EMQUAL
EMERGENCY MANAGEMENT QUALIFICATIONS

NATIONAL RURAL FIRE AUTHORITY

Working Safely at Vegetation Fires

LEARNER NOTES

Acknowledgments

The National Rural Fire Authority and EMQUAL acknowledge the help of industry personnel in preparing this resource.

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Contents

Introduction

Welcome to this resource on ***Working safely at Vegetation Fires***, supporting Unit Standard 3285. You have already shown a strong commitment as a fire fighter. The Rural Fire Authority appreciates your further commitment to studying how to be **safe and effective**.

To complete the self-study course please read and complete the self-checks in these Student Notes. Your trainer may also set up learning and practice sessions for you and other learners to practice new skills.

You will need around 10–15 hours to complete the Student Notes. Let family and friends around you know that you are doing this study, so that they can help you make time for it.

1. Student Notes and self checks

You will need to read the notes and answer the **self check** questions at the end of each chapter. The self checks are to help **you** see how you are doing. You can look up the answers in the student notes. Your pink **LACES card** will help you complete the self checks.

Your answers to the questions will show you how ready you are to be assessed. If you are going to take part in learning and practice sessions, you should make sure your assessor has seen your self check pages before the sessions start.

2. Personal Log Books

A personal log book is available from EMQUAL for recording what you have done in practice sessions and on the fire ground. Your supervisor will add his /her evaluation of the tasks you have completed.

3. Learning and practice sessions

You might take part in learning and practice sessions. If you do, bring your pink **LACES card** to the sessions as you will need it for exercises.

4. Formal Assessment

Your assessor will give you a formal assessment for Working Safely at Vegetation Fires. It is a **"closed book assessment"**, which means that you cannot look up any information.

Finding your way around the Student Notes

It's important that you begin by knowing the characteristics of vegetation fires, how they burn, and why. So in section **one** and **two** we talk about what vegetation fires are, and the factors that affect the way they burn. This will prepare you for section **three** and **four**, where we talk about how you can put these fires out safely, and about avoiding hazards. Finally, in section **five** we discuss how you can protect yourself and others from the fire.

There are a number of words that may be unfamiliar to you if you have not been with the rural fire force for very long. These are explained in word check boxes throughout the Student Notes.

There are also **safety tips. Please read these carefully!**

SAFETY TIP

This is a safety tip example.

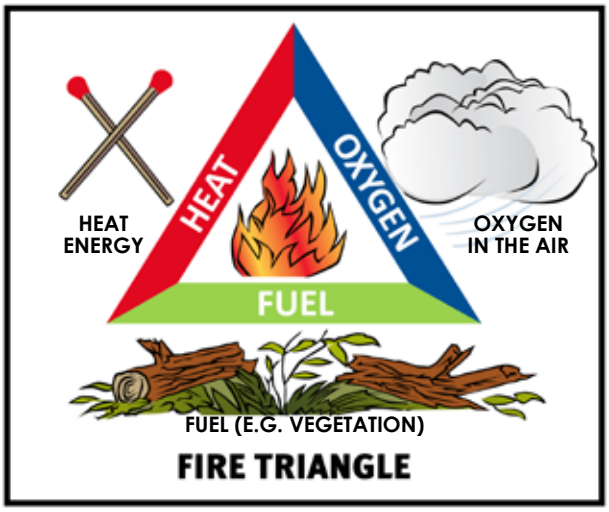
At the end of each section, read the **summary**.

Then complete the **self check** page for that section. If there's anything you don't understand, **always ask your trainer**.

SECTION ONE: How Fires Burn

What makes a fire burn?

Fire is created by fuel, oxygen, and heat. If you take away one of these, you can't make a fire. These three parts of a fire make up what is called the "fire triangle."



Oxygen is a gas in the air. Heat works with oxygen to create a flame. But they both need something to burn. Fuel is anything that will burn. It can be solid (e.g. wood) liquid (e.g. petrol) or gas.

Stages of combustion (burning)

There are three different but overlapping stages of combustion.

		
Preheating Unburnt fuels are heated and flammable gasses are released	**Gaseous** The escaping gasses are ignited and produce heat and light	**Charcoal** The fuel no longer gives off enough gas to support flame and the fuel smoulders

How do vegetation fires spread?

Heat can be transferred from burning vegetation to unburnt vegetation. The four different ways this can happen are **radiation**, **conduction**, **convection** and **ember transport**.

Radiation

Radiation is rays of heat coming in a straight line from something very hot like a fire or the Sun. The rays from burning vegetation travel in all directions to heat the unburned vegetation near it, before the flames get to it.

Conduction

Different substances conduct (carry) heat at different rates.

Metals (eg steel gates) are more effective conductors of heat than wood (eg fence).

Wood is a poor conductor of heat.

Convection

As the fire gets hotter, the air is heated to an even greater temperature than the fire and rises up.

A convection column of air can carry ash, embers and small pieces of burning fuel.

Ember Transport

Ember transport is when embers are carried by wind, by the convection column, or by rolling downhill.

Fire can spread faster by a combination of these methods.

Where do fires burn?

There are three main **layers** of fire.

Ground fires happen under the surface of the ground.

Surface fires happen on the ground and above.

Crown fires happen in higher vegetation layers.

Ground Fire

A ground fire burns in the organic materials under the surface in the soil layer (peat, humus, roots). It can also burn in buried materials (such as in landfills).

- Ground fires smoulder with no flame and little smoke
- They can burn unnoticed, and may later ignite surface fires

Surface Fire

A surface fire burns fuels at, and above, ground level.

Surface fires are the most common type of fire.

They burn fuels lying on or near the ground (e.g. grass and scrub).

They can be fast travelling in strong winds and on steep slopes and able to burn all fuels in their path.

Crown Fire

A crown fire burns in the tops of trees. It usually needs a surface fire to keep it going.

Crown fires can spread rapidly in strong winds and on steep upward slopes.

An intense surface fire may follow behind a crown fire. Ember transport from crown fires can cause new surface fires.

Your first responsibility is the safety and welfare of yourself and others, so you have to watch out for hazards!

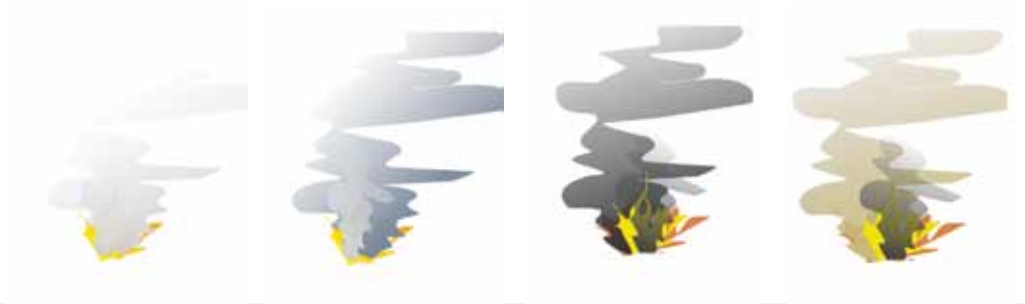
Don't risk your life to save property. Your life is more important.

How can we tell how hot a fire is?

Dry fuel will produce very intense heat.

We can tell the heat of the fire by the length of the flame and the colour of the smoke. The longer the flame, the hotter the fire.

In the following two tables, the **colour of smoke and length of flame** tells us something about the **dryness of the fuel** and the **heat of the fire**.



