

Investigating Water Uptake and Loss from Trees

Lesson Plan for 2 Experiments

Experiment 1: Investigating Transpiration

Experiment 2: Investigating how trees prevent flooding and pollution

Theme: Forests & Water

Resource: Lesson Plan

Green School Step:

Step 3 – Action Plan

Step 5 – Curriculum Link

Curriculum Links:

- ✓ Living Things
- ✓ Environmental awareness and care

Global Goals/SDG Links:

Goal 3-Good Health & Wellbeing

Goal 6-Clean Water & Sanitation

Goal 11 – Sustainable Cities and Communities

Goal 13 – Climate Action

Goal 14-Life below water

Goal 15 – Life on Land

Skills: Research; Observing;
Recording;

Aim: To introduce students to the important role trees and forests play in the water cycle

Background Information:

This lesson plan introduces teachers/facilitators to the connection between Forests & Water.

Support Sheet 1: Background Information Sheet will equip you with an understanding of how trees and water interact, with some age appropriate facts to share with your students.

The **Experiment Sheets and Worksheets** will help explore the role and value of forests for the Earth's

water systems. It aims to help students understand the path of water in a tree and the role that trees and forest ecosystems play in water redistribution systems. This also relates to their role as defense against flooding and extreme weather events.

Additional resources supplied:

- Support Sheet 1: Background Information
- Experiment 1 – Investigating Transpiration
- Experiment 1: Student Worksheet
- Experiment 1: Result Sheet
- Experiment 2:
- Experiment 2: Student Worksheet
- Experiment 2: Result Sheet

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Experiment 1: **Investigating Transpiration**

Resources:

- ✓ Worksheet per group
- ✓ Results sheet for teacher/facilitator
- ✓ Clipboards
- ✓ Pencils
- ✓ Tablet/Camera to record work
- ✓ Tree Swatches for Identification
- ✓ Printed transpiration diagram
- ✓ Plastic bags: preferably zip-lock (you may need to use string as well to secure it)

Methodologies:

1. Explain to student that trees, like all plants, take in water through their roots and lose water through their leaves. When plants lose water, we say they **transpire**.

Transpiration is the loss of water from a leaf through tiny holes on the underside of the leaf called stomata

2. Explain to students that they are going to investigate transpiration by placing plastic bags over leaves on trees as in the picture below:



3. Divide the class into groups and get them to place plastic bags on the leaves of various trees/plants as outlined in the work sheet.
4. Leave the bags in place for at least 30 minutes. If the day is not very sunny, they will have to be left for longer.
5. While waiting for a result, you can move onto **Experiment or carry out some basic Tree Identification and Physiology**. Introduce students to some trees in the school grounds. You could investigate the species of trees in the school grounds (use tree swatch) and revise the parts of the tree with students i.e. roots, trunk, branches, buds, leaves, flowers (keep it age appropriate!).
6. Using the transpiration diagram below, discuss how trees take in water and how it moves through the tree.

Explain that water moves into the tree through the roots and **travels up through narrow tubes called xylem just like a straw**. 95% of the water leaves through holes on the underside of the leaves called stomata as the tree transpires.

7. Ask the students to see if they can see these holes with their naked eye? If you have hand lenses per group, they can explore them closely and are more likely to see them.

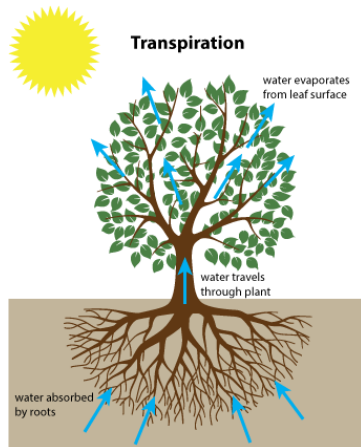
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DIAGRAM: **TRANSPIRATION IN TREES**



Of the 5% that is retained in the leaf, some is used to make food with carbon dioxide & water and some is stored in the body of the tree.

Links to follow workshop with:

Green Schools & Water Theme:
https://greenschoolsireland.org/resources/theme_category/water/

LEAF Theme – Forests & Water:
<https://leafireland.org/themes/forests-water/>

The Secret of Water in the Forest
https://drive.google.com/file/d/0B0nbpv-s_pubd2Njb0dSNEcta1E/view

Rivers and Wolves Video:
<https://www.youtube.com/watch?v=y5a50BhXz-Q>

8. Record results in worksheet. Ask group to compare results with each other. Are some results different from others? Why would this difference occur?
9. Discuss the factors that drive transpiration and cause water to be sucked up from the roots. The same conditions which dry clothes on a line speed up transpiration i.e. **sunlight, heat and wind**

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Experiment 2: **Investigating how trees prevent flooding and pollution**

- Record results in the table in worksheet and answer the questions.

Resources:

- ✓ Worksheet per group
- ✓ Results sheet for teacher/facilitator
- ✓ Clipboards
- ✓ Pencils
- ✓ Tablet/Camera to record work
- ✓ A well rooted pot plant (this represents a tree)
- ✓ A pot filled to the same height as the pot plant with compost
- ✓ A white tray or basin to collect runoff from the pots
- ✓ Measuring jug
- ✓ Stopwatch

Read the 'Trees can Change Weather' support sheet. Discuss the questions and answers with the group.

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LEAF Theme – Forests & Water:

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The Secret of Water in the Forest

https://drive.google.com/file/d/0B0nbpv-s_pubd2Njb0dSNEcta1E/view

Methodologies:

- Place the potted plant and the pot of soil in trays/basin to catch water runoff



Potted Plant Pot with Compost

- Add 500 ml of water to each pot. Start timer for 2 minutes.
- After 2 minutes, measure the amount of runoff from both pots.
- Compare the colour of the runoff from both pots.