THE WATER CYCLE

The water cycle has no starting or ending point. The sun, which drives the water cycle, heats water in oceans and seas. Some of this water **evaporates** as **water vapor** into the air. Ice and snow can **sublimate** directly into water vapor**. Evapotranspiration** is water transpired from plants and evaporated from the soil. Rising air currents take the vapor up into the atmosphere where cooler temperatures cause it to **condense** into clouds. Air currents move these clouds around the globe. Cloud particles collide with each other, grow bigger, and once they are big enough fall out of the sky as **precipitation**. Some precipitation falls as snow or hail, and can accumulate (pile up) to become ice caps and glaciers. These glaciers can store frozen water for thousands of years. Snowpacks can thaw and melt, and the melted water flows over land as snowmelt. **Gravity** causes most water to fall back into the oceans or onto land as rain. The water that doesn't soak into the Earth flows over the ground as **surface runoff.** A portion of runoff enters rivers in valleys in the landscape, with streamflow moving water towards the oceans. Oceans do not flow backward into rivers and streams. Runoff and **groundwater** seepage accumulate and are stored as freshwater in lakes. Not all runoff flows into rivers, much of it soaks into the ground as **infiltration**. Some water infiltrates deep into the ground and replenishes **aquifers** (saturated subsurface rock), which store freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as groundwater discharge. Some groundwater finds openings in the land surface and comes out as freshwater springs. Over time, the water returns to the ocean, where our water cycle started.

RESERVOIRS

In the context of the water cycle, a reservoir means the water contained in different steps within the cycle. The largest reservoir is the collection of oceans, accounting for 97.25% of the Earth's water. The next largest quantity (2.05%) is stored in solid form in the ice caps and glaciers. This small amount accounts for approximately 75% of all freshwater reserves on the planet. The water contained within all living organisms represents the smallest reservoir.

Volume of water stored in the water cycle's reservoirs

Reservoir	Volume of water (10^6 km^3)	Percent of Total
Oceans	1370	97.25
Glaciers and ice caps	29	2.05
Groundwater	9.5	0.68
Lakes	0.125	0.01
Soil moisture	0.065	0.005
Atmosphere	0.013	0.001
Rivers and streams	0.0017	0.0001
Biosphere	0.0006	0.00004

The only reservoir listed in the table that is salt water is the ocean reservoir. Though the other seven reservoirs are all freshwater, they only represent a small percentage of the total water on the planet. Glaciers lock up most of the freshwater and so it is inaccessible to humans. The freshwater reservoirs, particularly those that are *available* for human use, are extremely important water resources. Humans must conserve (use carefully without wasting) our freshwater and also make sure we protect our fresh water sources from pollution.

RESIDENCE TIMES

The residence time of a reservoir within the hydrologic cycle is the average time a water molecule will spend in that reservoir (see the adjacent table). It is a measure of the average age of the water in that reservoir, though some water will spend much less time than average, and some much more.

Average reservoir residence times[8]

Reservoir	Average residence time
Antarctica	20,000 years
Oceans	3,200 years
Glaciers	20 to 100 years
Seasonal snow cover	2 to 6 months
Soil moisture	1 to 2 months
Groundwater: shallow	100 to 200 years
Groundwater: deep	10,000 years
Lakes	50 to 100 years
Rivers	2 to 6 months
Atmosphere	9 days
Biosphere	Hours to decades

Groundwater can spend over 10,000 years beneath Earth's surface before leaving. Particularly old groundwater is called **fossil water**. This does not mean the groundwater is older than other water though. All the water on the planet is the same age as the planet is. Water stored in the soil remains there very briefly, because it is spread thinly across the earth, and is easily lost by evaporation, transpiration, streamflow, or groundwater discharge. After evaporating, water remains in the atmosphere for about nine days before condensing and falling to the earth as precipitation.

Water that enters living things can leave in a matter of hours through urination or defecation. If the water molecule is put into a cell, however, it can remain in the plant or animal for many years.

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