



'Peat is neat' Water Filtering Challenge

Time needed for activity 45 minutes

Location Outdoor area or near a water source

Context

This activity plan focuses on how peat, in the uplands and wetland bogs, helps to retain and naturally filter water. Understanding the structure and nature of peatlands can lead to better management techniques and protection of this declining habitat and important carbon store.

Natural Resources Wales' purpose is to pursue sustainable management of natural resources in all of its work. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

Curriculum for Wales

Science and Technology

- **What matters** - Being curious and searching for answers is essential to understanding phenomena.

Humanities

- **What matters** - Enquiry, exploration and investigation inspire curiosity about the world, its past, present and future.

Health and Well-being

- **What matters** - Developing physical health and well-being has lifelong benefits.

Objectives

By the end of this activity learners will be able to:

- Understand why peat is important to the planet.
- Experiment with filtering water through various soil types by making their own simple water filter.
- Observe and draw conclusions based on their experiment.

Equipment and resources

- Scissors or craft knife
- Plastic bottles (1.5 or 2ltr bottles)
- Clear beakers or the cut bottoms of the large plastic bottles
- Cotton wool - you could alternatively use a coffee filter paper or piece of cloth
- Washed gravel
- Different samples of local soil and one sample of peat-free compost (to mimic the behaviour of peat)
- Dirty water (mix soil, mud, dead leaves and water in a large clear container or bottle)
- Stopwatch
- Measuring jug or container
- Worksheet - Peat is neat



- Activity plan – Measuring the turbidity of water
- Resource card – Measuring the turbidity of water
- Teaching PowerPoint – Peat is Neat
- Check out the Lle Map Browser for access to aerial images and maps of Wales: lle.gov.wales/map. Change the background map in ‘layers’ for different aerial views and different types of map. Check out the ‘tools’ menu to measure distances and areas.

Background information

What is peat?

Peat is a type of soil that forms as a result of an accumulation of the remains of decaying organic material (plants or mosses).

How does peat form?

Sphagnum mosses play a vital role in the creation of peat bogs and peatland uplands – by storing water in their spongy forms, they provide essential nutrients and prevent the decay of dead plant material. As the decomposed plant remains accumulate and become compacted, layers of peat form. With the decaying plants decomposing at a very slow rate due to the lack of oxygen and waterlogged conditions, bogs and peatlands take thousands of years to form.

Why is peat so neat?

Peat is neat because:

- As water infiltrates through the air spaces between the grains of solid material in peat, it is naturally filtered. Debris, leaves, insects, chemicals and minerals are retained in the soil as water drains through.
- If left in the ground, waterlogged and in good condition, acting like a huge sponge, areas of peat can soak up and retain huge volumes of water, helping to prevent flooding. But, if peatlands are disturbed e.g. drained by man, their capacity to absorb rainwater is reduced, resulting in water flowing quickly and directly into streams and rivers without being filtered.
- Peatlands make up just 10% of UK land but they store a lot of carbon – more than our forests and woodlands do. They are significantly important to the planet and the extraction of peat not only disturbs rare wildlife but also releases millions of tonnes of carbon dioxide into the atmosphere each year, contributing to climate change.

Peat's problem

Peatlands are declining in size as many are being drained and dug out at an unsustainable rate to produce garden compost. Applying peat compost to the garden to produce an organic rich soil has long been regarded by gardeners as the best way of encouraging plant growth. Peat compost is made up of partially decomposed plant material that hasn't fully decayed and as a compost, holds water well, which is good for growing plants. Despite peat alternatives being developed using materials such as bark, wood fibre, bracken and green compost, 70% of mined peat ends up in gardens and allotments.

Leave peat alone

This activity will attempt to replicate a simple peatland or bog that water flows through, demonstrating the excellent filtering properties of peat and how if left undisturbed, they can help to retain and naturally filter water. For learners to fully appreciate and understand the importance of peat it's advisable to have played our 'Why are bogs important?' and 'To bog or not to bog' games before starting this activity.



Before you start this activity!

Do not use peat based compost. Please ask your local garden centre or supplier for peat-free compost. This may involve waiting a little longer for them to order it in. Please check the content and ensure it is 100% peat free. Peat is a non-renewable resource.

What to do

Ask your learners to think about and describe an area of peat if they have ever visited one. Explain they are areas of open and wild land that can be found in different landscapes and locations across Wales but they all have one thing in common – they require damp conditions for peat to form.

