

THE BENEFITS OF WATER SOFTENING

Water quality and hardness vary greatly across the United States, which can ultimately impact health and the environment. It's important to understand the benefits of water softening and how this can help protect your home and business from the effects of hard water.



HARDNESS ACROSS THE UNITED STATES

The term "hard water" refers to water that contains high levels of dissolved minerals – primarily calcium and magnesium. Hardness is usually expressed in grains per gallon (gpg) or parts per million (ppm) as calcium carbonate equivalent.

In general, some of the hardest water in the country can be found in the Midwest and parts of the Southwest, where water hardness levels can reach well over 20 gpg (342 mg/L). This is due to differences in geological formations and the presence of minerals in the soil and rock. However, it is important to note that water hardness can also vary greatly within regions and even within individual communities, so it's important to test the water in a specific location to determine its hardness.

Effects of **Hard Water** include:

- Stiff, dingy laundry
- Spots on dishes and sink fixtures
- Scale buildup in showers, tubs, sinks, and toilets
- Poor soap lathering
- Clogged pipes and damage to appliances

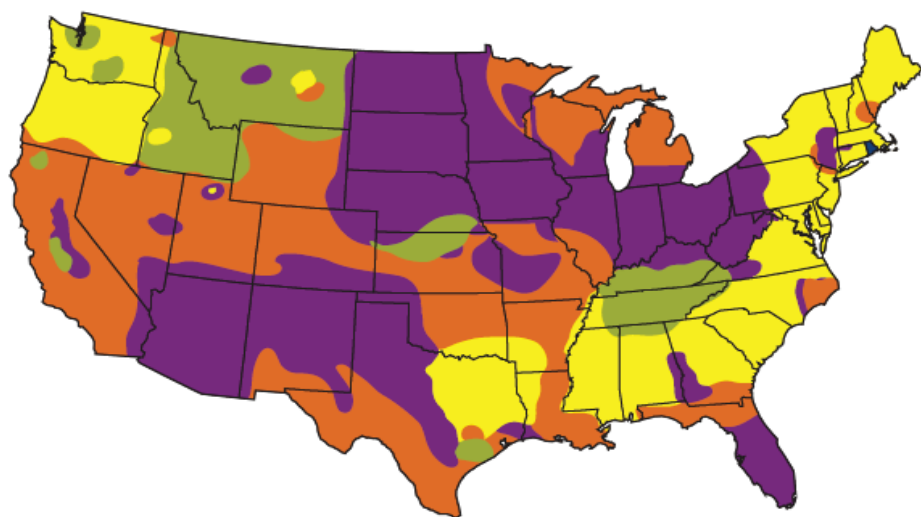


HOW IS SOFT WATER DEFINED?

Soft Water is defined in the North American standards NSF/ANSI 44 and NSF/ANSI 330 as water containing <1 grain of hardness per gallon (or <17.1 mg/L hardness).

GROUNDWATER HARDNESS

- Very Hard (10+ gpg)
 - Hard (7-10.5 gpg)
 - Moderately Hard (3.5-7 gpg)
 - Slightly Hard (1-3.5 gpg)
- gpg = grains per gallon



For more information on water hardness in the United States visit the U.S. Geological Survey website.

¹National Sanitation Foundation/American National Standards Institute. Glossary of Drinking Water Treatment Unit Technology. Standard No. 330, 2021. <https://www.neha.org/Images/resources/NSF%20330-2021%20-%20Watermarked.pdf>

