

FIREBUILDING

Fire building is an essential skill for many outdoor activities. Prepare to master fire building before heading into the woods. A basic need for camping is a good fire, for more reasons than you may realize. Campfires can be used for warmth, cooking food, boiling water, drying wet clothes, keeping annoying bugs away, signaling in an emergency, light, protection (or at least a feeling of protection) from wild animals, and of course for gathering around at night to talk, sing, and tell scary stories.

Rules to Follow

Be sure to follow the fire rules of the particular area you are visiting. In some regions of the country fires may be allowed only at certain times or in designated areas, such as in metal, enclosed fire pits in campgrounds, and at other times fires may not be allowed at all.

- For building the fire, select a spot as far as possible from trees, bushes, and fallen trees. Fires built over roots are dangerous because the fire can follow the roots back to the trees or bushes and cause larger fires. Never build the fire directly under branches or near dry grass or weeds. When possible, either use rocks to enclose the area where you plan to build the fire or dig a fire pit or trench and clear away flammable fuel within a ten-foot area around the fire (Figure 1).
- Build the fire only large enough to satisfy your needs. Big fires are not required in cooking, and too much heat makes it difficult to control the cooking temperature. Most cooking can be done best on hot coals rather than on direct flames. Also, big fires waste firewood, and you will have to spend more time finding and cutting firewood, which can be a lot of hard work.
- Never leave a fire unattended, and always have a bucket of water and a shovel near the fire to extinguish it in case of emergency. Report any wild fire to the nearest forest or fire officer as soon as possible. Put out your fire and your matches—dead out!
- Before leaving the campsite, make sure the fuel is cool, the fire is completely out, the ashes are buried, and the fireplace area is back to its natural state (if you are in a primitive area).



Figure 1: Safe fire area

The Fire Triangle

The fire triangle, also called the combustion triangle, is a simple way of understanding the three components necessary for a fire. Each side of the triangle represents one of the three components needed to have a fire—heat, oxygen, and fuel. The triangle shape demonstrates the interdependence of these components in creating and sustaining a fire (Figure 2). When there is not enough heat generated to sustain the process, when the oxygen supply is limited, or when the fuel is exhausted, removed, or isolated, then a side of the triangle is broken and the fire will die.

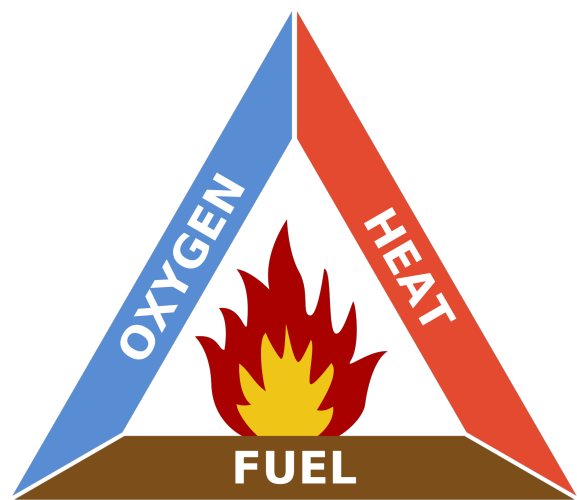


Figure 2: The Fire Triangle

Heat

A heat source, such as a match or lighter, is necessary to ignite the fire, and heat is also needed to maintain the fire and permit it to spread. Heat allows fire to spread by removing the moisture from nearby fuel, warming surrounding air, and preheating the fuel in its path, enabling it to travel with greater ease.

Oxygen

Air contains about 21% oxygen, and most fires require at least 16% oxygen content to burn. When fuel burns, it reacts with oxygen from the surrounding air releasing heat and combustion products, (i.e. gases, smoke, and ash).

Fuel

Fuel is any kind of combustible material, but for campfires, wood is usually used. Firewood is typically classified into three main categories—tinder, kindling, and fuel—which will be described in more detail later.

Before You Start the Fire

Upon your arrival at the campsite, one of your most important activities is building a good-sized woodpile. After you are in the process of starting the fire, it is inconvenient to stop and look for wood. You are much more likely to be successful if an ample supply of wood is available before you attempt to start the fire. Most novices do not have enough wood on hand, especially tinder and kindling, before trying to start their fire, and as they scramble to find more wood, their fire inevitably burns out.

Stacking the Wood

Care in stacking and storing wood can protect it from moisture. Stacking the wood on two long poles laid side by side horizontally is one way to protect it from the wet ground. Use a large piece of plastic or a tarp to cover the woodpile to protect it from rain. After it has rained all night, it can be very difficult to start a fire with wet tinder and kindling. Collecting and drying some tinder and kindling before going to bed and storing it in a plastic bag or under a rainfly is a good idea.

Types of Wood

As mentioned earlier, the three basic types of wood are tinder, kindling, and fuel (Figure 3).

