



# Making campfire charcoal

**Time needed for activity** 40 minutes plus

**Location** Outdoors

## Context

This activity plan highlights the importance of sustainably managing our natural resources, focusing on our use of wood products.

Natural Resources Wales' purpose is to pursue the 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** - Matter and the way it behaves defines our universe and shapes our lives.
- **What matters** - Being curious and searching for answers is essential to understanding and predicting phenomena.

### Humanities

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

## Objectives

Learners will be able to:

- actively keep themselves and others safe from harm.
- experience the use of fire as a tool for making a useful material.
- take part in an experiment and determine its level of success.
- understand that heat can alter some materials.

## Resources and equipment

- Safety procedures, for example, risk benefit analysis and fire safety procedure
- **Information note - Safe lighting, management and extinguishing of a campfire**
- **Film clip - Making charcoal and charcloth**
- Fire safety equipment, for example, water, first aid kit, fire blanket, etc.
- Fire lighting equipment
- Biscuit/syrup tin with metal lid
- Secateurs/loppers
- Hammer and large nail
- Freshly cut green wood and/or seasoned wood such as hazel
- Tongs, heatproof gloves or a cloth
- Metal wire (optional)
- Paper (optional)



## Background information

When planning a campfire, it is important that you consider how to do this safely and take steps to minimise the risk of damage to the natural environment and each other.

It is recommended that the leader of any campfire activities has:

- experience and knowledge of safe fire lighting, for example, accreditation such as a Level 3 Agored Cymru Coastal or Forest School qualification
- experience of group management around campfires
- policies and procedures on safe fire lighting and extinguishing
- client group medical information and permission to engage in the activity
- landowner's permission for fire lighting/collecting firewood
- suitable health and safety equipment
- sufficient water on site to extinguish the fire and deal with burns should they occur

## What is charcoal?

Charcoal is wood that has been heated without oxygen which is present in the air around us, which means it burns very slowly, to produce a lightweight black carbon residue. The amount of oxygen available affects the rate of burning so by removing the available oxygen the burning process is slowed right down. If burnt with air, wood will just turn into ash.

Charcoal burning is an ancient practice used mostly for cooking and industry. Charcoal burning was at its peak in Britain around 200–300 years ago.

In 1709 it was discovered that coal, a fossil fuel, burned well and was cheaper to produce than charcoal. Coal became the more popular fuel for cooking and industry. As the population increased, so did the demand. Many people moved into towns and were no longer near to forests for wood to make charcoal. Coal became cheaper and easier to access.

Today, charcoal is still in use but mostly for barbecues. A lot of the charcoal we use for our barbecues comes from the wood of tropical rainforests. Rainforests have taken hundreds of years to grow and are rarely replanted after they have been cut down. This is not sustainable.

It is sustainable to use charcoal made from Forest Stewardship Council (FSC) endorsed providers in Wales. The FSC is an international, non-governmental organisation dedicated to promoting responsible management of the world's forests.



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this logo

## What is green wood?

Green wood is wood that has been recently cut and the internal moisture has not had an opportunity to season (dry) by the process of evaporation. This means that green wood contains more moisture than seasoned wood.

Due to the moisture content, green wood smokes more on burning.

Green wood can be dried through aeration and the passage of time or by drying in kilns. Green wood is considered to have 100% moisture content relative to air dried or seasoned wood, which is 20%.

## What is seasoned wood?

Seasoned wood is wood that has been cut and stacked in a dry and airy place for approximately six to eight months, allowing the moisture content to slowly evaporate.



## What to do

To support your teaching, watch the [Film clip – Making charcoal and charcloth](#) before delivering the activity.

