Bushfire

Badja Forest Road Fire from Bermagui looking towards Verona - Cobargo

7.30am New Years Eve 2019

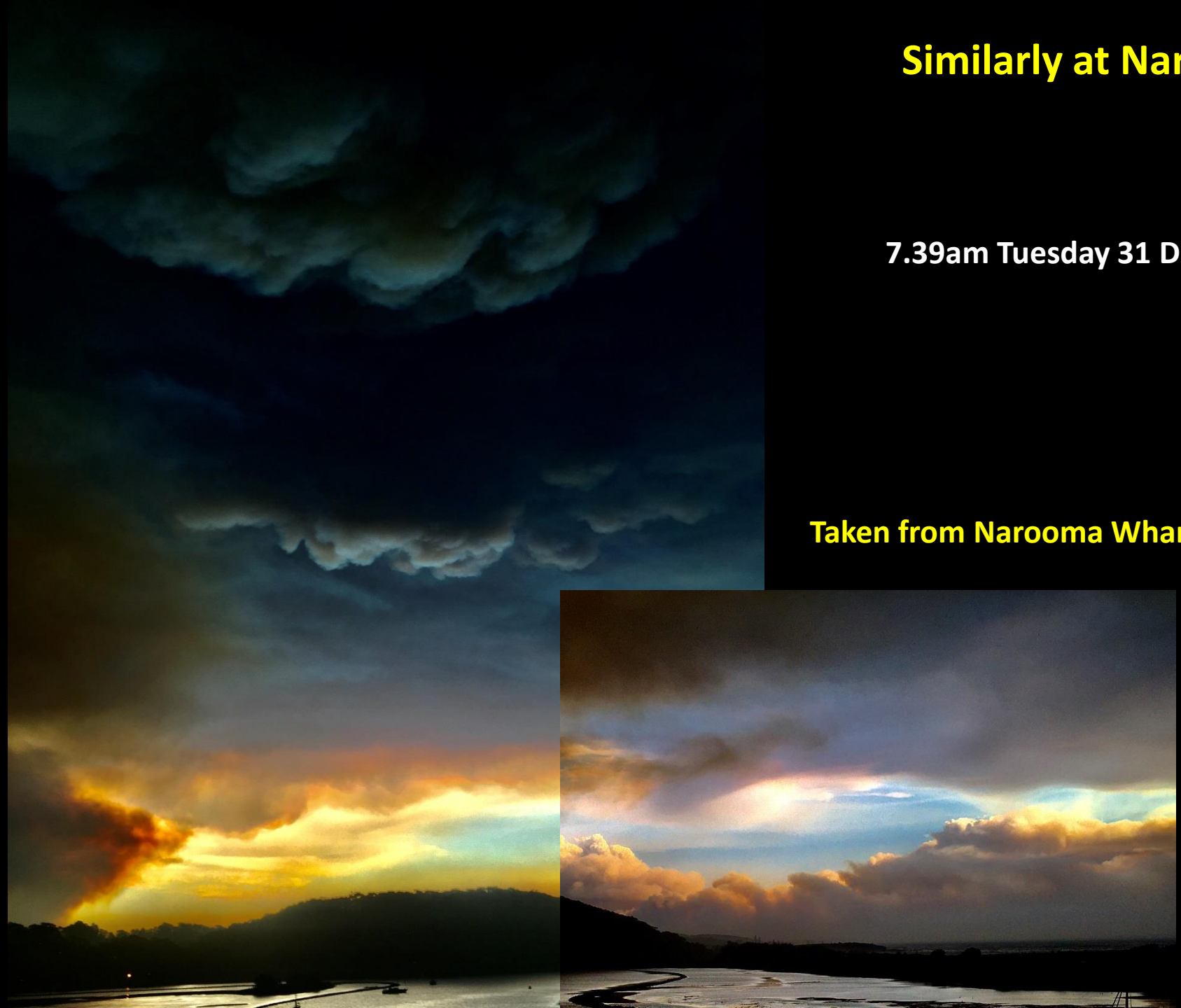
The Guardian

Similarly at Narooma

7.39am Tuesday 31 December

Cobargo Fire plume

Taken from Narooma Wharf looking north



Mogo Fire Plume

Belowra Fire plume

Photos Preston Cope

My fire management background

Bachelor of Science (Forestry)

Degree subjects included physics, chemistry, botany and bushfire science

Career in forestry, national park and heritage management in NSW, SA, Tas and the Commonwealth

Served on – NSW Bushfire Council Co-ordinating Committee
SA Bushfire Prevention Council
ACT Bushfire Council (twice, with a 15 year gap)

Experience in all levels of fire control and fire protection management from basic crew to wildfire controller


Coolagolite Fire from
Bermagui looking towards
Cobargo

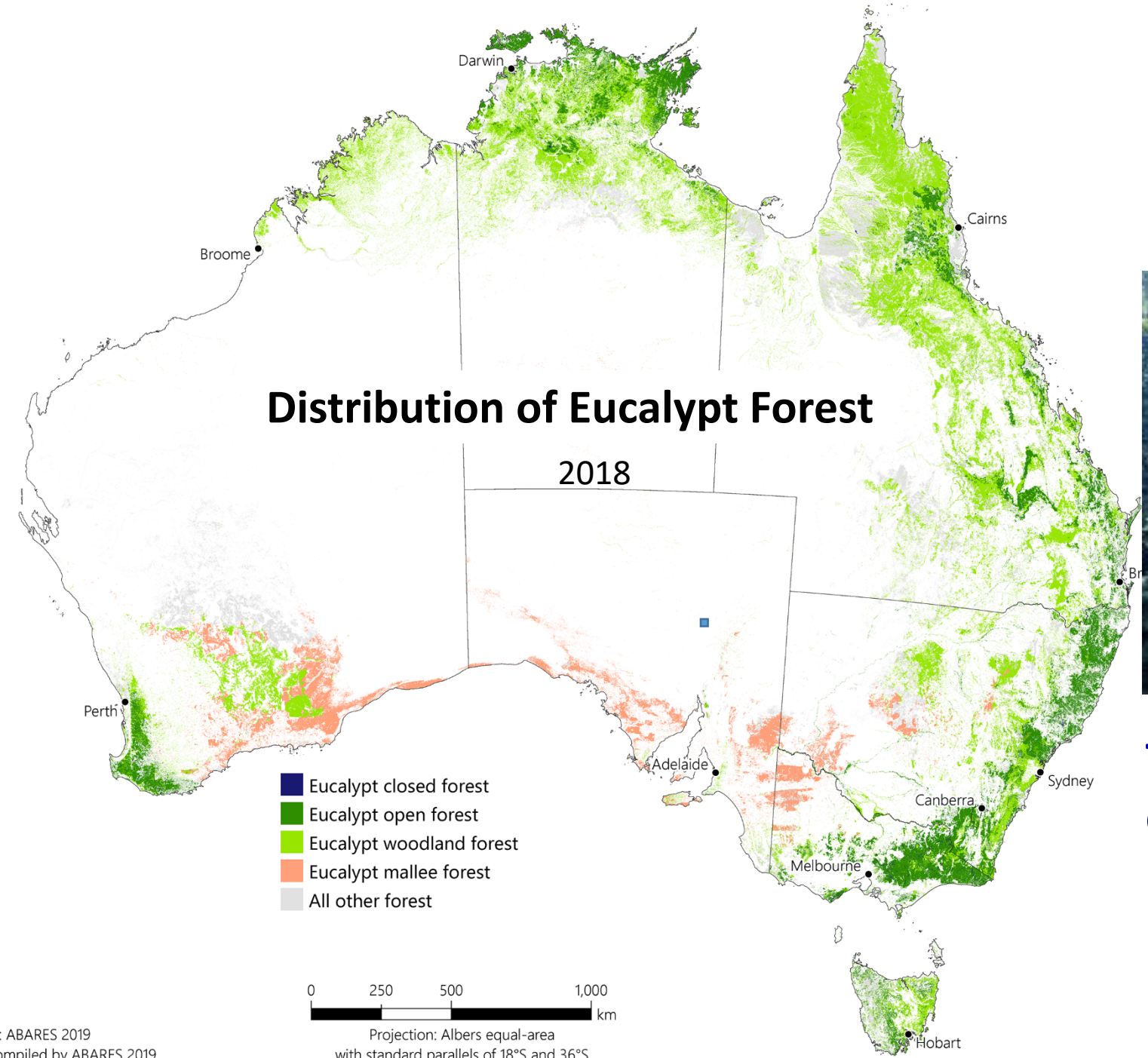
October 3 2023

Cuttagee

October 3 2023


The Australian forested landscape is highly adapted to bushfires
Wherever there are eucalypt forests, a high intensity wildfire put them there

South Eastern Australia started to dry out drastically 290,000 years ago. Rainforests were replaced by eucalypt forests and grasslands. By 128,000 years ago heavy deposits of charcoal appeared in the fossil record. The charcoal level increased with the arrival of humans in the region 46,000 years ago and further expanded as human occupation intensified after the end of the most recent glacial period some 8000 years ago (warmer and wetter).



Putting it another way, this a map of historic high intensity forest fire.

The age of a eucalypt forest is the date of the last high intensity fire.

Gondwanan battleground – Eucalypts vs rainforest

Eucalypts evolved to foster high intensity fire to win the battle with Gondwanan rainforests.

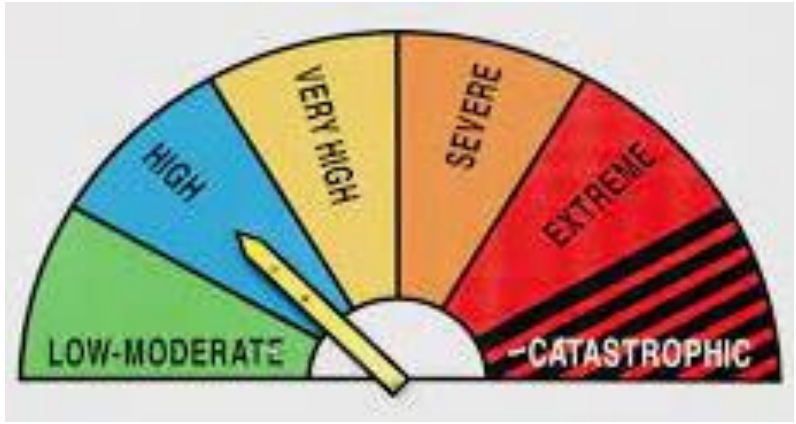
They produce highly combustible fuel and chemical strategies to make the site more fire prone – supressing litter breakdown in favour of fuel accumulation. Eucalypt reproduction flourishes following fire.

As Australia dried out in the Ice Age, eucalypts won the battle. Their incendiary legacy bedevilling us today.

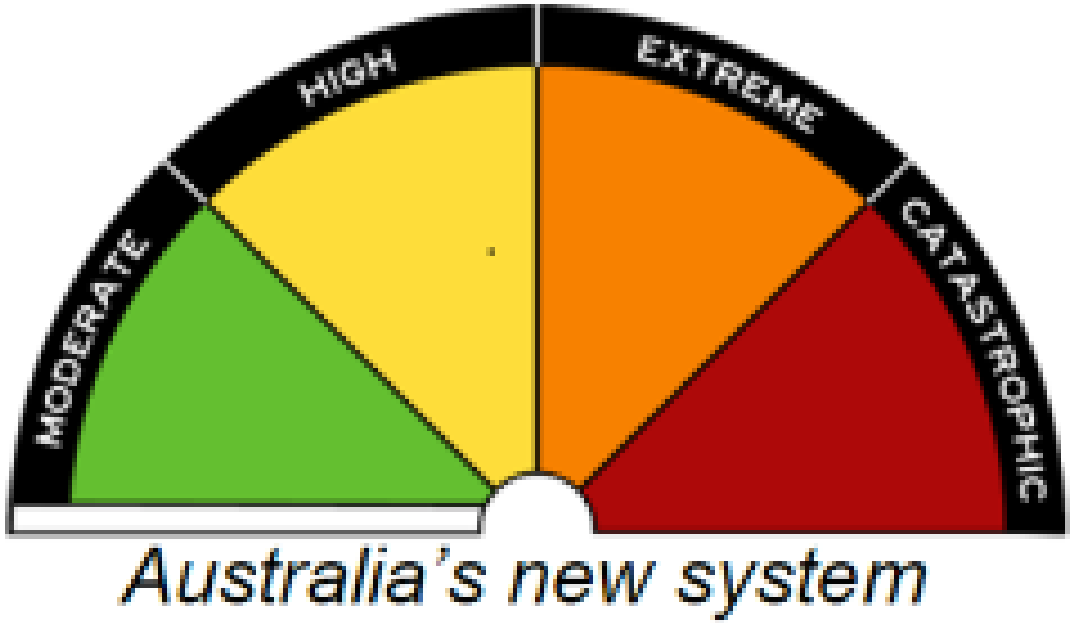
Mountain Ash (*E regnans*) forest being invaded by rainforest (Tas)

The Ash trees are several hundred years old – no young eucalypts in the stand. Waiting for a high intensity wildfire to remove the rainforest and regenerate.

Fire Danger Rating System



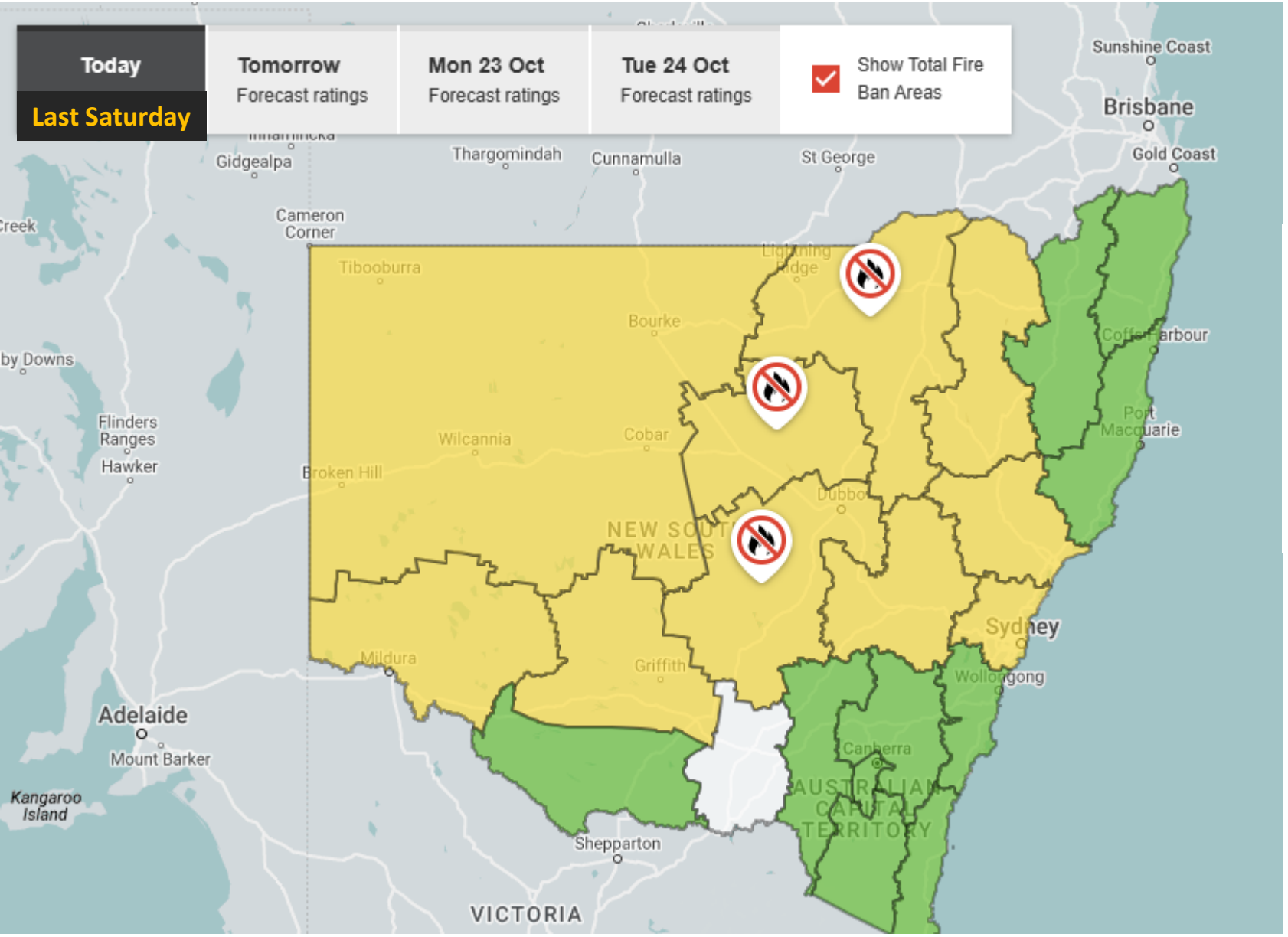
Old system



Australia's new system

- **Moderate: Plan and prepare**
- **High: Prepare to act**
- **Extreme: Take action now to protect your life and property**
- **Catastrophic: For your survival, leave bush fire risk areas**

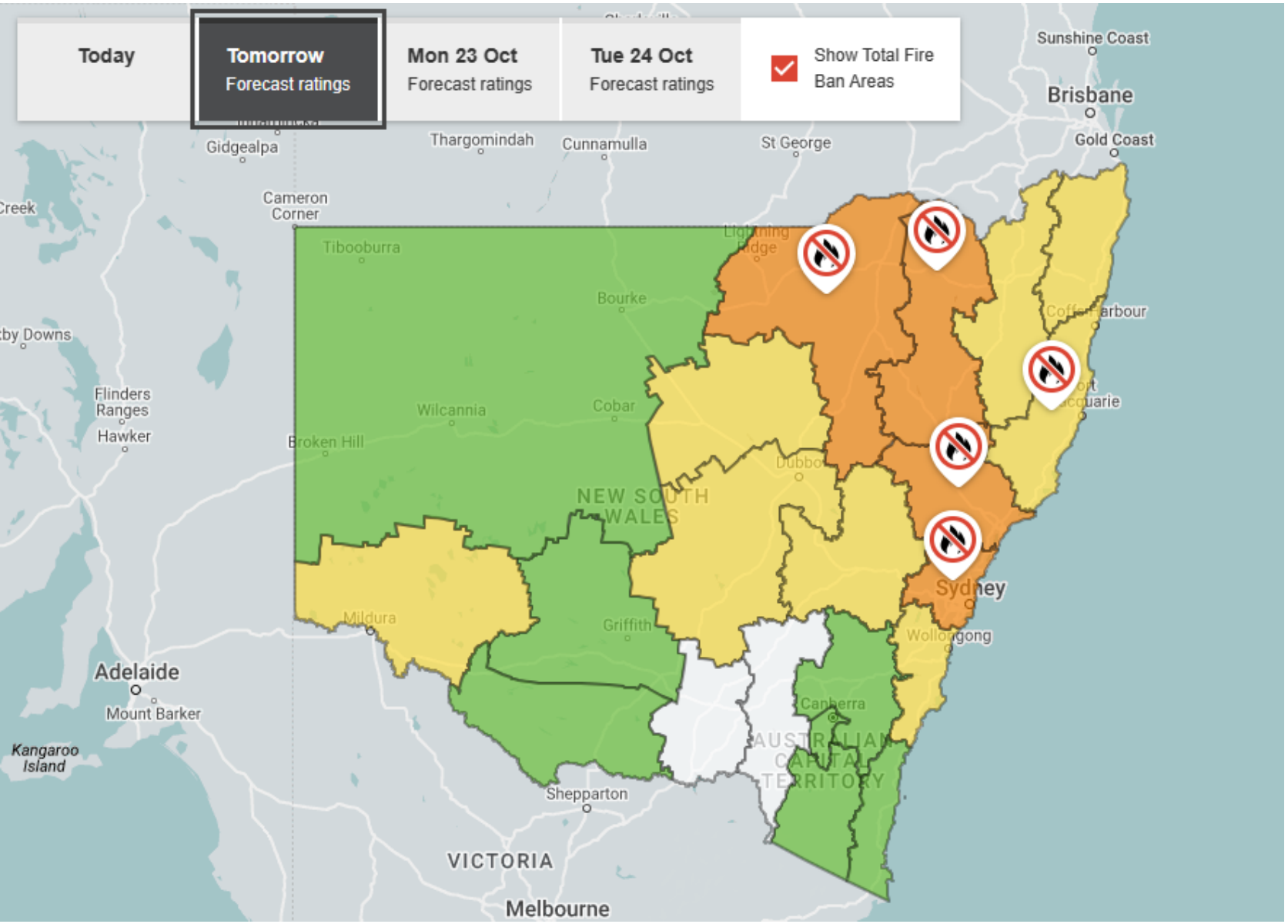
Fire Danger Ratings - A very useful addition to the RFS website



Key to Fire Danger Ratings

NO RATING	No rating issued
MODERATE	Plan and prepare
HIGH	Be ready to act
EXTREME	Take action now to protect your life and property
CATASTROPHIC	For your survival, leave bush fire risk areas

Total Fire Ban – There is total fire ban in place



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Bushfire threat broken down into its component parts:

I shall focus on key ones

1. Pyrolysis of wood
2. Fuel
3. Radiant Heat
4. Wind
5. Temperature
6. Relative Humidity
7. Fuel Moisture
8. Slope
9. Aspect
10. Convection column
11. Noise
12. Lightning
13. Season

The pyrolysis of wood

1 At 200°C heat decomposes the chemical structure of the wood, releasing flammable gases.

2 The flammable gases chemically react with oxygen. This reaction generates more heat which drives more reactions, cascading into a chain reaction soon reaching ignition temperature (which for eucalypts is 286°C).

The temperature of the burning flame is 1270°C

The reaction by-products are carbon dioxide, water and carbon (charcoal).