Tinder

For material to start the fire, use anything that will burn which is smaller than your little finger. Some examples of tinder are dry grass, small twigs, dry pine needles from evergreen trees, fine shavings, and bark. Start with the thinnest tinder and add larger tinder around it. A good rule of thumb is to begin with tinder that is thinner than a match. Remember also, most novices do not use enough tinder when starting their fires. You will want to have a ball of tinder that is five to six inches in diameter.

After a rain the best place to find dry tinder is on the lower inside branches of small trees. Use only the dead, dry branches that are suspended off the ground. Dead branches of small shrubs are also a good source of tinder if they are suspended off the ground. Even if they are wet on the outside, they will usually be dry in the center and burn fairly readily.



Figure 3: Tinder, Kindling, and Fuel

Fire starters are also tinder, and they can be a lifesaver after it has been raining and dry tinder is difficult to find. Fire starters, such as Coghlan's Fire Sticks (Figure 4), can be purchased in camping stores, but good fire starters can also be prepared at home for little or no cost.



Figure 4: Commercial Fire Starters

Egg carton fire starters are a popular home-made fire starter. Fill each cup of an egg carton with dryer lint, sawdust, wood chips, or something similar. Melt old candles in a large metal can, such as a coffee can, and pour the wax over the material in the egg carton until it is saturated (Figure 5). Do this over old newspapers or cardboard, as the wax will often run over the edges of the egg carton. Allow any extra wax to harden in the can and store it



Figure 5: Pouring wax over dryer lint



Figure 6: Using an egg carton fire starter

away until the next time you need to make fire starters. When it becomes difficult to start a fire because of wet wood or other reasons, tear off one of the egg cups and place the other tinder around it. After the carton is lighted, it will create a large flame which should burn for about ten minutes (Figure 6).

Cotton balls saturated with petroleum jelly and stored in a Ziploc bag also make a good fire-starting material. Make sure to use 100% pure petroleum jelly, and make sure that the cotton balls are also 100% cotton. Scoop out a large quantity of petroleum jelly with a cotton ball and place it in a Ziploc bag. Do this with as many cotton balls as you desire, then seal the Ziploc bag and knead the cotton balls and petroleum jelly together in order to work the petroleum jelly into each of the cotton balls (Figure 7). When you need a fire starter, remove one (or more) of the cotton balls and place the other tinder around it. After the cotton ball is lighted, it will create a large flame that will burn for about five minutes, depending on the amount of petroleum jelly it has been saturated with (Figure 8).



Figure 7: Preparing cotton ball fire starters



Figure 8: Using a cotton ball fire starter

Kindling

Kindling is wood which ranges in diameter from the size of the little finger to the size of the wrist. It is used to feed the fire until larger pieces of wood will burn.

Fuel

Pieces of wood the size of the wrist and larger are classed as fuel. This type of wood is used to sustain the fire.

Building the Fire

- In the center of the fire-circle, lay two larger pieces of wood side by side about five or six inches apart. Alternatively, use three pieces of wood to make a triangle. These pieces of wood will serve to hold the tinder together as it begins to burn.
- Between the two pieces of wood (or in the center of the triangle), loosely arrange the tinder in a ball shape, starting with the thinnest materials and graduating to more coarse materials. Lay some kindling directly against the tinder in the shape of a teepee. If you use a fire starter, place it first and add the tinder and kindling around it.
- Around this teepee lay the type of fire structure you desire. Light the tinder while it is still accessible, even if the fire structure is not entirely laid.
- It is important to lay the fire structure so air can circulate between the materials. Without enough air the fire will not continue to burn. If necessary, blow on the fire or fan the fire with a paper plate to aid the circulation of air.

Types of Fires

Fires are generally named from the manner in which the wood is laid.

Teepee Fire

A basic fire used to begin other fires is the teepee fire. Set the kindling and fuel on end in the form of a teepee. Remember, the kindling and fuel need to be laid directly against the layers of wood below. This fire radiates a lot of light and heat, so it is often used at night, and it is good for warming by and drying clothes (Figure 9).



Figure 9: Teepee Fire

Log Cabin Fire

To get a good bed of coals, build a log cabin fire by placing logs around the fire as if you were building a miniature log cabin. Gradually lay the logs toward the center as you build the cabin. It will have the appearance of a pyramid, and coals will form quickly (Figure 10).



Figure 10: Log Cabin Fire

Crisscross Fire

For a large, deep bed of coals for cooking or roasting, prepare a crisscross fire. Place the logs on the fire in layers, one layer crossing the other at right angles. Leave a little space between each log for air to circulate. This fire works well when you have wood of varying length, shape, and size, which is often the case when you gather wood in the forest (Figure 11).



