

Water: Where it is, Where it Comes From, Where We Want It

The water cycle, or hydrologic cycle, is a depiction or description of where water is on the planet, how it moves from one place to another and the factors that influence these movements. To begin with, a couple of astonishing facts.

First, the amount of water on the planet is essentially constant. In spite of how it may seem to us during droughts or floods, no net amount of water is actually being destroyed and none is being created. Secondly, of all the water on Earth, only 2.75% of it is fresh water! And this is distributed as follows; 2.05% is frozen in ice sheets at the poles and in glaciers, 0.68% is ground water in aquifers, and only 0.011% is in surface water in lakes and rivers. And most surface water is confined to two places, the Great Lakes and a large lake in Russia. So percentage wise, that doesn't leave much for the rest of us.

Taking a look at the big picture of the water cycle first, the sun provides the energy necessary to evaporate water from the oceans, and as the water evaporates, it leaves behind the salt in the ocean and becomes fresh water. As the water rises in the atmosphere, it cools and condenses into tiny droplets to form clouds. The clouds can be carried by winds, which are also fueled by energy from the sun, until conditions are right for precipitation in the form of rain, hail or snow.

As the rain hits the land, it either runs off the surface downhill into a stream or river, or it soaks into the soil. From there the water either seeps underground into deep aquifers or flows in shallow aquifers downhill toward the river valleys providing the base flow of the river as the water runs back toward the ocean. If the precipitation is in the form of snow, it will stay where it falls until it either melts or, to a smaller extent, sublimates back into the atmosphere.

Some of these processes take only a few days, some can take thousands of years. If the rain occurs over the ocean, then the water is returned to the ocean in a matter of days. If it falls over land as rain, it may take several months to flow downhill in streams and rivers to get back to the ocean. If it falls as snow in the higher mountains, it may take even longer. If it falls over the Arctic or Antarctic, it may take thousands of years before it returns to the sea. Some ice on Antarctica has been dated as 800,000 years old!

There are a few other aspects of the water cycle. When water soaks into the ground, some of it can evaporate back into the atmosphere directly from the ground. If the water is instead taken up by a plant, one of two things can happen. If the water taken up by the plant is used in photosynthesis to produce carbohydrates (starches, sugars, cellulose) then some water is actually used in that chemical reaction and becomes part of the carbohydrate molecules. Much of the water taken up by a plant, however, is not

used in photosynthesis, but is re-evaporated from the leaves of the plant in a process called evapotranspiration. This transport of water from the roots to the leaves helps bring minerals from the roots up to the leaves.

The water that was used in the chemical reaction to make plant tissues is released again as water when the plant material decomposes or is burned or eaten.

Obviously all of these processes take place without any help from us humans, and in fact have been taking place long before there were humans. So you might ask, what does this all have to do with us? Well, if we own land, we can have an effect on how the water cycle works on our property. We want the rain that falls from the sky to reach the ground and to soak into the ground, not run off.

How the land is managed and its condition determines how efficiently it captures rainwater and how much water the soil can hold. Well-managed land with good stands of native grass does a good job of capturing the rain and not let it run off immediately. If it runs off downhill to the nearest creek or river it can be back in the Gulf in a matter of a few days before it does us any good. We want the rain to soak in and flow downhill underground to local water tables to help maintain the base flow of our rivers between rain events.

Until next time...

Jim Stanley is a Texas Master Naturalist and the author of the books "Hill Country Ecology," "Hill Country Landowner's Guide" and "A Beginner's Handbook for Rural Texas Landowners." He can be reached at jstmn@kctc.com. Previous columns can be seen at www.hillcountrynaturalist.org .