**The Alkalinity Sponge**

**H2O + CO2 <--> H2CO3 <--> H+ + HCO3-**

**This is the chemical equation that describes what happens when carbon dioxide is added to water.** **Depending upon what is in the water or added to it, the equation can run in either direction.**

If CO2 is added to low alkalinity water (<20ppm), it will make carbonic acid and that will become hydrogen ion (H+) and bicarbonate ion (HCO3-). pH measures H+, so every CO2 molecule added to the equation enters the left side of the equation and results in one more H+ ion floating around on the right side of the equation.

When pH is measured, the pH should be lower. If this is done in medium to high alkalinity water (>50ppm), there is already HCO3- and CO3-- in the water. When the H+ is produced, these ions attach to it, neutralize it, and take it out of the equation, so it cannot add to the pH measurement. **The alkalinity acts like a sponge that sidelines the hydrogen ions and takes them out of the game.** When the sponge is full (the alkalinity used up), and H+ is still being made, then pH will change.

This happens at night in a pond, due to respiration (CO2 moves from fish and algae into the water).  But by the time this happens in a pond with good levels of alkalinity, daylight is beginning and photosynthesis begins to remove CO2. As that happens, CO2 is removed from the left side of the equation and the whole equation moves from right to left. This removes H+ from the right side of the equation, resulting in fewer hydrogen ions available to be measured by the pH meter and pH rises. This is what we see during the day in a pond. If there is high alkalinity, the sponge is greater so the high and low of daily pH will be less than in a pond with low alkalinity (smaller or no sponge) where the highs and lows of pH will be greater.