

NATURAL WATER CYCLE

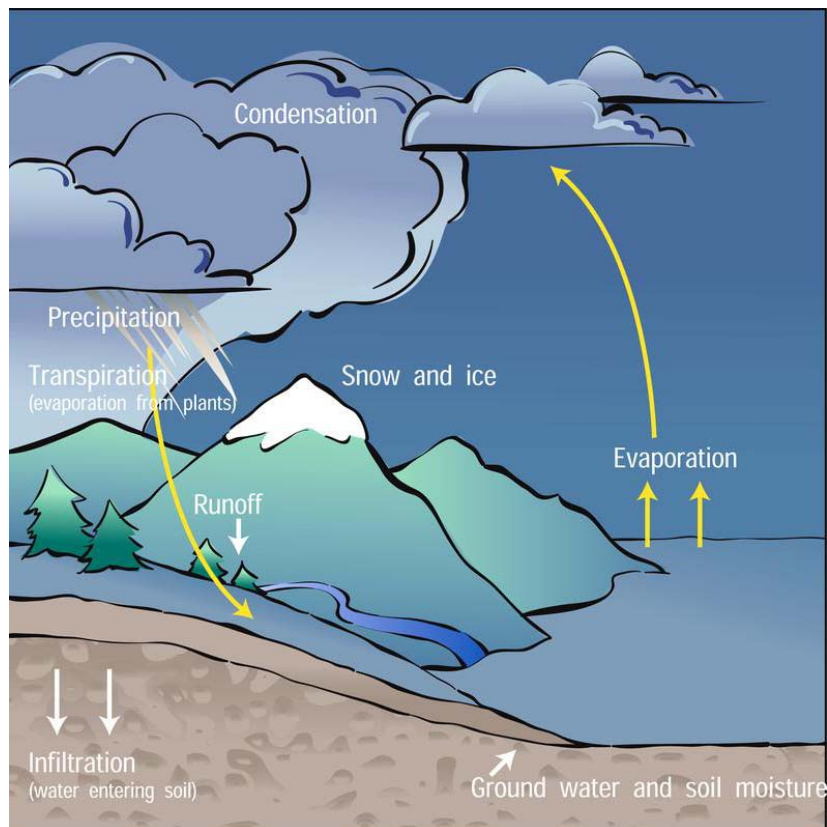
Water on the earth is constantly on the move, it recycles over and over again. This movement is called the water cycle.

Precipitation occurs when there is so much water in the air it cannot hold onto it anymore. It will rain, snow, sleet or hail. It fills up our lakes, streams and oceans on the surface of the earth.

The earth also soaks up some of the water, storing it in the ground until it is needed. This is called **ground water**. This storage area is called an aquifer. Many people pump water directly from an underground aquifer and use it for their drinking water.

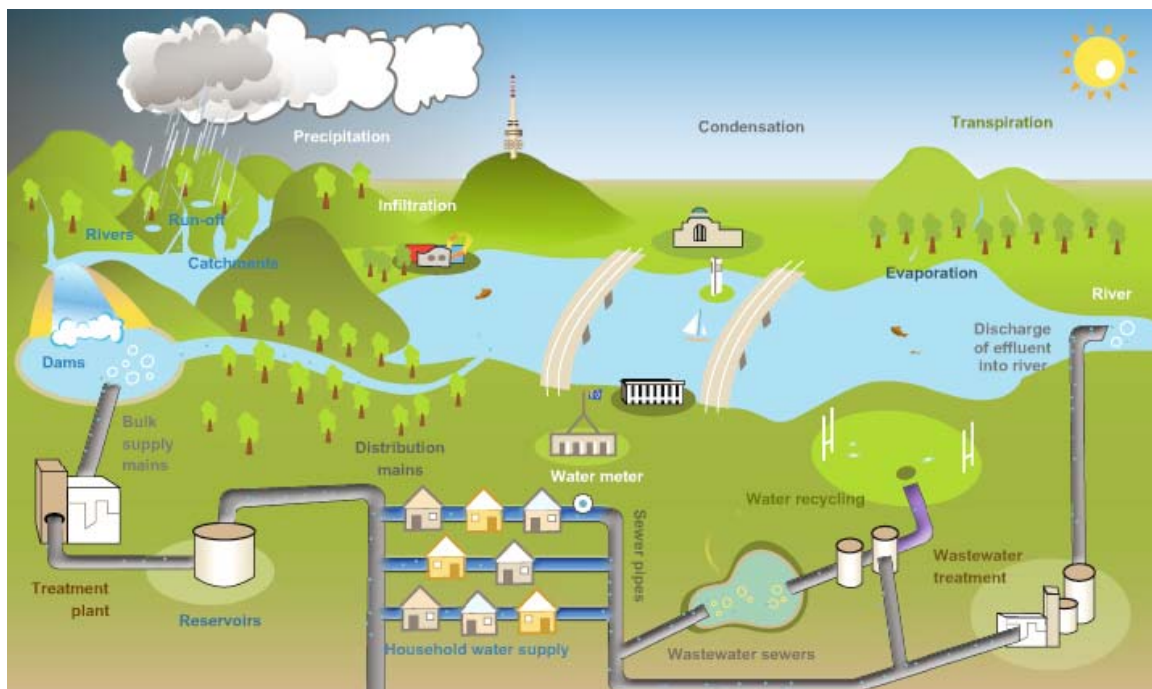
When the sun comes out and heats up the water it is called, it turns into vapor or steam. Helping to add vapor are the plants, trees and the land because they lose water too. This is called **transpiration**. Water also consistently evaporates from existing bodies of water including oceans and lakes. **Evaporation** is when the water that is at the top of the oceans, rivers and lakes into steam using the energy from the sun.