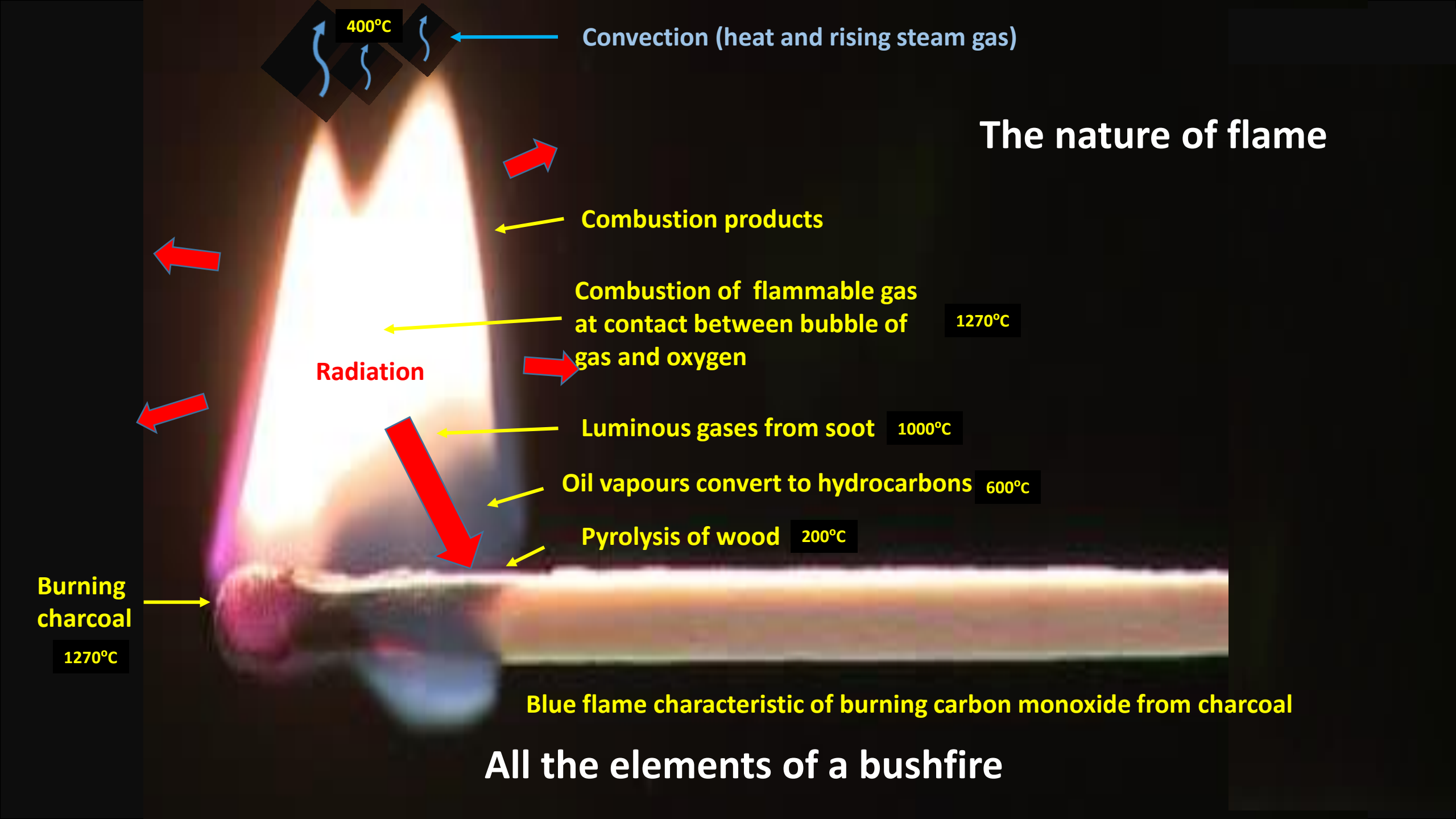
3 The carbon glows steadily as a further reaction.

Charcoal at a glowing red heat reacts with oxygen to form carbon monoxide which burns with a blue flame (at 1270°C) to form carbon dioxide (plus water ands heat).

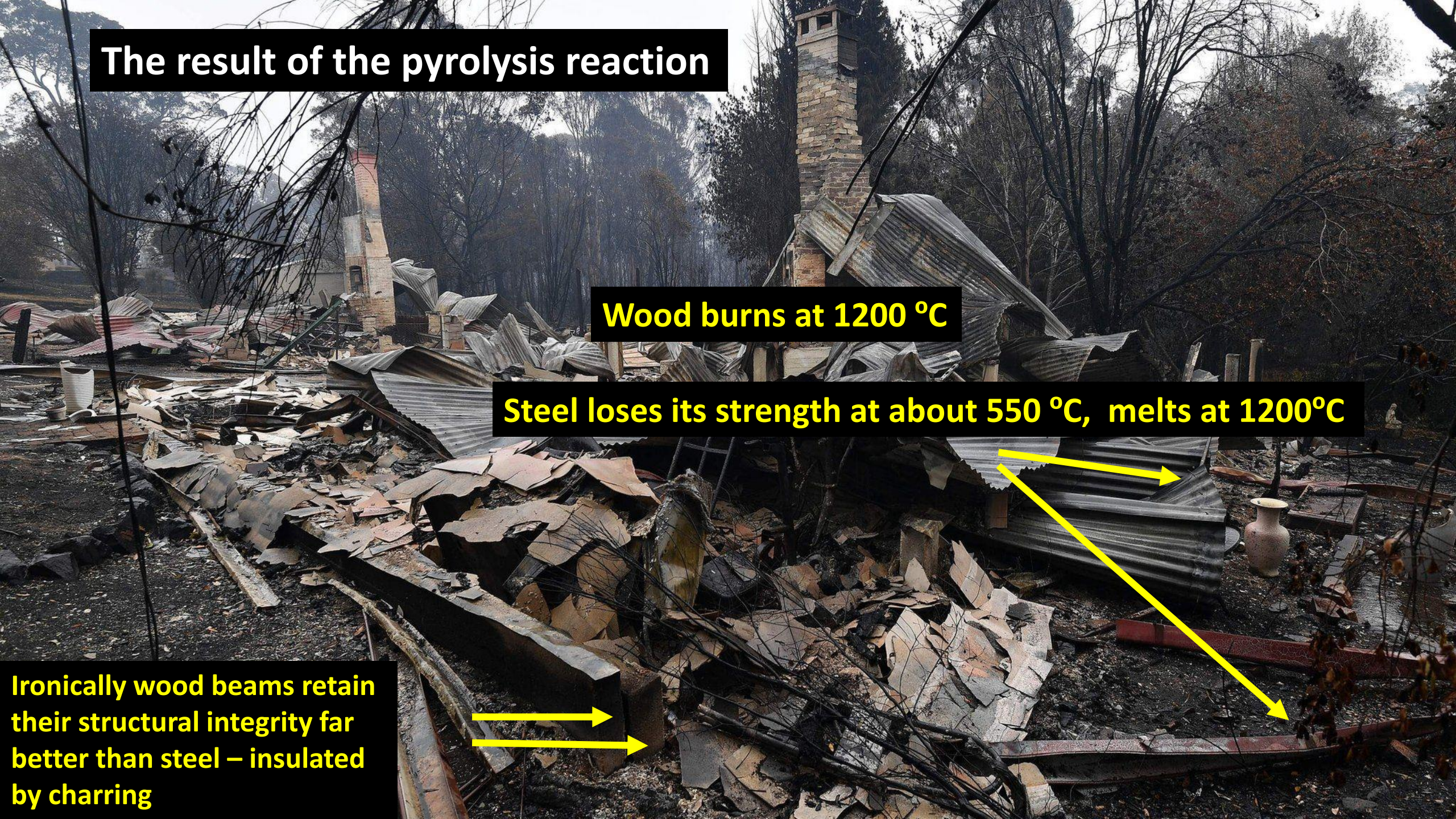
For the chemically inclined the basic equation is: $C_6H_{10}O_5 + 6O_2 \rightarrow 6CO_2 + 5H_2O$ (wood plus oxygen gives carbon dioxide plus water)

The water produced by the burning reaction rises as an invisible superheated gas (steam).

When the gas hit the cooler atmosphere it condenses into the familiar column – water vapour plus soot and other debris.


400°C
Convection (heat and rising steam gas)
The nature of flame
Combustion products
Combustion of flammable gas at contact between bubble of gas and oxygen
1270°C
Radiation
Luminous gases from soot
1000°C
Oil vapours convert to hydrocarbons
600°C
Pyrolysis of wood
200°C
Burning charcoal
1270°C
Blue flame characteristic of burning carbon monoxide from charcoal
All the elements of a bushfire

The result of the pyrolysis reaction


The result of the pyrolysis reaction
Wood burns at 1200 °C
Steel loses its strength at about 550 °C, melts at 1200°C
Ironically wood beams retain their structural integrity far better than steel – insulated by charring

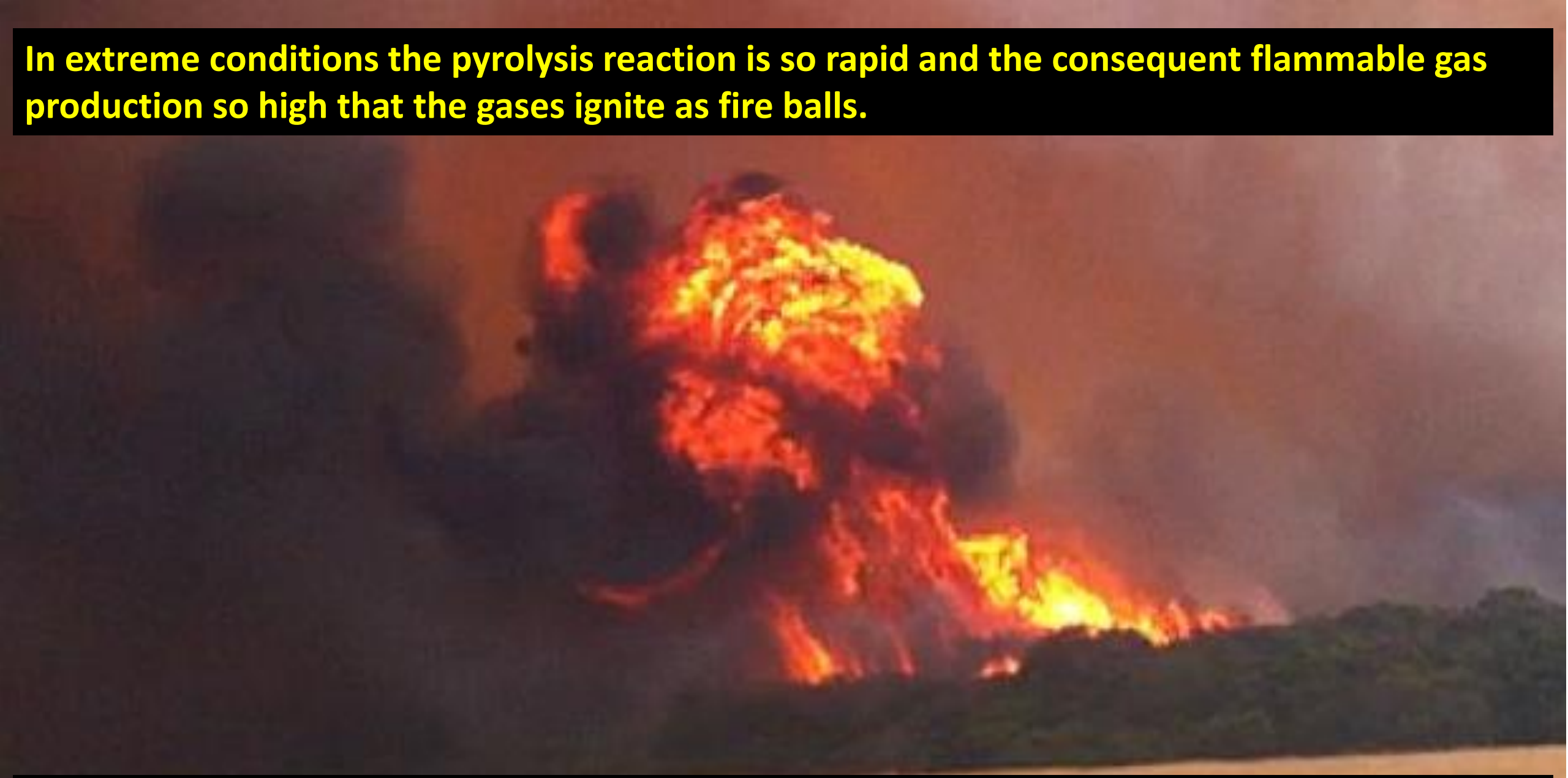

Melting point of aluminium 660°C – magnesium 600°C, steel 1200°C

We are looking at a turbulent mass of highly flammable hot gas that spontaneously ignites where it meets oxygen.

Combustion can only take place where the flammable gas meets oxygen in the right concentration.

Turbulence increases the surface area of such flame surfaces. It is therefore a major influence on oxygen consumption rate and fire intensity.

In extreme conditions the pyrolysis reaction is so rapid and the consequent flammable gas production so high that the gases ignite as fire balls.



The flame is not through the entire ‘ball’ but at the interface between flammable gas and the oxygen.

The dangerous aspect of chemical reactions in fire is the fact that they are self-perpetuating. The heat of the flame itself keeps the fuel at the ignition temperature, so it continues to burn as long as there is fuel and oxygen. The flame heats any surrounding fuel so it releases gases as well. When the flame ignites the gases, the fire spreads.


The *charcoal burn* reaction continues after the main fire has passed. Sometimes for months.

Why does water put out fire?

The primary role water plays in putting out a bushfire is cooling it down so there's no longer enough heat to sustain the combustion process.

When you pour water onto a fire, the heat of the fire causes the water to heat up and turn into steam. This is a very energy-absorbing reaction, and it sucks away the heat (which is a form of energy) from the fire, stalling the pyrolysis reaction.

This robs the fire of sufficient energy to keep burning. Less significant is the role water can play in 'smothering' a fire, depriving it of the oxygen that it needs to burn.

Key point - The level of bushfire radiation energy is expressed as 'fire intensity' – flame height is used as a surrogate measure of fire intensity

Radiation energy is expressed as kilowatts of energy released per metre of fire front kW/m (think of a 1 kilowatt bar radiator)

Fire intensities and mean flame heights for fires in open forests of *Eucalyptus* spp.

Rating 	Fire Intensity kWm^2	Max Flame Height m	Remarks
Low	< 500	1.5	Upper limit recommended for fuel-reduction burning
Moderate	501 - 3000	6.0	Scorch of complete crown in most forests
High	3000 - 7000	15.0	Crown fires in low forest types – spotting > 2 km
Extreme	7000 - 70000	> 15.0	Crown fire in most forest types – fire storm condition at upper intensities

Intensity levels

A hazard reduction fire – up to 500 kilowatts per metre of fire front (1.5m flame)

Fire becomes uncontrollable by machines at 2500 kilowatts per metre of fire front (5m flame)

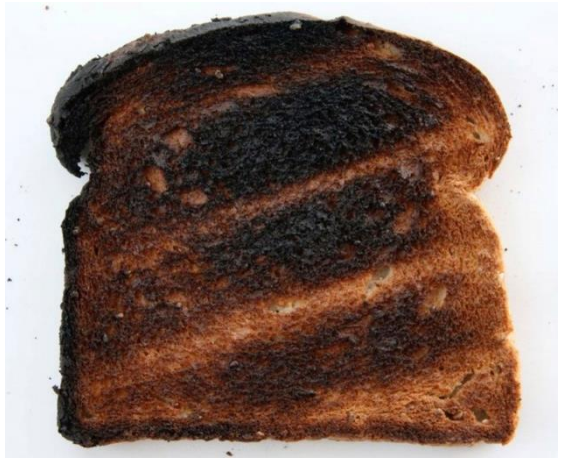
The coping limit for humans is 1000 kilowatts per metre (2.5m flame)

Uncontrollable wildfire can generate some 50,000 kilowatts per metre of fire front (15+m flame)

Extreme bushfire behaviour can generate over 100,000 kilowatts per metre of energy

Humans can only tolerate 1000 kilowatts per metre

Protection from radiation



The most dangerous aspect of a bushfire is radiant energy. This energy can be so intense it can kill people far from the fire. The most effective protection from radiation is distance, or a solid barrier, like a wall or an embankment (the radiation travels in a straight line).

Next best is covering up—putting on protective clothing like long pants and a shirt, or overalls made from natural fibres, not synthetics.

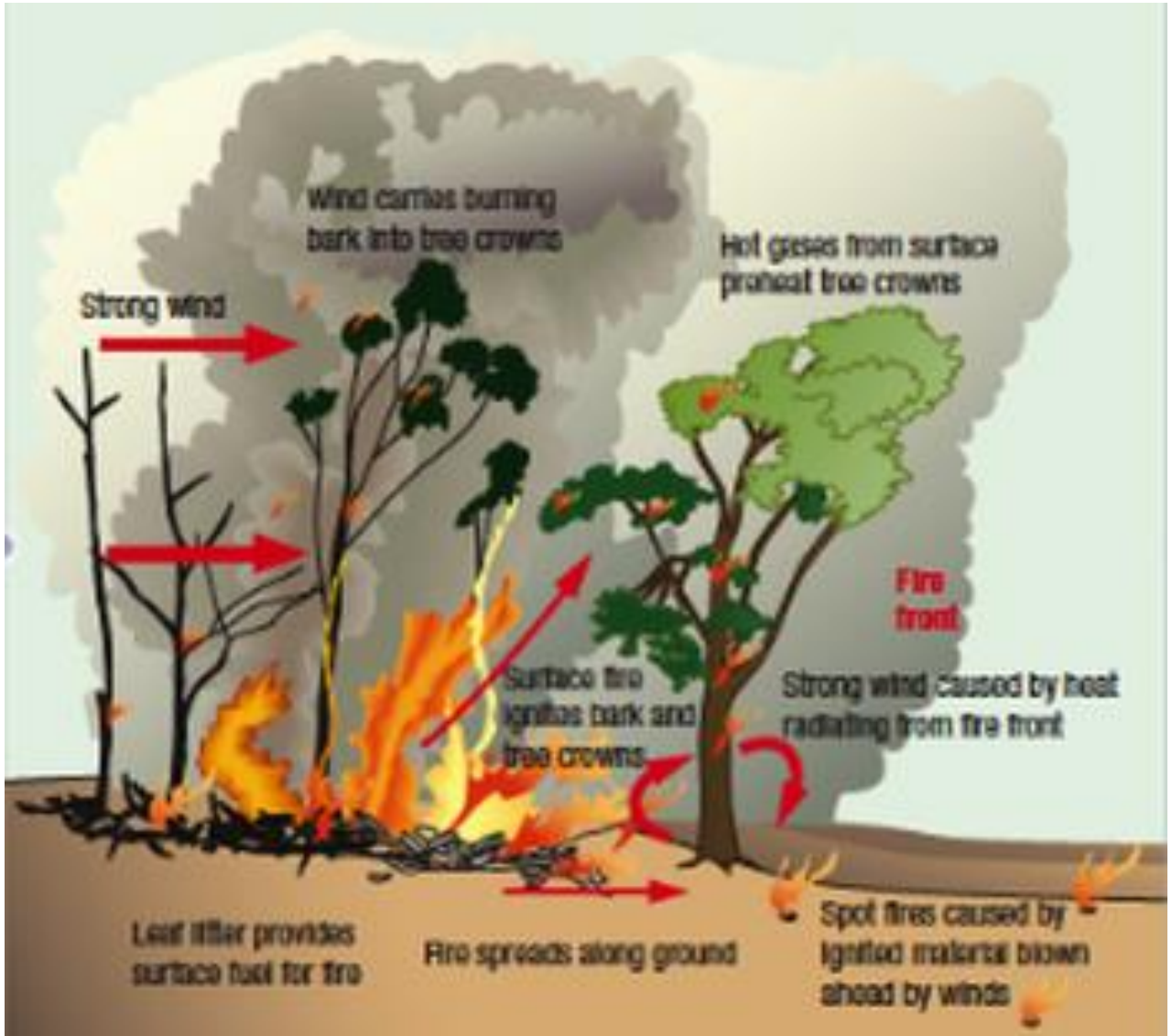
The gear firefighters wear is not simply a fashion statement.

Protection from radiation

They survived because of the radiation protection safety systems

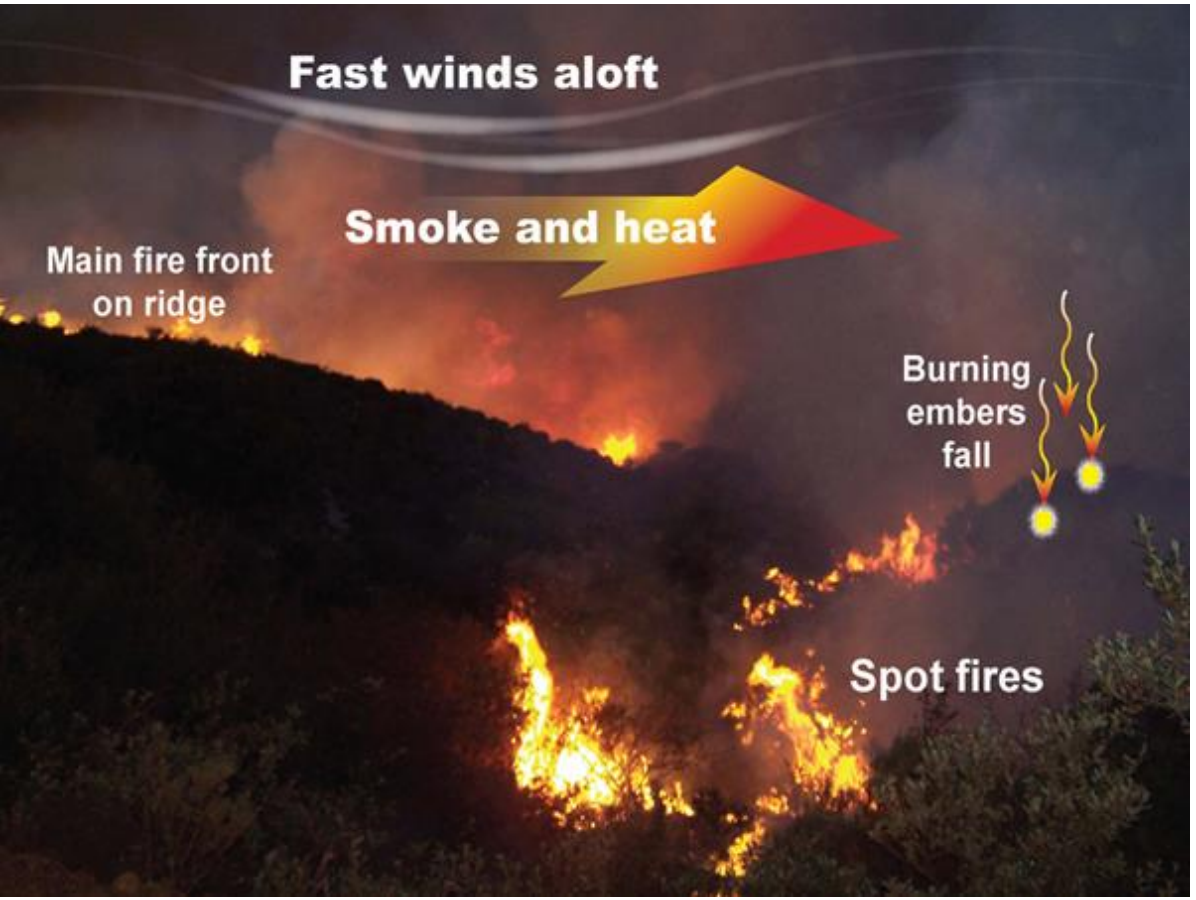
Wind is the most critical factor affecting fire behaviour and is also the most variable.

