

Peatland Acidification and Understanding pH

The raised areas of bogs are known to be very acidic. To better understand why these areas are acidic we must understand the pH scale and processes in bogs that contribute to their acidity. Acidity increases when hydrogen ions (H^+) buildup and hydroxyl ions (OH^-) decrease in solution. Look at the pH scale on the following page. The number 7 is considered neutral, neither acidic nor basic. When something is acidic it has a pH below 7; when alkaline (basic) it has a pH above 7. The pH scale is logarithmic, which means that each whole pH value below 7 is ten times more acidic than the next whole value, for example pH 5 is ten times as acidic as pH 6.

A neutral pH (7) occurs when the concentration of hydrogen ions equals the concentration of hydroxyl ions in a solution. Distilled water that has been shielded from air is a neutral solution with a pH of 7. Most plant species grow best at a soil pH around 7 because at near-neutral conditions they are best able to access needed mineral nutrients.

Orono Bog is a peatland with varying degrees of acidity. The raised part is very acidic, which means that hydrogen ions are in great excess of hydroxyl ions in that area. From the start of the boardwalk to the center of the bog the pH ranges from about 6.6 to 3.6. A pH of 3.6 is about 1000 times more acidic than a pH of 6.6. Most wetland plant species that grow by the beginning of the boardwalk cannot survive at the raised center of the peatland because at low pH they cannot obtain enough mineral nutrients. The species that grow at the raised part have special adaptations for survival at low pH.

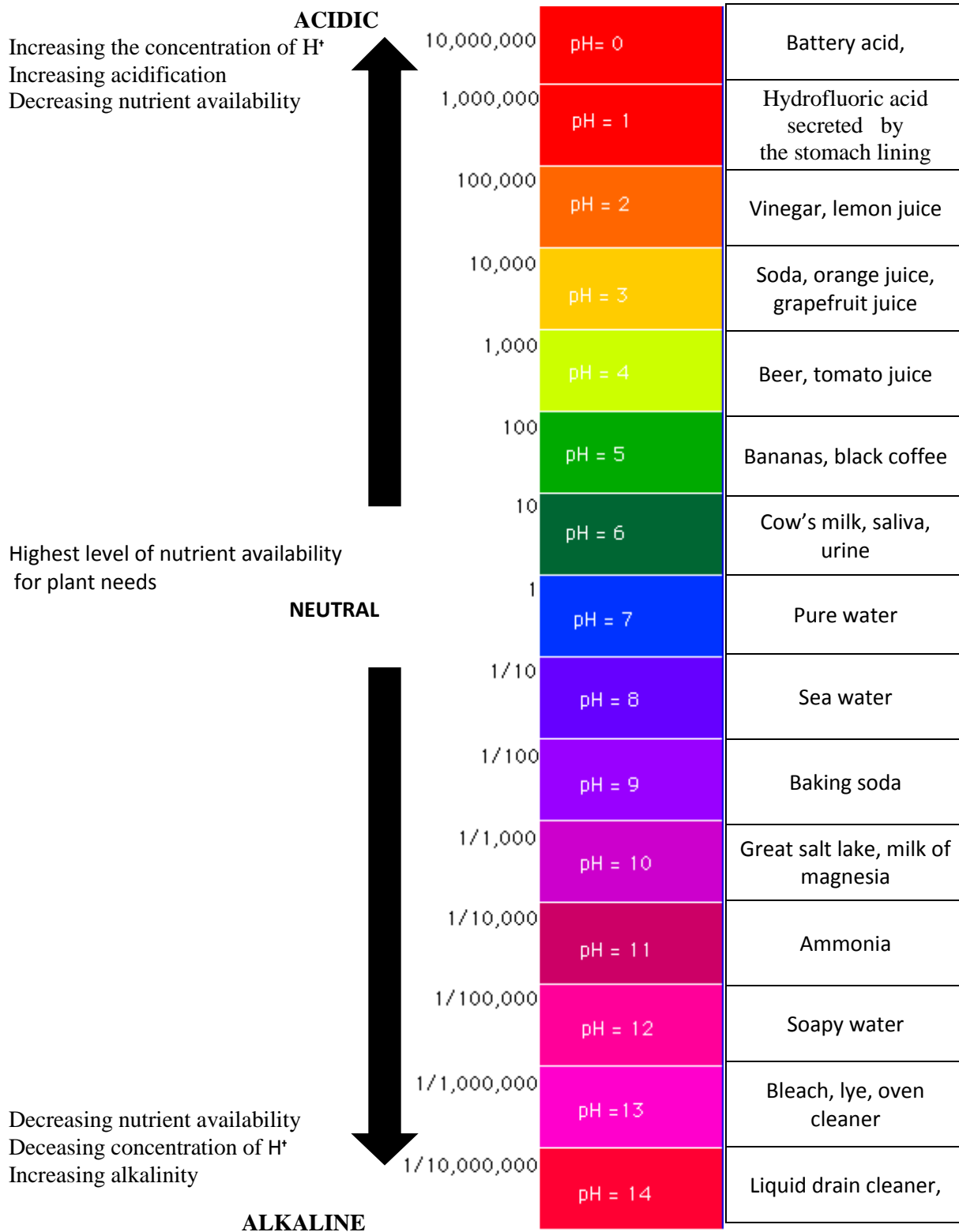
Acidity in peatlands is a by-product of microbial decay processes, cation exchange, and input of acids from the atmosphere. In the first case, bacteria and fungi breakdown dead plant and animal material and in the decay process acid is released into the surrounding environment. Second, where sphagnum is abundant it acidifies its surroundings by cation exchange. It adsorbs base cations such as calcium (Ca^+) and magnesium (Mg^+) from the soil water and exchanges or releases hydrogen ions in their

place. So as sphagnum moss (pictured below) grows and populates the peatland environment it is also increasing the amount of hydrogen ions in the ecosystem and therefore acidifying the peatland.



Sphagnum spp., Orono Bog (Priest, 2011)

The pH scale is used to express the concentration of H⁺ in solution



References:

Crum, H. (1988). *A Focus on Peatlands and Peat Mosses*. Ann Arbor, MI: University of Michigan Press.

Johnson, C. W. (1985). *Bogs of the Northeast*. Hanover, NH: University of Press of New England.

Priest, S. (2011). *Sphagnum spp.* Orono Bog Boardwalk [photo].

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