Smoke colour	Dense white	Grey	Black	Copper-bronze
Fuel moisture	Very moist fuel	Moist fuel	Dry fuel	Very dry fuel
Fire heat	LOW	MODERATE to HIGH	HIGH to VERY HIGH	EXTREME

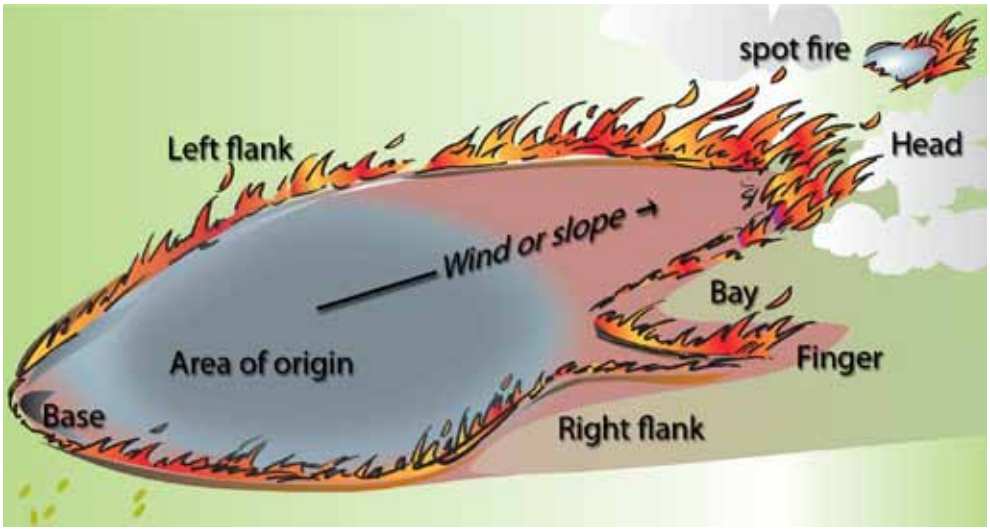
Flame Length

Less than 0.3 Metres	0.3 Metres to 1 Metre	1 Metre to 2.5 Metres	2.5 Metres to 3.5 Metres	3.5 Metres +
				
Low Danger Fire does not spread much and is easy to control	**Moderate Danger** Direct manual attack is possible	**High Danger** Water under pressure and heavy machinery for effective firefighting	**Very High Danger** The head should only be attacked with aircraft	**Extreme Danger** The only safe action is at the back and along the flanks

What are the parts of a fire called?

WORD CHECK

Area of origin	Where the fire starts
Base	Where the fire is the least intense
Bays	Indents between forward moving 'fingers' of the fire
Embers & Firebrands	Loose particles of burning fuel in the air
Flanks	The left and right outside edges of the fire
Head	The front of the fire
Islands	Areas of unburnt fuels within the fire
Perimeter	The whole outer edge, or boundary of the fire
Spot fires	New fires ignited by embers from the main fire



The fire usually starts somewhere between the **base** to the centre area. This is the **least intense** part of the fire's outer edges, and has the lowest flames and slowest rate of spread where possible. **Try not to work in the area of origin**. This area should be protected where possible to help find the cause of the fire.

The **head** of the fire is at the opposite end. It is the part of a fire where the rate of spread, flame length and **intensity** are **greatest**, usually when burning downwind or upslope. The position of the head of the fire depends on wind direction, fuel and topography. **It is dangerous to work in this area.**

The flanks are the sides of the fire. The fire intensity is lower at the flanks. Fingers are narrow slivers of the advancing vegetation fire that extend beyond the head or flanks. There will sometimes be 'islands' of unburnt fuels inside the fire perimeter.

Spot fires are new fires ignited ahead of, or away from, the main fire. They are started by embers, or by a burning object called a firebrand.

What helps a fire to spread?

Three things influence the spread of a vegetation fire – topography (the shape and features of the land), weather and fuel (usually vegetation).

Topography Fire can move quickly up slopes

Weather Wind speed and direction influence fire spread

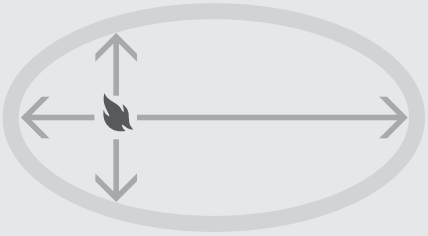
Fuel The dryness, size and amount of a fuel can effect how the fire spreads. Fires will spread quickly with dry fuels

The speed of the wind, the direction of the wind, and the slope of the ground has a major effect on how fast the fire spreads.

Spread pattern 1 (on a calm day and flat ground)
This is when the fire starts on flat ground, with an even fuel distribution, and on a calm day. The edge of the fire (perimeter) will move out evenly from the ignition point, in a circular pattern.

Fire spread is slow under these conditions.

Spread pattern 2 (on a windy day or slight slope)
The fire will travel in the same direction as the wind or up slope.



Spread pattern 3 (by strong wind on a steep slope)
Wind and slope both increase the heating of nearby vegetation.

The fire takes on an elliptical (egg) shape with the pointed end moving the fastest. It is pushed forward and up or down the slope by its steepness and the wind.

Fires respond quickly to shifts in wind direction or wind speed.

Fires run uphill much faster on steep slopes.

Summary

The **fire triangle** shows the three things necessary for a fire to ignite and continue to burn:

Oxygen + Heat + Fuel = Fire

Heat is **transferred** by:

Radiation	Heat energy that travels in a straight path outward in all directions from its source (like the rays of the sun)
Conduction	The transfer of heat through solid objects from an area of higher temperature to an area of lower temperature
Convection	The transfer of heat through air. As hot air rises, it carries heat with it, gradually losing this heat to the surrounding air
Ember transport	Hot embers are transported by wind, convection column or rolling downhill of a fire

The **shape** of a vegetation fire is determined by wind, topography and fuel.

There are three **types** of vegetation fire:

A crown fire burns in the tops of trees ahead of and above an intense surface fire

A surface fire burns in surface vegetation such as grass, scrub and forest litter

An ground fire burns the organic material in the soil layer, as in a peat fire

The **parts** of a vegetation fire are:

• Fire perimeter	• Fingers
• Area of origin	• Base
• Head	• Spot fires
• Flanks (left/right)	• Unburnt pockets or islands

Self check

	True ✓	False ✗
1. Taking away fuel stops the fire	☐	☐
2. Only radiation and convection transfer heat	☐	☐
3. Radiant heat needs a substance to travel through	☐	☐
4. Convection is when heat moves upward	☐	☐
5. A crown fire burns at the top of trees	☐	☐
6. Spotting is when hot embers start new fires	☐	☐
7. The intensity of the fire is greatest at its flanks	☐	☐
8. The area of origin is where the fire started	☐	☐
9. Wind has little influence on fire behaviour	☐	☐
10. Most fires are ground fires	☐	☐

11. What is your first responsibility in a fire?_____

12. Fires respond quickly to shifts in_____

13. The colour of smoke will tell you about the_____of fuel and the_____of the fire.

14. Draw the spread pattern you would find on a windy day or on a slight slope:

SECTION TWO: Factors that influence the behaviour of fires

The Fire Environment

The fire environment consists of three major components:

- Topography
- Fuel
- Weather

You need to be able to predict how the fire is going to burn. As the fire spreads, the land, vegetation and weather may change.

WORD CHECK

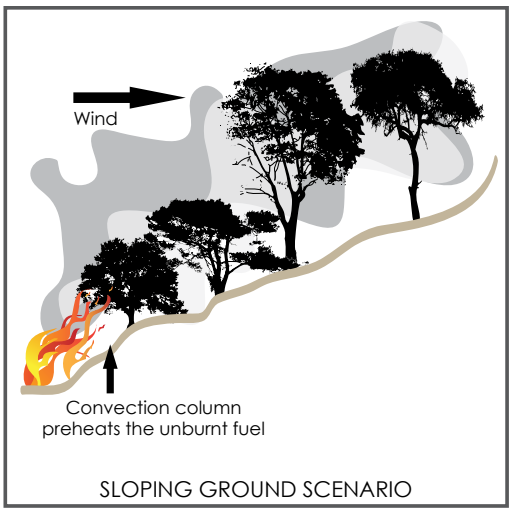
Fire Behaviour	The way fire burns
Fire Ground	The area where the fire is burning, may spread to, or anywhere firefighters are working
Fireline	The outer edge of the fire, where fire fighters are suppressing it
Terrain	The land surface (e.g. ridges, valleys and gullies)

What topographical factors affect fire behaviour?

The **slope** and height (**elevation**) of the land, the way it is facing (**aspect**), and its valleys and gullies (**terrain**) all affect the way the fire behaves.

Slope

The slope will affect the speed of a fire. A fire burning upslope preheats the unburnt fuels quicker than a fire on level ground. The opposite is true for a fire travelling downslope.



SLOPING GROUND SCENARIO

The fire **doubles its speed** as it moves **every 10 degrees** up a slope. For example:
A fire spreading at 500m (metres) per hour, will speed up to 1000m per hour up a 10° slope

The rate of fire spread will be slower downslope.

Slope, elevation and aspect can all affect wind strength, amount of rainfall and air temperature, which in turn affect the dryness of vegetation.

	Avoid being uphill or downwind of a fire.
	Fire can spread up a slope or downwind faster than you can move.