Figure 11: Crisscross Fire

Star Fire

This fire is sometimes called the lazy man's fire because, as the logs burn down, they are simply pushed farther into the flames. This fire uses a minimal amount of wood and is good for one pot cooking (Figure 12).



Figure 12: Star Fire

Methods of Starting a Fire

There are many ways to achieve actual combustion. Some of the more primitive methods need be used only in times of emergency or for practice and enjoyment of the challenge.

Matches and Lighters

The most common method of starting a fire is to use matches or a lighter. Waterproof matches can be purchased, but are not really necessary if you carry matches in a waterproof container, such as a Ziploc bag. The Ziploc bags with the sliding zippers are the most convenient. It is also a good idea to divide your matches into two or three different Ziploc bags in case one bag gets wet or lost.

Flint and Steel

A soft steel knife blade or a file struck against the harder flint will produce sparks. The sparks will produce a thin wisp of smoke if they come in contact with very dry tinder. When smoke appears, blow gently with short puffs of air until the tinder bursts into flame. Very fine tinder or charred cloth will facilitate ignition. A popular modern version of this method is the magnesium fire starter that has a ferrocerium rod on one side. Magnesium shavings are scraped off with the back of a knife, and then the back of the knife is used to scrape the ferrocerium rod, producing sparks that will ignite the magnesium.

Bow Drill

Of all the friction fire starting methods, the bow drill is the most efficient and easy to master. A notch is cut in the side of a fireboard beside an indentation on which a drill will rest (Figure 13). A socket to fit the hand allows the drill, operated with the string of a bow, to rotate first one way and then another until a fine, hot dust results that collects in the spark tray beneath the fireboard. The dust will smoke and a small coal will form (Figure 14). The coal should be placed into tinder and blown into flame.

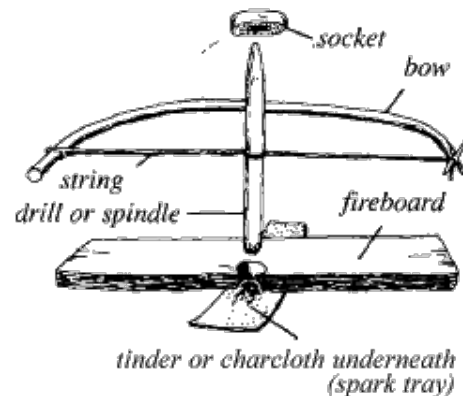


Figure 13: Parts of a Bow Drill



Figure 14: Using a bow drill

Magnifying Glass

A strong magnifying glass placed in direct sunlight so that a fine point of light is focused into dry tinder will cause the tinder to smoke and eventually break into flame (Figure 15). A magnifying glass is small and easy to use, but it won't work at night or on rainy or cloudy days—the times you most need a fire—so it is best to carry other fire starting materials as well.



Figure 15: Using a magnifying glass to start a fire

Fire Piston

The fire piston consists of two parts—a thick-walled tube with an opening at one end and a rod, with a seal that prevents air from escaping, that fits inside the tube. Tinder is placed in the tube, and then the rod is pushed in quickly, causing the air inside to be compressed. This creates a lot of heat and causes the tinder to ignite. The burning tinder is then quickly removed to get a fire going.

Batteries

In an emergency there are different ways that batteries can be used to start fires. Flashlight batteries, a 9-volt battery, a removable cell phone battery, or a car battery can be used to ignite steel wool or thin strips of aluminum foil. If using flashlight batteries, it is necessary to hold or tape two batteries together, as a single battery with only 1.5 volts is not enough. Use 00 or finer grade steel wool, lengthen out a strip, and touch each end to one of the terminals of a battery to ignite the steel wool (Figure 16). Thin aluminum strips (about 1/8 inch wide) will also ignite, and gum wrappers that are made of aluminum and paper work well, since the aluminum burns and breaks fairly rapidly, but the paper will keep burning a little longer. Jumper cables attached to a car battery can also be used to

create sparks that can ignite tinder by touching the cables together.



Figure 16: Batteries and steel wool

Extinguishing a Fire

Knowing how to extinguish a fire properly is as important as, if not more important than, knowing how to start one. First, break up the fire with a stick and spread out the coals. Next, sprinkle water over the coals. Finally, stir the fire with the stick and drench it with water until the coals are cold enough to touch. A fire is not out until the coals and ground are cold to the touch (Figure 17). If large logs have been burning, make sure all embers on the logs are put out.

If no water is available, it is best not to have a fire at all. However, if you must have a fire, use a shovel to stir dirt thoroughly through the coals in order to smother them. Continue adding dirt and stirring the fire until it is cold enough to touch. Again, the fire is not out until the coals and ground are cold to the touch. Begin putting your fire out well before you plan on leaving, so you can make sure it is dead out before leaving the campsite.



Figure 17: Make sure the fire is dead out!