

ANR-790-2.3.2

ALABAMA A & M AND AUBURN UNIVERSITIES

Typical Contaminants And Problems Water Hardness

In a recent survey, water hardness was ranked as one of the most frequently occurring home water quality problems in Alabama. Hardness minerals in water have a wide impact on households.

Hard water interferes with almost every cleaning task from laundering and dishwashing to bathing and personal grooming. Clothes laundered in hard water may look dingy and feel harsh and scratchy. Dishes and glasses may be spotted when dry. Hair washed in hard water may feel sticky and look dull. Hard water may cause a film on glass shower doors, shower walls, and bathtubs. In hard water, true soaps combine with hardness minerals to form soap curds or soap scum.

Cooking with hard water can also be difficult. Hard water can produce scale on pots. Some vegetables cooked in hard water lose color and flavor. Beans and peas become tough and shriveled.

Hard water also may affect the performance of household appliances. When hard water is heated, a hard scale is formed that can plug pipes and coat heating elements. Scale is also a poor heat conductor. With increased deposits on the unit, heat is not transmitted to the water fast enough and overheating of the metal causes failure. Buildups of deposits will also reduce the efficiency of the heating unit increasing the cost of fuel.

Causes Of Water Hardness

The cause of hard water is dissolved minerals. These minerals are usually calcium or magnesium that dissolve in rainwater as it passes through soil and rock formations. Other minerals, such as iron, may contribute to hardness of water, but in natural water they are generally present in insignificant quantities.

Hardness is generally defined as the concentrations of calcium and magnesium expressed in terms of calcium carbonate. There are two types of hardness: temporary hardness and permanent hardness. If the dissolved solids in water are carbonates or bicarbonates, the water condition is called temporary hardness because carbonates can be easily removed. If the

dissolved solids in the water are from chloride salts, the water condition is called permanent hardness because these salts are difficult to remove.

Water hardness is reported as either milligrams per liter (parts per million) of calcium carbonate or grains per gallon. Four levels of water hardness are given in Table 1.

Table 1. Water Hardness.

Classification	Grains Per Gallon	Parts Per Million (ppm)
Soft	0 to 3.5	0 to 60
Moderate	3.5 to 7	61 to 120
Hard	7 to 10.5	121 to 180
Very Hard	More than 10.5	More than 180

Source: Tyson and Harrison 1990.

Water in Alabama ranges from soft to very hard. See Figure 1.

Treatment Of Water Hardness

When To Treat. There is no well-defined maximum allowable amount of hardness. However, at 30 grains per gallon (about 500 ppm), water is so hard that it has an objectionable taste and may have a laxative effect if the hardness is magnesium sulfate. At that level, soap consumption is very high and pipe and water heater scaling is severe. Treatment is not recommended unless hardness exceeds 3 grains per gallon which is 51 parts per million. (One grain per gallon equals approximately 17 parts per million.)

Small amounts of dissolved minerals cause no problems and improve the taste of water. They also coat pipes and fixtures to help insulate them from corrosion. Mineral-free water can cause rapid corrosion of pipes and fixtures even though the pH may be near neutral.

Whether to soften household water supplies or not is not a decision to be made lightly. Among factors to consider are family composition, stage in the

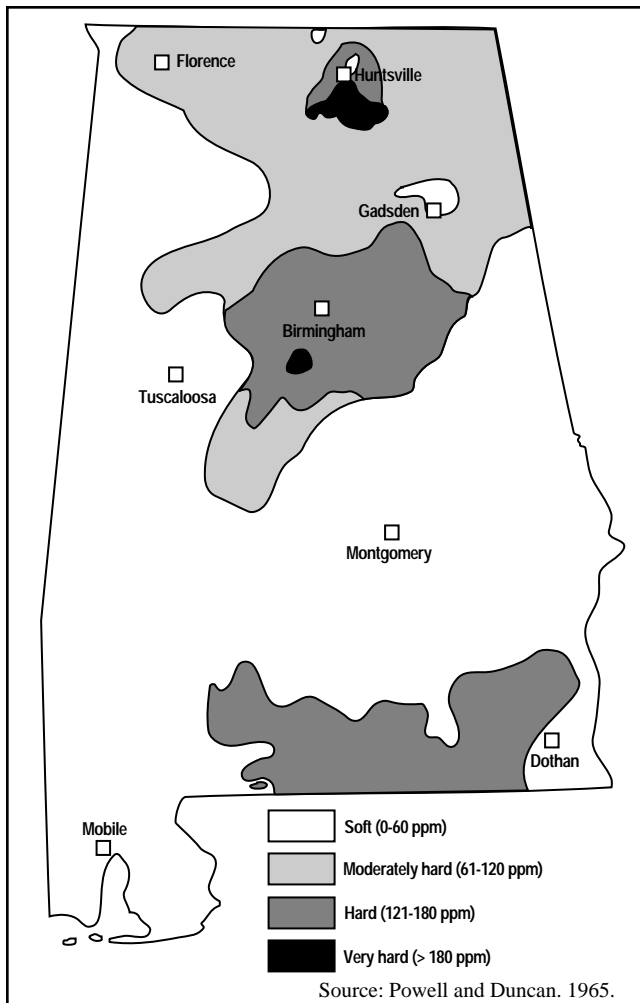


Figure 1. Mineral hardness in Alabama groundwater.

family life cycle, lifestyle, health, maintenance of the equipment, and cost.

How To Treat. You can reduce water hardness by using a mechanical water softening tank connected to your water supply line. Home water softening equipment operates on the cation exchange principle to remove hardness minerals from water. Reverse osmosis and distillation can also remove dissolved minerals, which cause hardness.

Questions About Softened Water

Should everyone use softened water?

Because of the high sodium content of softened water, individuals who have heart or circulatory problems or who are on low-sodium diets may be advised

not to install softeners. Persons with heart or circulatory problems should discuss the question with a physician.

In addition to sodium, are there any other ways in which softened water may affect health?

Water contains trace elements or vital minerals found only in minute quantities in the human body. These tiny amounts have a profound effect on human health. Researchers have found that the mineral content of water directly affects the risk of cardiovascular disease. The risk is lowest where the drinking water contains lots of minerals and highest where the water is soft. Consumers using water softening equipment may want to consider installing a bypass to the kitchen water supply for cooking and drinking purposes.

Is softened water harmful to plants, lawns, and gardens?

Softened water is not recommended for watering plants, lawns, and gardens because of its sodium content. Water used in recharging a water softener should be disposed of through a storm drain or sewer because of its damaging effects.

Should softened water be used in a steam iron?

The best water for steam irons is distilled water, particularly for use over a long period of time. Softened water is not free of minerals, which may clog steam irons.

Should softened water be used in operating an evaporative cooler?

The sodium in softened water will accumulate on evaporative cooler pads. The pads should be cleaned monthly by hosing them with hard water to remove the sodium buildup. Softened water may also be harmful to metal parts in coolers causing excessive accumulation of rust. Bypassing the cooler with a separate water line for hard water is possible, but installation and maintenance costs must be considered.

Water Hardness At A Glance

Symptoms: Scale on utensils, in hot water pipes, and water heaters; poor cleaning action of soaps and detergents; a film forming on skin, clothing, glassware, and fixtures after cleaning.

Causes Of The Problem: Dissolved minerals, primarily calcium and magnesium salts.

Suggested Treatments: Cation exchange (water softener), reverse osmosis, or distillation.

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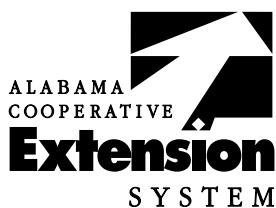
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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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