GEOLOGY

Largest Cities Usually Have Softest Water

IF YOU live in a city of over 20,000 the chance of having soft water supplied to your home is better than for rural or smaller communities. The reason: Larger cities usually obtain their water from the surface—rivers, lakes or reservoirs. Smaller towns use ground water from wells. Surface water, generally, is about twice as soft as ground water.

This is one conclusion from the new report of the U. S. Geological Survey on water hardness in the United States, prepared by W. D. Collins, W. L. Lamar, and E. W. Lohr.

A study of public water supplies of 670 cities throughout the country, representing nearly 57,000,000 people and hence 46 per cent. of the total population, indicates that about four out of five people of the number investigated use water taken from the surface of the earth.

What makes water hard? Water hardness is due to the presence of soluble salts of calcium and magnesium which react with soap to form insoluble compounds. And when water is heated and concentrated by evaporation the calcium and magnesium salts separate out and form scale in vessels ranging in size from steam boilers to tea kettles.

In the home, the insoluble, soap-formed compounds are best observed as the housewife's enemy—the familiar ring around the bath tub. Of more economic importance, however, insoluble compounds raise manufacturing difficulties. Scale on boilers is one handicap. And dyeing industries suffer, as do commercial laundries.

Water hardness is expressed as the amount of calcium carbonate equivalent to all the calcium, magnesium and other metals present. It is reported as so many parts per million of water.

Really soft water, class 1, has from one to 60 parts of calcium carbonate equivalent per million of water. Tolerably soft water, class 2, ranges from 61 to 120 parts per million.

Class 3 varies between 121 and 180 parts per million of water. Nearly everyone notices the hardness of the water in this group. Finally, there is class 4, the really hard water group, having over 181 parts per million of water. It extends to over 600 parts per million in some communities.

In classes 3 and 4 water must be softened for laundry and steam boiler uses. Water works of cities in these classes provide for the immediate or future softening of the water.

Taking water hardness by states, the really soft water groups include the coastal New England and coastal Southern states with the exception of Florida, and the extreme northwestern states of Oregon and Washington.

In group 2 come the Middle Atlantic states, plus West Virginia, Kentucky, Tennessee, Arkansas, Louisiana, Idaho and Montana.

Group 3, the hard water region, takes in Ohio, Michigan, Wisconsin, Minnesota, Missouri, Oklahoma, Texas, and also Colorado, Wyoming, Utah, Nevada, and California.

Having the hardest water of all, group 4, are the wheat and corn belt states of North and South Dakota, Nebraska, Kansas, Illinois and Indiana. The arid states of Arizona and New Mexico also fall in this category.

The Geological Survey issues its investigations with the warning that too general conclusions must not be drawn from the figures for there is a considerable variation within each state. Moreover, the study includes only half of the nation's total population.

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BOTANY

NATURE RAMBLINGS by Frank Thone

Patient Ferns

AUTUMN is a good time to pay attention to the ferns. We are kept pretty busy on our woodland rambles in spring and summer, and even during early autumn, trying to hold ourselves abreast of the rapid procession of the blossoming things. But when frosts have laid waste the petals and crippled the insects that make them worth producing, then we can turn our attention to the older relatives of the flowering plants, now consigned to seats below the salt by the hustling later comers.

The patient ferns have for the most part waited for us, too. Ferns do not shed their leaves as broad-leaved trees and bushes do, and while some of them, like the maiden-hair and the bladderwort, may have withered and curled beyond the possibility of examination, there are very many species that are true evergreens, holding their tough, strong little leaf-blades dark green and alive even when buried deep in snow. And there are others, like the royal fern and the spleenwort, that keep green in defiance of frost until really heavy cold weather strikes them, and then, though brown and dead, still hold their shapes well enough to be worth study.

Even when the vegetative leaves have all been struck down, there still remain those odd structures which many ferns produce, pre-Cretaceus analogues of flowers. "Fertile fronds," botanists call them; they bear clouds of spores that fly out like brown dust when you brush against them. You will find these among the sensitive ferns and cinnamon ferns. Others, like the Christmas fern, fashion their fertile fronds like the non-sporulating sterile ones, except that on the backs of the leaflets—perhaps only the leaflets near the tip—we find the little brown dots where the spores are borne.

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