HOW TO TREAT HARD WATER

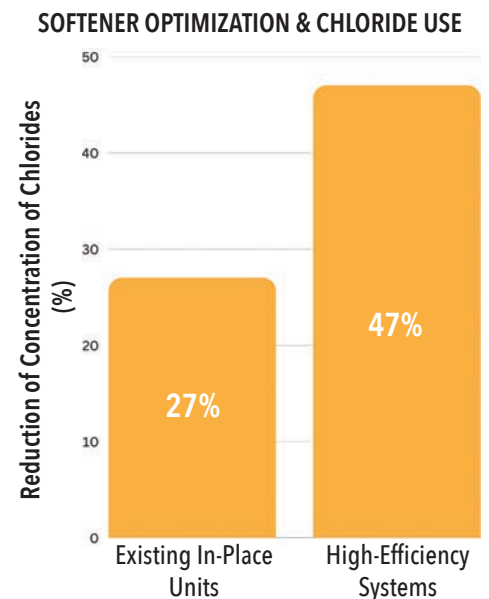
Hard water can be treated using a NSF/ANSI 44 certified cation-exchange water softener. The typical cation exchange system consists of a pressure tank filled with ion-exchange media that removes hardness ions from water, and replaces them with other ions, such as sodium or potassium. These units are connected to a brine tank that's filled with salt, which regenerates the ion-exchange media as required.

WHAT ARE THE BENEFITS OF WATER SOFTENERS?

- **Energy Savings:** Water softeners save energy. Water heaters and appliances that heat water will use less energy with soft water because there is no hardness scale present to degrade their efficiency. Research has shown that even small amounts of hardness scale significantly increase energy usage during water heating applications.²
- **Appliance Lifespan:** Studies^{2,3,4} show that water containing only 10 grains of hardness will destroy instantaneous water heaters within 4 years and that water containing 20 grains of hardness would destroy them within 2 years. Besides water heaters, other fixtures and appliances which can be damaged by hard water include low-flow showerheads, dishwashers, coffee makers, pipes, and fixtures.
- **Removal of Health-Related and Aesthetic Contaminants:** Cation-exchange water softeners can remove regulated contaminants such as radium and are used to remove unregulated contaminants like iron and others that have undesired health impacts, such as strontium. These systems serve as a preventative final barrier to capture accidental and unexpected spikes of health-related contaminants such as manganese.
- **Treatment Chain for Commercial, Industrial, and Medical Purposes:** Commercial, industrial, and medical equipment often require stringent quality standards and hard water can negatively affect these devices. Water softeners serve an important function in the treatment chain for many businesses to achieve a desired water quality.

ENVIRONMENTAL IMPACT & OPTIMIZATION

Water softeners promote sustainability, but there are trade-offs. Chloride discharge from detergents, water softeners, fertilizers, road salt, urban runoff, and animal and human waste can potentially impact the environment and elevate the concentrations of dissolved solids in the environment. Increased chlorides can also impact some aquatic life and can increase the corrosivity of the water thereby impacting infrastructure and drinking water quality. However, the water treatment industry, for its part, has developed two effective strategies to mitigate these impacts. They include (i) the replacement of older less efficient softeners with more modern high-efficiency models, and (ii) optimization of existing softeners. A 2015 study indicated that on average, softener optimizations for existing in-place units could reduce the concentration of chloride by approximately 27% while replacement of existing models with high-efficiency systems could reduce the concentration of chlorides by 47%.



How to find a qualified professional?

Water Treatment Professionals can be found through WQA's "Find a WQA Member" search engine.

² The Energy Savings Study was conducted in 2009 in conjunction with the Battelle Memorial Institute and funded by the Water Quality Research Foundation. The Detergent Savings Study was conducted in 2010 in conjunction with Scientific Services S/D, Inc. and funded by the Water Quality Research Foundation. From https://www.wqrf.org/uploads/8/3/5/5/83551838/040511_execsums_findings_final.pdf

³ Ministry of Health "Report of the Water Softening Sub-Committee of the Central Advisory Water Committee" Prepared for His Majesty's Stationery Office, 194

⁴ 2. SH Widder and MC Baechler, "Impacts of Water Quality on Residential Water Heating Equipment" Pacific Northwest National Laboratory, prepared for the U.S. Department of Energy, November 2013

⁵ AECOM, "Chloride Compliance Study Nine Springs Wastewater Treatment Plant Final Report", Madison Metropolitan Sewerage District, 2015. <https://www.madsewer.org/wp-content/uploads/2021/12/STUDY-2015-District-Chloride-Compliance.pdf>