



**Southern Rural Fire**

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**How To Safety Burn Stubble.**

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## Contents

1	Understanding the Risks .....	3
2	Fire Environment and Fire Behaviour .....	3
2.1	Topography .....	4
2.2	Fuel.....	5
2.3	Weather .....	7
3	Fire Environment Hazards .....	8
4	Clothing.....	8
5	Burning Crop Residue (Stubble Burning) .....	9
5.1	Preparation.....	9
5.2	Light up .....	9
5.3	After the fire.....	10

## 1 Understanding the Risks

Fire is a valuable land management tool for getting rid of unwanted vegetation. However fire use comes with an inherent set of risks, knowledge of these risks will help reduce the risk associated with fire use.

## 2 Fire Environment and Fire Behaviour

Fire is created by fuel, oxygen and heat, if we take one of these away the fire goes out.

Similarly the fire environment is made up of fuel, topography and weather, the Fire Environment triangle.

Understanding the Fire Environment helps us understand how the fire will behave and we can put things in place to reduce the risk.

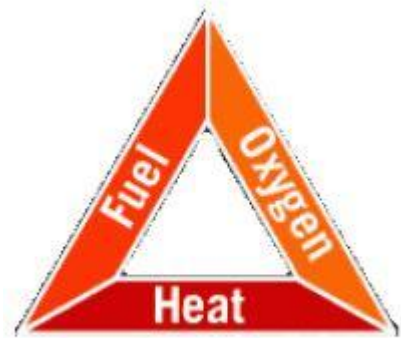


Figure 1 - Fire Triangle

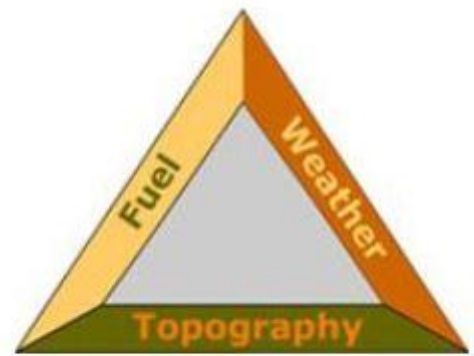


Figure 2 - Fire Environment Triangle

## 2.1 Topography

Is the shape of the land and

Topography	Description
Slope	Will affect the speed that a fire travels up hill. A fire doubles its speed for every 10 degrees of uphill slope.
Aspect	North/West facing slopes are usually sunny and dry and have lighter more flammable vegetation, allowing fire to spread faster and the fire to be more volatile.
Terrain	The valleys, gullies, slopes, ridges and flat areas can all affect the direction and speed that a fire travels. Rough, uneven or steep terrain can make traveling difficult and slow for vehicles, machinery and people.



## 2.2 Fuel

Understanding the vegetation or fuel you want to burn off is important to achieving the result you want.

There are a number of fuel factors which will determine how hot and long your fire will burn and how far and fast it will travel.

### Fuel Density

<b>Fuel</b>	<b>Description</b>
Fine Fuels	Such as grasses, fallen leaves, needles and small twigs, lose moisture easily and dry out quickly. Dry fine fuels ignite easily and can carry a fire rapidly. In most cases fires start in light fuel and spread to other fuel types.
Medium Fuels	Such as scrub, branches and young trees require more time to dry out and generally are too large to start a fire. Medium fuels will produce a hot fire.
Heavy Fuels	Such as stumps, logging slash mature trees, native forest and peat are usually difficult to ignite. Once on fire heavy fuels will produce high intensity fires and are difficult to put out.

### Three-Dimensional Fuel

Fuel is also described spatially across the land scape

<b>Fuel</b>	<b>Description</b>
Ground Fuels	Ground fuels are the rotted materials under the surface of the ground (duff, roots, peat, buried wood etc.). These fuels can burn from centimetres deep to a metre or more.
Surface Fuels	Surface fuels are on the ground. Examples are litter, low and medium sized shrubs, seedlings, grasses and fallen dead matter.
Ladder Fuels	Fuels that link together vertically. They may include dead fuels hung up in lower branches of scrub or un-pruned trees, tall shrubs, small size trees, bark flakes, draped needles and tree lichens.
Contiguous Fuels	This is the distribution of all the different fuel types across the landscape and how dense or scattered the fuel is.

