Cyfoeth Naturiol Cymru
Natural Resources Wales

Activity plan

Campfire fuel investigators

Time needed for activity

60 minutes plus

Location

Outdoors

Context

This activity plan highlights the importance of sustainably managing our natural resources, focusing on how humans use wood as fuel.

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:

- work together to ensure their own and each other's safety.
- explore the properties of wood fuel.
- undertake a hands on experiment to investigate the most effective campfire set up.

Resources and equipment

- Safety procedures including risk benefit analysis, fire safety procedure, landowner's permission, etc.
- Information note – Safe lighting, management and extinguishing of a campfire
- Information note – Wood fuel
- Information note – Fire (optional)
- Information note – Installing a log circle (optional)
- Information note – Campfire cooking (optional)
- Fire safety equipment, e.g. water, first aid kit, fire blanket, etc.
- Fire lighting equipment
- Firewood
- Secateurs/loppers

Background information

What is deadwood?

In forestry, the term deadwood is used for all dead or dying trees. This includes branches, stumps, roots, and other tree debris. Dead and decaying trees are vital components of the forest ecosystem and play an essential role in biodiversity, providing micro habitats for many different invertebrates and supporting soil fertility and energy flows. Deadwood also stores carbon and helps to mitigate the effects of climate change. Deadwood is seasoned by time and drier than greenwood so burns more effectively. Historically, deadwood was removed from woodlands to be used for firewood.

What is kindling?

Also known as tinder, this is small, dry material that can be readily ignited such as tiny twigs, bark, leaves, pine needles, grasses, seeds, and lichens. You can use other materials such as crumpled newspaper, cotton wool with petroleum jelly, lint, etc. Kindling takes the initial spark of the fire and can then be added to with bigger pieces of wood.

Using shop bought wood fuel

To ensure that you are using sustainably sourced wood products, purchase material that has the Forest Stewardship Council (FSC) logo. The FSC is an international, non-governmental organisation dedicated to promoting responsible management of the world's forests.

FSC

Look for this logo

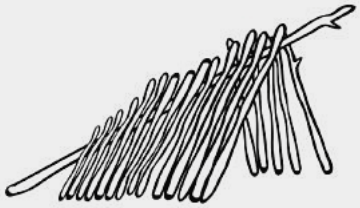
What to do

This activity asks learners to take on the role of scientists, investigating different campfire structures to see which will produce the most effective fire. For safety reasons, this activity needs to be carried out in very small groups with sufficient adult to learner ratios and led by a Forest School Leader or suitably experienced, qualified and knowledgeable person.

1. Begin the activity by ensuring that all participants are aware of the safety controls and expected behaviour with regards to the use of tools and gathering/moving around a campfire. Ensure they are all aware of the location of resources to extinguish the fire. Run through the **Information note – Safe lighting, management and extinguishing of a campfire** and establish your fire rules.
2. Discuss with your learners how our evolution as humans has been shaped by our ability to harness fire for warmth, cooking, and industry.
3. Ask your learners what elements are required to start a fire? Discuss the fire triangle of oxygen, heat and fuel and how fire cannot be created or sustained if any one of those three elements is missing.
4. Explain to your learners that the fuel they are going to use for their investigations is deadwood. Can they explain why deadwood is being used as opposed to green (live) wood? Encourage them to consider the differences between deadwood and green wood. For example, weight, moisture content, and appearance.
5. If there is an abundance of deadwood, ask your learners to collect kindling from the surrounding area. Ask your learners to only collect twigs and sticks from the woodland floor, not to break or cut branches from living trees. Avoid anything that is green, too wet, or that bends without snapping – it won't burn well.
6. Ask them to return their collections to you and instruct them to group their findings into:
   - twigs with the width of a matchstick and as long as their little finger.
   - twigs as long as the distance from their middle finger to their wrist and as thick as their little finger.
   - sticks as long as their forearm and as thick as their thumb. These are the sticks that will be used to create the main shape of your fire structure.

7. In your fire pit area (see **Information note – Safe lighting, management and extinguishing of a campfire**) begin to build your fire.
   - Establish a fire boundary: Position medium-sized logs in a circle. This will help set a boundary and contain the fire.
   - Create a fire bed: Place dead, dry sticks side by side to form a layer on the floor before placing your kindling on top to ensure your kindling doesn't get damp and to allow for improved air flow.
8. Now it's time to lay the fire. Ask your learners to follow the pictures of their given fire structure and build their structure. Depending on the size of your group:
   - Learners can either build and test one fire structure at a time until they have tried each one.
   - Split your group into 3 smaller groups with responsibility for one fire structure each.

Tepee fire



Lean to fire

Log cabin fire

9. When the structures have been built learners can ignite their campfires.
10. Once ignited, ask your learners to observe the progress of their fire and consider:
    - Which structure ignited the fastest?
    - Which structure produced the most flames?
    - Which structure burnt the material the quickest?

To assess the outcomes more accurately, you can use timing devices, suitable thermometers or try heating the same amount of water or cooking the same item on each fire type (see **Information note – Campfire cooking** for ideas of what to cook).

11. At the end of the activity, ensure all fires are completely extinguished. Lightly sprinkle water onto the fire bed and stir the embers and ashes with a stick. Heat test the fire by holding the back of your hand close to it. If it's too hot to keep your hand there, the fire is still too hot to leave. Continue to sprinkle water and stir until safe to leave. Bury, hide, disperse or discard the ashes. You can collect the larger pieces to dry out and reuse for further campfire activities. Leave only footprints, take only memories.
12. As a group, discuss your findings by comparing your observations.

Suggested key questions

- What is the fire triangle?
- Which fire structure do you predict will produce the most heat? Why?
- Which fire structure do you think will burn for the longest? Why?
- What changes do you expect to see happen to the firewood?
- Why do humans need fire?
- How can we be sustainable and minimise our impact on nature when using wood fuel?
  See background information on the Forest Stewardship Council.

Adapting for different needs or abilities

More support

- Complete the activity one-to-one or with learners in pairs.
- Try out just one campfire structure.
- Set up the campfires before learners arrive.
- Pre-collect firewood.
- Demonstrate the process with learners observing.

More challenge

- Learners to work in independent groups.
- Learners to investigate different tree species as wood fuel and compare results.
- Learners can be involved in collecting wood and lighting the campfire(s).
- Try different methods of ignition, such as a flint and steel.
- Attempt to create equal weighting of wood fuel for each set up before ignition to ensure a fair test.
- Try out TCV Scotland's Deadwood Survey citizen science pack.

Follow up activity/extension

Try out our:

- Activity plan – Making campfire charcoal
- Make a cooking stick using green wood and cook marshmallows or dampers to test cooking time.
- Investigate how humans have historically managed woodlands to ensure a sustainable supply of firewood, e.g. woodland management methods such as coppicing.

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 0300 065 3000**