WORD CHECK

Aspect	The direction that a slope faces (north, east, south or west)
Barriers	Areas of land with no vegetation cover
Elevation	The height of the land
Prevailing wind	The overall direction of the wind

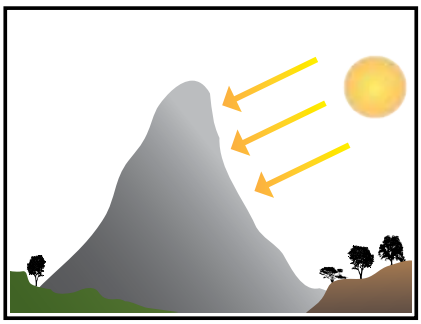
Elevation

Generally temperature decreases with elevation and relative humidity increases.

Wind strength can increase as airflow is forced over or around hills.

Rainfall will be greater on the side of a hill or mountain range that faces the wind.

Aspect



North/West facing slopes are usually sunny and dry. The sun shines on this side.

Northern / western slopes tend to have lighter, more **flammable** vegetation, while southern / eastern slopes have damper fuels.

South/East facing slopes are wetter.

Terrain

The terrain is made up of valleys, gullies, slopes, ridges and flat areas. These can all affect the direction and rate of fire spread, and fire behaviour. Like water, **wind** flows along the lowest and easiest path following the shape of the land.

Local winds can be shaped by ridges and valleys, and flow in a different direction than the prevailing wind.

Narrow, shallow gullies can "funnel" the wind creating a fast moving path. This is sometimes called the "chimney effect". It can cause high intensity fires and spot fires.

Spot fires starting away from the main fire may develop into other fires.

Barriers to fire spread include landslides or barren areas, roads and railways, firebreaks, rivers, lakes and fire resistant vegetation.

How does fuel affect fire behaviour?

WORD CHECK

Fire intensity	How hot a fire will burn
Flammable	Something flammable is easily set on fire
Relative humidity	The moisture in the air

Crown Fuels

Crown fuels are the tops of the trees. They are more affected by wind. Crown fires may be hotter and faster than surface fires.

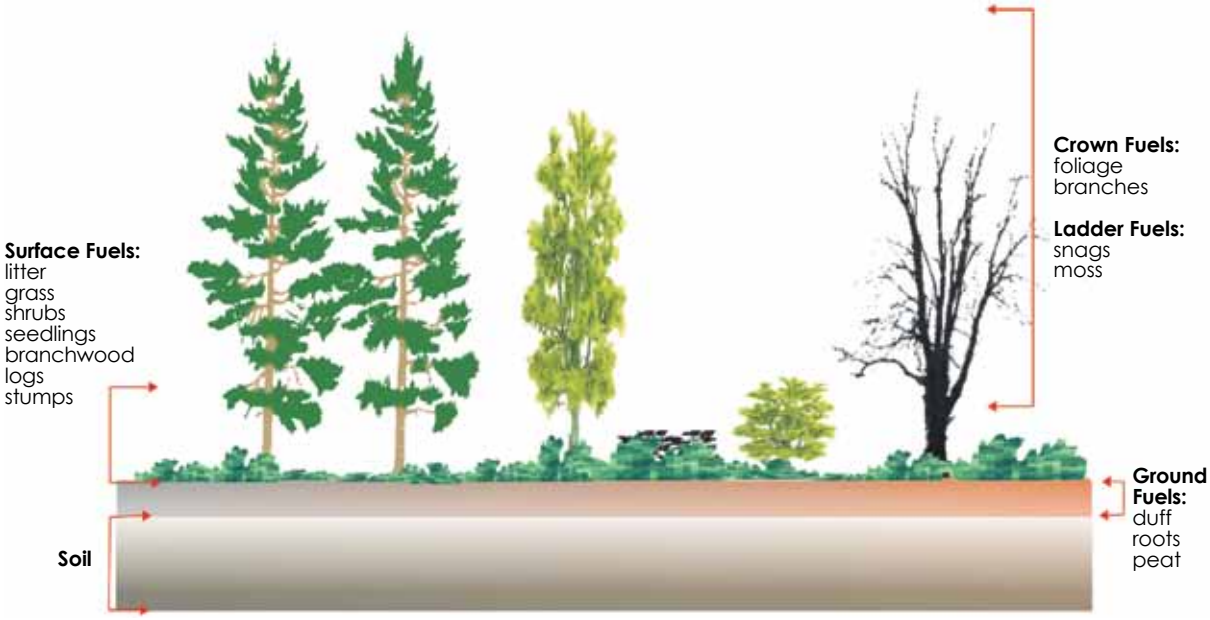
Ladder fuels are the fuels that link crown fuels and surface fuels. They may include dead fuels hung up in lower branches of scrub or unpruned trees, tall shrubs, small size trees, bark flakes, draped needles, tree lichens.

Surface Fuels

Surface fuels are at the surface of the ground. Examples are litter, low and medium sized shrubs, seedlings, grasses, fallen dead matter.

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.



Fuel Quantity

The greater the amount of fuel to burn, the larger the fire and the greater the fire intensity.

The more fuel there is to burn, the larger and hotter the fire.

Fuel Features

Fine Fuels
Examples are cured grass, fallen leaves, needles, small twigs, ferns, tussock and forest floor litter. They lose moisture easily and dry out quickly. Dry, fine fuels ignite easily. They carry a fire rapidly and can preheat surrounding fuels.

Medium Fuels
They require more time to dry out and are too large to be ignited until after the leading edge of the fire front passes. They are small enough to be completely burned. Examples are scrub, branches, young trees, manuka, gorse and coastal vegetation. They need a mixture of fine fuels to ignite them. They can spread the fire rapidly, and will produce hot fires.

Heavy / Coarse Fuels
These are large, dense, woody or deep organic materials. Examples are logging slash, stumps, wind-felled trees, mature trees and native forest. They are usually difficult to ignite. Once on fire, heavy fuels can take some time to burn. Once well involved in a fire, they will produce high intensity fires.

Chemical Composition

Some fuels are very **flammable** because of oils, waxes and resin. Examples are gorse and monoao. Manuka is a dense wood containing oils and resins that burn easily and produce large amounts of heat.

Other fuels may **look** the same but are resistant to burning, such as broom. Willow is softer wood containing a large amount of moisture that makes it difficult to burn.

Fuel moisture

Fuel moisture is the amount of water in the fuel.

Dryer fuels ignite more easily and burn quickly.

Fine fuels (small diameter)
These fuels lose moisture quickly and dry out easily and daily in warm dry conditions.

Medium fuels (greater diameter)
These take longer to be dry enough to burn than fine fuels. Drying out might take a week.

Heavy fuels
The fire has to evaporate the moisture before the fuel can burn. It will take a long drought to dry out these fuels.

How can weather affect fire behaviour?

"Weather" includes air temperature, relative humidity, wind speed and direction, and rainfall.

It can change often during a fire.

Air temperature

Fuels in direct sunlight will dry out and ignite more easily than shaded fuels. High air temperatures dry out and preheat fuels.

Relative Humidity

Moisture in the air can dampen dry fuels. Wet fuels lose moisture to dry air (sunny days). Green vegetation does not lose or gain moisture as quickly as dead fuels.

When relative humidity is low, fuels ignite and burn easily. Fires could be hotter.

Wind speed

Wind helps dry out fuels. It directly affects the rate of fire spread and fire direction.

Whirlwinds are formed when there is a difference in temperature between the burnt and unburnt area.

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

Fire normally burns quickly during mid afternoon when relative humidity is low and the temperature is higher. It usually burns more slowly during the night. Fast burning at night can happen with low relative humidity and strong wind speeds.

Fire Intensity

Topography, fuel and weather greatly affect the intensity of the fire. A fire that is burning a great amount of fuel quickly, will be much hotter than a fire burning a small amount of fuel more slowly. Knowing about potential fire intensity is important because it will tell you if you have enough resources to safely suppress the fire.

Combined Effects

A fire will react to the environment it is burning in.

When all the factors of topography, fuel and weather are known it becomes possible to predict the behaviour of a fire.

Wind shifts and steep terrain change fire behaviour more than any other cause – a change in fire direction or intensity may put the crew at risk.

A sudden increase in wind speed will rapidly increase fire intensity.

A flank fire can become a head fire with a change in wind direction.

Summary

The three main factors affecting fire behaviour are topography, fuel and weather.

