Heat and Fire

Camp fires, stoves and cooking

Sheet O.3

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20p (where sold)

Fire was one of the human species first and most devastating inventions (at least until the plough came along). Fire is a most useful means of converting the stored chemical energy of wood into useful heat energy, but in today's technological society, with predominantly gas and electric heating in our homes, people have lost the skill to use fire safely and have even come to fear it. This unit examines the issue around camp stoves, camp fires, and providing sources of heat.

Using fire is natural for humans

The human species has reshaped the Earth's environment, at a continental scale, using fire. Originally produced using friction or the dull sparks from iron nodules, fire became important not just as a means of keeping warm, but by cooking many types of food (especially meat or roots) the nutrients inside become more digestible to the human body. In our homes today open fires are becoming rarer, but still the flames of an open fire represent a mesmerising glimpse into the past history of our species (far more than the flame of a candle can convey!).

Today, be it electricity generating stations or car engines, we are still dependent upon fire – or rather the *combustion of fuels* to produce heat – to make our technological society function. The problem is that many people have lost the skills to manipulate fire, and have come to fear it as a threat to life rather than rather than respecting it as an aid to our existence.

Learning to produce and use fire and heat is an essential part of camping in a temperate climate – where over the space of a few days the temperature can swing from a manageable level to life-threateningly cold. Most modern camping stoves use fuels in a contained way to keep them 'safe', but as part of the re-skilling focus of the 'Great Outdoors' initiative we're encouraging people to 're-engage' with fire in order to understand it and use it constructively.

A little note on safety

Fire can save your life, but it can also end it! The difference between these two states is a matter of learning the sense and skill to deal with fire (the active part of the process) and fuels (the source of the fire, but the source of the much danger too).

Fire requires air to burn. Cover a very small fire with a damp cloth and you extinguish it. Throw soil or sand onto a camp fire and likewise, after a period of smouldering whilst the heat dissipates, you can extinguish it. Throw water onto a fire and you can often extinguish it, but if it's a fire based upon a liquid fuel such as petrol you'll make the problem a whole lot worse as the water can 'wash' the fire over a larger area (because the burning petrol floats on the surface of the water).

The burns created by fire, or scalds created by hot rocks, water or food, can cause serious damage to your body. ***The important factor with any burn is to cool the affected area immediately, and continue doing so for five to ten minutes – even if that means using a lot of water or jumping in a river.*** Although the heat from a fire damages the cells in the skin, it's the reaction of the cells swelling and bursting which creates a large proportion of the burn injury. By taking away the heat through cooling you help reduce the cellular reactions that cause this damage and you won't have such a bad blister or scar. Modern clothing is a particular problem in this respect; if your clothing melts it conveys the heat more effectively into your skin and causes the burn to go deeper, causing more scarring (the message – try to wear naturally fire resistant cotton or wool, not polyester or nylon).

With any serious burn injury (one which weeps fluid) you should seek medical attention as soon as possible. A minor burn which causes a small but uncomfortable blister is not life threatening, but you should keep it clean, and not cover it with a tight dressing or bandage until the blister bursts naturally (resist the urge to pop it – it will hurt like hell as the layer of skin beneath will not have matured fully). Reddened skin which is not blistered can be soothed with a little antiseptic cream, but again try not to cover the affected area as the pressure from the dressing will irritate the damaged layers under the skin more.

Using heat and fire

For camping fire is mainly a means to apply heat to food to make it digestible or just taste a lot nicer. In cold weather fire is also a means to provide an additional source of heat when our bodies can't maintain a comfortable temperature on their own. Finally, fire can also be a focus, as it has been throughout our history, for people to relax and socialise around – *a beacon of light in the dark*.

The important issue regarding the use of fire is to be sensible. We could use the phrase “common sense”, but unfortunately this knowledge isn't that common any more. Messing around with fire is what gets you hurt, not the fire itself!

The most important message related to stoves is that they are not safe to use within an enclosed tent. Not only is there an issue of the fumes from the burning fuel, but setting fire to a tent whilst you are inside it is a very serious and life threatening risk. If you don't take the stove inside the tent in the first place you avoid this risk. It's also for this reason that in the 'Great Outdoors' units we put great emphasis on having an open sided shelter to cook under (the cook tent) separate from your sleeping tent.

With open fires it's important that you have regard to the area around and above the fire. It's not just the direct heat from the fire that's a problem – the hot sparks/embers from an open fire can be carried for some distance on the breeze. Even if they don't set you tent on fire, they're often hot enough to burn small pin holes in the fly sheet that will create an annoying drip of water inside your tent when it rains. It's important to ensure that an open fire is spaced well away from tents, the cook tent and any other trees, bushes or scrub so that the fire cannot spread (well cover this in detail later).

