



THE WATER CYCLE

AN ETERNAL JOURNEY...

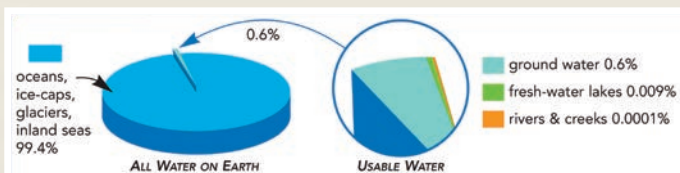
Which Water Where?

From space, it is obvious that the earth is a watery planet. About 70% of the earth's surface is covered by ocean.

The ocean makes up 97% of all the water on this planet. Only 3% of water is fresh, and most of this is stored in the polar icecaps and glaciers. Water in rivers, creeks, and lakes only makes up less than 1/100th of 1%. About 1/1000th of 1% of earth's water is in the atmosphere as clouds.



Source: NIX - NASA Image eXchange, Image No. PIA00122. Reproduced with permission as outlined at <http://nix.nasa.gov/>.



The earth is basically a 'closed system'. That means that very little water, or anything else, escapes into outer space. The same water that was here millions of years ago is still here. For all of that time, water has been moving from one place to another, from one form to another, in what is called '**the water cycle**' or the '**hydrological cycle**'. It is sometimes called the 'round river'.

• Evaporation (into clouds).

Heat from the sun makes water become a gas. This can happen to any water that is on the Earth's surface, whether in the ocean, rivers, on the land or from vegetation. As the Earth's surface warms, currents of air carry the water vapour up into the sky. The water vapour gets cooler as it rises, and condenses into tiny droplets that form clouds.

• Precipitation (as rain, snow, hail).

These tiny droplets cling together to form larger drops and when they get too heavy to stay in the cloud, gravity pulls them back to earth as rain, snow or hail.

• Surface Run-off (into creeks, rivers, lakes, wetlands).

This rainfall can run directly off the land into creeks, rivers, lakes, wetlands and on into the ocean.

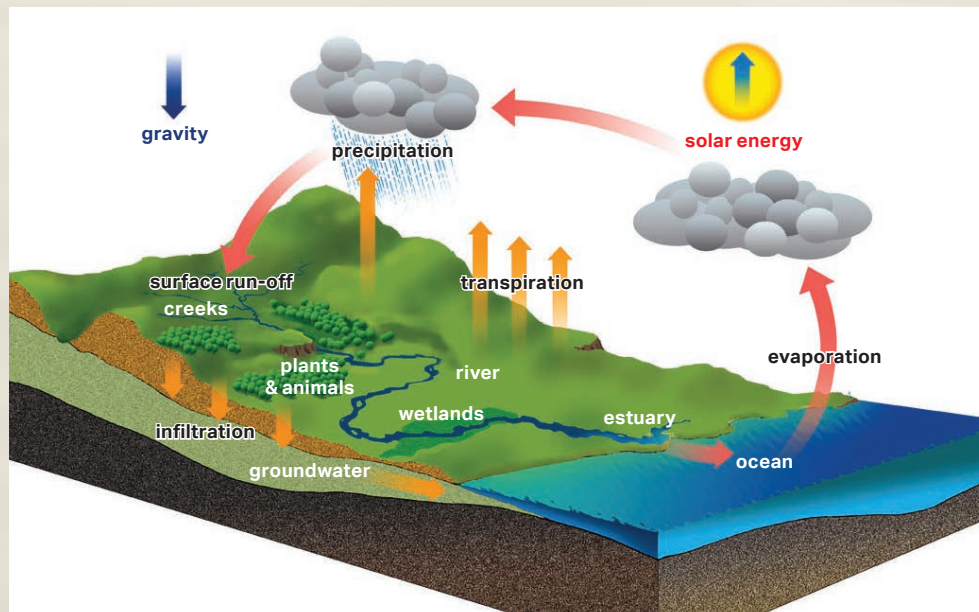
• Infiltration (into aquifers, groundwater).

Rainfall can also soak deeply into the ground and add to the groundwater, where it is stored in tiny spaces inside porous (spongy) rock. It then moves very slowly through the rock towards rivers, wetlands and the ocean. This can take hundreds or even thousands of years.

• Water held in the bodies of plants and animals.

Rainfall can soak a little way into the ground and be absorbed into the roots of plants, and then be expired as water vapour by the leaves of plants back into the air.