Key point - Wind



Wind has a strong effect on fire behaviour due to the fanning effect on the fire. ... Wind increases the supply of oxygen, which results in the fire burning more rapidly. It also removes the surface fuel moisture, which increases the drying of the fuel. Wind will push flames, sparks and embers onto new fuel.

Key point - Wind speed



Spotting can occur up to 35km downwind from the fire front.

There is a threshold wind speed of around 12 to 15km/h which makes a significant difference in the behaviour of bushfires. When wind speeds are below this threshold, fires even with heavy fuel loads burn slowly.

However, even a slight increase in wind speed above this threshold results in a significant worsening fire behaviour and rate of spread.

Wind – extremes

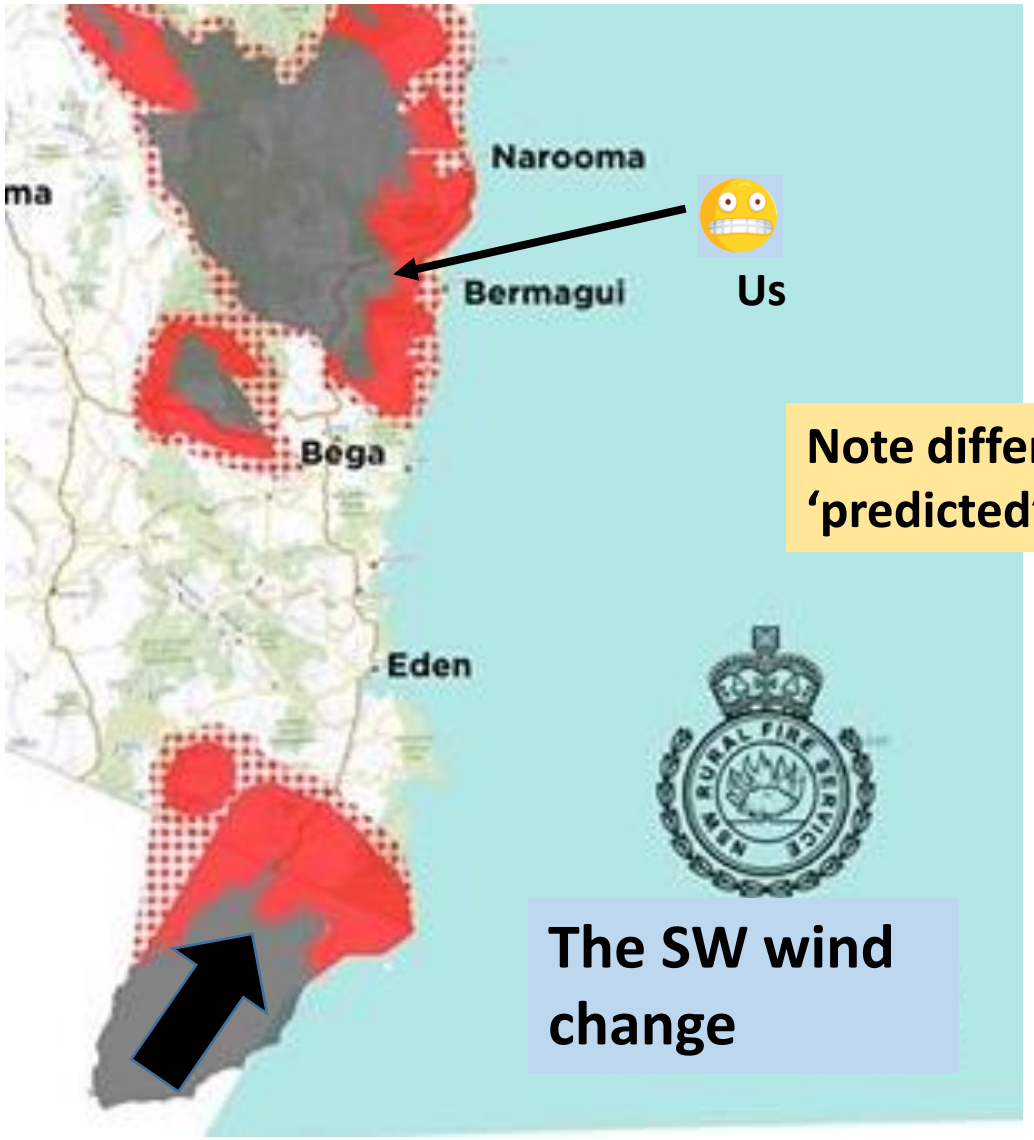
Fires develop wind patterns which can feed back into the way a fire spreads. Wildfires can generate fire whirls, like tornados, which result from combusting (vortices) created by the heat.

When vortices are tilted by convection from horizontal to vertical, it creates fire whirls. They have been known to hurl flaming logs over considerable distances.

The stronger the wind blows, the faster the fire spreads. The fire generates winds of its own that can be 10 times faster than the local wind.

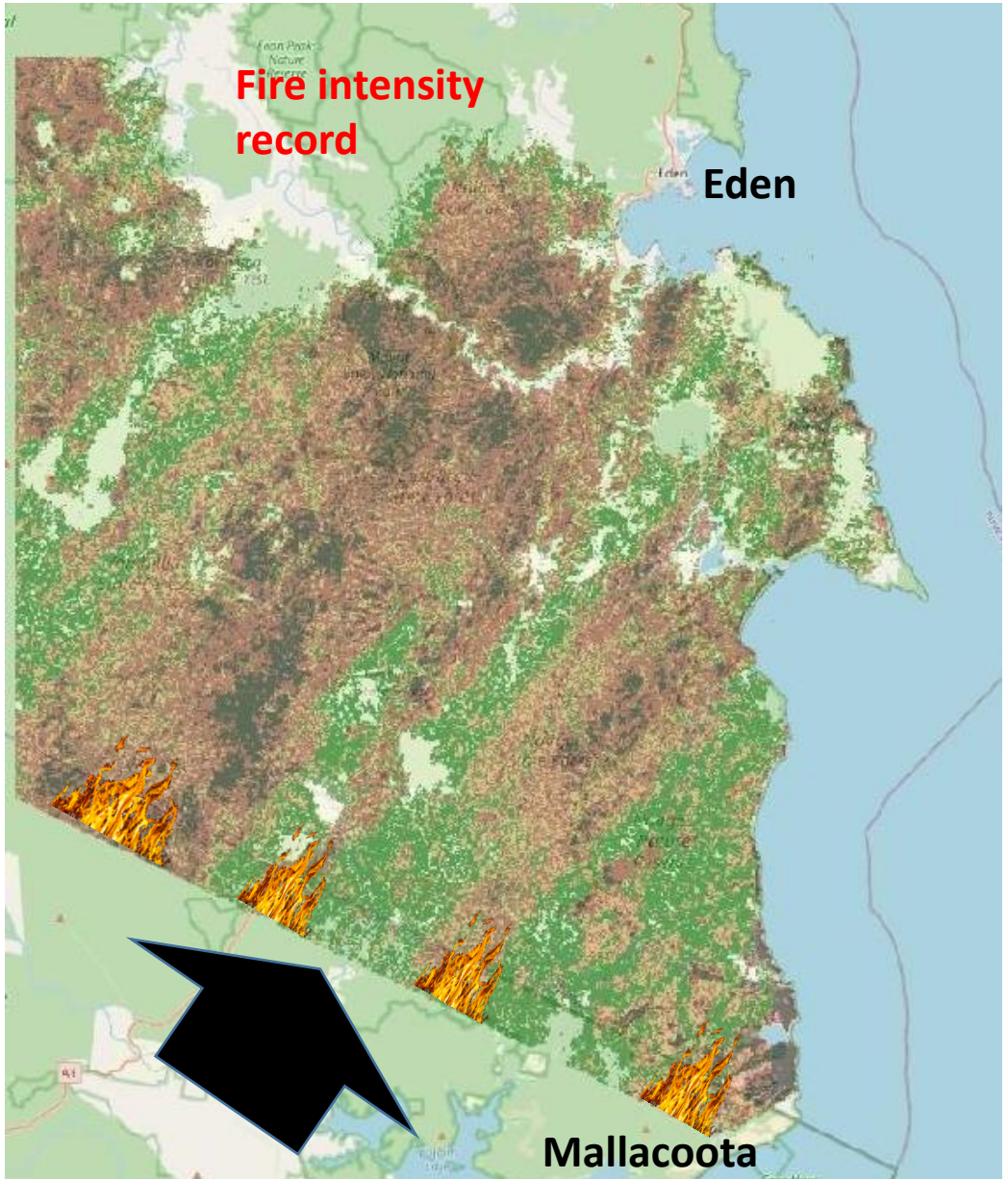
Wind can also change the direction of the fire, and gusts can raise the fire into the trees, creating a crown fire.


A fire tornado with an estimated 140kmph winds flipped this 8 tonne tanker
Sadly, a volunteer fire fighter was killed in this incident



Note difference between ‘predicted’ and ‘actual’

Scorch impact of howling southerly winds



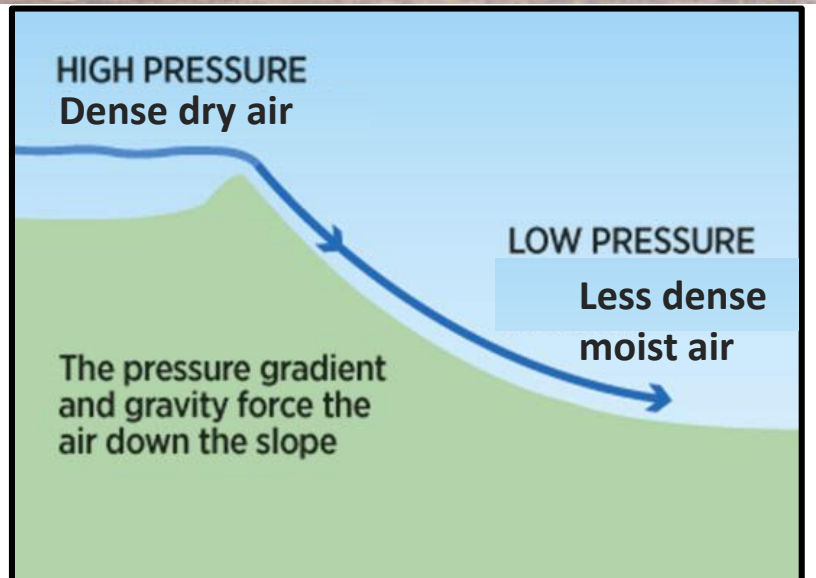
East Gippsland – 30 December 2019

In extreme conditions the fire does not advance as a wall of flame but rather a splatter of wind driven spot fires. This was a feature noted on Black Saturday.

The longest spotting distance observed on Black Saturday was 35km

Spot fires – ember storm

The splatter of wind driven spot fires.



Katabatic (foehn) Wind

A katabatic wind (named from the Greek *katabasis* - 'descending') is a drainage wind that carries high-density dry air from a higher elevation down a slope under the force of gravity. A fire related version is called a *foehn* wind.

Despite the wind plunging over the escarpment the cloud disappears half way down. The compressing air heats up (9.8ºC /1000m), dropping the humidity and evaporating the cloud.

In rugged terrain katabatic wind can generate unexpected extreme fire conditions at night – as we see in the examination of the Cobargo-Brogo Fire.

I mention katabatic winds as they were the driving factor in the Cobargo and Mogo Fires

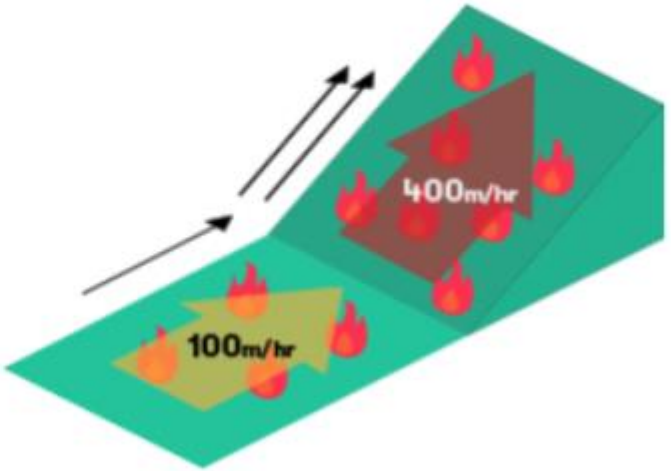
The Santa Anna katabatic winds California Sept 2020

Normally fires burn up-slope

Key point - Slope

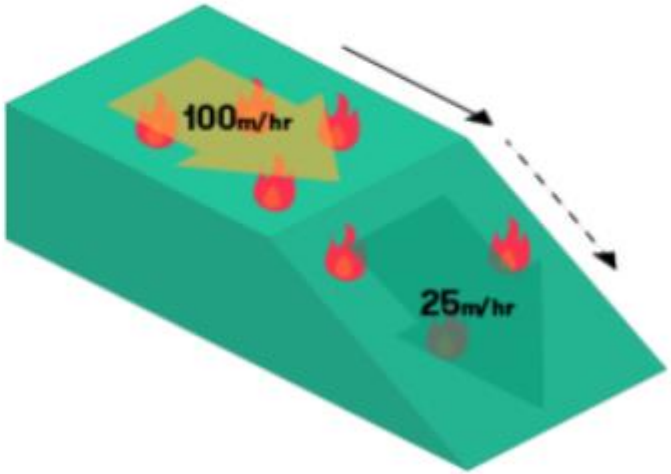
1 Going uphill

Fire moves faster uphill because there is less space between the flames and new fuel to burn. Also, the radiant heat caused by the fire pre-heats the fuel, making it easier to ignite.



2 Going downhill

The increased distance between flames and new fuel means fires spread more slowly when moving downhill (unless the slope of the land creates unusual air currents).



Double the slope = 4 times the flame height

Key point - Aspect

The north facing slopes are drier and on average 3°C warmer.

Conversely southern aspects are cooler and less prone to moisture loss.

Notice the different eucalypt species in the two aspects.

This is reflected in fuel loads. The northern aspects are lower in fuel load.

The southern aspects have a far higher fuel level but the fuel is often moist and compacted, only drying out in extended drought.

Relative humidity

Moisture in the form of water vapor is always present in the atmosphere. The amount of moisture in the air affects the amount of moisture in vegetation fuel. **Relative humidity** is the term used to express the amount of moisture in the air.

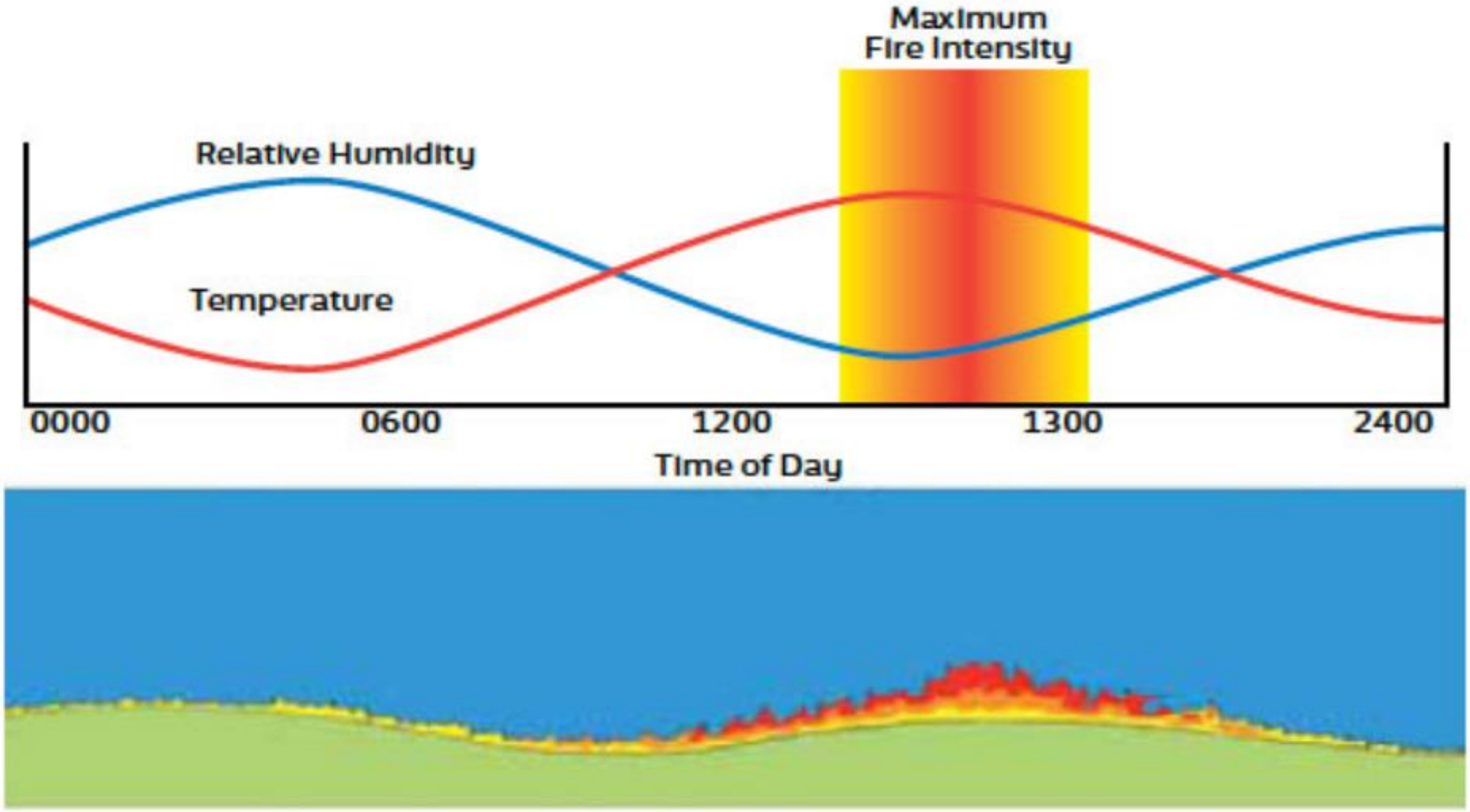
The lower the relative humidity, the more readily a fire will start and the more vigorously the fire will burn. Moisture in the fuel absorbs heat and reduces the fire's intensity before it is converted to steam and driven off.

When the relative humidity is low, the moisture in the fuel is readily evaporated.

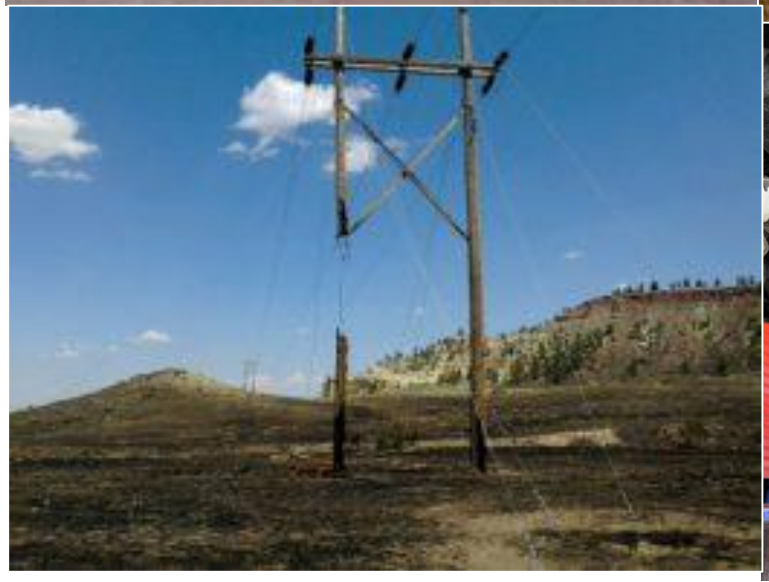
When the humidity is high, the moisture evaporates less readily into the air. Consequently, high humidity acts like a damper. If the humidity is 100 percent or close to it, the fuel will not dry.

Key point - Relative Humidity

Predicted relative humidity below 10% scares the life out of me



Activities that are usually safe can cause a bushfire when relative humidity is low



Fuel Moisture

Bushfire risk has a lot to do with fuel moisture. When bushfire fuel contains more than 30% moisture by weight it is impossible to ignite; when it is less than 20%, it can be readily ignited; when it is less than 10%, combustion is rapid and fires can spread easily; and when it is less than 5%, fire behaviour is dangerously erratic and fire spread is rapid.

On Vic's Black Saturday the entire landscape for much of the afternoon had a moisture content of less than 5%. Under these conditions the slightest spark can ignite the fuel and fires will spread very rapidly.

Dry fuel will burn quickly, but damp or wet fuel may not burn at all. As a consequence, the time since rainfall and the amount of rain received is an important consideration in assessing bushfire danger. Often a measure of the drought factor, or moisture deficit, will be used as an indicator of extreme bushfire weather conditions.