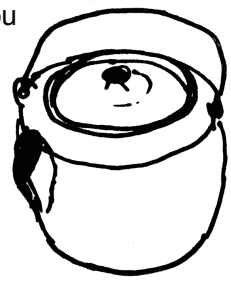
Gas stoves

The most popular kind of camp stove is the butane or LPG (propane) stove. Butane stoves usually use an integrated (blue) gas canister, whilst LPG stoves often have a separate canister. Also, as many stoves now assume that you'll be site camping and using a car for transport, they tend to be miniaturised replicas of a home cooking range rather than a simple, single gas burner.

gas (butane/LPG)

For the small gas burners the most important safety issue is making sure they have a solid base to sit on. When you put a saucepan of water on them they're very top-heavy, and the slightest wobble in the base of the stove will cause the whole lot to topple over. Another problem can be wind. Butane isn't an very energetic gas, which is why the more heavy-duty stoves use LPG/propane because it has a hotter flame. For this reason they are sensitive to a strong wind – the heat gets blown away rather than cooking your food! If it is windy you need to set up your gas stove in the shelter, or use a solid obstruction on the windward side to provide shelter.

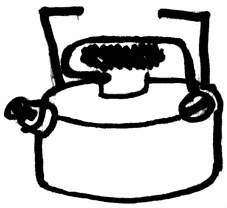
Finally the most serious drawback of butane, and one not often highlighted, is that the temperature at which the fuel in the cylinder boils and turns into gas isn't low (propane is lower, and so works more effectively in the cold). That can mean that when the temperature begins to approach freezing your butane stove will produce very little heat, or if very cold it might be functionally useless. If you are caught out with this problem you need to get into your sleeping bag with your stove in order to get it warm enough to work. If you are camping outside of the Summer months then you really should consider one of the alternative options.



Solid fuel and gel stoves

These stoves are really just large open tins with holes in the side. They use quite a lot of fuel, the fuel can be expensive and it's not easily available outside of camping shops. Some are sold as 'disposable'! For this reason we don't cover them here as they not really in keeping with the 'simplicity' principle. However, if you can get the leftover 'tin' of a gel stove does make a good base for a small-stick open fire!

Primus stoves



primus (alcohol/petrol)

Primus stoves are more technical than ordinary gas stoves to operate, and take a little practice to use efficiently. They burn a liquid fuel under pressure, created by a small pump built into the stove. The air pressure forces the fuel through a small pipe which sits in the middle of the burner, and this causes the fuel to vaporise and burn as a gas. This can mean the stoves are difficult to get going, but once hot they will keep on burning provide that the fuel is there and you give them a pump-up every now and again.

Primus stoves can use either an alcohol- (or methylated spirits) or petrol-based liquid fuel. It is theoretically possible to burn paraffin/heating oil in them if desperate, but it stinks and smokes rather a lot (diesel is very difficult to burn, and smokes an awful lot!). The design of Primus stoves varies, but on the whole they tend to be small and have a hotter flame than butane gas stoves and so are better for backpacking. The fuel, especially if using a petrol stove, is also more easily available – although the increase in fuel prices means that the cost of running a stove is shooting up, and for some stoves the “cuppas per litre” you get isn't great.

The main problem people have with Primus stoves, especially the petrol-fuelled stoves, is fear of a fire or explosion. In practice the risk is small if you follow a few simple rules:

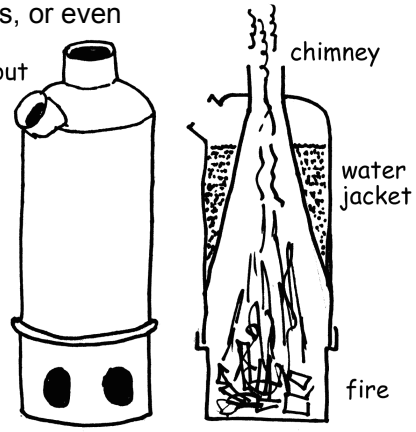
- Don't refuel the stove whilst it's hot – make sure you have enough fuel inside the tank to cook your whole meal before you start, and if necessary refill it before you light it up;
- Keep the spare fuel in a steel or aluminium container, with a seal and screw top that are petrol/alcohol resistant (some plastics are softened or dissolved by petrol), well away from the stove;
- When you first light the stove do so in an open space and then carefully move the stove back nearer to your shelter. This is a problem with the alcohol-fuelled stoves as they produce an awful lot of flames before the temperature in the burner gets hot enough to vaporise the fuel and produce the neat blue flame for cooking (petrol stoves tend to light almost instantaneously);
- Make sure the stove has a firm base so that it can't tip over when you put a heavy saucepan on top; and
- Never use any Primus stove in an enclosed space, such as a tent, because it produces unhealthy fumes.

