[This article, written by the American Ground Water Trust was originally published in
THE AMERICAN WELL OWNER, 2003, Number 3]

ACID RAIN AND GROUND WATER PH

An important measure of water quality is its pH. The letters (pH) describe the acidic or basic nature of a substance. Scientifically a liquid's pH is a measure of the concentration of hydrogen ions (H^+) it contains. The Danish biochemist S.P.L. Sorenson originally proposed the concept or the pH scale in 1909 as a method to describe the "acidity" of beer.

The pH scale ranges from 0 to 14 with a value of 7 indicating a neutral pH (neither acidic nor basic]. Distilled water has a pH of 7. Basic (or alkaline) solutions (i.e. bleach and ammonia) have values greater than 7. Acidic solutions (i.e. battery acid, lemon juice, and vinegar) have values less than 7. Each unit change in pH is equal to a 10-fold (10 times) change in the pH. The table shows the approximate pH value for some common substances.

Rain and snow (the principal sources of ground water) have pH values near 5.6, if they are relatively free of pollution. However, in many areas of the United States "acid rain" is now the norm because of pollution emissions from sources such as coal-fired power plants and car exhaust. Acid rain can have pH values near 4. There are concerns that acid rain is having effects on vegetation and aquatic fauna. Once on the ground, some of the acidic precipitation infiltrates downward to mix with ground water and can affect the ground water pH.

The pH of ground water will vary depending on the composition of the rocks and sediments that surround the travel pathway of the recharge water infiltrating to the ground water. Ground water chemistry will also vary depending on how long the existing ground water is in contact with a particular rock. The chemical composition of the bedrock tends to stabilize (buffer) the pH of the ground water. The longer the contact time, the larger the effect of the rock chemistry on the composition and pH of the ground water. Ground water passing through carbonate-rich rocks (e.g., limestones and marbles) will usually have pH values greater than 7 as the acidic water is "neutralized." If the geology of the aquifer containing the ground water has few carbonate rocks (e.g., sandstones, metamorphic granitic schists and gneisses; volcanic rocks, etc.) the ground water will tend to remain acidic.

Acidity in water is not in itself harmful to health. Many popular beverages have considerable acidity or alkalinity. The concern for acidity in drinking water is that even mildly acid water can dissolve lead or copper that may in plumbing pies and fixtures. In theory, there should be no lead content in homes built since 1987. However for millions of homes there is the potential for a problem. For this reason, the United States Environmental Protection Agency has determined that drinking water should have a pH between 6.5 and 8.5 in order to limit the concentration of dissolved contaminants from acidic waters or the build up of scale deposits from alkaline water. (Learn more about this situation at the Trust website page http://www.agwt.org/info/pdfs/leadandplumbing.pdf).

It is a good idea to test the pH when a new well is drilled (check again after six months of use), when you move to a new home, or if your well has never been tested. If the pH is not within the EPA recommended range then it may be necessary to increase the pH of the water with limestone or marble chips or to reduce the pH with caustic soda (sodium hydroxide) treatments. These treatments are not expensive, not difficult to maintain, and can be easily installed by a professional. Test your water to make sure you actually need the pH adjusted before you install any equipment.