

Tigris and the Euphrates, Egyptians on the flood plains of the Nile, the early Hindus along the Indus River and the Chinese along the Hwango-ho and Yangtse Rivers. Some early European cities grew beside rivers—Paris on the Seine, London on the Thames, Rome on the Tigris, and Frankfurt on the Rhine. These and other rivers served not only as sources of water, but as routes for trade, communications and occasionally invasions. Today man has made other, more sophisticated uses of these surface waters—for beauty and recreation.

Much of the water falling as rain, or melting from snow and ice, seeps down into the land where it forms part of that great underground reservoir of fresh water known as groundwater.

At any one time, more than two million cubic miles of this water exist under the earth's surface, lying beneath mountains, plains, forests, cities, and even under the huge dry deserts of the world. For instance, beneath the hot sands and arid regions of the Sahara lie an estimated 150,000 cubic miles of water.

Moving slowly between the soil particles and through rock cracks by gravity or pulled along by capillary action, this groundwater replenishes springs, rivers, lakes and water wells on its long downhill journey through the earth. Eventually it reaches the sea, where it is evaporated from the surface and once again rises into the sky.

Contamination Main Problem

In this ancient vast cycle, the water is dirtied, used, filtered and reused many times. The biggest problem facing the world today is not the supply of water, which remains constant, but the abuse and contamination of it.

Natural forces have been polluting the waters for eons. As water erodes mountains, carves out valleys and washes away the plains, it carries away particles of soil, rock and vegetable debris. This silt—sometimes the richest, most valuable soil on earth—is considered the major "pollutant" of many streams and rivers.

To this natural pollution is now added the pollution of man—sewage, chemicals and wastes from his fast-growing cities, farmlands and industries.

Man's use of water is now becoming so great that nature needs help in order to supply mankind with enough fresh water. Normally nature has a remarkable ability to clean up its own waters by processes of filtering through the soil, aeration in waterfalls and sedimentation in quieter waters.

But now the load of pollution is becoming too heavy, and rivers and lakes can no longer purify themselves. They are becoming eutrophicated, which means they are overburdened with nutrients and short on oxygen. The water becomes unfit to drink, even to wash with or use in any ca-

capacity; fish sicken and die; and the foul-smelling area is tragic testimony to man's careless waste and misuse of his most precious resource.

Yet people are beginning to awaken to the crisis in various parts of the world. They are beginning to clean up their messes before tossing them into the rivers. Many private industries and city, state and Federal agencies have undertaken expensive operations necessary to filter, settle out or chemically remove pollutant agents before water is returned to streams and rivers. Other industries are trying new methods of re-using water. Some of the biggest water users—the steel mills, chemical plants, paper mills and refineries which use enormous amounts of water for cooling—are turning to salty water and reclaimed sewage for their cooling processes instead of using fresh water.

Water engineers are devising bigger and better methods of extracting fresh water from the sea by processes such as flash distillation, electric separation, freezing, and reverse osmosis. Other engineers are considering helping restore groundwater reservoirs by pumping fresh water back into the soil.

Man has long used systems of dams and surface reservoirs to catch and store the water in times of wetness, and disperse it in times of drought or summer dryness. Throughout the world, immense dam and waterway projects continue to be built—in the United Arab Republic, India, Italy, Russia, France, Africa and the United States. Water engineers are successfully reclaiming parts of the dry deserts and making them bloom along the northern edge of the Sahara and in Israel's Negev desert.

Even greater visions of water conservation and management are being dreamed of. NAWAPA (the North American Water And Power Alliance) is an immense plan designed to channel the water of North America and redistribute them through seven provinces of Canada, 35 of the United States and three states of Mexico. Long Island Sound has been described as potentially the largest fresh water reservoir in the United States, if dams were built at either end of the Sound and the somewhat salty water flushed out with fresh river and groundwater.

Man is beginning to realize the value of his most precious resource.

GEOLOGY

Freshwater 'Leaks' Spotted in Hawaii

► HAWAII is "leaking."

Fresh groundwater is leaking steadily into the ocean from 219 areas along the Hawaiian shoreline, the largest being Hilo Bay, about five square miles in size, where an estimated 100 million gallons of water are lost every day.

The leaks were revealed by variations in image tone on some aerial photographs indicating differences in water temperatures.

Fresh water, appearing darker than ocean water, was found to be about 12 degrees cooler by analysis of samples.

Sources of fresh water are of considerable importance to the people of Hawaii, for although the average daily rainfall is about 13,000 million gallons, only two to three percent is useful for human consumption.

"In seven-eighths of the Island's area, potable water cannot be practically recovered because of the high permeability of the volcanic rock, which allows water to sink to levels only a little above sea level," William A. Fischer of the U.S. Geological Survey, which conducted the study reported.

Now that aerial infrared photography has been used successfully to pinpoint the specific places where abundant quantities of fresh water are being discharged into the salty sea, plans may get underway for the possible tapping of some of the underground water supplies.

An atlas report of the freshwater leaks called "Fresh-Water Springs of Hawaii from Infrared Images" by Mr. Fischer, Dan A. Davis and Theresa M. Sousa has been published by the Geological Survey, Washington, D.C.

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