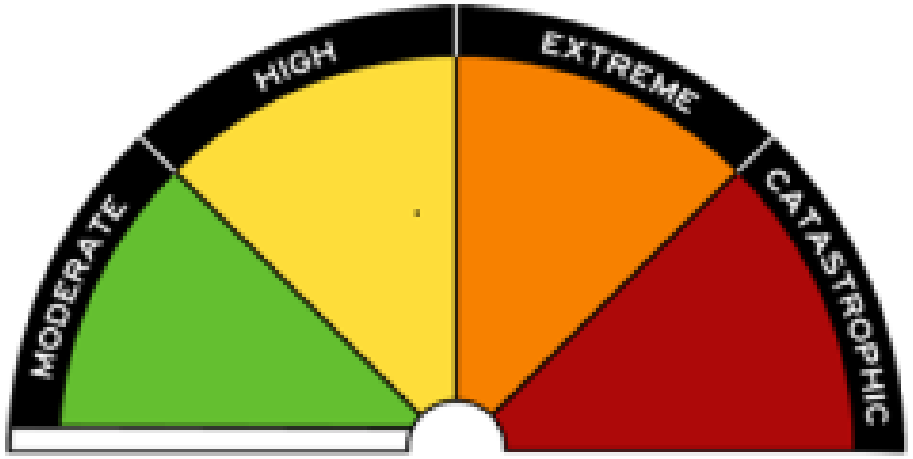
Note – *fuel moisture* is relevant to the sprinkler discussion

Why sprinklers are effective:

1. Water douses embers
2. Raises fuel moisture levels in nearby fuels
3. Creates a high humidity bubble over the site

Gutter blockers

The factors used to calculate fire danger

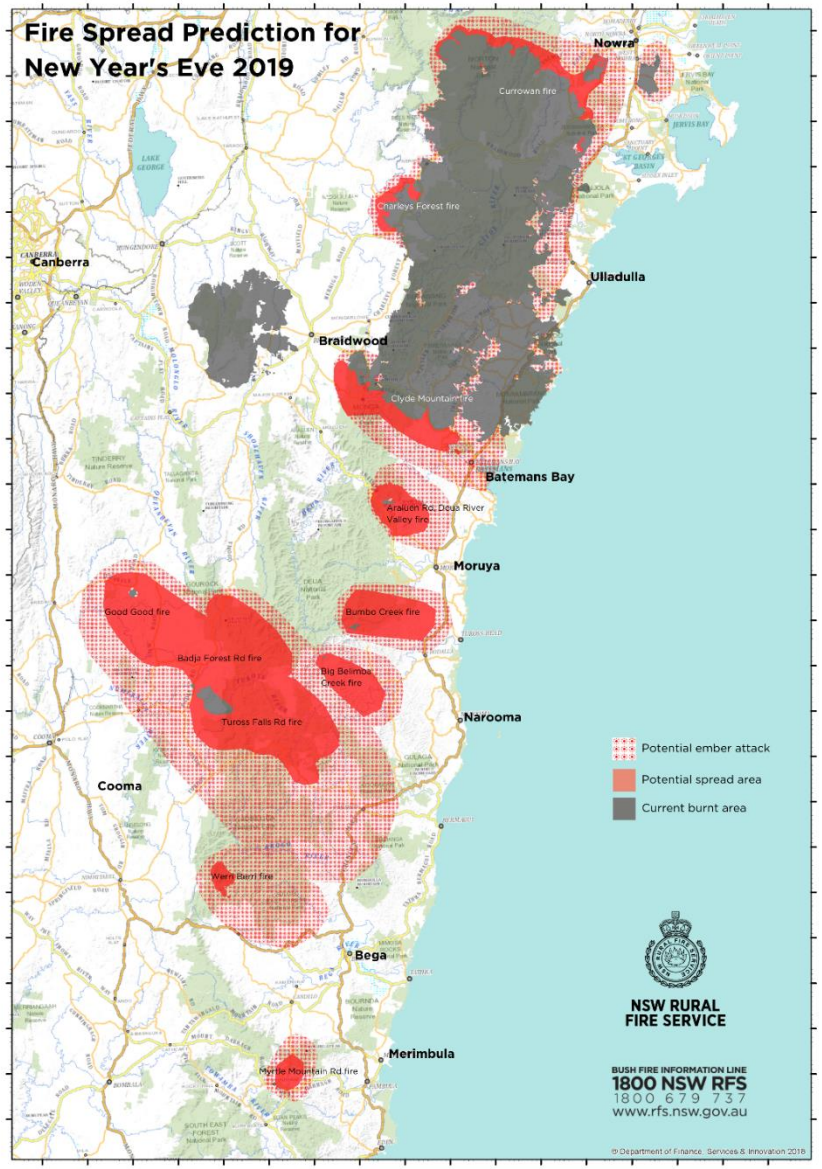


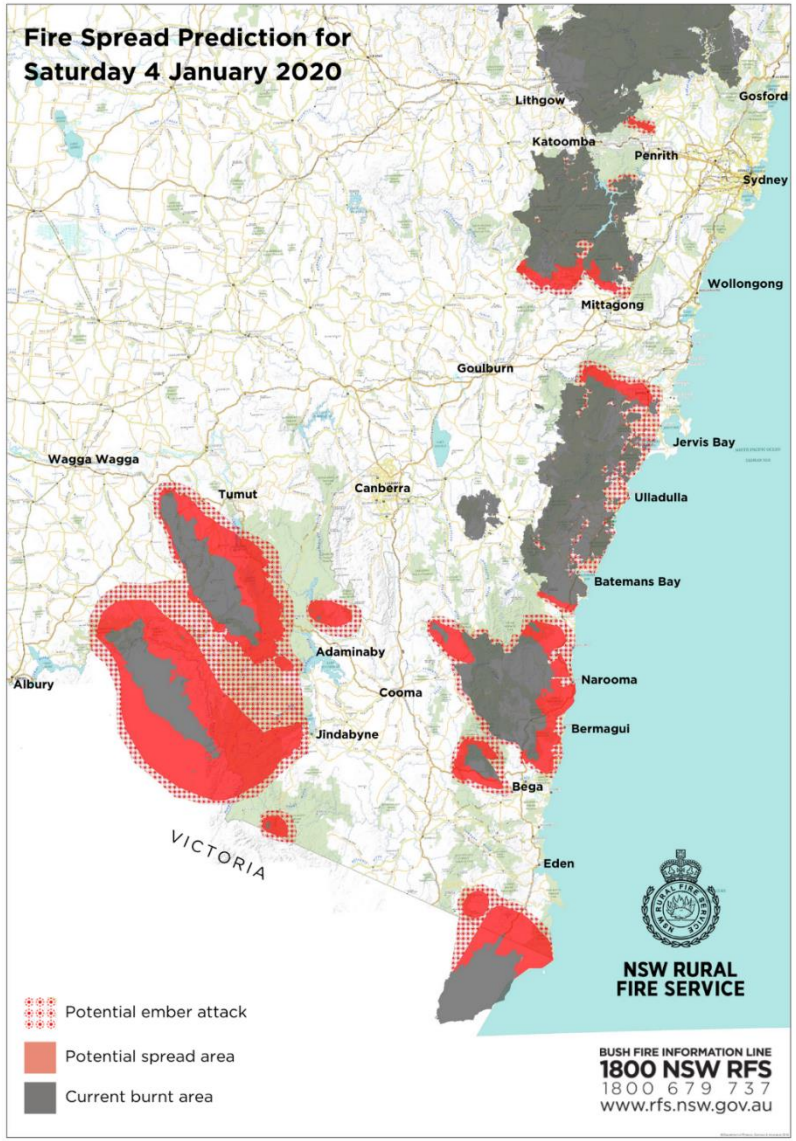
1. Pyrolysis of wood
2. **Fuel load**
3. Radiant Heat
4. **Wind speed**
5. **Temperature**
6. **Relative Humidity**
7. **Fuel Moisture**
8. **Slope**
9. Aspect
10. Convection column
11. Noise
12. Lightning
13. Season

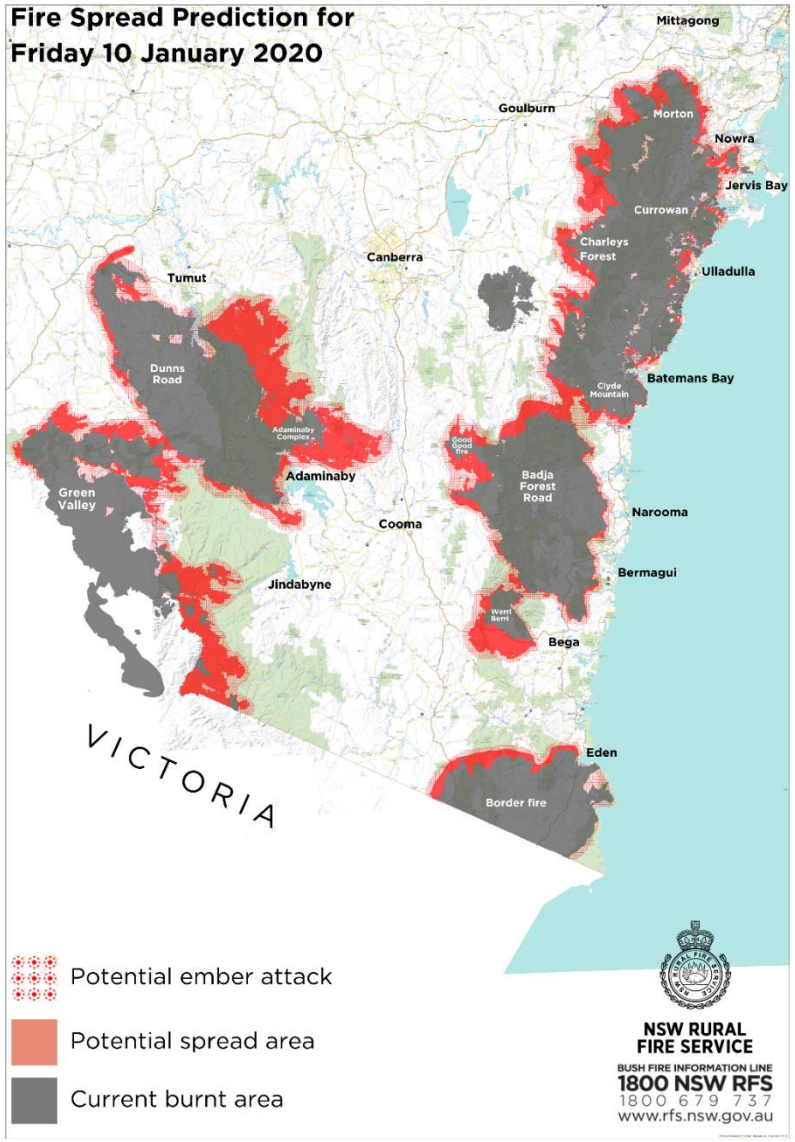
Fire prediction is an important task for modern fire management organisations

Producing Prediction maps

The predictions notoriously underestimate extreme fire behaviour








Surviving
Emergency Paramedics
Ambulance

Casualties

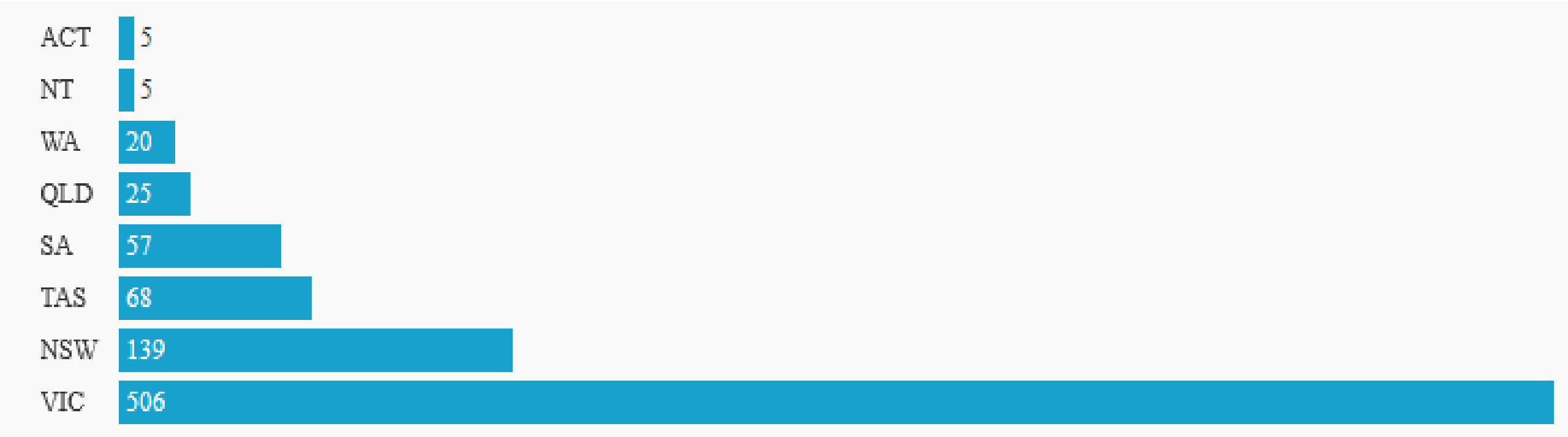
Casualty in the making

Most fatalities occur out in the open, with nearly 75% within 200 metres of their home.

Other risks are dehydration, smoke inhalation and heat stroke, which can cause people to lose consciousness.

The fumes from burning materials, particularly houses or cars, can be toxic, and inhaling them can lead to disorientation or death. In many cases, the fumes are heavier than air so they sink to the lowest part of the landscape or building. This is one of the reasons why sheltering in a cellar or 'bunker' under a house is not recommended.

Bushfire fatalities between 1901 and 2011



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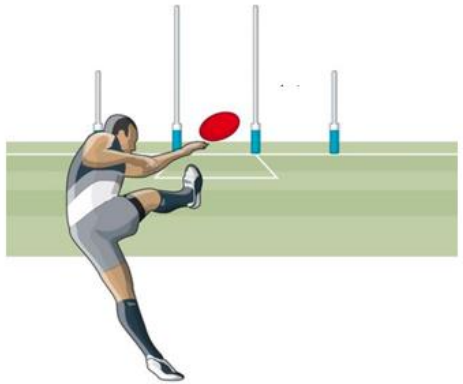
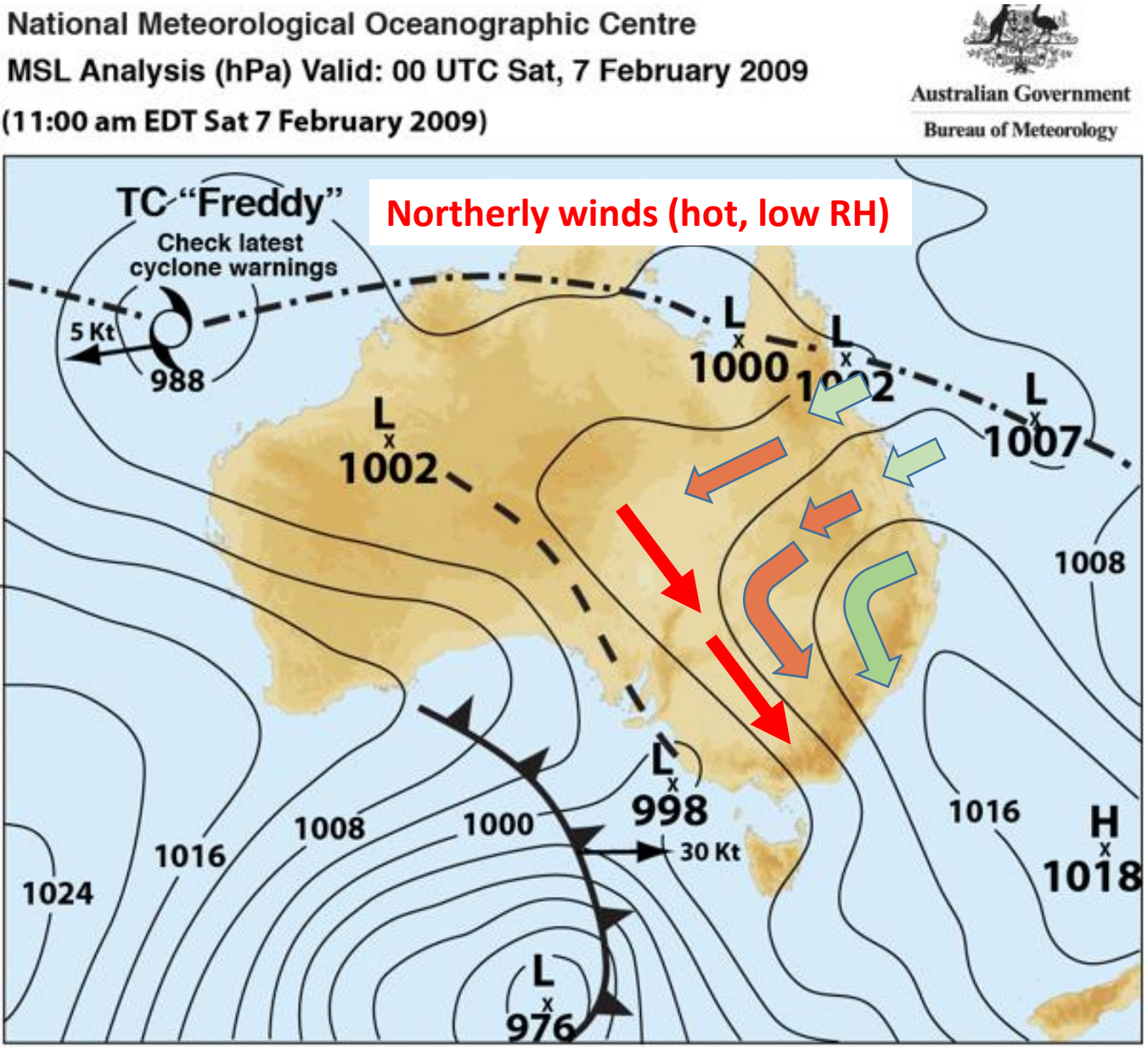
Why Victoria?





Black Saturday

It's Vic's geography

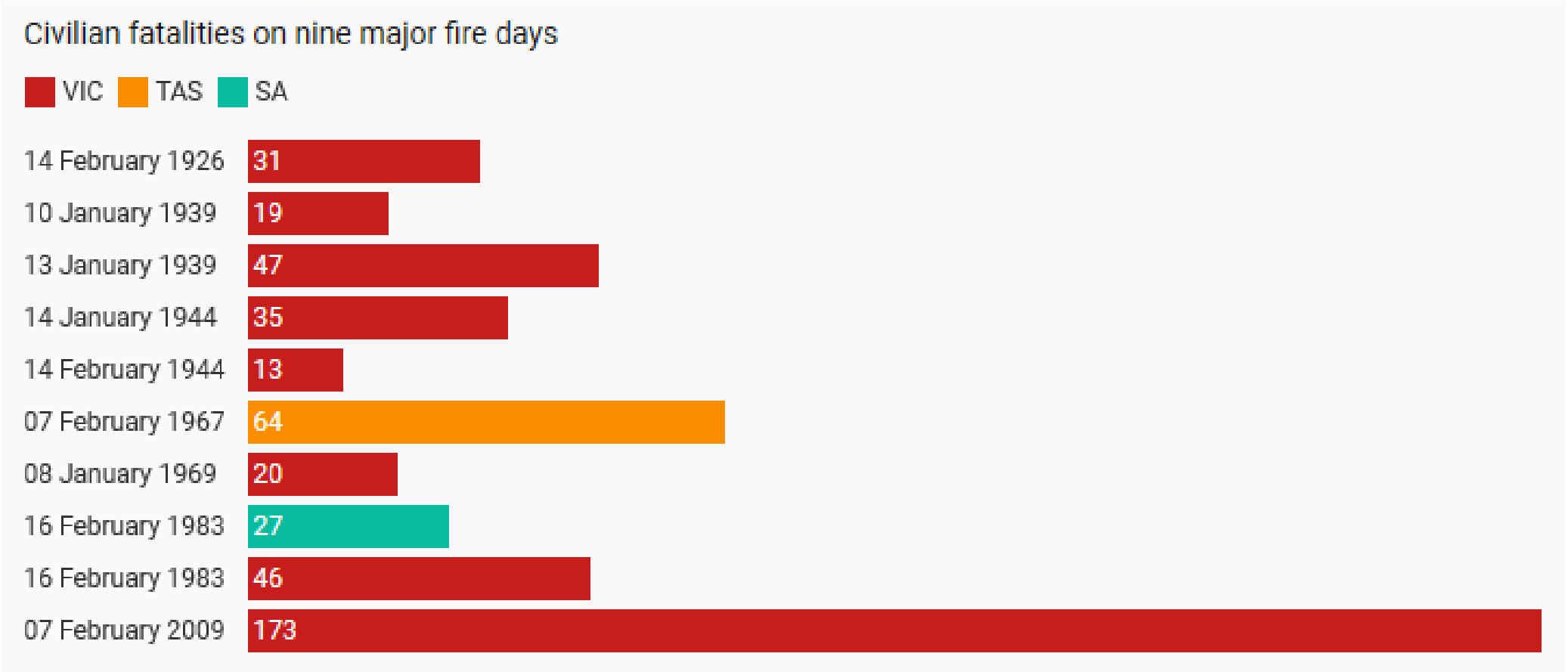
The big summer high pressure systems parked in the Tasman Sea bringing in hot dry desert air (low humidity) onto eastern Victoria. The tightening pressure gradient preceding a cold front generates strong winds.

Add dry fuel to the brew and you have a recipe for disaster.

Also a problem for SE NSW but not nearly as bad.

The extreme events are the most dangerous

Nearly 60% of bushfire deaths in Australia since 1926 occurred on just 9 days



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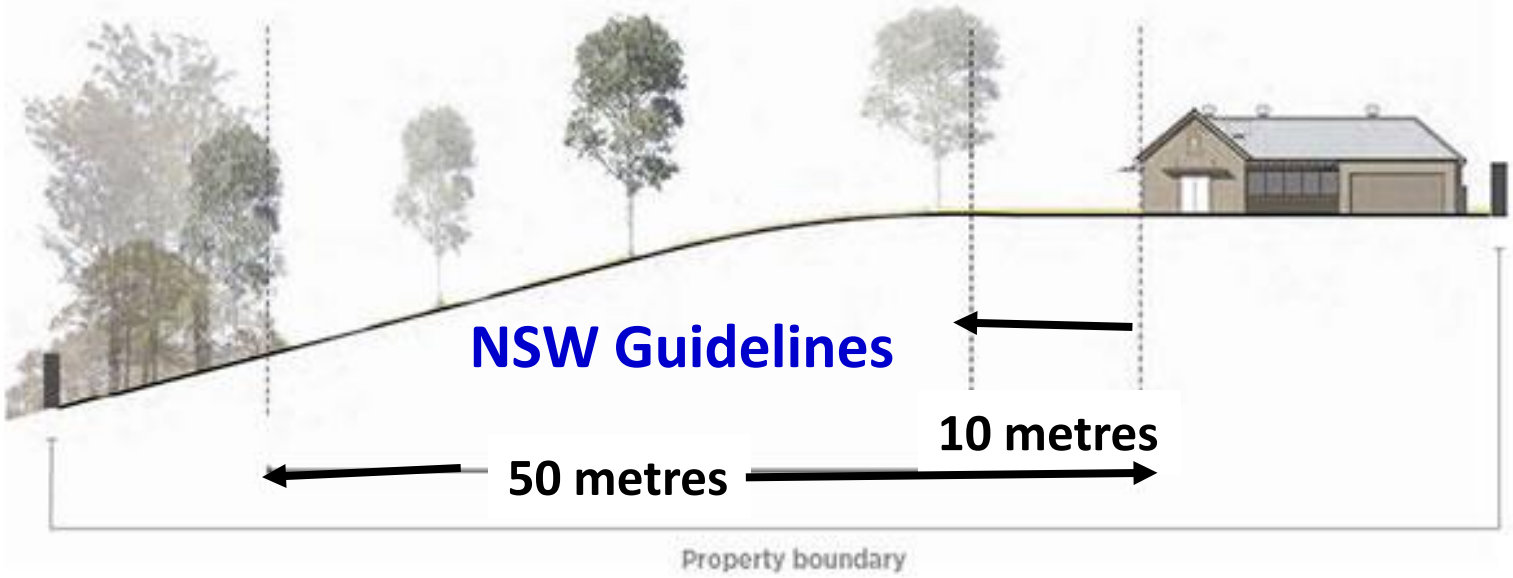
Surviving bushfire

Its about managing:

1 potential fire intensity

2 potential ember attack

Radiation decreases as a square relationship from the source. Double the distance from the source is four times reduction in radiation intensity. Double it again is 16 times less. Double again is 256 times less. This element of physics provides a way to mitigate the threat.