Where can peat be found?

Peat forms in:

- Lowland raised bogs - land which was historically an area of standing water such as a lake which has infilled e.g. Cors Caron (Tregaron) and Cors Fochno (Aberystwyth).
- Blanket bog where peat has accumulated to a depth of at least 0.5m – typically forming in the uplands where drainage is poor and at the top of river catchments, where rainfall is frequent and heavy and the water table is high. Examples include Hiraethog (Denbighshire) the Migneint (Conwy/Gwynedd) and areas of the Brecon Beacons (Carmarthenshire/Powys/Monmouthshire).
- Lowland fens - wet areas which are fed by streams and groundwater. Examples include Cors Erddreiniog (Anglesey) and Crymlyn Bog (Swansea).

Having access to aerial photographs, maps of Wales and/or photos of the Welsh uplands will be useful for learners to research and understand the location, landscape and character of these areas:

- Use our Teaching PowerPoint - Peat is Neat
- Visit the Lle Map Browser: lle.gov.wales/map
- Visit our **New LIFE for Welsh Raised Bogs webpage**
- For further information on where our woodlands, nature reserves, trails and open access land are located, please visit our **'Places to Visit' webpage**.

Peat lends a hand

Ask your learners to explain why peatlands are important? The reasons are covered in our 'Why are bogs important?' and 'To bog or not to bog' games.

Explain to your learners that peat has an important role to play as it's a natural resource which helps to keep us healthy by naturally filtering the water that we drink. As rain passes through the soil via the air spaces between the grains of solid material, the water is naturally filtered. Debris, leaves and insects are removed from the water before it drains into rivers and reservoirs. If peatlands are in good condition and undisturbed (not dug up and drained), the water that runs off them is usually cleaner, thanks to special plants called sphagnum moss which filter the water. The more peat that is left in position and undisturbed, the less work water companies have to do to clean and purify water before they supply it to our homes because the peat does a lot of the hard work for them!

Before moving forward, check that your learners understand what a filter is - a device or object that allows water to pass through it, but traps solid particles. Use a tea bag or coffee filter paper to aid discussion.

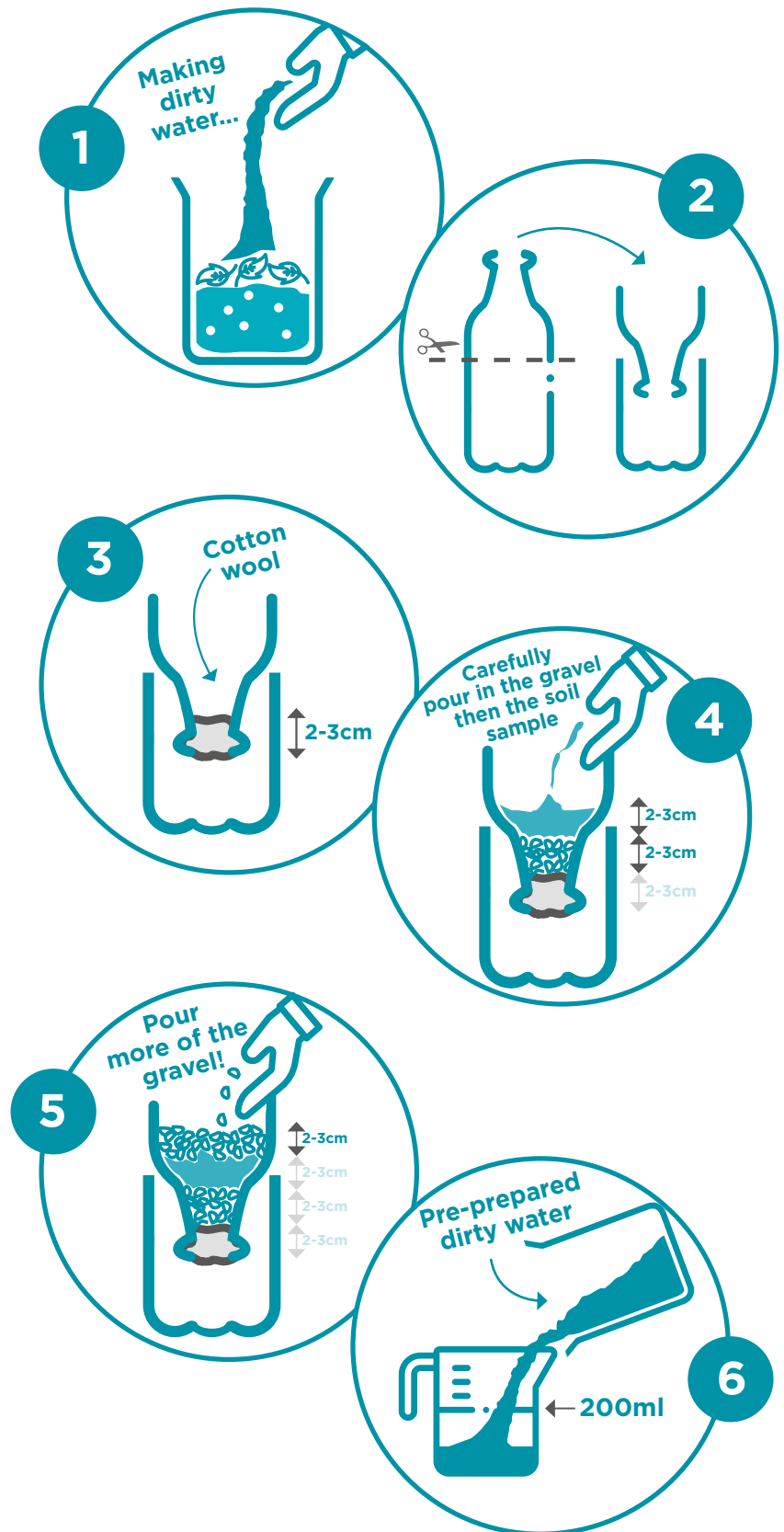
Explain that each layer of the homemade water filter they are going to make has a purpose - the gravel or small stones will filter out large particles that are not dissolved in the dirty water, whereas the 'peat' (compost or soil) will filter out finer debris.

