

LEAF TRANSPIRATION

Do plants sweat? The answer is yes! The name for this is **transpiration**, a process that can be compared to **perspiration** (sweating) in humans. Transpiration describes the way water moves through plants and the **evaporation** of water from the stems, flowers, and especially the leaves.

The process begins when a plant absorbs water from the soil through its roots. Water is transported, along with dissolved minerals, up the plant through tubes called **xylem**. The water and minerals help to nourish the plant as it moves through the plant tissues. Eventually, the water is released into the atmosphere through little pores on the plant's leaves, called **stomata**.



Stinging nettle leaf

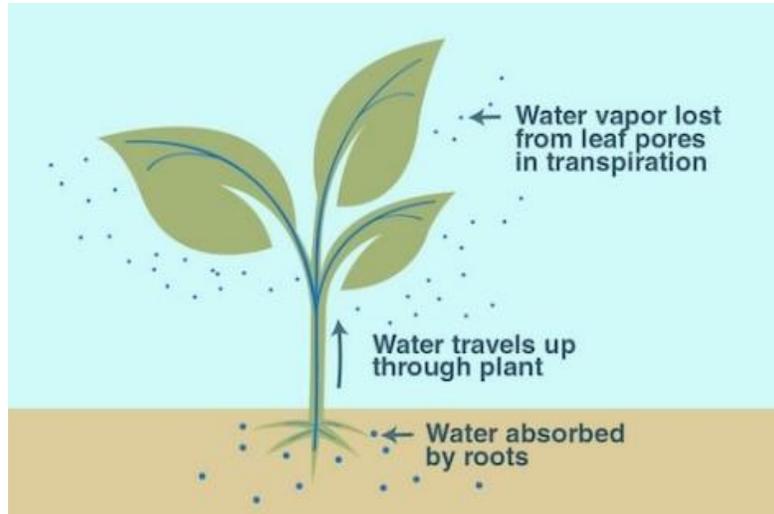


Illustration of transpiration process. Image credit: NASA/JPL-Caltech

Most stomata are found on the underside of leaves, especially if the plant is growing in full sunlight. This helps the plant **conserve** (save) water. Although they are very small, you might be able to see some of these pores on the bottom of some leaves with a magnifying glass.

The stomata are surrounded by **guard cells** that open and close the pores. Pores open to take in **carbon dioxide**, a colorless, odorless gas that is absorbed by plants for **photosynthesis**. That's the process plants use to make food from carbon dioxide, water and sunlight.

The same pores release water vapor and oxygen into the air, which helps keep the plant cool and transports the flow of water and minerals (**mass flow**). Mass flow occurs because there is less water pressure in the upper parts of the plant due to the movement, or **diffusion**, of water out of the stomata into the atmosphere. This creates a suction force that pulls more water up from the roots. Water flowing through the xylem is called the **transpiration stream**. This stream helps keep the stem firm so that it can support the plant. Very cool!



Here is what you will need for our leaf transpiration activity:

- Clear plastic bag
 - Rubber band or tape
 - Find a big leaf on a tree or bush on a sunny day
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1. Cover the leaf that you found with a clear plastic bag
 2. Seal the bag around the leaf with a rubber band or masking tape.
 3. Leave it alone for an hour or two
 4. Observe what happened

What did you find?

Was there water in the bag? How much?

How long did it take for water droplets to appear?

Did it have an odor?

You just observed evidence of the invisible process of plant transpiration! The leaves are “breathing”! The water is being put into the air all the time, even though you can’t see it happening.

On a hot, dry day, a large tree may lose several hundred gallons of water through its leaves. About 90% of water that a plant takes in through its roots is used for this process!

Things that affect transpiration:

 Temperature

 Humidity

 Wind

 Available soil moisture

 Type of plant. Plants, like cacti and succulents, growing in dry climates conserve water by transpiring less water than other plants

ADDITIONAL RESOURCES

Websites

Frontiers for Young Minds, How Do Plants Deal with Dry Days?

<https://kids.frontiersin.org/article/10.3389/frym.2017.00058>

United States Geological Survey, Evapotranspiration and the Water Cycle https://www.usgs.gov/special-topic/water-science-school/science/evapotranspiration-and-water-cycle?qt-science_center_objects=0#



Videos

California Academy of Sciences, How Do Trees Transport Water from Roots to Leaves?

<https://www.youtube.com/watch?v=9-dicqNoODg>

TEDEd, The Simple Story of Photosynthesis and Food - Amanda Ooten <https://ed.ted.com/lessons/the-simple-but-fascinating-story-of-photosynthesis-and-food-amanda-ooten>

Books available from the Washoe County Library System

The ABCs of Plants by Bobbie Kalman

Amazing Plants by Sally Hewitt

People Need Plants! By Mary Dodson Wade

Plants by Ray Boudreau, Ontario Science Center

The Secret Lives of Plants! By Janet Slingerland and Oksana Kemarskaya