A high intensity fire inside 50 metres away causes problems but radiation threat is alleviated by fuel removal (eg burn, mow, clear, or pave).

The most important fire protection decision you can make is your real estate choice .

The CSIRO's database of 110 years of deaths shows that:

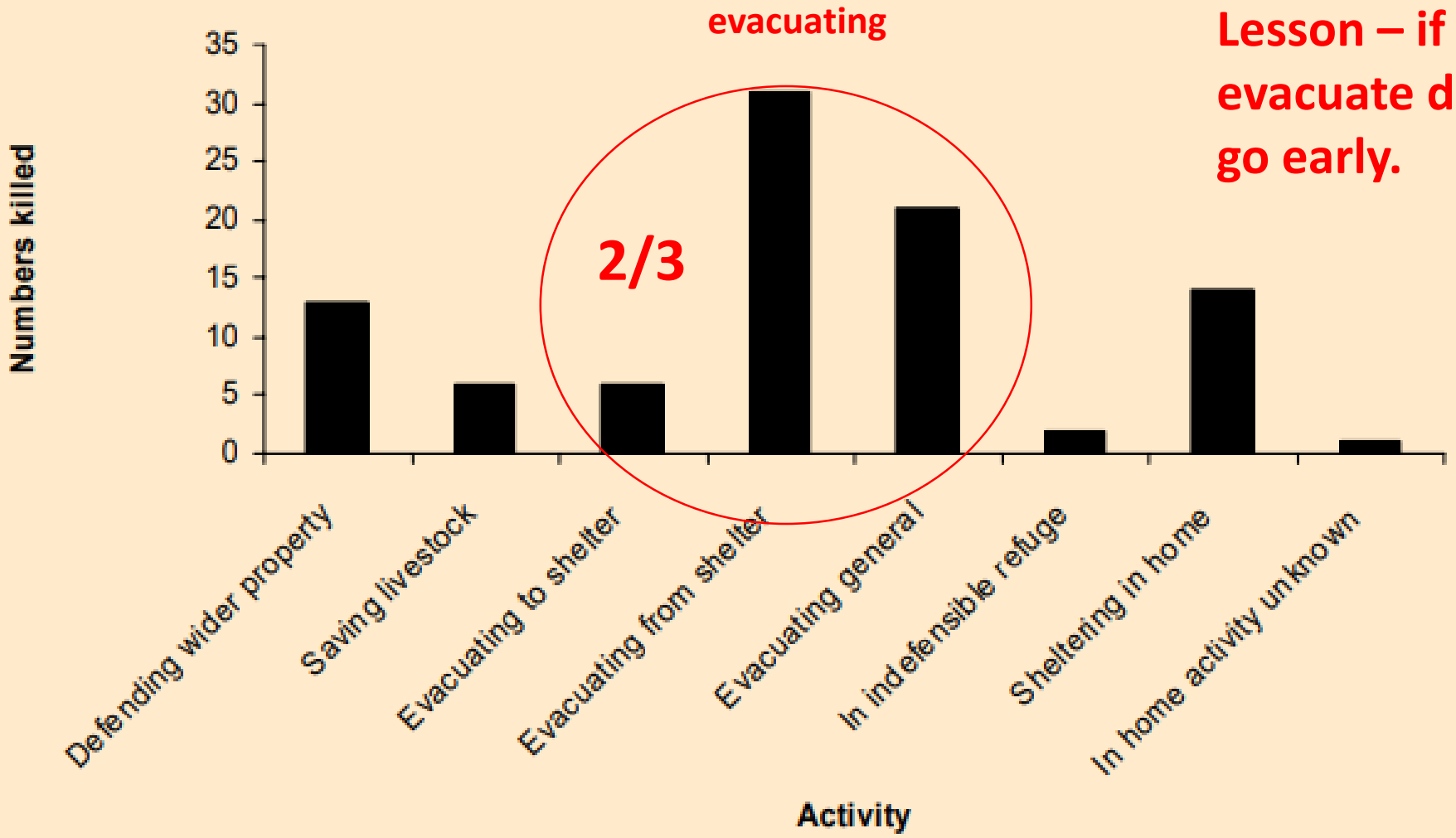
Over 75% of all fatalities occurred within 30m of a forest edge and half of all fatalities occurred on days with a forest danger index greater than 100 (the current threshold for declaring a day as '*catastrophic*').

58% of fatalities out in the open occurred while evacuating or defending a property.

When bushfires occurred in '*catastrophic*' conditions over 75% of all fatalities occurred within buildings. These are associated with people attempting to shelter, mainly in their house. When the index is lower, more people are caught outside while defending their properties.

Of the fatalities which occurred inside, 41% occurred in rooms with reduced visibility to the outside conditions (mainly the bathroom) and one exit door.

Victorian deaths 1951 onwards



Lesson – if you intend to evacuate don't frig around, go early.

The dangers of evacuation

If you are going to evacuate, do so early

	Tasman	TAS	61.7
	Blue Mountains	NSW	51.7
	Huon Valley	TAS	40.1
3	Eurobodalla	NSW	40.1
	Mundaring	WA	38.1
	Scenic Rim	QLD	35.3
	Chittering	WA	30.9
	Murrindindi	VIC	30.0
	Hornsby	NSW	29.8
	Ku-ring-gai	NSW	29.7
	Kingborough	TAS	28.9
	Hawkesbury	NSW	28.6
	Derwent Valley	TAS	27.7
	Toodyay	WA	27.6

Top 25 local government areas with % of addresses at high risk

	Murchison	WA	27.3
	Wollondilly	NSW	25.3
17	Bega Valley	NSW	25.3
	Adelaide Hills	SA	25.2
	Ipswich	QLD	25.0
	Port Stephens	NSW	23.5
	Doomadgee	QLD	23.3
	Shoalhaven	NSW	22.1
	Logan	QLD	22.0
	Central Coast	NSW	21.7
	Sunshine Coast	QLD	20.8

Gardens as fuel – Canberra 2003

…the secondary cause is the same embers igniting flammable fuel near and around the house, generating '*localised flame*' very close to the house


Mr Mulch is no longer your friend

Garden mulch contains enough energy to break a window and ignite curtains in a blink of an eye (wood spontaneously ignites at about 300°C and burns at 1270°C – glass breaks at about 200°C, melts at 750°C).

Watered deciduous trees are a defence against ember storm

They cool the site, create a *humidity bubble*, and absorb ember attack without the foliage igniting.

THE WEEKEND AUSTRALIAN FEBRUARY 21-22 2009

BLACK SATURDAY DISASTER THE NATION 9

Further donations of roses will be made from his business, the Buxton Zoo Nursery, to a memorial garden being planned for the town.

A former owner of the Crossways Hotel in Marysville, which survived the recent fire, Mr Lawrey is advising residents to plant European trees around their houses rather than eucalypts.

"European trees saved my house," he said. "The embers that landed in the trees had time to burn out.

"If they land in eucalypts, they burn immediately."

He said all three commercial buildings left standing in Marysville had European trees nearby.

"Of the famous oak trees lining the main street, only three will have to be removed immediately," he said.

"They really cooled the fire down when it reached them."

Disability services worker Megan Buntine and her architectural designer husband plan to rebuild their accommodation fa-

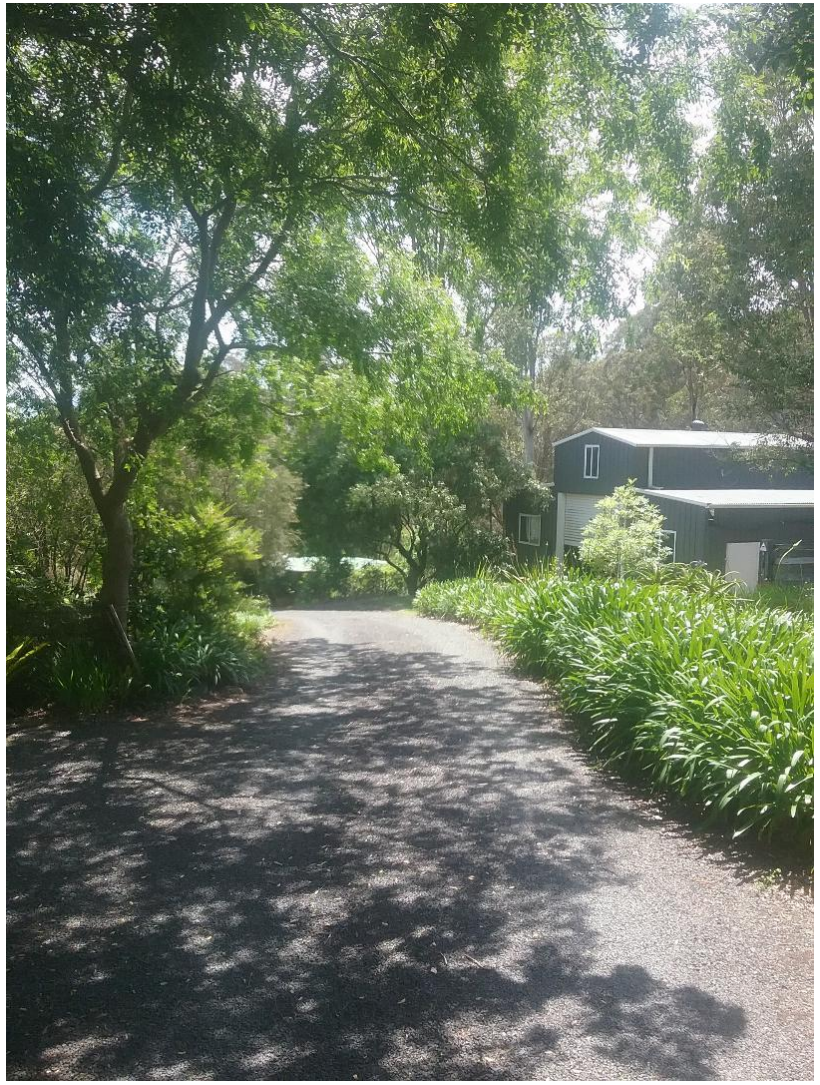
Marysville Vic

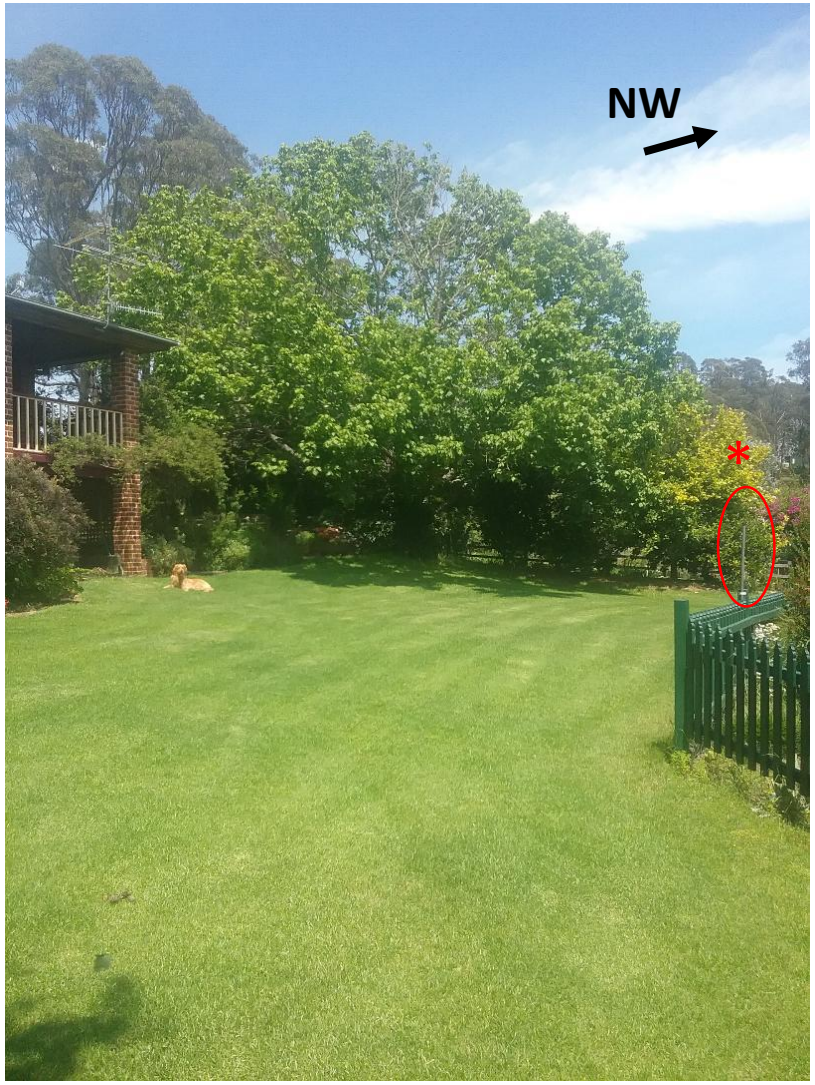

Upper Brogo

Developing bushfire retarding garden landscapes

Walls of agapanthus have been used as fire breaks for over 100 years

Low seeding varieties such as *Queen Mum* can be used if there are weed spread fears





Fire Retardant Plants*

•Fleshy or watery leaves, such as cacti and succulents.

•Leaves with high water content and a low volatile oil content, such as most exotic deciduous shrubs and trees

*** Any plant can burn but some are less likely to ignite or take longer to ignite**

There is plenty of advice on the internet eg https://apsvic.org.au/fire-resistant-and-retardant-plants/

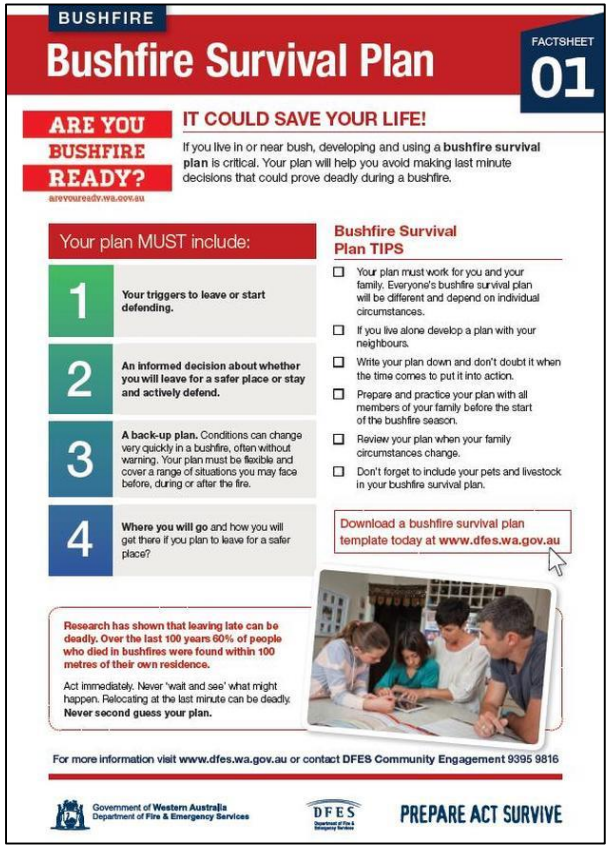
* **Part of the sprinkler line**

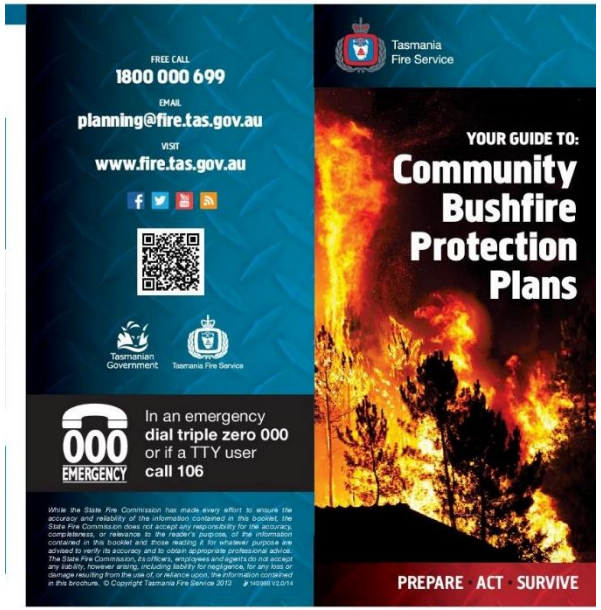
The most important bushfire protection decision is made in the real estate office

If however, your real estate decision erred on the side of combustibility:

Planning for bushfire

There is an enormous amount of information readily available





Fire control basics

Fire Intensity

0 kw/m

1000 kw/m

2000 kw/m

3000 kw/m

Under 800 kw/m

Hand tools and water support

Under 2,000 kw/m

Direct attacks by machines, tankers & water bombers

Under 3,000 kw/m

Indirect attacks by machines, tankers & water bombers

Over 3,000 kw/m

Unlikely to be suppressed

Back burning

Back burning is a common practice to deny flammable fuel to an oncoming wildfire.

A defendable line (road, trail, river, lake, or even a hoed break) is used.

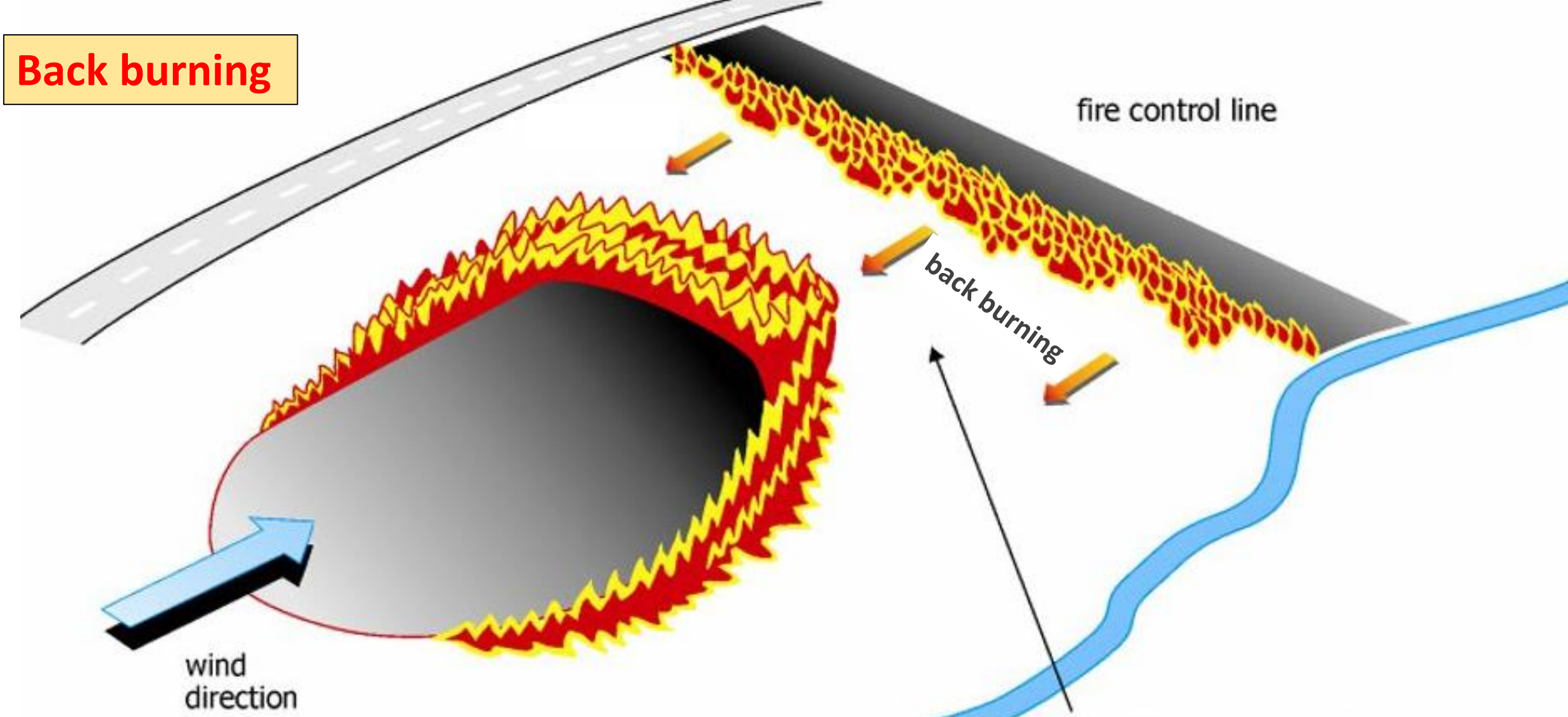
The line is lit, usually at a safe time when wind and temperature have abated and relative humidity has risen. Usually at night.

The fire extends a burned out area towards the wildfire. When conditions deteriorate, the surging wildfire will (hopefully) be contained against the fresh back burn area.

Back burns obey the same laws of combustion physics as wildfires and have a nasty habit of getting out of control.

