

# WATER BULLETIN

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## Hard Water

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Hard water is a problem in over 85% of the United States according to the US Geological Survey. Your water is considered "hard" when it has a high concentration of dissolved minerals, specifically calcium and magnesium. Water is a good solvent and these minerals dissolve in it as it moves through soil and rock and are carried along, eventually ending up in your water supply.

### **Problems with hard water<sup>1</sup>**

Hard water interferes with almost every cleaning task from laundering and dishwashing to bathing and personal care. The amount of hardness minerals in water affects the amount of soap and detergent necessary for cleaning. Clothes laundered in hard water may feel harsh and scratchy. Dishes and glasses may be spotted when dry. Hard water may cause a film on glass shower doors, shower walls, bathtubs, sinks, faucets, etc. Skin washed with hard water can become itchy and dry. Water flow may be reduced by deposits in pipes and shower heads. Faucets and other fixtures can have permanent deposits on them and the chrome finish can be destroyed.

Dealing with hard water problems in the home can be a nuisance. Soap used in hard water combines with the minerals to form a sticky soap curd in washbasins and bathtubs. The film may prevent removal of soil and bacteria. Bathing with soap in hard water leaves a film of sticky soap curd on the skin.

When laundry is done in hard water, laundry detergent is made less effective because of hardness minerals and additional detergent must be added to get the same results. Incomplete soil removal from laundry causes graying of white fabric and the loss of brightness in colors.

Some powdered detergents have ingredients that combine with hard water minerals to leave a white deposit on clothing, making it look faded.

Hard water also contributes to inefficient and costly operation of water-using appliances. Heated hard water forms a scale of calcium and magnesium minerals that can contribute to the inefficient operation or failure of water-using appliances. Pipes can become clogged with scale that reduces water flow and ultimately requires pipe replacement.

### **Health effects**

Hard water has no known adverse health effects. On the contrary, hard water, particularly very hard water, can be a small contributor to the daily need of calcium and magnesium. There has been research that shows that drinking hard water can decrease the risk of heart attacks.<sup>2</sup> The decrease was very small, and it is still under investigation.

### **Water testing results**

When you are on public water, your water supplier will know the hardness of the water, but private water owners need to do a test to determine the hardness of their water. Many plumbing supply stores that sell water softeners will do the test for free. With the results from your water test, you can classify your water hardness, a good thing to know for possible problems that might arise. In Table 1 the hard water classifications are shown using the two most common units: calcium in mg/l and grains per hardness. One grain of hardness equals 17.1 mg/l or ppm of hardness.

**Table 1:** Qualifications WQA (Water Quality Association) for water hardness

Classification	mg/l or ppm	grains/gal
Soft	0 – 17	0 – 1
Slightly hard	17 – 60	1 – 3.5
Moderately hard	60 – 120	3.5 – 7
Hard	120 – 180	7 – 10.5
Very hard	180 and over	10.5 and over

### Water treatment

There are several options to soften water. Two options are discussed below.

#### Ion exchange

Ion exchange is the most commonly used method to soften water. When using ion exchange devices calcium and magnesium are exchanged for sodium. The hard water is piped through a resin bead medium that is saturated with sodium. Then the calcium and magnesium attach themselves to the resin beads while the sodium in the resin beads is released simultaneously into the water. After the sodium in the resin medium is depleted, the medium can be regenerated by rinsing (backwashing) it with a concentrated salt (brine) solution.

People who are on low sodium diets or have heart or circulation problems might not want to soften their water by ion exchange because of the increased sodium content. In some cases potassium can be used instead of sodium, but it is more expensive. Another alternative is to soften only the hot water or to have one faucet in the kitchen be fed by a pipe that has bypassed the water softener. Water softened by ion exchange is not recommended for watering lawns or plants due to the sodium content. A reasonable price for a quality water softener, installed, is about \$600 to \$800.<sup>3</sup>

#### Reverse Osmosis<sup>4</sup>

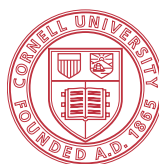
Reverse osmosis is a way to remove certain dissolved salts from water using very high pressure and special membranes. It will remove the hard water minerals, and it will not raise the sodium level. This technique is also used for preparing seawater for drinking water (desalination). However, using reverse osmosis just to soften water is an expensive solution and thus not recommended.

### Conclusion

Hard water is a nuisance but can be solved. There are no negative health effects for hard water consumption. Before buying a water treatment unit, always check on the websites of NSF International ([www.nsf.org](http://www.nsf.org)) or the Water Quality Association ([www.wqa.org](http://www.wqa.org)). These two not-for-profit organizations certify water treatment units and make sure their claims are true.

### References

1. <http://www.water-research.net/hardness.htm>
2. Kousa, A. et al: Geochemistry of ground water and the incidence of acute myocardial infarction in Finland, *J Epidemiol Community Health* **2004**; 58: 136-139.
3. <http://agfacts.tamu.edu/D10/Comal/FCS/Water/F1/nhardwtr.htm>
4. Factsheet 4 Reverse Osmosis treatment of drinking water: <http://www.cce.cornell.edu/factsheets/wq-fact-sheets/index.htm>



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