

FORESTS & WATER

Support Sheet 1: Background information

Forests & The Water Cycle:

Like all living organisms' trees need water to survive. The process by which water moves from the roots to every part of a tree is transpiration.

Transpiration is the process by which moisture is carried through plants from roots to small pores on the underside of the leaves. These pores are called stomata. Here, it changes to vapour and is released to the atmosphere. The tubes through which water moves are called xylem, which act just like a straw, sucking the water up from the roots, up the trunk and to the branches and leaves.

Water naturally moves upward in narrow tubes and this partly accounts for the movement of water up to the leaves. **The greatest driver of transpiration is evaporation of water vapour from the leaves.** As water molecules are lost from the leaf they pull on the water molecules behind them effectively pulling water up through the xylem. **Sunlight, high temperature** and **wind** allow water to leave the leaves quickly, which increases the rate of transpiration.

Cooling Effect of Trees:

Trees can have a cooling effect on the local environment. If you go to the garden, local park or forest on a hot day and go under a tree, you will feel the cooling effect immediately. Forests cool the earth's surface. Not only do they provide shade, the water they transpire also cools the air nearby. You may have noticed that animals will often seek shade from a tree in the both sun and rain.

As much as 70% of the atmospheric moisture generated over land areas comes from plants (as opposed to evaporation from lakes or rivers). Air that has passed over extensive vegetation in the preceding few days produces at least twice as much rain as air that has passed over little vegetation. This shows the immediate effect of that deforestation has on rainfall patterns. When areas of forest are cleared, such as The Amazon or Borneo Forests, this has a huge impact on weather and rainfall patterns.

It takes a lot of energy to change liquid water into water vapour which disperses into the air and we do not really appreciate the work trees around us are doing to make our life more comfortable!

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Trees help to make clouds:

Tiny particles like fungal spores, pollen, microorganisms and tiny bits of dust rise from the forest with the transpired water vapour. These are swept up into the atmosphere in currents. These tiny particles make that easier by providing surfaces for the water to condense onto. Rain can only fall when water vapour condensates into water droplets. These water droplets then gather together as clouds. They release the water as rain when their weight becomes too heavy for the cloud to hold.

Trees can increase the amount of water in the soil and reduce flooding.

When rain falls in non-forested areas, it can flow straight into rivers. If water goes straight into rivers, it can cause erosion of soils and flooding downstream.

Trees allow more water to drain into the soil, due to their root systems and the spongy nature of the leaf compost around their bases. Some of this water is held in the soil and some gets into underground aquifers (naturally occurring water systems). In areas that are forested, water soaks into the ground easier. This is because tree roots and the animals they attract, like ants, woodlouse, worms, etc, help to create holes in the soil for the water to flow through at a slower rate.

If water is stored in soils or underground, it can be slowly released into rivers or be used later by trees and by people who have wells.

Forests draw moisture into the heart of continents:

When large forests transpire, they create winds, bringing rain into the heart of continents. This explains why you can get really high rainfall in the interior of continents when the original source of water, the ocean, is so far from where the rain is falling. Examples of this are: The Amazon Basin in South America and the Congo Basin in Africa. Central Europe still has large areas of forest, but much of it has been lost. How has this affected our local and global weather patterns, do you think?

Global weather, wind and rain patterns real time: <https://earth.nullschool.net>

Forests and Hurricanes:

<https://mylandplan.org/content/how-hurricanes-affect-your-forest>

<https://forestsnews.cifor.org/51566/forests-versus-hurricanes?fnl=en>