



# Virginia Household Water Quality Program: Hardness in Household Water

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Private water sources such as wells and springs are not regulated by the U.S. Environmental Protection Agency (EPA). Although private well construction regulations exist in Virginia, private water supply owners are responsible for providing maintenance for their water systems, monitoring water quality, and taking the appropriate steps to address problems, should they arise.

The EPA public drinking water standards are good guidelines for assessing your water quality. “Primary drinking water standards” apply to contaminants that can adversely affect health and are legally enforceable for public water systems. “Secondary drinking water standards” are nonregulatory guidelines for contaminants that may cause nuisance problems such as bad taste, foul odor, or staining.

Testing your water annually and routinely inspecting and maintaining your water supply system will help keep your water safe. For more information, visit the Virginia Household Water Quality Program website at [www.wellwater.bse.vt.edu](http://www.wellwater.bse.vt.edu).

## Introduction

Hard water contains high levels of calcium and magnesium ions. These ions, among others, are naturally dissolved into groundwater as it comes in contact with soluble limestone and other rocks and minerals. While consuming hard water does not present a health risk, it may cause aesthetic or nuisance problems such as bitter taste or mineral deposits (scale) on dishes, utensils, and plumbing fixtures. Hard water can also reduce the efficiency and life span of water heaters.

## Problems Associated With Hard Water

There are no EPA public drinking water standards for hard water. It is considered safe for drinking, cooking, and other household uses. Nuisance issues associated with having hard water include reduced sudsing and cleaning action of soaps and detergents and buildup of

soap scum or residue on hair, skin, laundry, plumbing fixtures, and cookware.

Hard water can also produce a mineral scale on the inside of pipes, cookware, and plumbing fixtures, as well as appliances like water heaters and coffee makers. In pipes, excessive mineral scaling can reduce water flow and pressure. Mineral scaling in water heaters can increase heating costs by reducing their efficiency. Scale buildup can also affect the operation and life span of small, water-using appliances and cookware.

## Testing for Hardness

A qualified laboratory can analyze your water for hardness. The Virginia Household Water Quality Program maintains a list of certified laboratories on its “Resources” page at [www.wellwater.bse.vt.edu/resources.php](http://www.wellwater.bse.vt.edu/resources.php).

Test results for water hardness are usually reported in either grains per gallon (gpg) or milligrams per liter (mg/L) of calcium carbonate. When you receive your water test results, you can evaluate the hardness of your water supply by referring to table 1. Generally, water hardness levels less than 7.0 gpg or 120 mg/L do not require treatment, and treatment is only necessary when the hardness level is causing a problem for the homeowner.

## Treatment Options

The most common way to treat hard water is through ion exchange water softening. An ion exchange water softener replaces calcium and magnesium ions with sodium or, less commonly, potassium ions. Water for outdoor use does not need to be softened. Water softeners can either treat all of the water entering a house or only the water to be heated and used for washing.

- If scale forming in your water heater is an issue, consider softening only water that is to be heated.
- If scale forming in or on cookware or small appliances is an issue, consider softening all of the water used for cooking and in coffee makers and other small appliances. Typically this means softening all of the water entering the house.
- If using hard water is limiting the effectiveness of soaps and detergents and/or you are left with a soapy film feeling after showering or bathing, consider softening all of the water entering the house.

Water used for drinking or cooking does not necessarily need to be softened, but if all the water entering the house goes through a water softener device, it will be. If a sodium-based ion exchange water softener is used (the most common type), the sodium content of the water will increase. If increased sodium consumption is an issue, consider softening only the hot water and drink and cook with the unsoftened cold water. See *Sodium and Chloride in Household Drinking Water*, Virginia Cooperative Extension (VCE) publication 442-661 for additional details about sodium levels in drinking water. A water treatment specialist can

**Table 1. Test results: hardness in household water.**

Hardness rating	Grains per gallon (gpg)	Milligrams per liter (mg/L)
Soft	<1.0	<17.1
Slightly hard	1.0-3.5	17.1-60
Moderately hard	3.5-7.0	60-120
Hard	7.0-10.5	120-180
Very hard	>10.5	>180

help determine the best installation scheme for each household.

The appropriate size of a softener depends on the level of hardness (see table 1) and the daily water use in your household, among other factors. When considering any water treatment device, consult a qualified water treatment professional. The Water Quality Association provides a Water Quality Specialist certification, or you can look for the Water Quality Association gold seal or a National Sanitation Foundation (NSF) certification mark.

There are a variety of devices that claim to manage hard water scale using primarily magnetic or electrical technology. Manufacturers generally claim the devices utilize energy to alter the behavior of compounds or elements within the water. They do not claim that water chemistry is altered. In fact, the hardness of the water before and after treatment is not changed. This complicates assessment of the devices' performance. While a protocol has been established to assess the effectiveness of ion exchange water softeners (NSF/ANSI 44), at this time, no recognized agency in the United States has established protocol to assess the effectiveness of physical water treatment devices. Therefore, questions remain as to their effectiveness.

The Virginia Household Water Quality Program, offered through Virginia Cooperative Extension (VCE), periodically conducts county-based household water sampling clinics where you can learn about the quality of your water supply, proper water supply system maintenance, and, if needed, possible water treatment options. Please contact your local Extension office or visit [www.wellwater.bse.vt.edu](http://www.wellwater.bse.vt.edu) for more information.

For more information, see the following websites:

- Virginia Household Water Quality Program: [www.wellwater.bse.vt.edu/resources.php](http://www.wellwater.bse.vt.edu/resources.php).
- Virginia Cooperative Extension (VCE): <http://pubs.ext.vt.edu/category/home-water-quality.html>.

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## Resources

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