Topographical factors that affect fire behaviour

Slope affects speed, direction and intensity of a fire

Aspect influences fuel dryness

Shape of terrain influences speed and direction of fire spread

Elevation influences fuel dryness

Barriers to fire spread can assist with containment of a fire

Fuel factors that affect fire behaviour

The main fuels are:

Ground Fuels are the rotted material under the ground surface

Surface Fuels are at the surface of the ground

Crown Fuels are the tops of the trees

Fuel features include:

The **size** of the fuel

The **quantity** of the fuel

What the **chemical composition** of the fuel is

How much **moisture** is in the fuel

Weather factors that affect fire behaviour

Weather variations affect fire behaviour:

Air temperature affects fuel dryness and fuel preheating

Relative Humidity affects the fuel moisture content

Wind affects rate and fire direction. It can change quickly

Rainfall affects fuel moisture content

Air temperature, humidity and wind, change between **night and day**

Knowing about potential fire behaviour and intensity is important because it will tell you if it is safe to fight the fire.

Self check

	True ✓	False ✗
1. Fuel, weather and topography influence fire behaviour	☐	☐
2. Coarse fuels ignite more readily than fine fuels	☐	☐
3. The moisture content of fuel affects fire behaviour	☐	☐
4. Dry fuels ignite easily and burn quickly	☐	☐
5. Fires usually travel faster down than up a slope	☐	☐
6. Temperature increases with elevation	☐	☐
7. On steeper slopes, the heat can be more intense	☐	☐
8. Heavy fuels are the easiest to ignite	☐	☐
9. High air temperatures dry out and pre-heat fuels	☐	☐
10. Wind shifts change fire behaviour more than other factors	☐	☐

11. What are some barriers to fire spread? _____

12. The slope will affect the _____ of the fire

13. Materials under the surface of the ground are called _____ fuels.

14. Some fuels with resins, waxes and oils in them, are more _____

SECTION THREE: Extinguishing Fires

Safely extinguishing a fire needs:

- Good leadership
- Structure
- Good communications
- Correct PPE
- LACES

Chain of Command at a rural fire

The Incident Controller has the highest level of responsibility at a fire. At a fire, you will report to your Crew Leader who may also act as the Incident Controller.

Incident Controller

The Incident Controller assesses the risks and makes decisions about the strategy. He/she asks:

• Is it safe for the fire fighters?	• How much spotting is there?
• What is the rate of spread?	• What kinds of fuel are there?
• What is the fire intensity?	• What resources do we have?

Crew Leader

The Crew Leader makes sure that tasks get done and that the crew is safe.
He/she gives safety briefings to the crew.

Firefighters

Firefighters carry out tasks given by the Crew leader. They look out for the safety and welfare of themselves and others.

As a firefighter, you must report to your Crew Leader if there is a problem on the fire ground.

WORD CHECK

Anchor point	The best place to start a fireline – where you are least likely to be flanked by fire
Chain of command	The way that orders are passed down in an organisation (e.g. in the rural fire force)
Metabolic heat	Heat in your body can increase due to hard work, hot conditions and heavy clothing

What is a safety briefing?

Safety and welfare are the first responsibilities of everyone at a fire. Crews must be briefed before going on to the fireground. Briefings may include:

- Fire suppression objectives
- Methods of communication
- Escape routes / safety zones / anchor points
- Teams which are to work together
- The tasks that will be allocated to the crew
- Reminder of safe work practices
- Known hazards

Each person must clearly understand:

- **Who** they are responsible to / for
- **What** they are responsible for
- That no one should be given a task beyond his / her ability

What Personal Protective Equipment should you wear?

All crew members need to have good clothing and equipment for their personal protection. You should not attend a fire unless you are safely clothed. Personal protective equipment, (PPE), must protect you from:

- Physical injury – scratches, abrasions and direct burns
- Exposure to radiant heat
- A build up of metabolic heat

You will need a balance in the type of protection.

Clothing for firefighting must include approved:

- Safety helmet with neck-protecting cloth
- Fire resistant coveralls
- Leather or other safety boots with woollen socks

It is recommended you wear woollen or plain cotton underclothes.

Other safety items:

Earmuffs for when you are near pumps, power equipment, heavy machinery and aircraft.

Goggles and masks for when you are in smoky, ashy and dusty conditions.

Gloves for when you are working with hand tools and mopping up.

You may need extra warm clothing (e.g. woollen coat, balaclava and gloves) when working in cooler areas (e.g. high country or overnight).

Take a drink bottle.

Wear a small back pack with extra clothing and high energy food, if you are likely to be working in remote areas for some time.

A kit bag might be useful for carrying PPE.

How can you suppress a vegetation fire?

1. Cutting off the oxygen supply will **smother** the fire. Use foam or soil.
2. Reducing the temperature will **cool** the fire. Use water at the base of the flames.
3. Removing the fuel from the path of the fire will **starve** it. Use hand tools or machinery to create a firebreak (Sometimes called "dry firefighting").

You can use a combination of all three methods.

Fire suppression can be dangerous work. You must have:

- A safe working environment
- Understanding of correct safety procedures
- Safe work practices at all times

You will need to be able to act quickly and effectively.

- Provide for safety first
- Be organized
- Stop the fire from spreading
- Make sure you have enough resources
- Work hard and act quickly to bring the fire under control

There are four stages to extinguishing a fire:

1. Knock Down

Focus on reducing fire intensity.

- Start firefighting from the base of the fire
- Work around the flanks
- Keep in the black

2. Containment

After the fire intensity is reduced, work to contain the fire within the perimeter.

3. Control

Once contained, the blacked out perimeter should be widened to reduce the risk of fire escaping.

4. Mop up/extinguish

Completely extinguish the burning area and stay there until there is no possibility of re-ignition. This may include digging out, cutting down or cutting open smouldering fuels.

Type of Attack

Depending on the type of fire, you can attack it directly or indirectly.

Direct Attack

A **direct attack** is used mainly on **low intensity** wildfires that can be easily and safely reached by firefighters.

Firefighters work from an **anchor point** on the base edge of the fire and this edge then becomes the fire line.

For further information on direct attack see resources for:

Control vegetation fires using dry fire fighting techniques US 3286*, and Suppress vegetation fires with water and with water with additives* US 3287.

Indirect Attack

An **indirect** method is to use a natural fire barrier, or to construct a fire line some distance from the fire's existing perimeter.

What are the different methods of communicating at a fire?

Make sure that you understand instructions. Ask again if you don't. If you give an instruction, make sure it is clear.

There are four main ways of communicating in a fire: face to face, radio telephone, hand signals and runners.

General Communication Guidelines

What to do:

1. Plan what to say.
2. Speak clearly.
3. Identify who you are.
4. Repeat a message if in doubt.
5. Record important messages.
6. Keep to the point.

Radio Telephone:

Sending a message	Examples
Calling	*Pump this is Nozzle Operator*
Receiving	*Nozzle Operator this is Pump*
Message	*Water off*
Acknowledge	*Water off*

Stand at least 5 metres away from a running engine (pump) when you use a portable radio telephone, so that you can hear.

Emergency Message

To clear the radio channel and gain the attention of other radio users in an emergency, call: "**EMERGENCY – EMERGENCY – EMERGENCY**"

When you get a reply you must give your **name and location** and **describe the emergency**. Stay in contact, as you may have to give more information.

If anyone else is on the radio at the same time, they must:

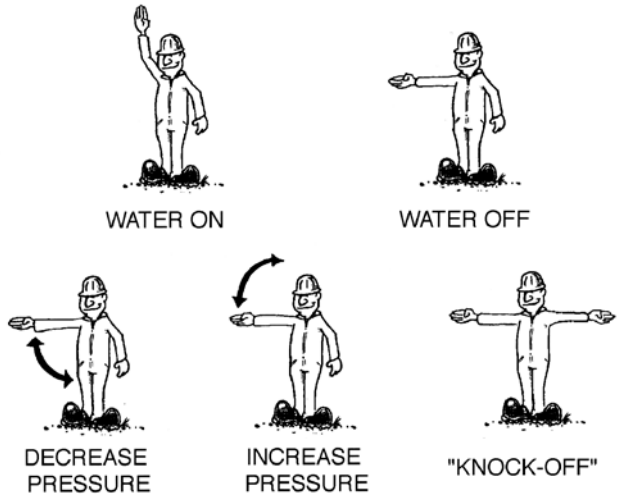
- Leave the channel free for you to send the emergency message
- Leave the channel free while you wait for a reply

Any listeners must also wait in case they are asked for assistance.