1. Begin the activity by ensuring that all participants are aware of your safety controls for the use of tools and campfires. Use the controls to inform the activity.
2. Start your campfire. Our [Information note – Safe lighting, management and extinguishing of a campfire](#) explains how to safely light, maintain and extinguish a fire. Wait until the flames die down and the fire is well banked – burnt down to embers.
3. Introduce the activity by asking your learners to explain what charcoal is and what it is used for. For example:
  - barbecues to cook food on
  - artists throughout history have used it to draw and sketch with
  - gardeners have added charcoal to compost to increase carbon content
  - activated charcoal is used as alternative medicine in treating wind and indigestion
  - charcoal can be found in whitening toothpaste and facewashes
4. Explain that you are now going to try to make a small batch of charcoal. Ask your learners if they can guess what process might be required to change wood into charcoal. As a clue can they work out what you need a campfire and a tin for? Explain that the wood will need to be heated without any air, which means it burns very slowly, otherwise it will just turn into ash instead of carbon. The tin will act as a small oven, with the oxygen inside used up quickly ensuring that the carbon in the wood doesn't oxidize (combine with other chemicals). This will allow the carbon to turn into charcoal. Then when we burn charcoal on our barbecues, only carbon dioxide is released and there is neither smoke nor smell.
5. Allow your learners to handle the green or seasoned wood and discuss. What is green or seasoned wood. Which type are you going to use for this activity? Could you experiment with both? What would your learners expect to be different about using either green or seasoned wood? Is the wood hard or soft wood? What species of tree has it come from? What else might we use wood from this tree for? Do your learners think it is sustainable to use wood for making charcoal?
6. Prepare the tin by making a small hole in the tin lid using a hammer and a nail. Can your learners explain why this small hole is needed? Explain that it is needed to make sure that pressure doesn't build up in the container as it heats, causing it to explode and possibly injure someone. You may also want to wrap some metal wire around the tin that you can use to hook onto with long armed tongs or a similar tool to reposition and remove from the campfire when needed.
7. Demonstrate how to safely use the tools to cut the wood into small sections that will fit inside the tin. Ask your learners to use the tools in a safe and appropriate manner to cut the wood into small sections.
8. Allow your learners to place the wood sections inside the tin.
9. Once the tin is full, firmly apply the lid and place the tin carefully into the centre of the campfire.
10. Ask your learners what they think is going to happen? How long will it take? Can they estimate timings and test their theories? Discuss how they will know when the process is complete.
11. Now observe the changes as the tin heats up. Firstly, your learners should see steam and a flammable white smoke – escaping gases - emerge from the hole in the lid. This should gradually change to a blueish colour showing that any moisture from the wood has been removed by the process of heating.





12. Just before the charcoal is ready, the white smoke will combust, and a flame will appear from the hole.
13. Once the flame has died down, showing that oxygen has been used up, carefully remove the tin from the campfire.
14. Explain to your learners that the tin needs to be allowed to cool down. Can they explain why? Can they estimate how long it will take to cool down so it can be handled safely? What variables will need to be considered to work out an approximate timeframe? Timing will vary according to the size of the tin, the amount and type of contents, the type and amount of wood used on the campfire, the ambient air temperature, etc.
15. Once the tin is cool enough to handle the lid can be removed to see if the wood has successfully transformed into charcoal.
16. Once the charcoal is cool enough to handle, pass pieces around and give your learners time to try and use them to draw on the paper or other nearby surfaces such as stones and wood.
17. Ask your group to evaluate the activity. Did it work? How could it have been improved? Could anything have been done differently?
18. To draw the activity to a close, discuss how charcoal is made and used across the world. Do your learners think that charcoal is a sustainable and efficient wood fuel? It is sustainable to use charcoal made from Forest Stewardship Council (FSC) endorsed providers in Wales. How does your group feel about trying to encourage their families to source sustainable charcoal products? Could they inspire them to look for the FSC logo?

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### Suggested key questions

- What changes do we expect to see once the wood is heated?
- What happens to the wood as it heats up inside the tin?
- Why does the smoke change colour?
- Other than barbecues, what else could we use charcoal for?

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### Adapting for different needs or abilities

#### More support

- Complete the activity with smaller groups.
- Set up the campfire before learners arrive.
- Pre-cut the wood.

#### More challenge

- Learners can source and cut the wood themselves.
- Learners can be involved in collecting wood and lighting the campfire.
- Experiment with a range of different species of green and seasoned wood and compare results.
- Learners can predict timeframes and outcomes prior to the activity.



## Follow up activity/extension

Try out our:

- **Activity plan – Campfire fuel investigators**
- Use cut up squares of cotton material instead of greenwood to make charcloth and investigate its uses. Charcloth is any cloth made from 100% plant fibres that has been charred but not burned and can be made using the campfire/tin method above.
- Investigate the practice of coppicing and pollarding – a sustainable woodland management practice which is used to ensure a continuous supply of wood for charcoal making.
- Research different types of charcoal and what they are used for.
- Look into the history of charcoal making in Wales and any places that got their names from charcoal making. For example, Coedpoeth in Wrexham.

## Looking for more learning resources, information and data?

Please contact: [education@naturalresourceswales.gov.uk](mailto:education@naturalresourceswales.gov.uk) or go to <https://naturalresources.wales/learning>

Alternative format; large print or another language, please contact: [enquiries@naturalresourceswales.gov.uk](mailto:enquiries@naturalresourceswales.gov.uk) 0300 065 3000