As a control and to highlight the important role soil and in particular peat plays in filtering water, you as the teacher or group leader could complete the experiment with a bottle that contains no soil, just gravel.



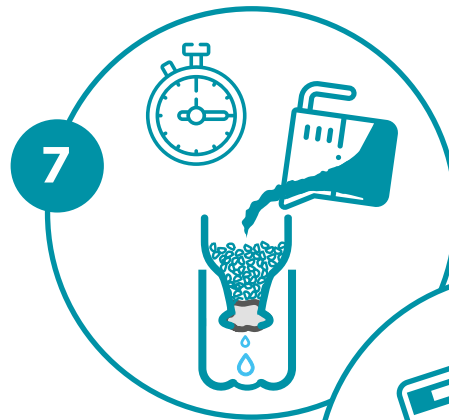
Making your water filter

1. Working in groups of 3-4, ask your learners to collect materials to make a sample of dirty water. They should mix soil, mud, dead leaves and water in a large clear container or bottle.
2. Next, leaving their dirty water to one side, ask your learners to cut their plastic bottle in half with a pair of scissors or a craft knife. The top half of the plastic bottle (take the lid off) will be stood upside down inside the bottom half of the bottle. The funnel-like top half will be the filter, and the bottom half of the bottle will collect the filtered water.
3. With the neck end of the bottle stood upside down, ask your learners to insert a layer of cotton wool in the neck end of the bottle. This needs to be thick enough to prevent the next layer of gravel falling out of the bottle's neck - approximately 2-3 cm in thickness.
4. Next, they should carefully pour in a 2-3 cm layer of gravel before adding an equal layer of peat-free compost on top. Instruct them not to pack the layers down hard as there is a danger that everything will fall out.
5. Finally, ask your learners to add one more 2-3 cm layer of gravel.
6. Next, ask your learners to measure 200ml of the pre-prepared dirty water into a measuring jug or beaker.