!	**Make sure you or someone else knows the area.**
	Normally familiar country can become foreign in the dark or in smoky conditions.
	Crew members can easily lose contact with each other.

Hand Signals for Hose Lines

When radio telephones are not available, use clear hand signals. They are more likely to be understood than shouted instructions.



When sending a signal

Face the person you are sending the hand signal to.

Make the signal clear

Hold the signal until you receive a reply

When receiving a signal

Face the sender and repeat the signal to show you have understood it

Runner

When hand signals and radio telephone cannot be used, send messages by runner.

A verbal message is enough for brief messages. Messages with a lot of information will need to be written down e.g. messages between the Crew Leader and the Incident Controller.

Keep contact with crew and Crew Leader.

Make sure instructions are always clear and are understood.

Summary

Chain of command	The chain of command tells you who you should report to. If there is a problem on the fire ground, you should report first to your Crew Leader.
Safety Briefings	You must be given a safety briefing before starting work on the fire.
Personal Protective Equipment	You must wear an approved safety helmet, coveralls and safety boots.
Communications	You need to know how to communicate clearly face to face, using a radio telephone, with hand signals and with runners.
Fire suppression	The stages of fire suppression are: knock down; containment; control; mop up. To put out a fire you need be safe and organised. You also need to be able to make decisions quickly and to work hard. The fire must be mopped up thoroughly, so that it doesn't re-ignite. To extinguish the fire you can either: • **Cut off the oxygen** supply to smother the fire • **Reduce the temperature** of the fuel to cool the fire • **Remove the fuel** from the path of the fire to starve the fire (dry firefighting) **Or combine all three methods**

Self check

	True ✓	False ✗
1. Report problems at the fire to your Crew Leader	☐	☐
2. Only experienced crew members attend safety briefings	☐	☐
3. If you can't do a task, tell someone	☐	☐
4. PPE stands for personal protective equipment	☐	☐
5. PPE protects you from injury and exposure to heat	☐	☐
6. You can smother, cool or starve a fire	☐	☐
7. You can cool the fire with soil	☐	☐
8. Mopping up only involves finding and extinguishing burning fuel above ground	☐	☐
9. Direct attacks work best with low intensity fires	☐	☐
10. Using a natural barrier is an indirect method of attack	☐	☐

11. Name three PPE items you should wear _____

_____

12. You can communicate face to face, by radio telephone, hand signals and

_____

13. You should k_____ d_____ a fire, c_____ it, control it, and, finally, m____ up.

SECTION FOUR: Hazards and survival

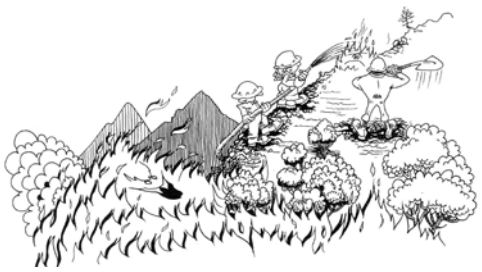
WORD CHECK

Black area	Burnt fuel area
Branch	Nozzle
Spar	Dead tree

Fire Behaviour Hazards

Topographic Hazards

- Being uphill of a fire
- Obstacles, loose ground and slips
- Rough country
- Unfamiliar area



Fuel Hazards

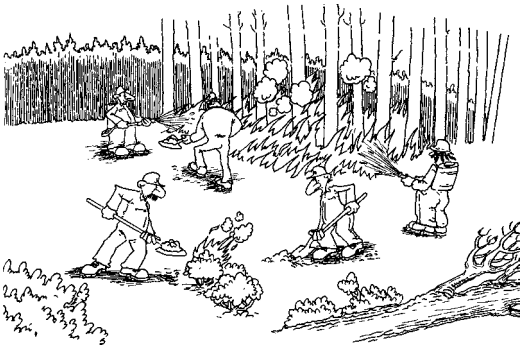
- Unburnt vegetation
- Fire spreading across fine fuels more quickly than you can escape
- A spar is unstable and can break and fall. Stay two tree lengths away
- Spot fires

Weather Hazards

- Change of wind speed or direction
- Being downwind of a fire
- Weather hotter and drier after midday.

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

How should you deal with fire behaviour hazards?



Spot fires

- Spot fires are part of extreme fire behaviour
- Convection currents can cause spot fires
- Try to detect spot fires early and let your crew leader know

Flare-ups

Wind gusts can suddenly increase fire intensity and flame length, especially in light fuels. Burning overhead fuels during wind gusts can cause burning material to drop.

A fire may burn the surface fuels but leave the overhead fuels unburnt.

An increase in wind and temperature may lift a surface fire into the unburnt overhead fuels. Flare-ups can occur during mop-up stages when crews relax their guard.

	Do not work in unburnt fuels when fighting a fire.
	Keep one foot in the black.

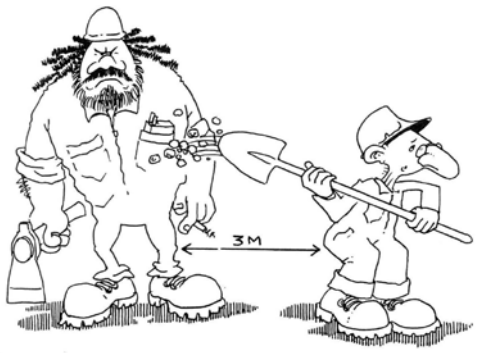
Operational Hazards – Tool and equipment

WORD CHECK

Concentrates	A foam or retardant in its strongest form
Foams	Makes water more effective
Retardants	Used as a chemical fire break

Hand tools

Sharp tools will reduce muscle strain. Take care, they can cut you and others.



Check that handles are not loose and that they have no splinters. Carry tools at waist height with the working edge facing forward.

You should walk up the line in single file to avoid injury to others.

Stay at least **THREE** metres apart when using hand tools.

Stay two tree lengths away from a chainsaw operator during felling operations.

You must be properly trained before using motorised tools.

Retardants

Liquid fire retardant is sprayed onto vegetation to form a chemical fire break. Try not to let your skin come in contact with retardant concentrate. Use rubber gloves, goggles, and wet weather gear when mixing. If you are mixing powdered concentrate wear a dust mask and goggles.

Most retardants contain a vegetable dye that will leave stains on your skin and clothing. Wash splashes off with water. Some people may have skin that is sensitive to some retardants. If you have skin irritation see a doctor.

Foams

Foams are a basically a detergent that makes water more effective. Wash any splashes of concentrate off with water.

Watch your footing! Foam and retardants will make hard ground and logs very slippery.

Hose Lines

If you are a nozzle operator, you may get to the fire edge before water is available at the nozzle. This might put you at risk.

Keep away from flames until you have water.

Retreat from the flames if the water goes off without warning.

Powerful jets of water can throw a nozzle operator off balance on slippery or steep ground. A jet of water may splash water and ash into your eyes.

Machinery hazards

Watch out and keep a safe distance (minimum 2 tree lengths) between yourself and a working machine. Don't work downhill of machinery. Try to maintain eye contact with the machine operator.

It is difficult for a machine operator to see people on the ground through vegetation, dust and/or smoke.

Watch out for falling trees or previously felled trees, which may be shifted around by heavy earth moving machinery.

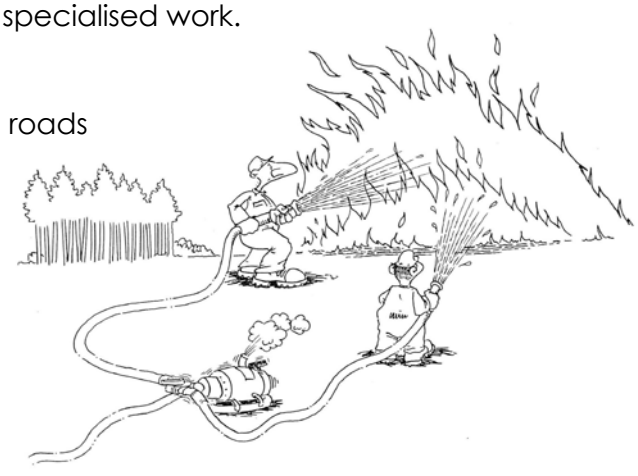
Discs and ploughs often extend beyond the width of the tractor and may hit anyone standing close to the path of the tractor.