When vapor in the air gets cold, it changes back into liquid to form clouds. This is called **condensation**. Those clouds get heavy and we start all over again with precipitation.



BUT: How does water get to my sink or shower at home?

Image example:



DELAWARE RIVER and GROUND WATER:

In Philadelphia, the water that comes into your sink starts at a river, most likely the Delaware River.

The quality of the water entering our water supply system depends on the health of our rivers. This is in turn affected by human activities.

Recreation, agriculture, soil erosion and industry on or near rivers impact the health of our rivers. We need to use our river environments responsibly and care for them to ensure we continue to have a quality water supply.

TREATMENT PLANTS:

The water we drink is piped from a location near the Delaware River to a treatment plant that is surrounded by grassy fields. These fields are used as the first thing that cleans the water. The soil is used to clean out a lot of the large particles that would enter the pipes if the water was collected directly from the river. This process is a

natural process called filtration, this takes time and requires pollution-free and ecologically balanced environments. It also does not guarantee the same level of quality every time, which is why there are other methods of man-made filtration on the water that travels through the water-treatment plant.

To remove the risk of organisms in water making us sick, today the water we use is processed at a water treatment plant before it reaches our homes. This makes sure that the water we drink is of high quality all the time.

Treating water for human use involves steps including pre-treatment, flocculation, filtration and chemical dosing.

- * Pre-treatment involves adding alum and a polymer coagulant to the water. These substances attract solid particles in the water that could host viruses and bacteria. This leaves the water cleaner and less turbid.

- * Flocculation is a process of separating the solid particles out of the water. It involves mixing and circulating the water and causing the solid particles caught by the pre-treatment additives to float to the top in a sludgy froth.

- * Filtration involves pumping the water through filters to remove any remaining particles.

- * Chemical dosing involves adding chlorine to kill any remaining microorganisms (germs), adjusting the water's pH level (acid or alkaline levels in the water) to balance it and adding fluoride to protect our teeth.\

SUPPLY MAINS to RESERVOIRS:

Extremely large pipes carry water from the water treatment plants to the storage areas that are used to store water for the use of people in the city.

The size of these pipes is designed to transfer enough water for all the households in the area in a 24 hour period. Pipes can be as thick as 8 feet and as thin as 6 inches in diameter near the treatment plant.

Water reservoirs store water for later distribution to households.

They help the water network cope with changes in water demand and help manage the water pressure so that water flows out of taps at the speed people expect.

Reservoirs may be above or below ground. Underground tanks are often rectangular with a concrete lining. Above ground reservoirs are often circular tanks made of

concrete or steel. All are roofed and designed to blend in with the environment as much as possible.

Where possible, reservoirs are placed on high ground so that gravity will help provide enough pressure to push the water through the pipes.

HOUSEHOLE WATER SUPPLY-HOW IT FINALLY GETS TO MY SINK!

Smaller pipes branching from the large pipes, transport water into your home.

A water meter, normally be found in your front or back yard, measures the amount of water used by your household.

The service line into your home branches into smaller pipes, which transport water to each of the taps in your house. One of these branches will go to the hot water service in your home, where the water is heated and then piped to all of the hot water taps.

These small pipes can be found all through your home, under floors and in walls. Wherever you have a tap, there's a pipe in the wall behind it.

Used water goes down your drains and enters the wastewater network where it flows into the sewerage system.

WASTEWATER and WASTEWATER TREATMENT:

Where does the water go when it goes down the drain or toilet?

The wastewater system, is the network of pipes that takes sewage away from households and businesses. The network carries the wastewater to a treatment plant where it is treated, so that it can be safely recycled back to nature.

Pipelines from individual homes, which feed into larger pipes and sewers, lead to treatment plants for treatment of sewage.

Most sewage pump stations contain a large well where the sewage collects until it is high enough to start the pump automatically. The pump stops when most of this sewage is pumped away to the treatment plant.

There are factories that exist that clean all of the wastewater enough to put it back into nature.

In Philadelphia, the sewage is pumped to one of the treatment plants and goes through an intense cleaning and filtration process.

Preliminary Treatment. Wastewater flows through several sets of screens, from thick to very tiny, where debris is removed. The trash is collected and is hauled to a landfill off-site.

Primary Treatment. The wastewater flows slowly through primary sedimentation tanks. The solids that are heavier than water sink to the bottom, while scum and grease float to the top. The excess from the top and the bottom are removed and sent to a landfill, while the remaining water is treated further.

Secondary Treatment. The wastewater is combined with tiny natural organisms that decompose sewage in nature. The wastewater and organisms are mixed together in open tanks.

The wastewater from these tanks then flows to the final cleaning tanks. Wastewater slowly flows through these tanks, allowing the solids to settle. These solids are pumped to another process where the water is removed.

Just before reaching the river, the water is mixed with enough chlorine to kill any remaining disease-causing organisms. The treated water is even cleaner than what is required by the government.

Stormwater system

Philadelphia also has a stormwater system. These systems collect all of the extra water from rain, such as from roads, parks and from the gutters in roofs. This water drains into lakes, rivers or the oceans.