

# Healthy Drinking Waters

for

M A S S A C H U S E T T S

Safe and healthy lives in safe and healthy communities

## pH - Acidity of Private Drinking Water Wells

Private well owners are responsible for the quality of their drinking water. The U.S. Environmental Protection Agency (EPA) does not regulate private wells. Homeowners with private wells are generally not required to test their drinking water, although local Boards of Health or mortgage lenders may require well water testing. While there is also no state requirement to have your well water tested, the Massachusetts Department of Environmental Protection (MassDEP) recommends that all homeowners with private wells do so, and use a state certified testing laboratory. Refer to the fact sheet *Drinking Water Standards* for more information.

The Secondary Maximum Contaminant Level (SMCL) for pH is 6.5 to 8.5 on the pH scale as established by the EPA.



Concentrations of Hydrogen ions compared to distilled water		Examples of solutions in this pH
10,000,000	pH = 0	Battery acid, strong hydrofluoric acid
1,000,000	pH = 1	Hydrochloric acid secreted by stomach lining
100,000	pH = 2	Lemon juice, gastric acid, vinegar
10,000	pH = 3	Grapefruit, orange juice, soda
1,000	pH = 4	Tomato juice, acid rain
100	pH = 5	Soft drinking water, black coffee
10	pH = 6	Urine, saliva
1	pH = 7	Neutral
1/10	pH = 8	Sea Water
1/100	pH = 9	Baking Soda
1/1,000	pH = 10	Great Salt Lake, Milk of Magnesia
1/10,000	pH = 11	Ammonia solution
1/100,000	pH = 12	Soapy water
1/1,000,000	pH = 13	Bleaches, oven cleaner
1/10,000,000	pH = 14	Liquid drain cleaner



Johnson County Community College Department of Chemistry web page

### Summary

pH is an indicator of the acid or alkaline condition of water. The pH scale ranges from 0-14; 7 indicates the theoretical neutral point. Water with a pH value less than 7 indicates acidity and tends to be corrosive, while water with a value greater than 7 indicates alkalinity and tends to affect the taste of the water.

Acidity or low pH of drinking water is usually a result of natural geological conditions at the site, possibly compounded by acid rain. Testing for the pH of your well water is crucial for:

- Evaluating the potential for your household plumbing to be subject to aggressive corrosion.
- Evaluating the potential for your drinking water to contain leached metals such as copper, lead, iron, cadmium, and zinc from your well pump and plumbing system.
- Determining the effects of proper home treatment on other drinking water contaminants. Depending on the pH level (how acidic or alkaline), pre-treatment may be needed to adjust the pH of your water to a more neutral range. Otherwise, home treatment systems may not work as designed.

Home treatment methods to adjust pH include neutralizing filters and neutralizing solutions (soda ash).

### Potential Health Effects

The pH of drinking water is not a health concern, however, acidic water (low pH) can leach metals from plumbing systems, which can cause health problems.

### Indications of Low pH

Symptoms of low pH are bluish green stains on fixtures with copper plumbing; reddish stains with galvanized iron plumbing; and water system corrosion problems and plumbing leaks.



### Sources

In most locations, well water in Massachusetts is naturally acidic due to the surrounding soils and bedrock.

### Testing for pH in Private Drinking Water Wells

To determine the pH, arrange to test your drinking water at a state certified laboratory. Follow laboratory instructions carefully to avoid contamination and to obtain a good sample. Home test kits may not provide accurate results. Determining pH is often essential in evaluating the presence and effective treatment of other drinking water contaminants, such as:

- Determination of proper chemical or other home treatment methods that may be needed for other well water quality problems.
- Adequate disinfection.

### Corrective Actions

#### Neutralizing Filter

If your water is acidic (low pH), you can use a neutralizing filter containing calcite or ground limestone (calcium carbonate) or magnesia



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(magnesium oxide) to raise the pH. Neutralizing filters must be backwashed periodically since they serve as mechanical filters to remove solid particles from the water. They also require periodic replenishment of the neutralizing material within the filter bed. When acidic water is treated with a neutralizing filter such as ground limestone (calcium carbonate), hardness is added to the water. This happens as a result of adding calcium and magnesium minerals that the water absorbs when passing through the filter. This is also why the neutralizing materials need periodic replenishment. Installing a cartridge filter prior to the neutralizing filter will remove solid particles from the water and can help to prolong the life of the neutralizing filter.