Using heavy machinery

Constructing fire lines with machinery is specialised work. Heavy machinery can be used to:

- Open up roads or make new access roads
- Make fire lines

When Crew Leaders follow a machine to mop-up, they can be responsible for the safety of the machine operator as well as their crews.



Heavy machinery used in fires includes:

- Tractors (bulldozers)
- Skidders
- Graders
- Excavators (any machine that can move soil and vegetation)

If the crew and machine are cut off from the escape route, move into the burnt over area.

If that is not possible, move the machine to an area of least fuels.

Clear an area to soil, then push a mound of soil towards the fire – the crew should take cover behind the mound or machine.

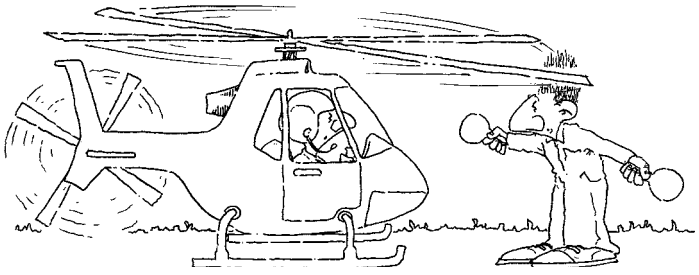
Aircraft Hazards

Helicopters are used in fire fighting to:

- Transport fire fighters and equipment
- Survey the fire scene
- Carry and drop off water

The main use of helicopters is that they can drop water to knock down surface flame so that ground crews can get in to extinguish the fire.

- Working around helicopters is potentially dangerous



- Rotor blades, the tail rotor and engine exhaust are all hazardous
- Helicopters are unstable while hovering.

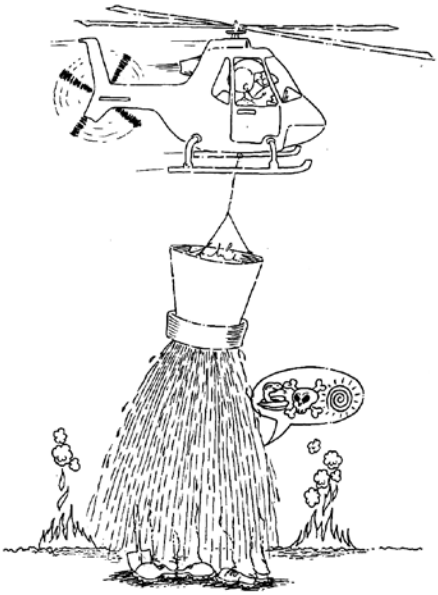
Firefighters transported by helicopter will need further training, see Learners' Resources for *Work Safely with Aircraft*.

Fixed Wing Aircraft

Some agricultural aircraft have been modified to be used for water dropping. They can release water through the tree canopies.

Stay clear of firebombing drop zones. If caught in a firebombing drop zone:

- Place your hand tools well clear of you
- Protect your head with your hard hat or arms
- Lie face down with your head facing the coming aircraft
- Watch your footing
- Watch out for falling branches and debris



How can you and others survive when things go wrong?

All decisions you make in fighting a fire will depend on:

- Having an escape route
- Planning an escape route

Anchor point

Always start with an anchor point. This may be a fire break, road, river, or the base of the burnt area. This safe area is then continually extended along the flanks of the fire. It will provide an escape route back to the anchor point at all times.

In case the fire does something you didn't expect, your crew should have an alternative escape route planned.

Safety zone

You also need somewhere else to go to, in case it is too dangerous to just go back to the anchor point. A burnt out area could provide an alternative.

Survival in vehicles

DO NOT drive a vehicle through heavy smoke. Flying embers may enter parked vehicles through open windows. Dust and smoke can affect your ability to see ahead. If you can't see through it, you could crash or drive off the road into a greater danger.

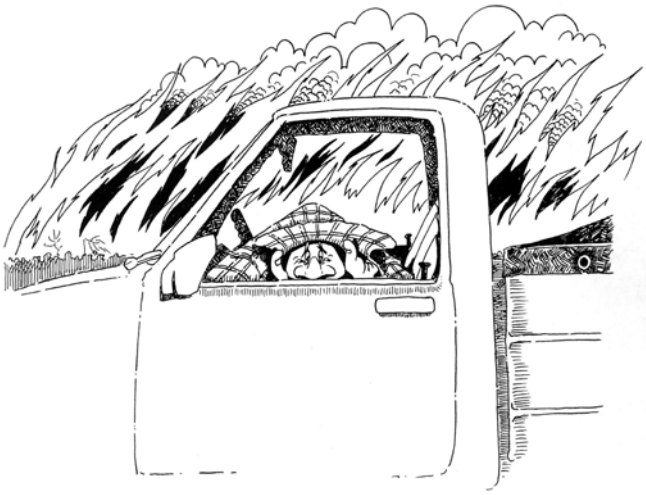
In most circumstances, the vehicle bodywork will protect you from flames and radiant heat. So if your escape is cut off by the fire, stay in

the vehicle and:

- Park on the side of the road opposite the fire or in the middle of a clear area
- Close all doors, windows and vents to prevent smoke getting in
- Switch on hazard warning lights/head lights
- Keep below window level and stay covered to protect yourself from the heat that will be transmitted through the glass

If the conditions are safe to drive:

- Use only experienced drivers
- Drive carefully
- Use headlights at all times
- Park where fire spread will not threaten the vehicle
- Park facing the way out
- Shut windows
- Park to the side of road so other vehicles can pass
- Leave keys in ignition



Under a vehicle burn-over situation the conditions in the cab may be as bad as outside. Stay in the cab for longer than is comfortable, to make sure that the conditions outside have improved.

Even in high intensity fires the chances of survival are greater in a vehicle than out in the open.

Modern vehicles are fitted out with synthetic materials that may melt or emit toxic fumes when very hot.

Survival in Buildings

A building that can be closed up – a house or fully enclosed shed – offers the best shelter from radiant heat in a vegetation fire. Even though the building may eventually burn down, it will provide protection for you while the main intensity of the fire passes. If you

have time, make the building as safe as possible:

- Close all windows, doors and openings to prevent embers blowing in
- Have ready any garden hoses, buckets, wet towels for gap filling
- Check the water supply
- Take in a hose and fittings if you know that the fitting attached to the end of the hose can be coupled to an internal tap
- If the building should catch fire and the main fire has passed, wrap yourself in a woollen blanket and leave

Stay outside for as long as possible extinguishing any small outbreaks of fire. When no longer able to stay outside, go into the building and watch for signs of fire starting inside. Look out for roof spaces.

Take shelter on the side of the building away from windows and the approaching fire. Keep low. When the fire passes check for fires on the building.

Survival in the Open

Survival in the open is not easy. If you are suddenly threatened by fire:

- Stay calm
- Assess your options
- Act quickly

In a panic a safe refuge may be easily overlooked.

Don't worry about leaving equipment behind. Lives are more important. Make sure all members of the crew know that the crew is pulling out and move out together – appoint a "tail end Charlie."

- Walk at a steady pace and keep watching for further dangers
- Count and name everybody when you are at the anchor point / safety zone

If the fire has blocked the escape route you and the crew may need to:

DIG IN and wait for the danger to pass over.

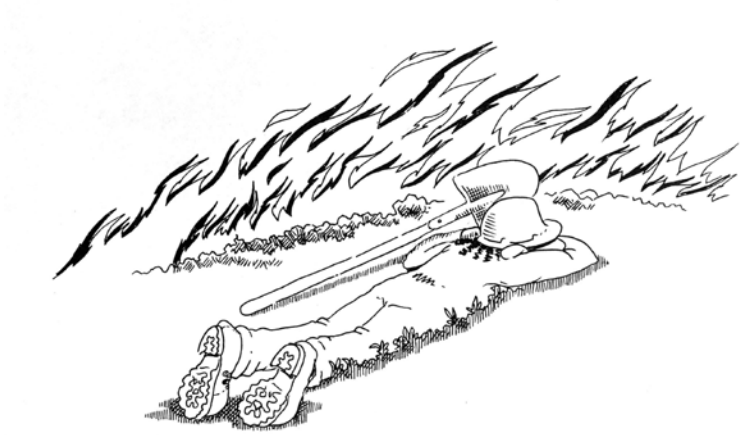
- Choose an area with little or no vegetation
- Shelter behind a rock outcrop, in a ditch or behind a fallen tree

- If you have enough time, use hand tools to clear an area of vegetation
- Dig shallow trenches surrounded by cleared ground
- Lie face down and shield your body as much as possible from the heat
- If you have water, cover the surrounding vegetation on full spray

Air temperature, heat and smoke 1–2 metres above the ground will be at least 4 times worse than that at the dig in. The chances of survival will be halved by standing up and exposing your body to the above ground conditions.

