-neutralizing components it contains.

The indicator solution already present in the mixture causes the liquid to change color as the sulfuric acid is added. When the solution turns a precise shade of salmon pink, our chemists know they have added enough sulfuric acid to the solution to give it a pH of *exactly* 4.5.



Our chemists calculate the alkalinity of the water sample from the amount of sulfuric acid needed to reach pH 4.5.