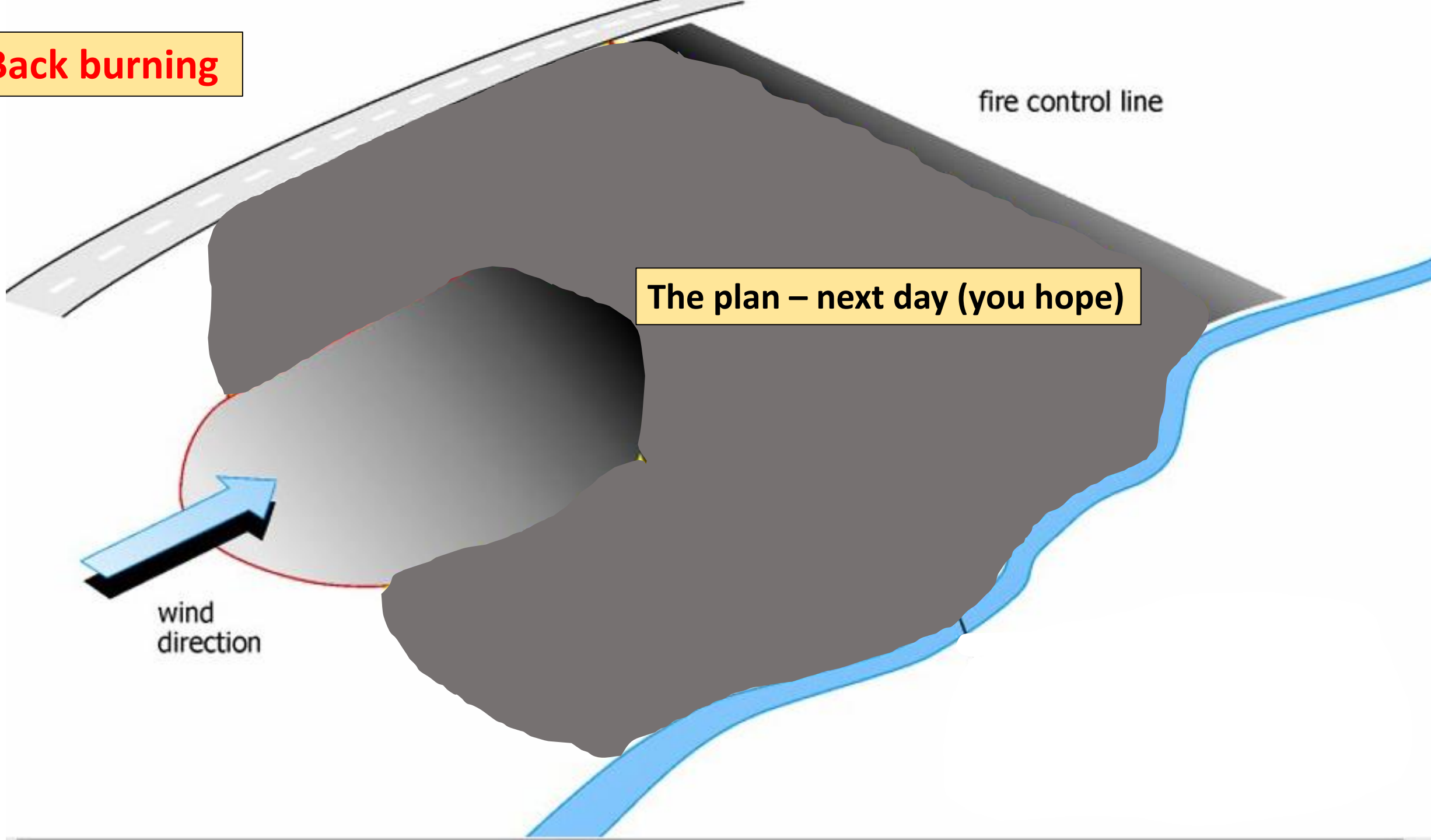
The term ‘back burning’ is often muddled up with the term ‘hazard reduction burning’, particularly in media reports.

Back burning



Conducted in a lull in the fire weather – often at night

Back burning



A back burn can be a cruel taskmaster

Wise saying – when you light a backburn you no longer have a bushfire,

Firefighters lose control of 'mega-blaze' backburn, homes destroyed

By Jenny Noyes, Nick Moir, Laura Chung and Peter Hannam
Updated December 16, 2019 — 4.19pm, first published at 10.58am

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A bushfire emergency that destroyed a number of homes in the Blue Mountains on Sunday night was sparked by a "crucial" backburn that got away, the Rural Fire Service (RFS) has confirmed, as firefighters continue to work on containment ahead of deteriorating conditions.

Firefighters have been carrying out backburning for a number of days along the southern edge of the massive Gospers Mountain fire, which has burnt through about 380,000 hectares of the Wollemi National Park, ahead of severe heatwave conditions forecast for the end of the week.

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Backburns backfired at Balmoral and the Blue Mountains, RFS investigation finds

7.30 / ABC Investigations: By Sean Rubinsztein-Dunlop and Amy Donaldson
Posted Wed 10 Jun 2020 at 6:53am, updated Wed 10 Jun 2020 at 11:20am

A back burn can be a cruel taskmaster

Wise saying – when you light a backburn you no longer have a bushfire, you have two.

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GOSPERS MOUNTAIN FIREFRONT
12km
Mt Wilson Back burn
Lithgow
Bell
Bilpin
BELL
MT WILSON
MT WILSON BACKBURN
MT TOMAH

Mt Wilson Back burn

Mt Wilson back burn

Initial attack

The quicker a bushfire outbreak is controlled the less chance it will build up to uncontrollable levels.

This is particularly the case for remote lightning strikes. Today agencies invest considerable resources in training and equipping specialist teams that can be helicoptered into remote locations to contain lightning ignitions.

These are highly trained fit teams

There were 41 remote area lightning fire ignitions in the Greater Blue Mountains last bad season. 20 were contained by the *Remote Area Fire Teams*.

Significant increasing use of fire retardant drops


The most tedious part of firefighting is the mopping up


Countless bushfires have set off again because of inattention to mopping up

Public discussion on hazard reduction*

If they more conducted hazard reduction burns it would never have happened

Where science meets politics

* Also called ‘prescribed burning’ or ‘controlled burning’ or ‘cool burns’.

The notion of less fuel producing a lower fire intensity is obvious.

Indeed that simple proposition is the basis for most bushfire protection programs.

The complications arise as fire weather conditions worsen. At conditions of *Severe* and above, other factors increasingly dominate fire behaviour.

“Hazard reduction is absolutely an important factor, but it is not the panacea. When you are running fires under severe, extreme or worse conditions, hazard reduction has very little effect at all on fire spread.”

Shane Fitzsimmons,
RFS NSW Commissioner

Royal Commission
into National Natural Disaster Arrangements

“The royal commission’s final report released on Friday (28 October), said lives and property were mostly lost on extreme fire danger days but controlled burning to reduce fuel loads ‘may have no appreciable effect under extreme conditions.’

‘The weight of research into the effects of fuel reduction on the propagation of extreme bushfires indicates, as conditions deteriorate, fuel reduction is of diminishing effectiveness’. “

SMH 2 November 2020

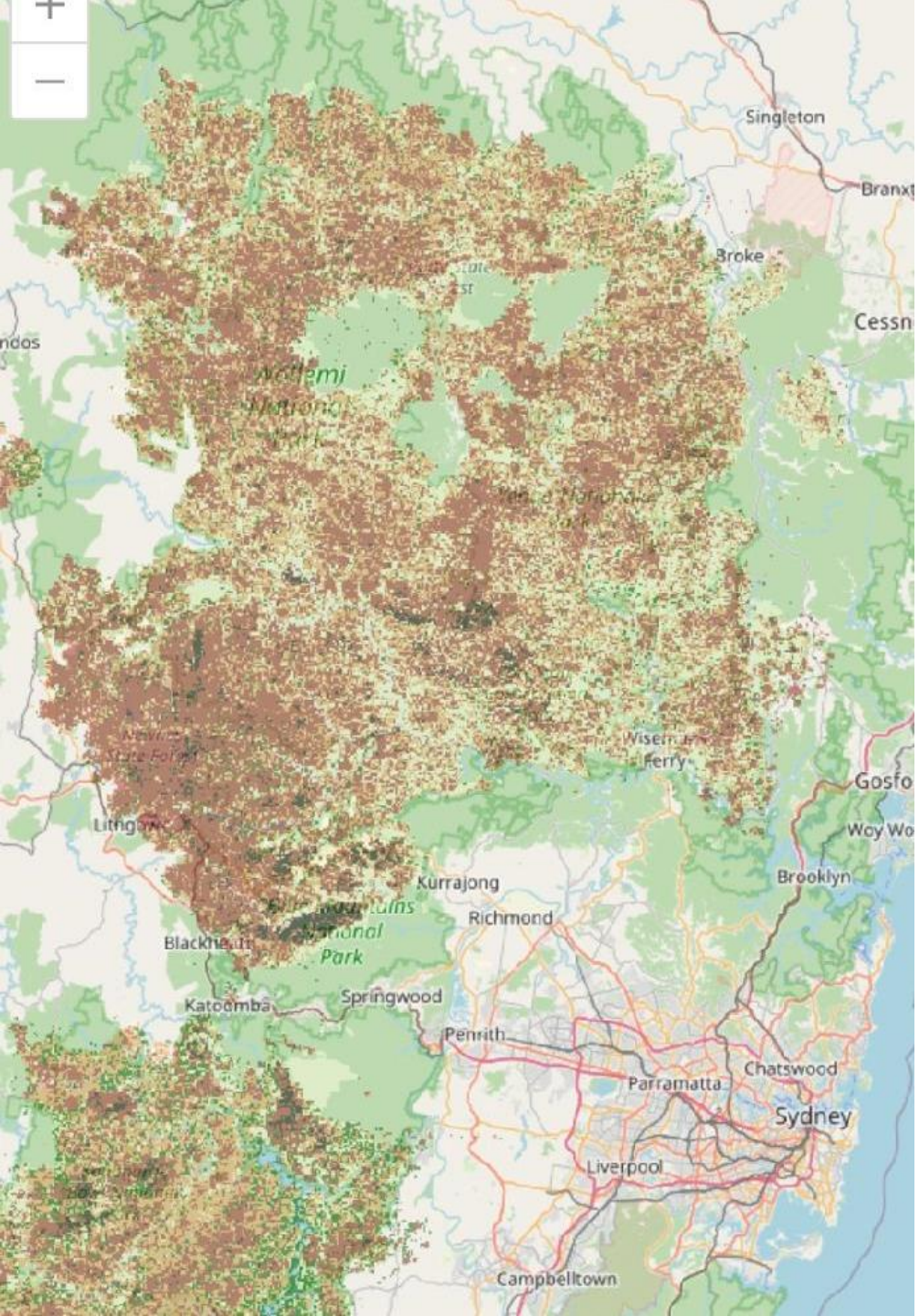
The take home message is that in *extreme + fire danger* conditions the realities of combustion physics produce energy release and fire spread that is far beyond human capacity to modify or control.

These outcomes operate down to fuel levels that ordinarily would be considered very low.

Harbouring a belief that fuel reduction in a forested landscape brings a level of protection in extreme conditions may prove a fatal delusion.

So why do it?

Most of the time in major bushfires the extreme conditions are infrequent.



The Blue Mountains 838,000 ha fires burned for 4 months. Out of some 120 days the number of days when the conditions were *extreme* was about 5, for about 4 hours. On those days the fire burned with high intensity and high rate of spread. This is shown in the map as black shading.

It illustrates that the majority of the suppression effort is undertaken in quieter conditions. Suppression is a relentless slog of fire line construction, back burning and mopping up - interspersed with bursts of high drama in extreme conditions.

Suppression is focussed on defendable fire lines (which anchor back burns) and the protection of assets (housing and infrastructure). Success is highly dependent on not having to face high intensity fire at these locations. Success is helped immeasurably if the fuel hazard has already been reduced.

The hazard could have been reduced by burning, clearing, mowing or paving, depending on the circumstances.

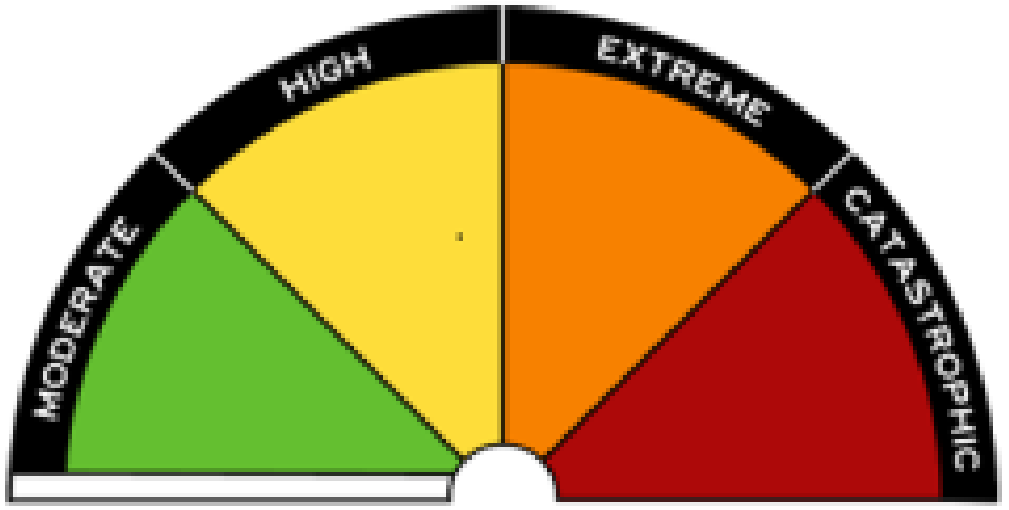
Planning for and implementing this fuel reduction is the essence of sound bushfire planning and management.

Hazard reduction summary

Hazard reduction is most effective when targeted at infrastructure protection and potential control lines where reduction of potential wildfire intensity is critical for effective suppression and protection of lives and property.

Targeted local hazard reduction will provide protection in most bushfire season circumstances. At fire danger levels above *High* that level of protection rapidly diminishes as other fire behaviour factors increasingly predominate.

In those circumstances even low fuel levels will generate uncontrollable high intensity wildfire.

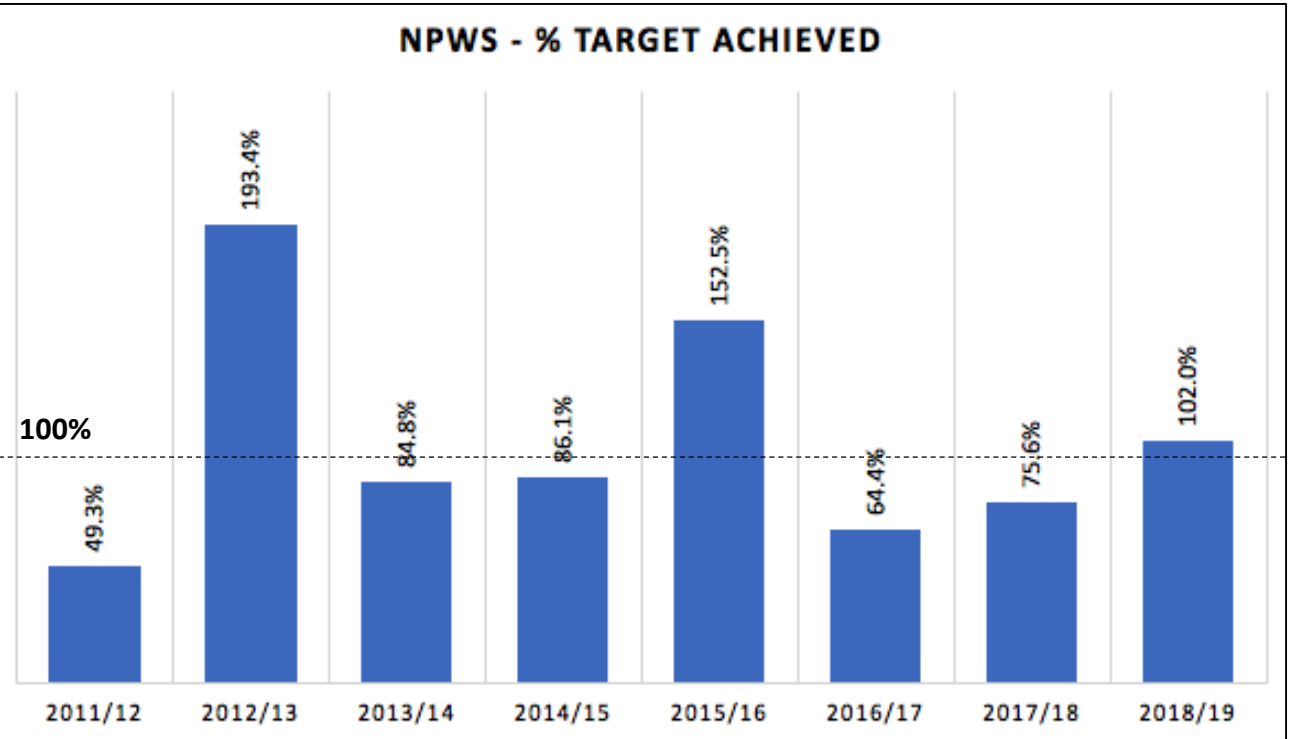


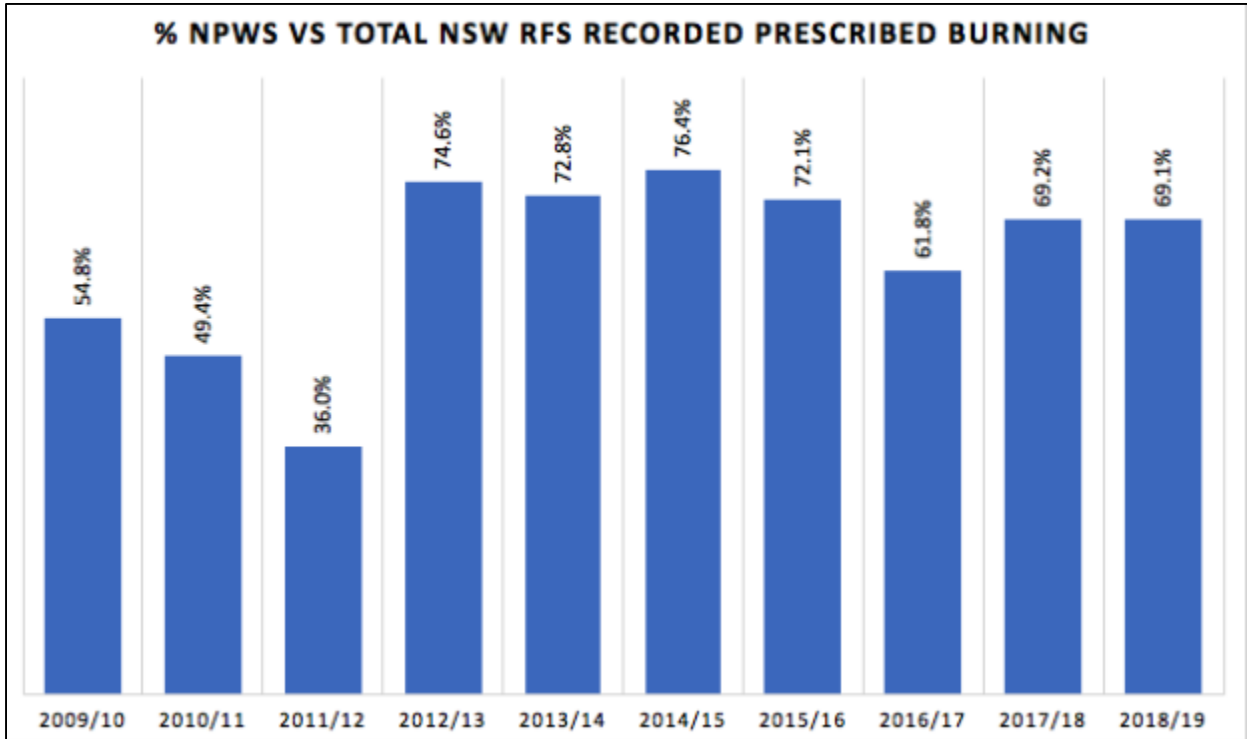
Wadbilliga National Park burn

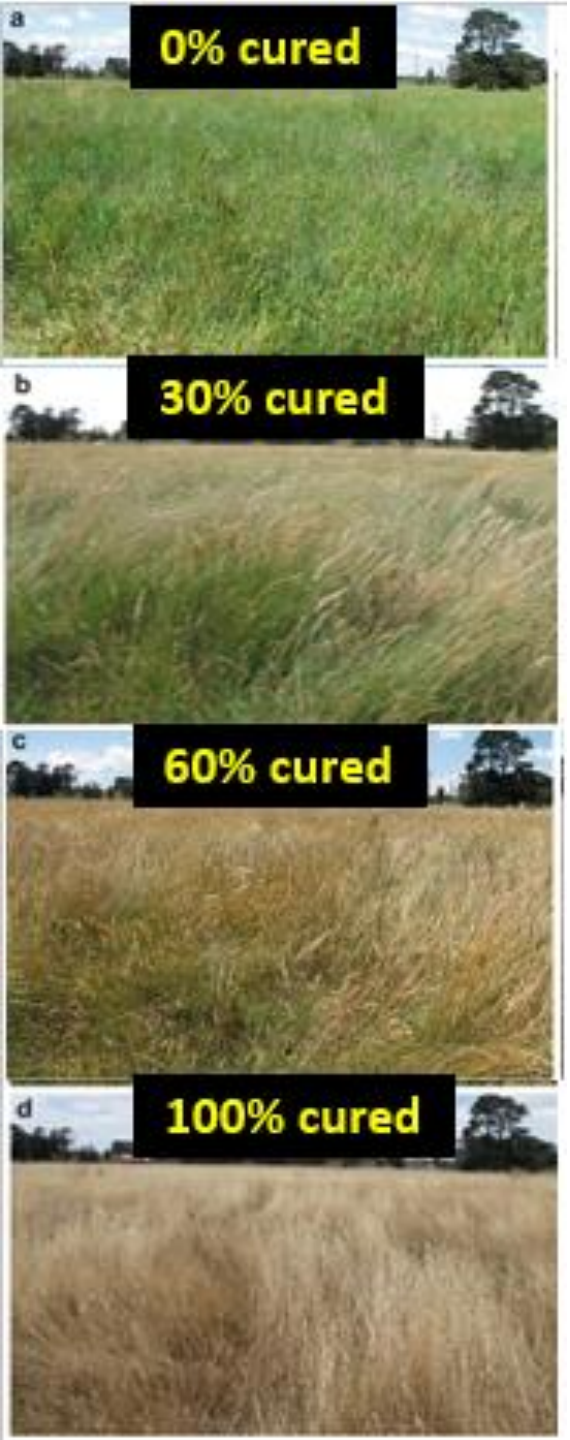
The capacity to meet a burning target mostly depends on the season.

