pH in Streams

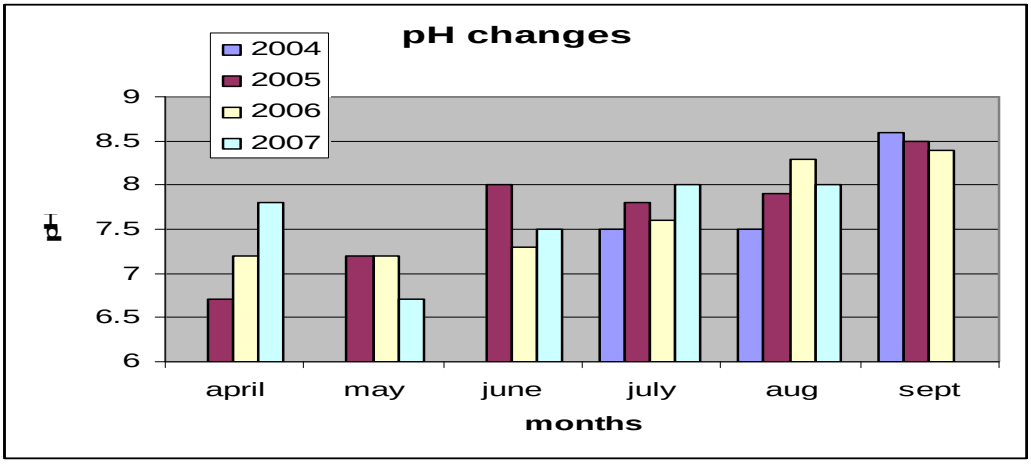
The pH of a sample of water is a measure of the concentration of hydrogen ions. The term pH was derived from the manner in which the hydrogen ion concentration is calculated – it is the negative logarithm of the hydrogen ion (H+) concentration. At higher pH there are fewer free hydrogen ions, and a change of one pH unit means there is a tenfold change in the concentration of the hydrogen ion. For example, there are ten times more hydrogen ions available at a pH of 7 than at a pH of 8. The pH scale ranges from 0 to 14 with pH of 7 to be neutral. Substances with pH less than 7 are acidic, while substances with pH greater than 7 are basic. **The pH of most natural waters ranges between 6.5 and 8.5.**

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 (e.g., phosphorus, nitrogen, and carbon) and heavy metals (e.g., lead, cadmium, copper). For example, in addition to determining how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it.

Geology of the watershed and the original source of the water determine the initial pH of the water. The greatest natural cause for change in pH in a stream is the seasonal and daily variation in photosynthesis. Photosynthesis uses up hydrogen molecules, which causes the concentration of hydrogen ions to decrease and therefore the pH to increase. Respiration and decomposition processes lower pH. For this reason, pH is higher during daylight hours and during the growing season, when photosynthesis is at its peak. Although pH may be constantly changing, the amount of change remains fairly small.

Because polluted conditions typically correspond with increased photosynthesis in a stream, pollution may cause a long-term increase in pH.

Here is summer pH data for Lick Run –



Data from external lab sampling and analyses –

Comparison Data

team	external		PaSEC pH	external lab pH	difference in analysis	RPD %	difference in analysis	RPD %
a	x		7.4	7.2	0.2	3		
a	x		8.1	8.1	0.0	0		
a	x		7.1	6.7	0.4	6		
b	x		7.5	8.4			-0.9	12
c	y		7.1	8.2			-1.1	14
c	y		6.9	8.5			-1.6	21
d	y		8.0	8.2	-0.2	2		
d	y		8.2	8.5	-0.3	4		
e	y		8.2	8.5	-0.3	4		
		average	7.6	8.0				
		range	**6.9 - 8.2**					**overall RPD average = 7.2 %**

RPD = Relative Percent Difference

Precision describes how well duplicate and/or split samples agree.
The RPD target per QAPP is 20% for measurements on the same sample.

Accuracy is the closeness to the measurement's true value. It is improved when comparing to known samples.
It is recommended that pH and conductivity be calibrated with standard solutions in every outing. It is not recommended to reuse standard solutions after calibration.

The accuracy objective is + / - 10%. Meter pH accuracy alone is ~ 0.2 units.

jmm
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