This is called '**transpiration**'. The rainfall could also be drunk by an animal, which then releases it as water vapour (breath) into the air, or as liquid (sweat, urine) back into the land or water. In between 'drinking' the water in, and releasing it back out, water is stored inside the bodies of all the plants and animals alive today!



One of the special properties of water is that it is the only substance on earth to naturally exist in three states: solid (ice), liquid (water), and gas (steam or water vapour). See Info Sheet 3: Water is Amazing! for more details about water.



Time Travel

This process of the water cycle carries water through time. Water is chemically very stable.* That means that a water molecule which you drink today could have been drunk by a possum in the rainforest a few months ago, by a farmer in India a few centuries ago, and by a Tyrannosaurus Rex 65 million years ago!

A Natural Filtration System

By going through this process, changing between forms and moving from place to place, the water is filtered through soils and rocks and living organisms, which 'pick up' many of the substances dissolved in or carried along by the water. When water evaporates or is transpired by plants, this also purifies it, as the substances being carried by it are left behind as it transforms into gas. This naturally occurring system (without human interference) generally provides healthy, filtered water suitable for the survival and health of many ecosystems along the way.

The Circulatory System of the Planet

As you can see in the diagram, the water cycle connects different ecosystems (from rainforest gullies to coastal dunes) and even different regions of the world (from the polar ice-caps to the equator).

Like blood in our bodies, the water cycle carries nutrients and oxygen to all parts of the Earth's system, and filters out poisons and pathogens. Water is pumped around the body of the Earth by the energy of the sun (lifting it through evaporation, hot air currents, and transpiration) and by gravity (pulling it down as precipitation and from wherever it falls down to the ocean). Together, the sun's energy and gravity act like the heart of the Earth.

The health of each part of the Earth's system affects the quality of the water, which then affects the health of many ecosystems. Just like toxins in our blood, pollutants can prove too much for the natural filtration processes, and cause sickness and death to many animals and plants. Just like when we get dehydrated, droughts and too little water left in the natural water cycle can mean the delivery of oxygen and nutrients, and the removal of toxins don't take place properly, making ecosystems sick. If our whole bodily system is not in balance, like by not eating healthy food or getting enough sleep or exercise, then our circulatory system can be affected, making us less energetic and more easily sick. In the Earth's body, a problem like climate change, for example, could disrupt the water cycle and all the important functions it performs.

Just like in our own bodies, we need to make sure that the natural processes are functioning properly so that we can live a full and healthy life. The way we, as humans, treat the water cycle affects the health of the Earth.

Because the water cycle carries water over time, the health of the water cycle can have long-term effects. It is extremely important for the health of the planet, and all its ecosystems, that the water cycle stays healthy.

(Sources: World Book Encyclopedia; DPWS web-site; Sydney Water web-site; Sydney Catchment Authority web-site; US Geological Survey website)

** Note: Although water is chemically very stable and some individual molecules may last a very long time made up of the same hydrogen and oxygen atoms, many common chemical reactions do 'split' water regularly. For example, photosynthesis splits H₂O and forms glucose and oxygen gas; and the respiration of animals forms 'new' water. That is, if water was not split up by plants, we would not be breathing!!*

TRY THIS!

Learn with your...



"Squeeze a drop of water from a water bottle onto your hand. Think of all the different places that this droplet of water could have been before. Brainstorm. Think of as many wild ideas as possible."



"Look around you and feel yourself as one part in this huge, pumping 'round river' of water. Feel the part you play in it. How does it feel to see things this way? Have you ever thought of your environment around you in this way before? How does it feel to see it in a new way?"



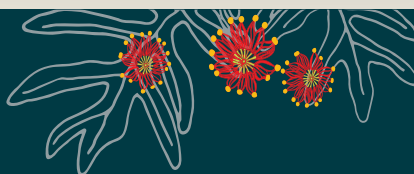
"Look around you and see what parts of the water cycle you can see from where you stand. Make a quick drawing of them. Imagine them playing their part in the water cycle. How does water flow through them? How are they connected? Draw this with arrows."

Learning objective: To understand how the natural water cycle operates and what functions it has. To understand that we are each a part of the water cycle.

For further information contact:

Rous County Council

02 6623 3800 www.rous.nsw.gov.au



These information sheets were originally prepared for Rous County Council by Sustainable Futures Australia in liaison with Widgee elders. © Rous County Council and Sustainable Futures Australia 2004. This is an educational project for the protection of water land, and for reconciliation.

All information provided is done so in good faith, but on the basis that Rous County Council and its consultants are not liable for any damage or loss that may occur in relation to this information.