The final two factors to consider are:

- The quantity of fuel – the more fuel there is the greater the intensity of your fire.
- Fuel moisture – The greater the moisture content of your fuel (especially green vegetation) the harder it will be to light and sustain a fire.



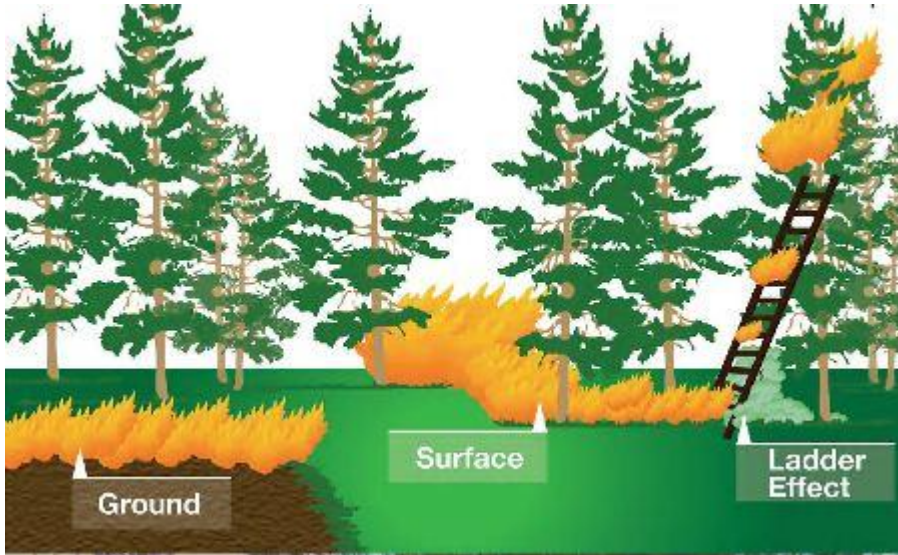


Figure 3 - Different Fire Types

### 2.3 Weather

Weather is the most variable factor in the Fire Environment changing the fastest and catching people out.

Element	Description
Air Temperature	Fuels in a warm environment are pre-heated by the air temperature and the sunlight, drying it out and making ignition easier.
Relative Humidity	The amount of moisture in the air. When relative humidity is low, fuels dry and ignite easier. Wet fuels lose moisture to dry air (sunny days). Green vegetation does not lose or gain moisture as quickly as dead fuels.
Wind Speed	Wind helps dry out fuels, it directly affects the speed at which a fire spreads and direction the fire will travel. Wind is the biggest element that catches people out when they are using fire.
Rainfall	Fuels absorb moisture in continuous rain or high relative humidity. In short periods of heavy rain, water tends to run off and not be absorbed by fuels.

#### Change between day and night

You need to be familiar with your local and regional weather patterns. Fire generally burns quickly during mid-afternoon when relative humidity is low and the temperature is higher.

- In coastal areas, look out for the onshore coastal breeze that arrives most afternoons
- In hilly/mountainous areas, cool wind displaces warm air down valley systems in the afternoon.

### 3 Fire Environment Hazards

Each Fire Environment element can have its own set of hazards. Where Fire Environment hazards overlap there is an increase in the chances of a disaster occurring.

Fire Environment	Sample of Hazard
Topographic	<ul style="list-style-type: none"><li>• Being uphill of a fire (fire moves faster up hill)</li><li>• Obstacles, loose ground and slips</li><li>• Rough country</li><li>• Unfamiliar area</li><li>• Not being able to see the fire</li></ul>
Fuel	<ul style="list-style-type: none"><li>• Unburnt vegetation</li><li>• Fire spreading across fine fuels more quickly than you can escape</li><li>• Unstable spars</li><li>• Spot fires</li></ul>
Weather	<ul style="list-style-type: none"><li>• Change of wind speed or direction</li><li>• Being downwind of a fire</li><li>• Weather hotter and drier after midday.</li></ul>

**Be aware of the combined effects of topography, fuel and weather**

### 4 Clothing

To prevent injury and harm to yourself and others, wear the right clothing when working around fire.

