USDA
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NATURAL RESOURCES CONSERVATION SERVICE

24A

SOIL TECH NOTES

pH

What is it and why is it important for a good soil condition??

pH is a measure of the acidity and alkalinity of soluble substances. The "reference point" is the concentration of H+ in pure water at 75 degrees. (F). At this point, there are an equal number of H+ and OH- ions present, assuming no other materials are dissolved in the water.

The **number** of each H+ and OH- ions do not remain equal when other ions are present, but the **product** of their **concentrations** does! So in a water solution, we can calculate the concentration of each one if the other value is known.

The pH scale is set up so that pH 7.0 is considered neutral, with equal amounts of the H+ and OH- ions present. This number represents the actual concentration of 0.000 000 1 (gram equivalent weight) of H+ in one liter. This could also be written 1.0 X 10-7 ions of H+. To simplify this number, the **negative** logarithm is used, which gives a +7 or pH of 7.0. We also know that concentration of OH- is also 1.0 X 10-7 (gram equivalent weight) of OH-.

Many of our soils for agricultural purposes have a pH of 6.0 to 7.5. Remember, that a pH of 6.0 is 10 times more acid than a pH of 7.0. At this pH, most plant nutrients are "available" for uptake by the plants. We must monitor pH closely so that healthy crops can be grown that have access to all available macro and micro nutrients they need.

The soil pH influences the solubility of all the materials in the soil, rate of plant nutrients released by weathering, and the amount of nutrient ions on the cation-exchange sites (CEC). The CEC is a direct indicator of the natural productive capacity of the soil.

Excessive leaching of soil will lower the pH or make the soil more acidic because H+ ions are exchanged for cations on the very tiny micelle receptor sites located on the organic matter and clay particles. Certain fertilizers can also increase the leaching in soils because their byproducts produce acidic conditions, which can also cause H+ to replace positive cations.

A main factor in the decomposition of organic matter is the pH. Most microbes are affected by differences in pH levels. Bacteria tend to prefer pH levels between 6.0 and 8.0, while fungi and actinomyces prefer more acid conditions in the pH range of 5.8 to 6.4. Other factors being somewhat equal, carbon breakdown releasing nutrients to the soil is most rapid in neutral to slightly alkaline soils.