It may be too wet or too dry to carry out a program.

With climate change the hazard reduction window is narrowing.







LAND AND WATER
www.csiro.au

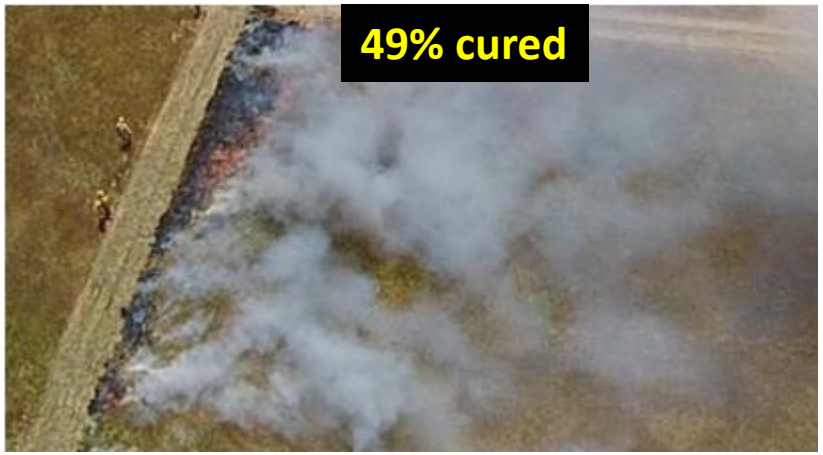
CSIRO

With grassland the issue is curing – not the fuel load

'We investigated the effect of fuel load on grassland fire behaviour.
Fuel load was not found to influence fire rate of spread or flame height (intensity)'.

'Sustained fire spread in grasslands was observed with curing levels between 20 and 30%.

Fire in grasslands will not self-sustain when the curing level is below 20%. Above this level, fire rate of spread increases with increasing curing levels.



Adjacent test fires – simultaneously lit

The narrowing window for autumn hazard reduction is pushing more burning activity into spring.

This is a huge gamble. Logs and stumps (even roots) can smoulder for months, ready to cause a bushfire with the arrival of summer.

The other gamble is sudden hot gusty winds in spring that can change a low intensity burn into a high intensity wildfire.

Access to vital information

Living with bushfire, particularly in an emergency, is much easier if you know what is happening and have the basic information to enable you to implement your survival plan.

No two circumstances will be the same. At my property our capacity to manage our situation was facilitated by having our own power (generator) and internet access (satellite).

Useful web pages include:

- **The current weather map (BoM)**
- **The BoM rain radar site - tracking pyrocumulous columns**
- **RFS Fires Near Me**
- **RFS Fire Danger Ratings**
- **ARC GIS – active fire and burned area**
- **NASA – Active fire**
- **Digital Earth Hotspots**
- **Lightning Maps**

In a bushfire seasonal climate outlook for Oz:

La Niña is the good witch

Cooler and wetter

(2020-2022)

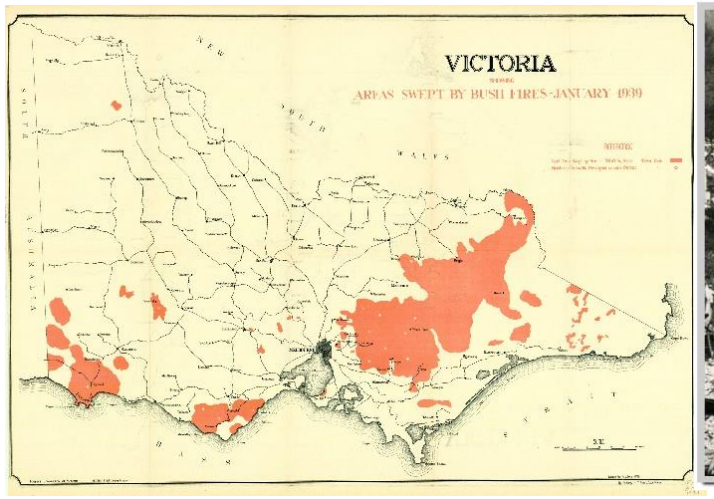
El Niño is the wicked witch

(2023-?)

Hotter and drier

Beware - La Niña can turn nasty

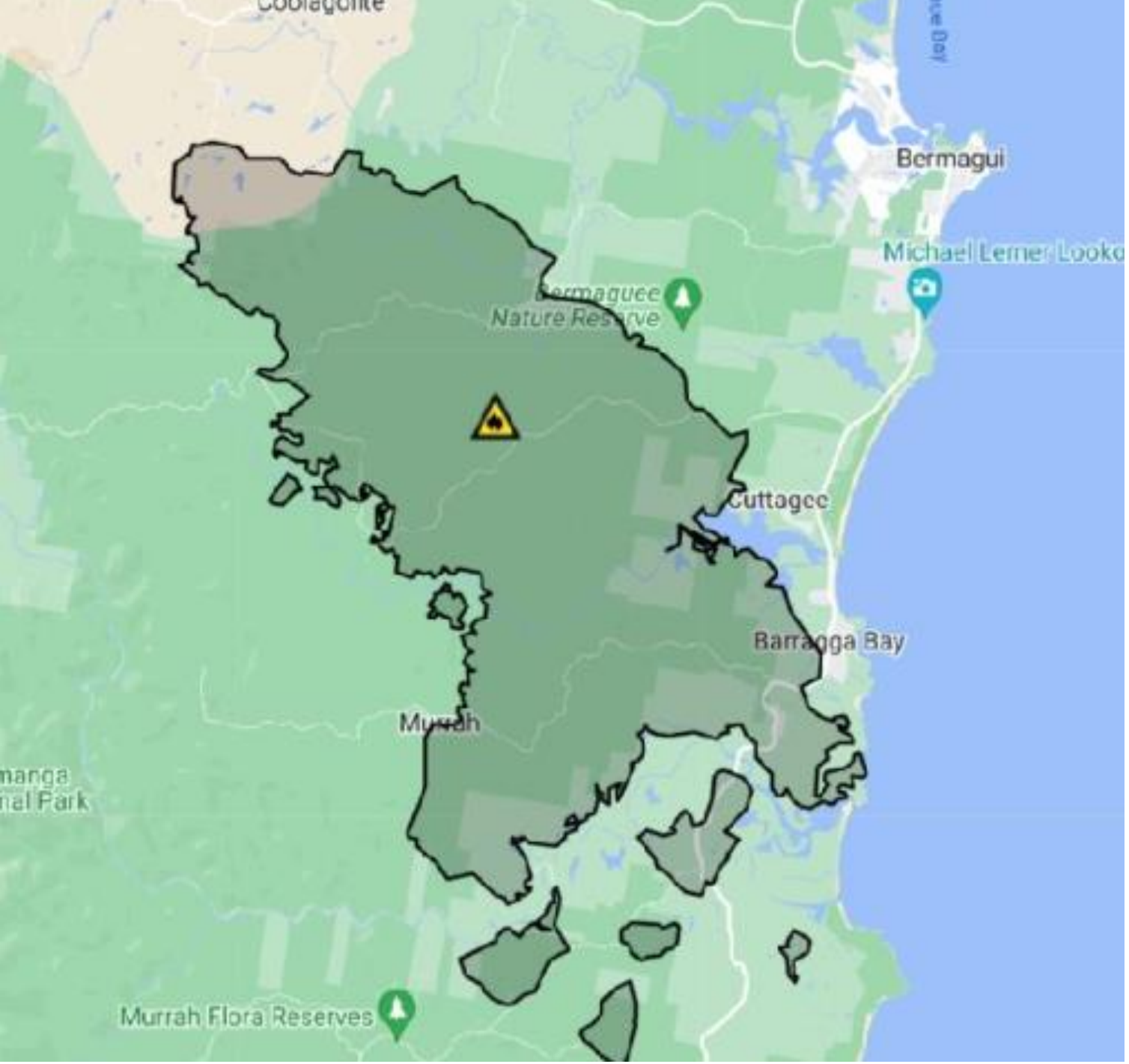
The increased La Niña rainfall can produce copious fuel that can readily dry out with an increase in the frequency of *bad fire weather days (as already evident in 2023)*:



Black Friday 1939

Black Saturday 2009

Bega Valley Feb 1 1952

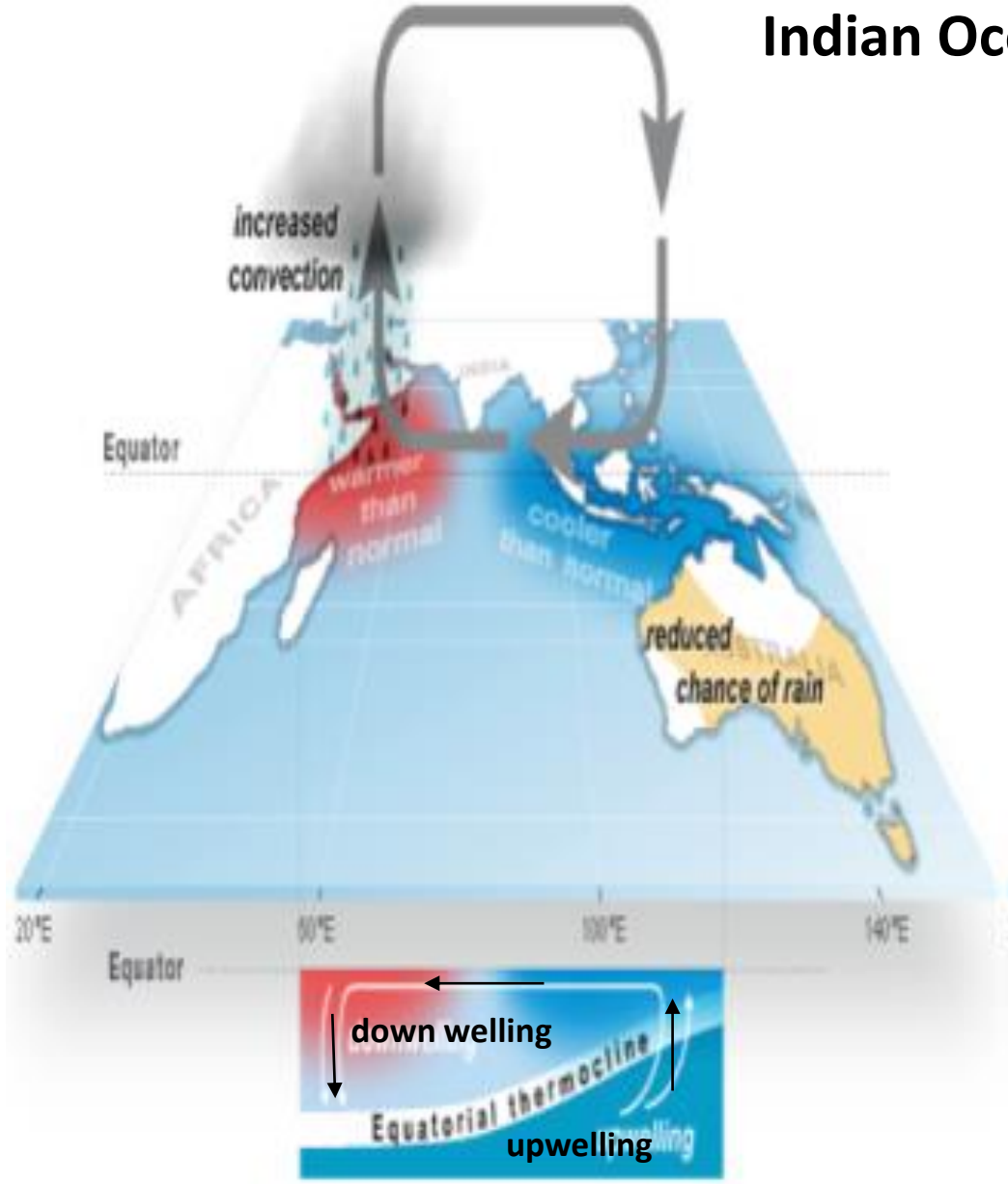


Add to the list of post *La Nina* bad fire seasons:

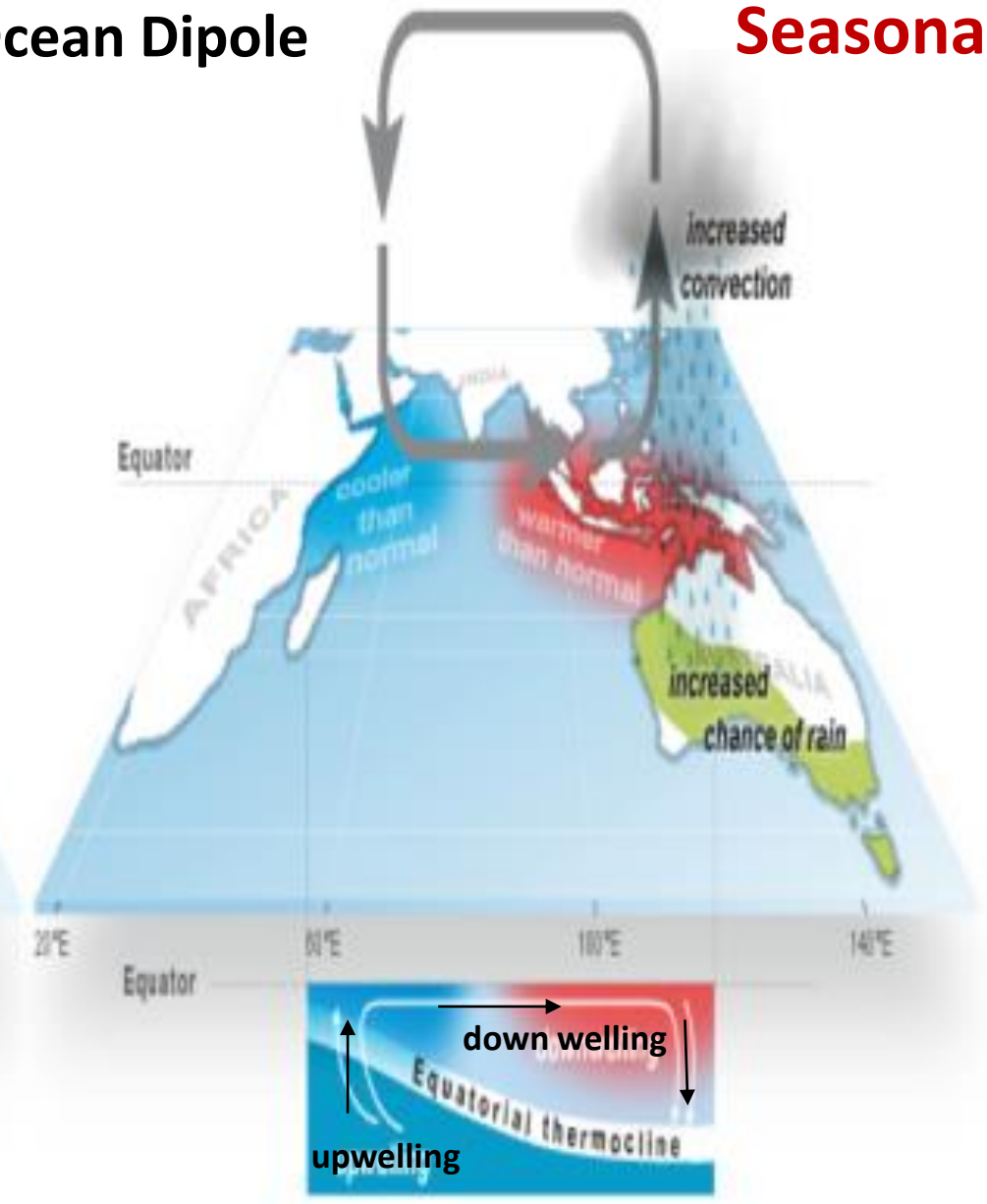
Coolagolite 2023

Indian Ocean Dipole

Seasonal drivers



Indian Ocean Dipole Positive phase

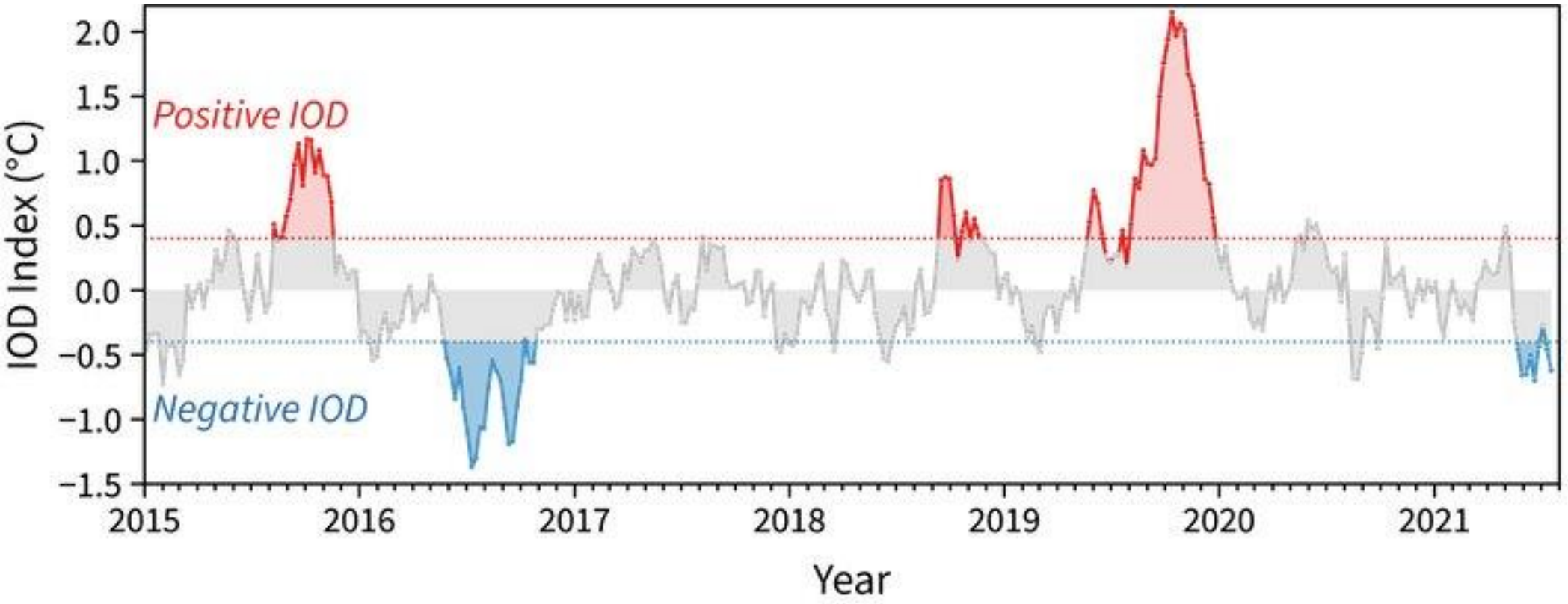


Indian Ocean Dipole Negative phase

Indian Ocean Dipole

1.8 (Oct 2023)