Arrange to test your water for hardness after installation of a neutralizing filter. Levels up to 120 milligrams per liter of calcium and magnesium are acceptable, however, at levels between 120 milligrams per liter and 180 milligrams per liter, the user may prefer to soften the water, or remove some of the calcium and magnesium. If either calcium or magnesium is present in your water in substantial amounts, the water is said to be “hard,” because making a lather or suds for washing is “hard” (difficult) to do. Water containing little calcium or magnesium is called “soft” water. Ion exchange treatment can be used to treat “hard” water. It is also commonly used in Massachusetts to remove iron and manganese. Refer to the fact sheet *Ion Exchange Treatment of Drinking Water* for more information.

#### Neutralizing Solutions

For high yield water supplies, an alternate method of neutralizing acidic water is to feed a solution of soda ash to the water supply with a chemical feed pump. Sodium carbonate can raise the pH level to 8 or higher. Where

water contains a lot of iron, or if you need to disinfect the water, a chemical feed pump is often used since hypochlorite bleach and soda ash may be mixed in a single solution and fed into the water system with the same pump unit. Potassium can be substituted for sodium if necessary. Like sodium, the potassium substitute should be evaluated for any possible human health effects. Too much potassium can cause nausea, diarrhea, muscle weakness, and even cardiac arrest.

When choosing a treatment method, consider both the initial cost and the operating costs. Operating costs include the energy needed to operate the system, additional water that may be needed for flushing the system, consumable supplies and filters, repairs, and general maintenance.

Regardless of the quality of the equipment you purchased, it will not operate well unless maintained in accordance with the manufacturer’s recommendations. Keep a logbook to record equipment maintenance and repairs. Equipment maintenance may include periodic cleaning and replacement of some components. Also consider any special installation requirements that may add to the equipment cost. See the fact sheet *Questions to Ask When Purchasing Water Treatment Equipment* for more information.

#### Protection of Private Drinking Water Supplies

You can protect your private well by paying careful attention to what you do in and around your home as well as your neighbor’s activities near your well. Regular testing and adopting practices to prevent contamination can help ensure that your well supplies you and your family with good quality drinking water. For more information on well protection see the fact sheet *Drinking Water Wells*.



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### Resources

#### UMass Extension

This fact sheet is one in a series on drinking water wells, testing, protection, common contaminants, and home water treatment methods available on-line at the University of Massachusetts website:

[http://www.umass.edu/nrec/watershed\\_water\\_quality/watershed\\_online\\_docs.html](http://www.umass.edu/nrec/watershed_water_quality/watershed_online_docs.html)  
and Cape Cod Cooperative Extension:  
508-375-6699  
<http://www.capecodextension.org>

#### MA Department of Environmental Protection, Division of Environmental Analysis

Offers assistance, information on testing and state certified laboratories: 617-292-5770  
For a listing of MassDEP certified private laboratories in Massachusetts:  
<http://www.mass.gov/dep/service/compliance/wespub02.htm>

#### U.S. Environmental Protection Agency, New England Office

Information and education on where drinking water comes from; drinking water testing and national laws; and how to prevent contamination:  
<http://www.epa.gov/ne/eco/drinkwater>

#### US Environmental Protection Agency

For a complete list of primary and secondary drinking water standards:  
<http://www.epa.gov/safewater>

#### MA Department of Conservation and Recreation, Division of Water Supply Protection

Maintains listing of registered well drillers, information on well location and construction: 617-626-1409  
<http://www.mass.gov/dcr/waterSupply/welldrill/index.htm>

#### NSF International

The NSF International has tested and certified treatment systems since 1965. For information on water treatment systems: 800-NSF-MARK (800-673-6275)  
<http://www.nsf.org/consumer/>

#### Water Quality Association

The Water Quality Association is a not-for-profit international trade association representing the household, commercial, industrial, and small community water treatment industry. For information on water quality contaminants and treatment systems:  
<http://www.wqa.org>



This publication is adapted from a URI fact sheet by the same name produced by the Rhode Island Department of Health and the University of Rhode Island Cooperative Extension Water Quality Program.

UMass Extension is an equal opportunity provider and employer, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations or the UMass Extension Director if you have complaints related to discrimination, 413-545-4800.

This project was funded, in part, by a grant from US EPA.

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 2004-51130-03108.

06/01/07