Wood-fired stoves

The problem with gas or Primus stoves is that you need the fossil fuels to operate them (technically you can make the alcohol to run a Primus stove, but it's a long, complex and energy intensive operation that you're not realistically going to do in camp!). For this reason there's a lot more interest in wood-fuelled stoves as a means to avoid petroleum fuels.

Wood stoves come in a variety of designs: 'storm' or 'volcano' stoves that burn small sticks; fire-grates, made of old car wheels or the steel drums of washing machines (suitable for a fixed camp) that you can sit around; and more recently 'gasifying' or 'producer gas' stoves which produce a hotter flame by generating a mix of hydrogen and carbon monoxide gas by heating/smouldering the wood.

For living outdoors, or even just going out for a hike for a day, the simplest wood-fuelled stove is probably the 'volcano'-style Kelly Kettle. These come in two sizes: the original 2½ pint version is useful for a small groups of people, and the recently introduced 1 pint version is ideal for one or two people.



To begin with you light a small fire in the base section of the kettle. Then you can drop small twigs, sticks and pieces of paper down the chimney to burn. Like other storm kettles, the stove works by providing a large surface area for the flames from the burning sticks to heat the water. The chimney also creates its own draught so that, even in the wind, the stove still works well. Once the water's boiled the top section detaches from the base containing the fire to allow you to pour out the water. Recent versions of the stove also come with a small grill and saucepan that can fit into the base and this allows you to use the embers rather like a mini-barbecue.

The big advantage of the Kelly Kettle's design is that the fire in the base is contained within a metal container. This means that technically you're not lighting a fire 'outdoors' on the ground. When you've finished cooking you can then douse the base with water to completely extinguish the embers before you throw them away. As a mean of using wood this makes the Kelly Kettle safer than an open fire as you've got less risk of setting the ground or the grass on fire (we deal with this problem in the next section).

The traditional camp fire

Understanding how to set a fire is a process of learning. It's possible to explain the basics, but you need to actually do it to learn the 'feel' of it – it's a very sensual skill. The problem is that lighting fires in the countryside is generally frowned upon: Lighting fires on access land is prohibited (see unit 1); the *Country Code*, whilst not literally banning (or even expecting that you should light) fires asks you to not "*drop a match or smouldering cigarette at any time of the year*"; the new *Moorland Code* specifically commands, "*Never light fires on moorland – not even gas stoves or barbecues*".

There are good reasons for this cautious approach, and there have been instances where people have caused a lot of damage by lighting fires in the countryside, but it's a *Catch-22* situation; how can people learn to use a camp fire responsibly outdoors if they can't light a fire there, but at the same time we prevent people from lighting fires because they don't have the sense/experience to do so safely.

In Scotland the camp fire situation, as with the trespass issue, is very different. People have the ancient right to access the foreshore, and as part of that they can light fires. On any other land to which they have access under the *Land Reform Act*, though not on sites of cultural or historical interest, they can light fires, with the caution that,

> *Wherever possible, use a stove rather than light an open fire. If you do wish to light an open fire, keep it small, under control and supervised – fires that get out of control can cause major damage, for which you might be liable. Never light an open fire during prolonged dry periods or in areas such as forests, woods, farmland, or on peaty ground or near to buildings or in cultural heritage sites where damage can be easily caused. Heed all advice at times of high risk. Remove all traces of an open fire before you leave.*

You can of course create a lot of damage when lighting fires. This is usually because people don't have the knowledge to light them in places, or in ways, where they can burn safely. As a general guide on what to do and what not to do:

- *The No.1 rule.* Don't light a fire unless you intend to stay with it until it's out. The greatest danger is that the smouldering embers of a fire set the ground or surround grass alight. If you need to light a fire and extinguish it reliably then light it in a place that helps you do this – on muddy ground (difficult for the ground to burn); on the gravelly shore of a river/stream/the sea (douse it with lots of water when you're ready to leave), or on solid rock (the ground can't burn). Don't just throw soil or sand on top of the fire because it can still smoulder underground – douse it with water and rake over the embers to make sure it's out.
- Don't light fires on slopes or under trees. The heat from the fire kills the roots in the soil underneath the fire. Under trees this will of cause damage the roots of the tree, but on slopes it kills the roots of the grass and this will lead to erosion of the soil and scarring of the landscape.
- Don't light fires in scrub or long grass as it's more likely to set the grass on fire, especially during dry weather. Instead look for a clear area, ideally with no grass, but if there is grass make sure it's lush and green (lush grass doesn't smoulder).