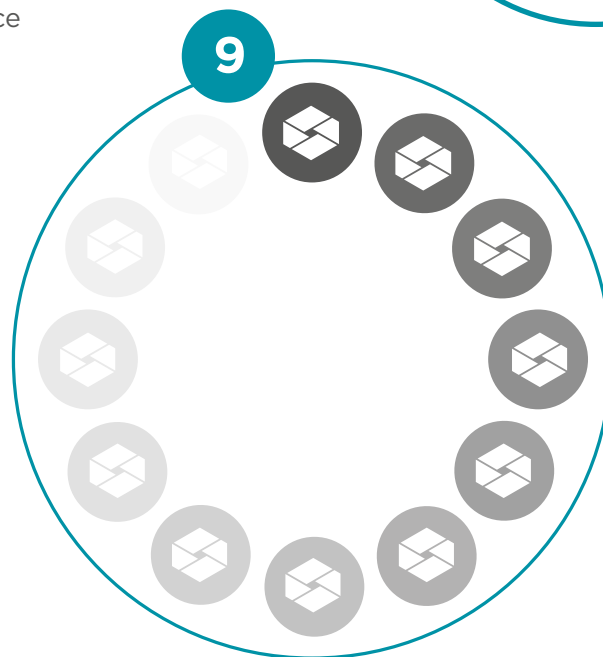
7. Starting their stopwatch, they should slowly pour the 'dirty water' into the top of their filter and watch carefully as it makes its way through each layer. Does water collect at the bottom of the funnel? Does it run fast or slowly through the soil? As the water passes through the different layers the dirty water should be filtered out with clean water accumulating at the bottom of the plastic bottle.



8. Your learners should record their findings and observations in the Worksheet - 'Peat is neat' Water Filtering Challenge.



9. Using our 'Activity Plan - Measuring the turbidity of water' and 'Resource card - Measuring the turbidity of water' they should measure the turbidity of the filtered water and record the findings.





10. Congratulate your learners – they have just filtered dirty water. Explain that this is what peatland, if left in situ, does naturally. To ensure we have enough safe and reliable drinking water, water companies filter water on a large scale with much more technical equipment, ensuring that everything that could be harmful to our health is removed.
11. Once your learners have completed the experiment using peat-free compost, they should repeat the process and experiment with other soil types e.g. a clay or a sandy soil, depending on what you have locally and record their findings on the worksheet. Alternatively you could split the soil types amongst the class and have several groups filtering at the same time and sharing their results.
12. Once the experiment has been completed the bottles can be washed and kept for another occasion or recycled.

Please note - This activity is for demonstration purposes only - no one should drink the filtered water.

Suggested key questions

- Which soil type was the most permeable? i.e. which soil type allowed water to pass through its layers the most quickly? Why do you think some soils let more water through than others?
- Has one of the soil types allowed more water to filter through compared to the other soils?
- Ask them to consider the creation of a playing field. Which would be best - a soil that lets water flow through quickly or a soil that retains water? Why?
- How clear are the water samples (turbidity)? Is one clearer than the others? Why might this have happened? Which soil type has filtered the water most effectively?
- What parts of our landscape are important in retaining and filtering our water?
- Why does the water we consume need to be filtered?
- What can you do as an individual to help protect peatlands?

Adapting for different needs/abilities

Less able

- Conduct the experiment with one type of local soil, a peat-free sample and one bottle without soil.
- Set up the equipment ready for the learners.
- Complete the activity as one group with adult support.

More able

- Investigate and identify your local soil types.
- Ask your learners to investigate and learn about peatlands – their character, history, wildlife value and uses.
- Ask the learners to self-lead the activity.
- Discuss how can we fairly test the filtering properties of different soils using this equipment?
- Discuss how humans' impact on water quality e.g. pollution, abstractions etc, and consider possible consequences to ourselves and the wider environment if we do not manage this resource sustainably.



Follow up activity/extension

Encourage your learners to help our precious peatland habitats by asking them to:

- Create a poster to encourage their parents/the general public to buy peat-free compost and plants grown in peat-free soil for their garden.
- Write a letter or email to the school Eco-Council, Headmaster/Group Leader or caretaker explaining the importance of peat, and asking them to buy peat-free compost and plants grown in peat-free soil for their settings' grounds.
- Investigate and make their own compost at home or at their setting using food waste.

Other resources

- Activity plan - Why are bogs important?
- Activity plan - To bog or not to bog?
- Information note - Water quality
- Glossary game - Sustainable development

Additional information

- Find out what is being done to protect Welsh raised peat bogs, check out the **New LIFE for Welsh Raised Bogs website**.

Looking for more learning resources, information and data?

Please contact: education@naturalresourceswales.gov.uk or go to <https://naturalresources.wales/learning>

Alternative format; large print or another language, please contact:
enquiries@naturalresourceswales.gov.uk
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