Stay where you are until conditions ease.

Staying put may seem the wrong choice. You are safer to stay put.



Don't wet the crew! In a high intensity fire, this may give them steam burns.

• DO NOT run through flames unless you can clearly see the ground beyond.

• DO NOT run uphill or down wind away from the fire

• DO NOT run into unburnt vegetation

- **DO NOT burn an area to make a safe refuge**

Follow the instructions of your crew leader

Other hazards

Treat power lines as live at all times. Avoid work under power lines. Fallen power lines can still be live. Heavy smoke or water can conduct electricity.

When you are applying water to a fire, remember that overhead power lines can be hidden by trees or darkness.

Know your local hazards – these may include mine shafts, thermal ground, underground collapse.

LACES:

Lookouts – **A**nchor points/**A**wareness – **C**ommunication – **E**scape routes – **S**afety zones

Your Rural Fire Authority will have issued you with pink LACES cards. They will tell you, on one side, the most common dangerous situations you should watch out for. On the other side it lists the 10 standard fire fighting orders. Read and remember these points. **They may save your life**.

The 'Pink Card'

Summary

Topography, fuel and weather hazards

Avoid being uphill of a fire

Watch out for obstacles that can block an escape route

Keep the main fire in sight or be in communication with someone who can see it

Get a map – insist on a thorough briefing – seek local advice

Establish an escape route and maintain a lookout

It may be better to take an alternative route – or cut a hand line through

Get advice on local weather influences from local people

Watch out for possible flare ups and check escape route

Wind shifts change fire behaviour more than any other cause

Withdrawing crews and reassessment of actions may be a safer option

General

Sacrifice property rather than risk lives

Making a stand in front of a head fire is an extremely dangerous situation and should never be attempted

Spot fires may create an entrapment situation

Avoid working near a fire in unburnt fuels
Don't work in isolation
Keep in contact with crew members and crew leader
Get clarification when instructions are unclear
Make sure people know when you are taking a rest break
Take regular breaks, food and water to avoid fatigue and heat illness
Rotate jobs
Obey road laws – use headlights – proceed cautiously
Treat Power lines as live at all times
Stay at least THREE metres apart when using hand tools
Stay two tree lengths away from a chainsaw operator during felling operations
Commence firefighting at an anchor point and progress along the flanks
Wash splashes off immediately with water. Get medical help if your skin feels irritated
Nozzle/branch operators should keep away from flames until they have water on
Nozzle/branch operators should retreat from the flames if the water goes off without warning
Keep a safe distance (minimum 2 tree lengths) between the crew and a working machine
Watch out when working near heavy machines
Don't work directly down hill of machinery
If you are caught in the fire, take shelter in, a cleared area, vehicles or buildings until it passes

Self check

	True ✓	False ✗
1. Start fighting a fire from the base	☐	☐
2. Treat power lines as live at all times	☐	☐
3. Stay 3 meters apart when using hand tools	☐	☐
4. Use your vehicle to get through heavy smoke	☐	☐
5. Open all windows if you are sheltering in a building	☐	☐
6. If you have to dig in, find an area with little or no vegetation	☐	☐
7. Spot fires indicate safe conditions for firefighters	☐	☐

8. Describe a hazardous situation _____

_____

_____

_____

_____

9. How far away should crews stay from machinery or tree felling?

_____

10. What should you do when a flank fire turns into a head fire?

_____

_____

_____

14. What does L.A.C.E.S. stand for?_____

_____

SECTION FIVE: Protecting yourself and others

When fighting fires you are at risk from heat, smoke and stress.

You are ultimately responsible for your personal safety.

You are also responsible for the safety and health of others on the fireground.

You can reduce risk to your and others' safety if you look after your equipment and use it safely.

But you also have to look after yourself, to make sure that you are in the best possible condition for fighting a fire. If you:

- Are physically fit for the task
- Are properly trained
- Have an understanding of fire behaviour
- Have a positive attitude
- Follow the safety precautions

….you will be less likely to be caught in a dangerous situation

If you have a medical condition or disability, you may become a liability to yourself and others.

Tell your Crew Leader if you have any medical condition that could affect your performance. Tell your crew leader if you are taking medication.

WORD CHECK

Radiant heat	Heat from the fire
Hydration	When your body gets enough water
Dehydration	When your body doesn't get the water it needs

How does exposure to radiant heat affect you?

As flame length increases, so does radiant heat.

Even during normal firefighting activities, exposure to radiant heat can be hazardous.

Personal protective equipment (PPE) is designed to offer you some protection against radiant heat.

What can you do?

You should only attack the fire using hand tools when flame lengths are 1 metre or less.

You should only attack using hose lines when flame lengths are 2 metres or less.

In cases of sudden flare-ups, you need to move further away from the flame to a more comfortable distance. In an emergency you can use water spray to shield the crew from radiant heat while retreating to a safer distance.

As radiant heat only travels in straight lines from its source, try to get behind a solid object – it will shield you from the radiant heat. Keep as low as possible, lie face down and cover up all exposed skin until the flare-up subsides.

How does exposure to smoke and dust affect you?

Smoke and dust will irritate your eyes and lungs at fires. As well as restricting visibility, heavy smoke contains carbon monoxide (CO) – a poisonous gas, and may contain toxic gases from other burning material (e.g. rubbish, tyres, chemicals)

Prolonged exposure to heavy smoke can be hazardous to your health. It can:

- Reduce your performance on the fireground
- Bring on fatigue more quickly
- Bring on illness
- Alter your perception and judgment

In severe cases, exposure may result in breathing difficulties, injury or death.

What can you do?

Avoid working in smoke unnecessarily, especially for long periods.

Use approved Personal Protective Equipment (PPE) (e.g masks and goggles) when required, especially during mop up.

Be aware that fresh air pockets may be found near the ground.

In situations where there is heavy smoke, move to a safer area.

How does metabolic heat affect you?

Metabolic heat (body heat), is when:

- You are working your muscles hard
- You are absorbing heat from the environment
- The air temperature is high
- You are wearing clothing that has no ventilation

What can you do?

Wear PPE that allows metabolic heat to escape.

How does fatigue affect you?

You get over tired (fatigued) simply because of how stressful and demanding the job is.

If you are exposed to radiant heat and smoke for a long time, it will be stressful, and that is likely to lead to fatigue.

What can you do?

Take regular rest breaks, with food and drinks of water. This will give you time to cool off, to replace lost body fluids, and to replace energy.

Rest breaks should be suited to the least fit person in the crew.

They should be taken in a safe area such as a constructed fire line or natural firebreak, where the fire can be seen. If possible taken in the shade and where there is a breeze.

Use the rest break to loosen clothing. This will help you to cool down. Eat small amounts of protein foods, for energy.

How can burns affect you?

Burns vary in depth, size and severity. They may damage the underlying tissues as well as the skin.

Burns can result from direct contact with the flame, or from exposure to radiant heat. The immediate dangers are when the burn continues burning the skin and tissues, and shock.

What can you do?

Firstly, you must wear approved Personal Protective Equipment (PPE).

If you are burned, cool the burn immediately with water for at least 10 minutes and get medical help.

If you are badly burned, another member of the crew will have to cool the burned area immediately and watch out for signs of shock.

How does sunburn and windburn affect you?

Prolonged exposure to sun and wind can lead to burns. You can easily be burnt even when the sky is overcast.

What can you do?

When you are working outdoors during the day, cover bare skin with sunscreen. Repeat every 2 hours. Make sure that it is water-resistant, and has a sun protection factor (SPF) of at least 30+.

How does lack of food affect you?

Carbohydrates such as bread, pasta and potatoes help maintain energy.

You need carbohydrates and protein for energy and strength to fight prolonged fires.

What can you do?

Make sure you have plenty of carbohydrate rich meals and protein rich snacks. Eat regularly.

For a short term top up of energy reserves – use protein or snack bars.

How does dehydration affect you?

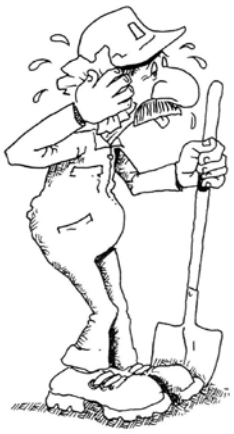
The body's cooling system involves perspiring (sweating). You will get dehydrated if you lose a lot of fluid through sweating, and don't drink water. Muscle cramps are an early sign of dehydration.

