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GROUND WATER MISCONCEPTIONS

We can't really see ground water except where there is a spring or a flowing artesian well. Because this resource is hidden, for some people, the existence of ground water is still mysterious. However, our knowledge of geology and our understanding of how the laws of physics work, provide explanations of how much water there is and how ground water is stored and moves in the subsurface.

The movement of water from the clouds to earth and eventually back to the clouds is called the hydrologic system [Hydrologic system is a more accurate way to describe the complexity of the pathways than hydrologic cycle]. Global surface and ground water resources are continuously moving to and from the oceans, atmosphere, plants, rivers, lakes, wetlands, estuaries, and/ or aquifers and back again. Water molecules may move as a gas, through evaporation, transpiration, sublimation [direct from ice to the atmosphere], or as a liquid, rain, rivers, ground water flow, ocean currents, or as a solid, snow hail and ice (yes, ice moves too as glaciers and icebergs).

The mistaken concept that all ground water occurs in underground lakes and rivers is based upon conditions that do sometimes occur in areas, such as Florida, where limestone rocks form aquifers. In such areas, water may flow in underground openings, such as caves and solution channels. In the vast majority of the world, however, ground water occurs in tiny fractures, fissures and spaces in rock. To work as an aquifer, rocks formations must have a sufficient number of interconnected openings (permeable material) for the water to be stored and pass through.

Much of the water in aquifers infiltrates close to where it is found. It is rare for ground water to travel great distances except in some of the major aquifers. Ground water moves very slowly through the earth, in most cases only a few inches per year. There are no underground rivers flowing with great volumes of water from "Canada to Kansas" or Michigan to Florida." However, there are some large aquifers, such as the Ogallala in the United States High Plains that do extend for hundreds of miles.

It is commonly believed that ground water and surface water are separate systems. However, consider, a stream in late summer. Although it may not have rained for several days or weeks, there may still be a considerable flow of water in the stream. This water could not have been derived from surface runoff or rainfall. The water in the stream is water that has flowed from ground water storage in the geologic formations adjacent to the stream channel. In dry periods, this ground water is 100% of the flow. In times of storm rainfall, the percentage of ground water will fall, and much of the flow will be surface runoff. As time goes on after the storm, the percentage of the flow from ground water will increase. In fact, about 40 percent of the entire combined annual river flow in the U.S. (including the Mississippi River) originates as ground water.

Some people worry that once ground water is removed it never returns. In most parts of the United States, water removed from the ground is constantly replaced through rainfall or snowmelt. Thus, ground water is a renewable resource, although in some places the rate of replenishment is very slow. If a slow rate of replenishment is exceeded by the rate of ground water pumping it is called ground water mining. If the amount of water taken from wells in a certain locality, combined with other (ecological) water demands, is less than the long-term aquifer replenishment from rainfall, pumping may be continued indefinitely without causing any harmful effects. This is called sustainable use.

Before the development of scientific techniques of ground water hydrology, the natural laws controlling water movement were unknown. This led to the idea, preserved in case law in the courts, that the occurrence and movement of water in the ground was mysterious and occult and that the principals of its behavior could not be known. In fact, using well-established natural laws of physics and thermodynamics and the relevant hydrologic data, the quantity and quality of ground water can be predicted and the effects of pumping from wells calculated. For most home wells, there is also an onsite wastewater disposal system and so virtually 100% of in-house water use is returned to the ground water system. Using ground water for lawn irrigation in summer may result in depletion of the aquifer. Our use of resources needs to be based on sustainability.