Groundwater Overview
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Groundwater is the water stored underground in geologic formations called aquifers. An aquifer is typically composed of sand, gravel, broken rock, rock with hollow openings like limestone, or even clay. Rain or melting snow seeps into the soil and continues downward due to gravity until it reaches the water table, where the geologic material is saturated, meaning water completely fills all the void spaces in the rock or sediment. We call this process "groundwater recharge". Over the course of years or decades and under natural conditions, this recharge is balanced by groundwater discharge to streams, lakes, and the ocean. Beneath the Sahara Desert, where rain is extremely scarce, the groundwater is can be thousands of feet deep and in some cases it recharged a million years ago!

Almost anywhere on Earth, if you drill deep enough you will eventually find groundwater. However, some geologic materials, like sands and gravels, are more permeable than others, like solid rocks and clays, meaning the water flows more easily and can be pumped more quickly from a well. The High Plains (Ogallala) aquifer in the central U.S. is an example of a highly permeable aquifer composed of ancient sediment. Groundwater can be very shallow, especially near the edges of a lake or river, or very deep, particularly in arid climates. Groundwater is often fresh and clean, as the soil above acts like a giant filter. In fact, in most cases you can drink well water without having to filter or otherwise decontaminate it. However, groundwater may become contaminated by agricultural fertilizers and chemicals, leaking underground storage tanks, or saltwater intrusion from the ocean.

Groundwater is important precisely because it is usually clean and can be found almost everywhere. Outside of cities and towns that have municipal water supplies, most people rely on well water for their domestic water needs. However, the largest consumptive use of groundwater by far in the U.S. and worldwide is irrigation of food crops. Groundwater is like your savings account. You can use it when times are tough (i.e., during droughts) and let it fill up when times are good (i.e., when it rains or snows). However, many of the most productive agricultural regions of the world are semi-arid, meaning there is not enough rain to support the crops that are grown, and farmers make up the difference by pumping groundwater and using it for irrigation. In some aquifers, the withdrawals have been exceeding recharge for many years, and as a result the water levels have declined. These include the southern half of the High Plains aquifer, California's Central Valley aquifer, the North China Plain aquifer, and aquifers in northern India. An aquifer's water is not limitless, and long term groundwater depletion to support agriculture causes wells to go dry. Deeper wells can be drilled, but eventually either the water is gone or what is left is too saline to be used.

What is the solution? Because agriculture is the biggest consumer of freshwater, reducing irrigation water usage is the most obvious answer. Farmers have been switching from

spray irrigation and flood irrigation to drip irrigation, which is much more efficient. Planting crops that need less water and/or drought resistant varieties is another option. Improved irrigation scheduling, which takes advantage of new technologies and even computer models, is gaining acceptance. Finally, growing crops that can survive on the rainfall available in a given location may be the most important decision of all.