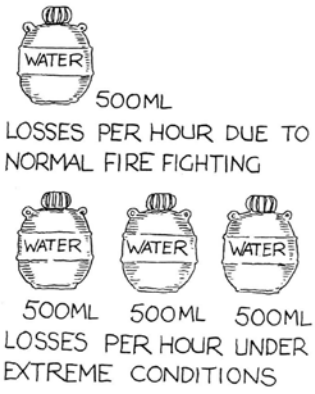
Some people dehydrate quickly, and others more slowly – each person has a different ability to regulate heat.

You may begin to suffer the effects of dehydration before you realise it. Even before you get thirsty.

What can you do?

Drink to **prevent** thirst – always drink more water than you need. On days of extreme fire danger, drink more water in case you get called out.





On the fireground you need to replace fluids **frequently**.

There's a time lag between the onset of dehydration and feeling the need for water.

When you are **perspiring** – this as an indication that your body needs appropriate fluids.

You may need up to **150–200 ml every 15 minutes** (depending on your metabolism).

If you are using hand tools you may need to increase this to **300 ml every 15 minutes**. Water is best.

Avoid:

- Milky or fat-containing drinks
- Alcohol (never use during or before fighting a fire)
- Chilled and electrolyte drinks

— They can quickly quench your thirst, but may not have enough fluid for re-hydration

— They can cause stomach cramps

Dilute energy drinks 4:1 to ensure adequate re-hydration.

There may not be good drinking water in or near the fire ground. Always carry containers of fresh water, especially when assisting outside your local area.

Never drink water from vehicle tanks or knapsacks – it may be contaminated.

Noise

When working in a noisy environment you **must** wear the appropriate grade of earmuffs.

Heat illness

WORD CHECK

Evaporation	When something turns from liquid to vapour in the air (e.g. sweat)
Hypothermia	Having a dangerously low body temperature
Respiration	Breathing

Heat illness has three stages – **heat stress**, **heat exhaustion** and **heat stroke**.

They affect not only your physical welfare, but also your judgment and ability to do the job.

Watch for signs of heat stress in yourself and other crew members. Cool yourself or the affected person immediately.

Stage One: Heat stress

A person suffering from heat stress will have these warning signs:

• Flushed face	• Tiredness
• Sweating	• Dizziness
• Weakness	• Nausea

If heat stress is recognised early enough and the right action is taken, the person will recover quickly.

If you get heat stress and don't treat it, your performance as a firefighter will be lowered.

Your body controls its temperature by blood circulation and sweating.

Your heart rate increases and pumps the blood near to your skin (your face may become flushed) and your body sweats. The sweat evaporates, drawing heat from your body – evaporation requires heat – so your body is cooled.

Heat stress will affect some people more than others, as we all have a different ability to manage it. If you are physically fit you will probably cope better with heat stress.

You need to watch for warning signs of heat stress. Loosen clothing, cool with water, fan the person to increase evaporation cooling.

If you miss the warning signs, you may move in to a state of heat exhaustion.

Stage Two: Heat exhaustion

When your brain recognises that the body is overheating, it slows down body functions and the symptoms change. A person suffering from heat exhaustion will now have:

• Weak pulse (blood pressure is lowered)	• Clammy skin (sweating)
• Shallow breathing (breathing rate increases)	• Pale face (result of lowered blood pressure
• Slow reactions	

If a crew member has these symptoms, he or she is unwell and must be removed from the fireground to rest and recover, and get medical attention. Loosen his or her clothing, cool with water, fan the person to increase evaporation cooling.

Stage Three: Heat stroke

This is when your regulatory system can no longer cope with the over-heating body. Your brain has become affected and stops telling the body to cool down.

URGENT MEDICAL ATTENTION IS ESSENTIAL!!!!

Symptoms are:

- Rapid and strong pulse (increased heart rate)
- Hot, dry skin (dehydration – no sweating)
- High temperature (body heat not controlled)
- Flushed face (increased circulation and temperature)

- Headaches and dizziness
- The person is likely to be irritable, confused, disinterested
- The person may lose consciousness

If someone has these symptoms, you must cool the body immediately.

Loosen his or her clothing, cool with water, and fan to increase evaporation cooling.

Do not move the person out before medical treatment has been started.

Hypothermia

Hypothermia occurs when your body temperature falls below 35° Celsius. Normal body temperature is about 37°. This drop in body temperature is usually caused by exposure to cold, when you are not wearing the type of clothing needed to prevent loss of body heat. This can happen:

- At night
- In cold wind
- At high altitudes
- Working under helicopters filling monsoon buckets
- Being wet through in a cool environment

The effects of hypothermia will be different for different people. Mild symptoms are shivering, cold or numb hands and feet. You can lose consciousness when:

• Shivering slows or stops	• You become irrational and clumsy
• Your skin is cold to touch	• Your speech is slurred
• Your pulse and breathing slow down	

Treatment for hypothermia:

If you are helping someone else, gradually:

- Remove the person to a warm dry shelter out of the wind

- Provide warm/dry clothes
- Keep a watch on the condition of person
- Get medical help

First Aid Awareness

First aid is treating an injury or sudden illness using what you have available, until qualified medical aid is able to take over. First aid treatment is given to:

- Preserve life
- Prevent the condition worsening
- Promote recovery

You will need first aid skills and training, to the level of a current certificate from a recognised first aid authority (e.g. St. John's). Your responsibilities as a first aider are to:

- Assess the situation
- Identify the cause of the suffering
- Give immediate first aid treatment

Arrange for further medical attention if necessary.

Get medical help for all injuries at fires. Remove unwell firefighters from the fireground.

Inform fire management of where firefighters are injured or become ill at fires.

Summary

Hazards

Most accidents can be avoided – take protective measures.

Crew members must be physically capable and properly trained for the job.

People overcome by fire will be under a lot of stress – they may act irrationally and expose themselves to excessive heat.

Heavy smoke / dust may cause you breathing difficulties, injury or death. Move away.

A build up of body heat can lead to heat stress.

Take preventative action

Take regular breaks, food and compulsory drinks of water are vital to maintain crew health.

Wear approved PPE.

Immediately cool all burns with water for a minimum of 10 minutes and get medical attention.

Where appropriate apply sunscreen liberally to any exposed skin every 2 hours.

For a short term top up of energy reserves, use protein or snack bars.

Always keep a lookout for the unexpected hazard while in the fire area.

Take regular rest breaks as an important part of fire attack strategies.

Wear earmuffs when you are in a noisy environment.

Heat stress and dehydration

Drink water. Dilute energy drinks 4:1 to help re-hydration.

Watch for signs of **heat stress** and treat early on the fireground.

Cool a person affected by heat stress immediately.

Warning

DO NOT run through flames unless you can clearly see the ground beyond.

DO NOT run uphill or down wind away from the fire.

DO NOT run into unburnt vegetation.

Modern vehicles are fitted with synthetic materials (e.g. nylon) that may melt and / or give out toxic fumes in the heat.

Make sure you have an escape route at all times, and make sure everyone knows what it is.

Get treatment for:

• Burns	• Heat stroke
• Bleeding	• Hypothermia
• Foreign bodies in the eye	• Smoke inhalation
• Fractures	• Soft tissue injuries
• Heat exhaustion	

Read and remember your LACES:

Lookouts

Anchor points/**A**wareness

Communication

Escape routes

Safety zones

Self check

	True ✓	False ✗
1. Fatigue affects your performance	☐	☐
2. If you are fit you are less likely to get overheated from working hard	☐	☐
3. Solid objects can shield you from radiant heat	☐	☐
4. Avoid pockets of air near the ground	☐	☐
5. An anchor point is the best place to start a fire line	☐	☐
6. Nausea is a sign of heat stress	☐	☐
7. Shallow breathing is a sign of heat exhaustion	☐	☐
8. Do not cool someone suffering from heat stroke	☐	☐

9. If a fire turns on you, which way do you go to get out?

_____

_____

10. If caught by a fire does the crew split up or stay together?

_____

_____

11. If trapped, where should you try to find shelter? _____

_____

12. What do you do if you get sprayed with retardant?_____

_____

13. How does smoke and dust affect you?_____

_____

_____

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