- Wear natural fibre clothing, such as cotton or wool. Synthetic materials can melt and cause severe injuries.
- Ensure your legs and arms are covered
- Do not tuck clothing in; instead create layers so hot material you come into contact with doesn't catch in your clothing. E.g. don't tuck the bottom of trousers into socks, let the trouser leg fall over the outside of your boot.
- Wear sturdy laced up leather boots, ideally with a steel cap.
- When working close to the fire use heavy leather gloves to protect your hands from radiant heat and hot material.
- Wear woollen hat or safety helmet if working near heavy machinery.



## 5 Burning Crop Residue (Stubble Burning)

Stubble burning involves using a low intensity fire. However, light fuels are susceptible to weather changes and for this reason, a little planning can go a long way to ensuring you burn safely.

### 5.1 Preparation

Ensure there is at least a seven meter bare earth perimeter around the area you intend to burn.

Think about when you light.

- Wind should not exceed 10km per hour.
- Consider lighting your stubble burn after 1pm as weather patterns for the day are generally more stable in the afternoon.

### 5.2 Light up

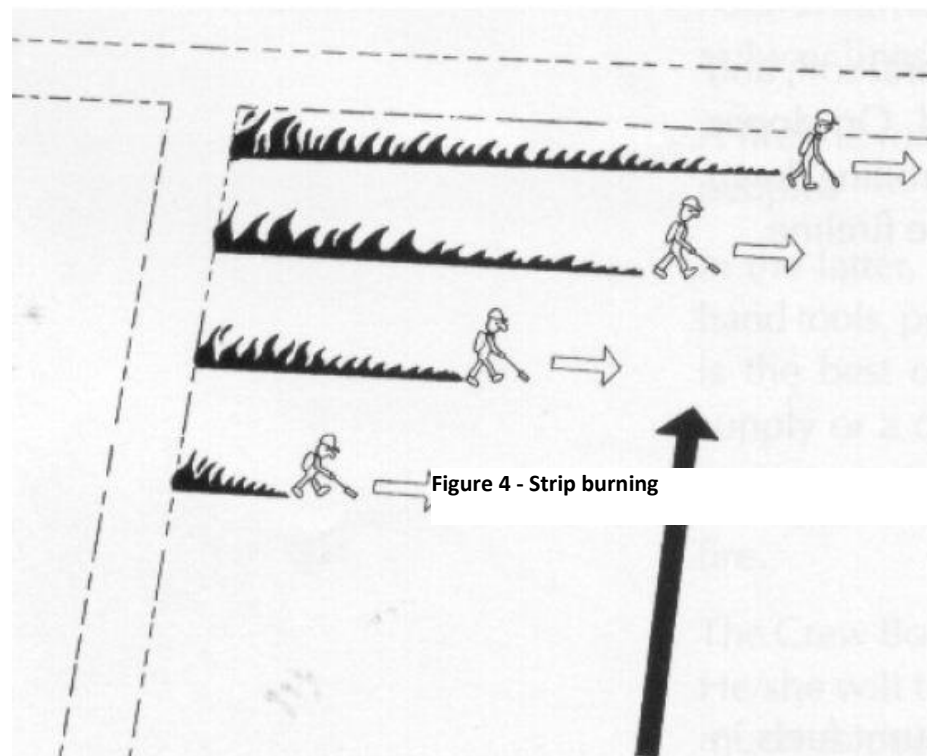
How should I light up a stubble burn?

Strip burning creates a solid line of fire, starting at the downwind side of your burn area.

Successive strips are then created, some experiment may be required to work out the width of the lines.

More than one person can be used to burn in this way **AS LONG AS EACH PERSON REMAINS BEHIND THE PERSON DOWN WIND OF THEM.**

The same light up pattern can be used from a quad bike, laying successive strips



Wind direction

Figure 5 - Example of strip burning

### 5.3 After the fire

Make sure the stubble burn is completely out, even stubble fires can start unwanted fires.



Figure 6 - Stubble Burn