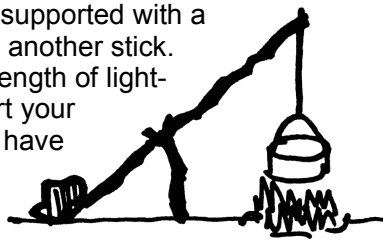
- Don't light fires on very dry or peaty ground in moorland, or on the leaf litter in/near woodland areas – the fire can set the soil alight, it can smoulder underground and then a little later it might set the whole area alight. Instead find a hard rock base to set you fire. If that's not available collect lots of small rocks, build a solid rock base and set the fire on top of it. Better still, find a wet area next to a stream or lake where the waterlogged ground can resist the heat of the fire and you can douse the embers with water.
- Always scrape back the vegetation to create a clear space to set the fire, and if possible surround it with small rocks (though don't use flint or igneous/glassy/granite-like rocks as they can suddenly fracture throwing off hot shards). The rocks not only help stop the fire spreading, by stopping the embers falling out, but they also heat up, storing and radiating heat.
- High winds make a fire burn quickly and uncontrollably. Dig a shallow pit to light the fire inside, or if that's not possible mound up rocks around the fire and set the fire in the middle.
- Try to avoid using green (live) wood as it smokes more, and avoid cutting wood from live trees. In most places it's possible to find dead wood on the ground, or fallen trees and branches, to light a fire. The shore of the sea or large rivers also provides a lot of drift wood (it might be a bit damp, but if you stack it by the fire it will dry out.
- Don't burn plastics, rubber, car types, etc., as the ash and soot they produce is toxic. Also don't burn Tetra-pak type containers or foil coated crisp packets because the metal will not degrade and will continue to little the environment for years. You can burn paper and card provided it's not plastic or foil coated (in short, *don't bring the non-degradable stuff into the countryside with you and you won't need to dispose of it!*).

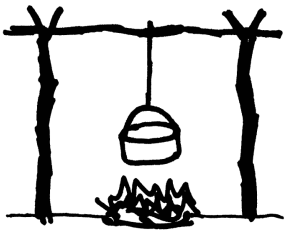
Setting your fire

You build different types of fire for different purposes. For a small camp fire you use small sticks, no more than the width of your finger, so that they burn quickly and release lots of heat for cooking. If you want a slow fire to sit by for a few hours then you might start with a small stick fire but once you've built up a bed of ash you can put larger branches on that will smoulder for a longer period. Note that accumulating a bed of ash is important; unlike coal fires, where you always rake out the ash, burning larger lumps of wood requires that you build-up a bed of ash and embers to allow the wood to smoulder and decompose in the heat.

The simplest type of fire is just a small circle of rocks with a fire in the middle. The rocks are important because they retain the fire, but they also act as storage radiators – shining out more heat.

If you want to cook on your fire then the simplest method is to use a 'gin pole'. This is just a long straight branch that is supported with a rock or propped-up on another stick. You then use a short length of light-weight chain to support your pots (but they need to have handles – a lot of camping pots don't as they're designed for gas burners).

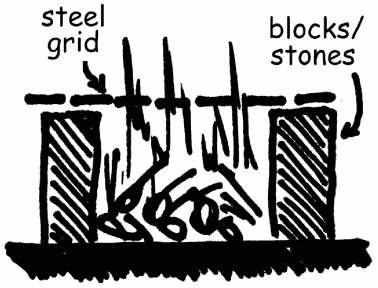




Alternately you could create a more elaborate tripod of sticks or a spit arrangement. This is a lot of extra work, and so it's really only of use if you're going to stay in the same place for a couple of days. For just an evening, a gin pole is far better.

Although spits, tripods and gin poles are suited to small stick fires and fast cooking, you can use thicker wood and a slow burning fire. In this case you would need to have the pots strung closer to the wood.

When cooking for groups, or if your pots don't have handles, you need to carry a steel wire or mesh grid – an old shelf from the oven of a cooker is ideal because it's not too heavy and it's machined without sharp points or edges. You stack stones or bricks to create two solid pillars (solid! – if they collapse you might lose your dinner!) and rest the grid between them. You can then place your kettle and cooking pots on top of the grid to heat them. With this set-up you use large sticks or branches in order to get a hot bed of embers, rather like a barbecue. You could use small sticks but it will deposit a lot of soot on the underside of your pots (but that's not a problem if you don't mind blackened cooking pots).



Get to know your woods

Some types of wood burn better than than others. Elder is a very widespread shrub with produces lots of sticks, but when you burn it the smoke has an acrid smell and make lots of soot. Ash or oak on the other hand burns hot and clean, but you usually need another wood to burn alongside oak because it doesn't burn easily. Other types of wood burn well but they're a nuisance. White willow or sallow is an example; it burn well but it has a habit of spitting little burning embers all over the place. Knowing what to burn is again a matter of experience.

Finally, don't chop/cut live wood from a tree. Also don't take wood that's cut at both ends – under common law it belongs to someone, so it's theft. You should only take dead fallen wood, or the remaining parts of a tree that are only cut at one end.

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