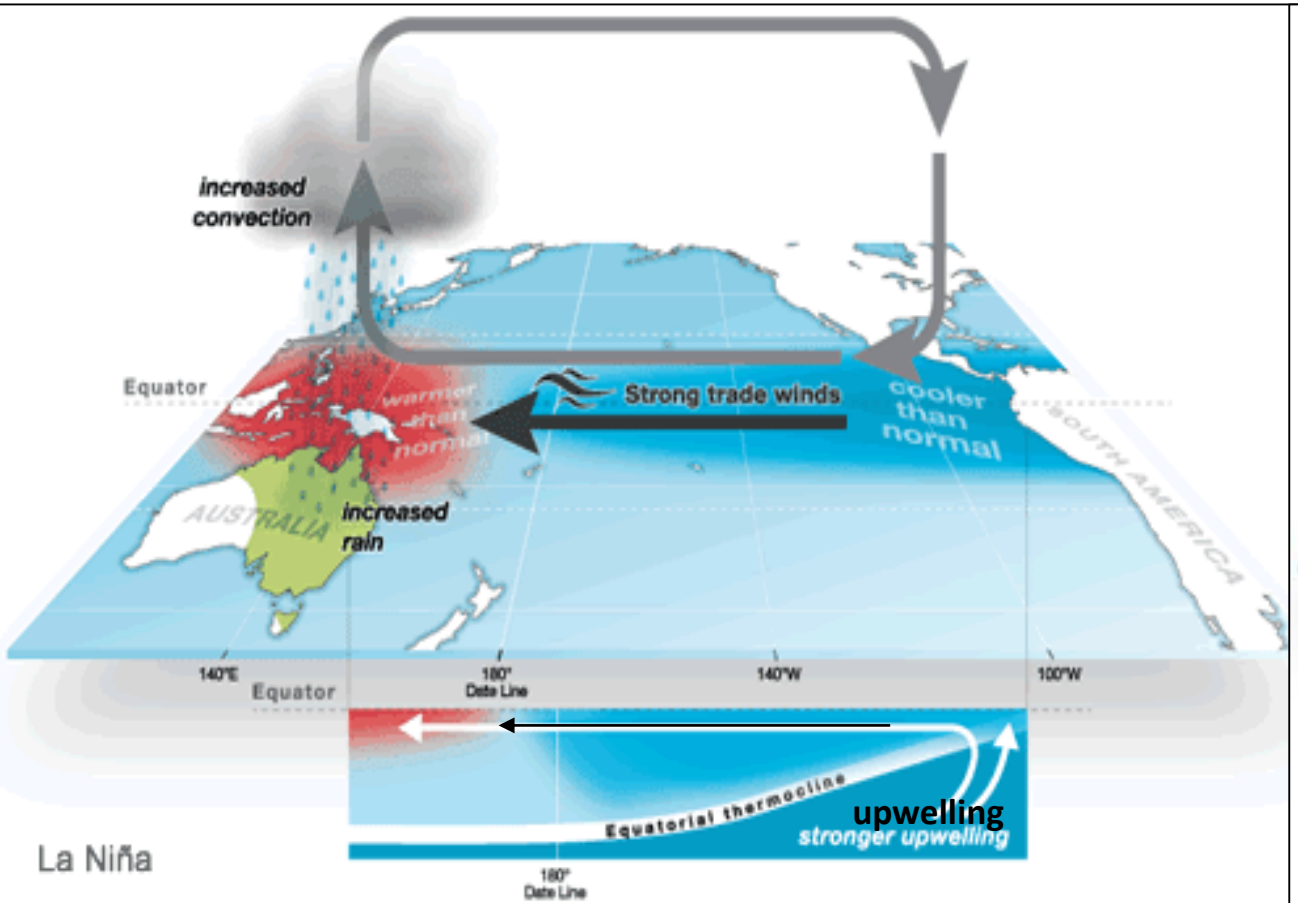
★ This year

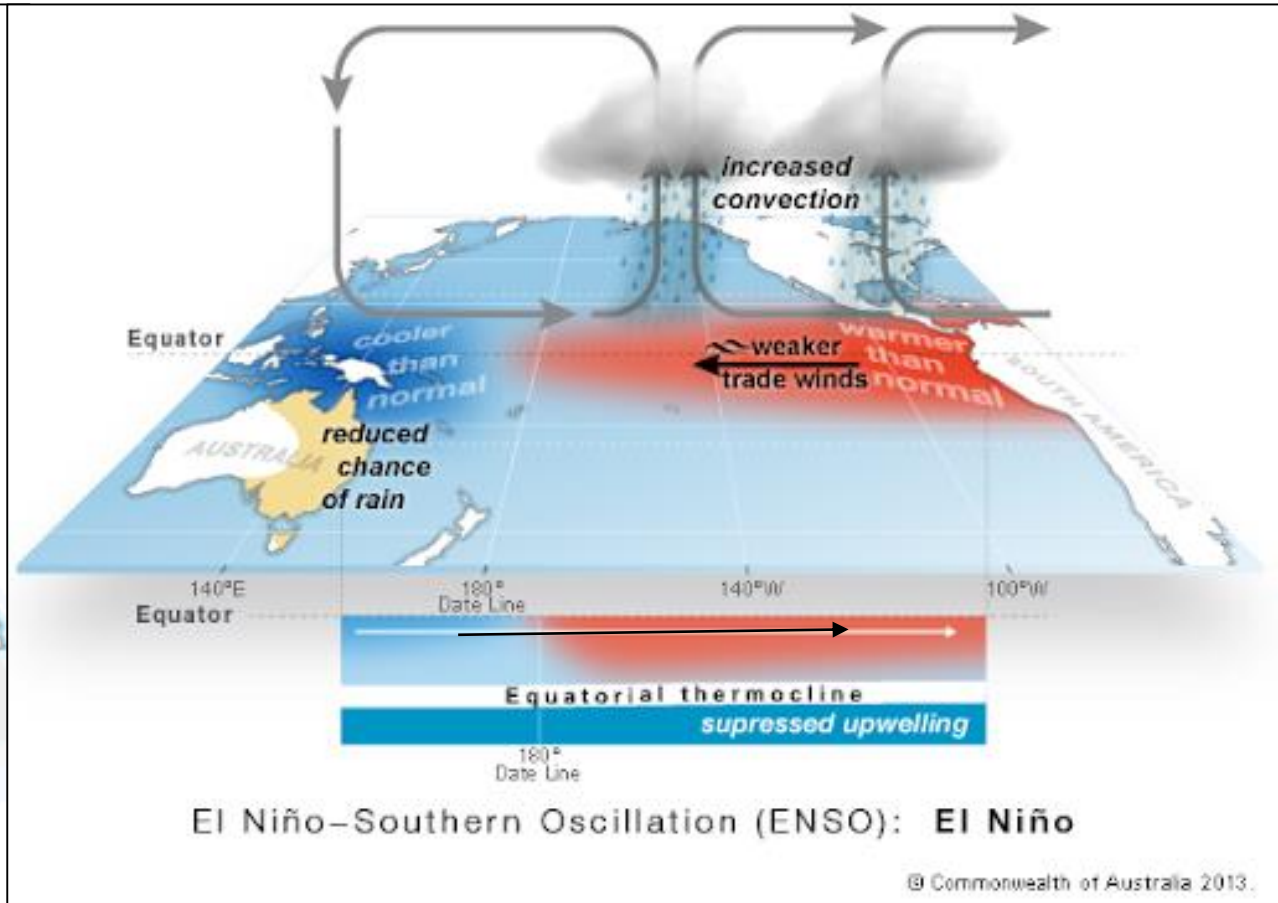


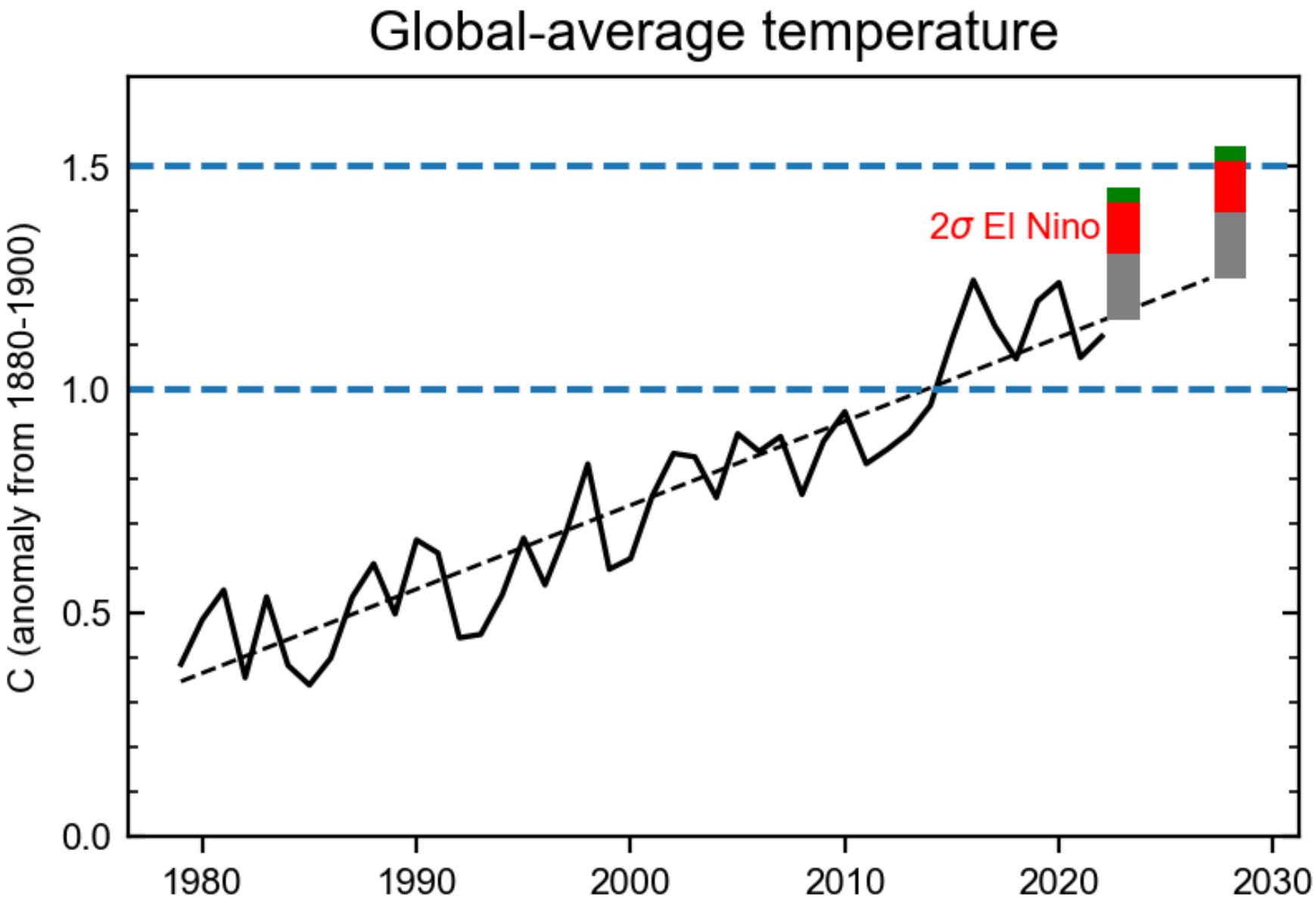
La Niña

El Niño

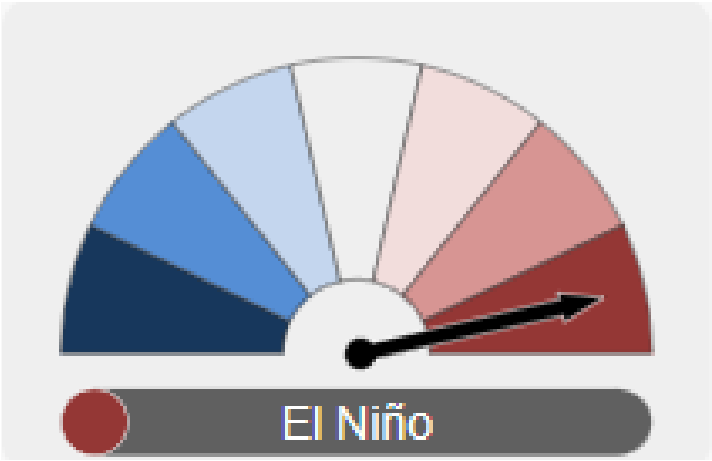
The story is of Peruvian fishermen who noticed cyclic weather that favoured fishing.
The warmer episodes coincided with Xmas and the birth of the boy child (El Niño in Spanish).
La Niña (girl child) was the opposite cooler episode.



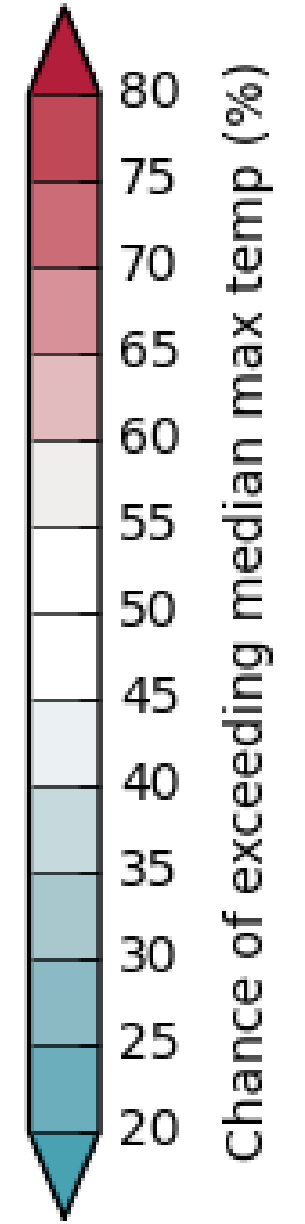




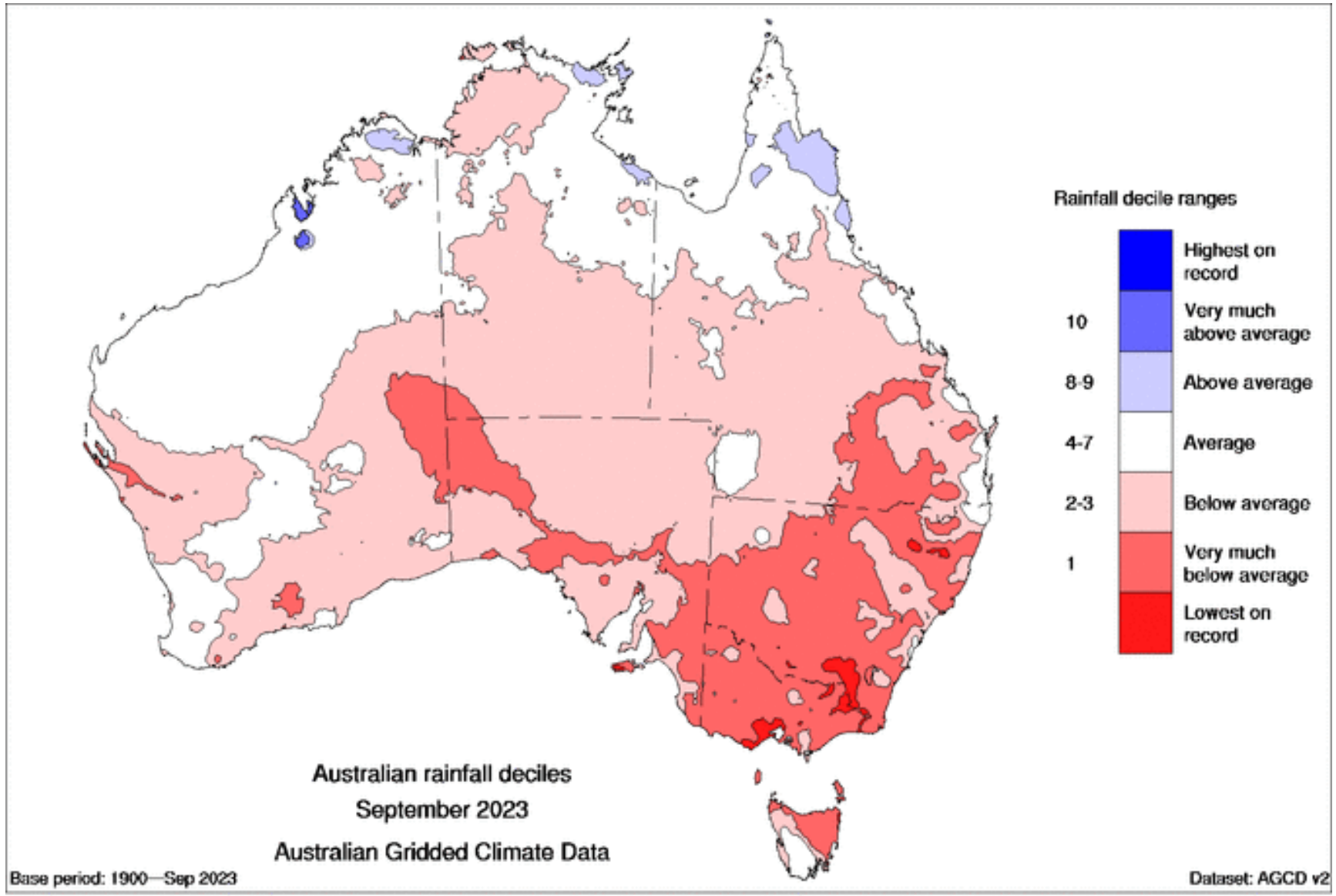
October 2023



2023 Forecast - Temperature

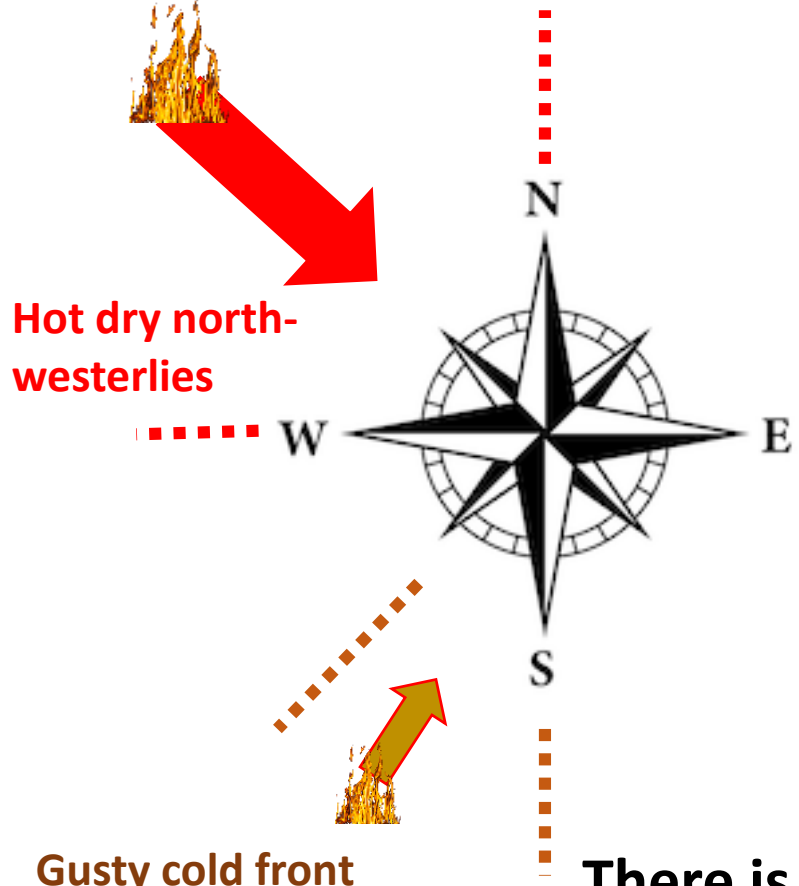


For Australia as a whole, September 2023 rainfall was 70.8% below the 1961–1990 average, the driest September on record (since 1900)



The long-range forecast released on 5 October 2023 indicates for November 2023 to January 2024, that below median rainfall is likely to very likely (60% to greater than 80% chance) for much of Australia

Staying alive



Assess your threat

- Likely threat direction
- Slope
- Aspect
- Fuel
- Potential fire intensity

Action

- Strategically reduce fuel
- Defence against ember attack

There is a wealth of information readily available.

A good start is: https://www.myfireplan.com.au/

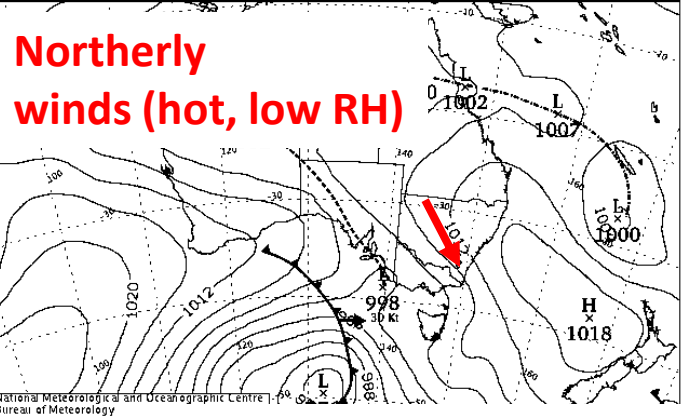
NSW RURAL FIRE SERVICE
FIRE + RESCUE

You should aim to develop your own Bushfire Survival Plan. There is a lot of information online that will assist you.

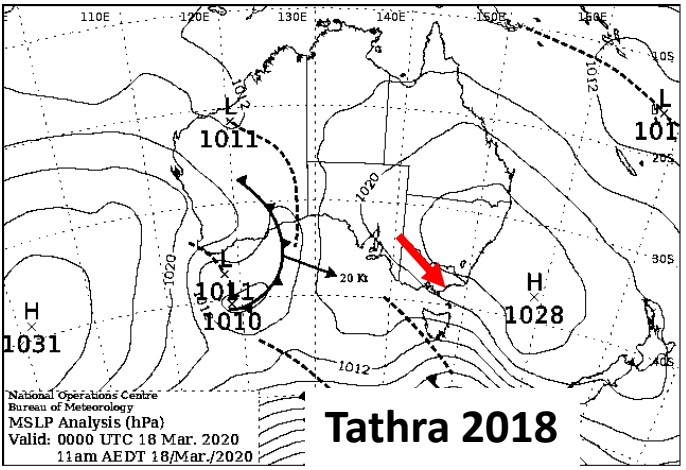
Become adept at recognising serious fire danger weather maps.

The onset of high summer temperatures and north westerly winds.

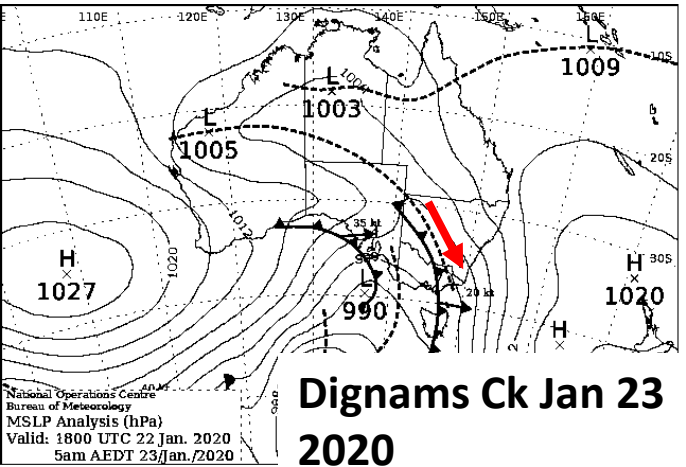
The key is a big high pressure system in the Tasman Sea with winds coming off the desert landing on us as hot, dry (low humidity) and blustery if they are pushed by an incoming cold front.



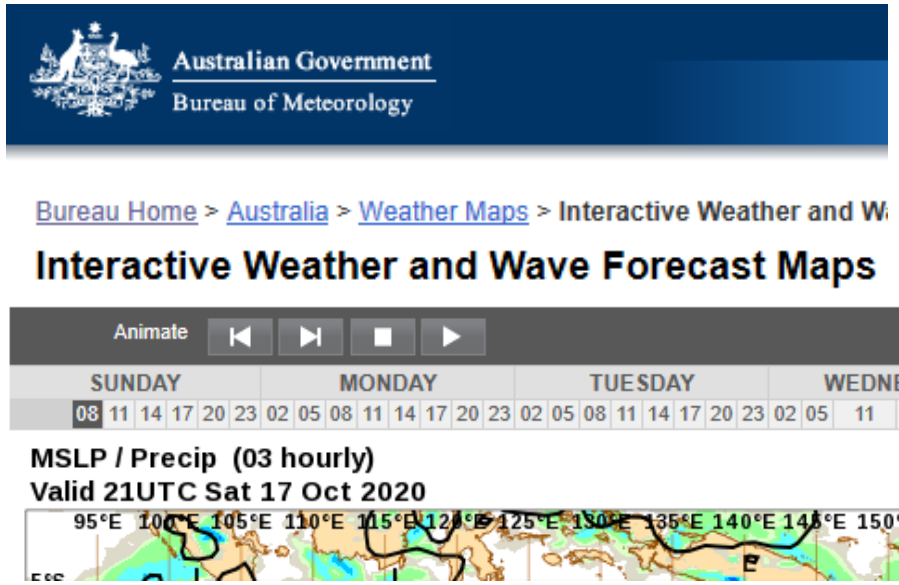
Black Saturday 2009



Tathra 2018



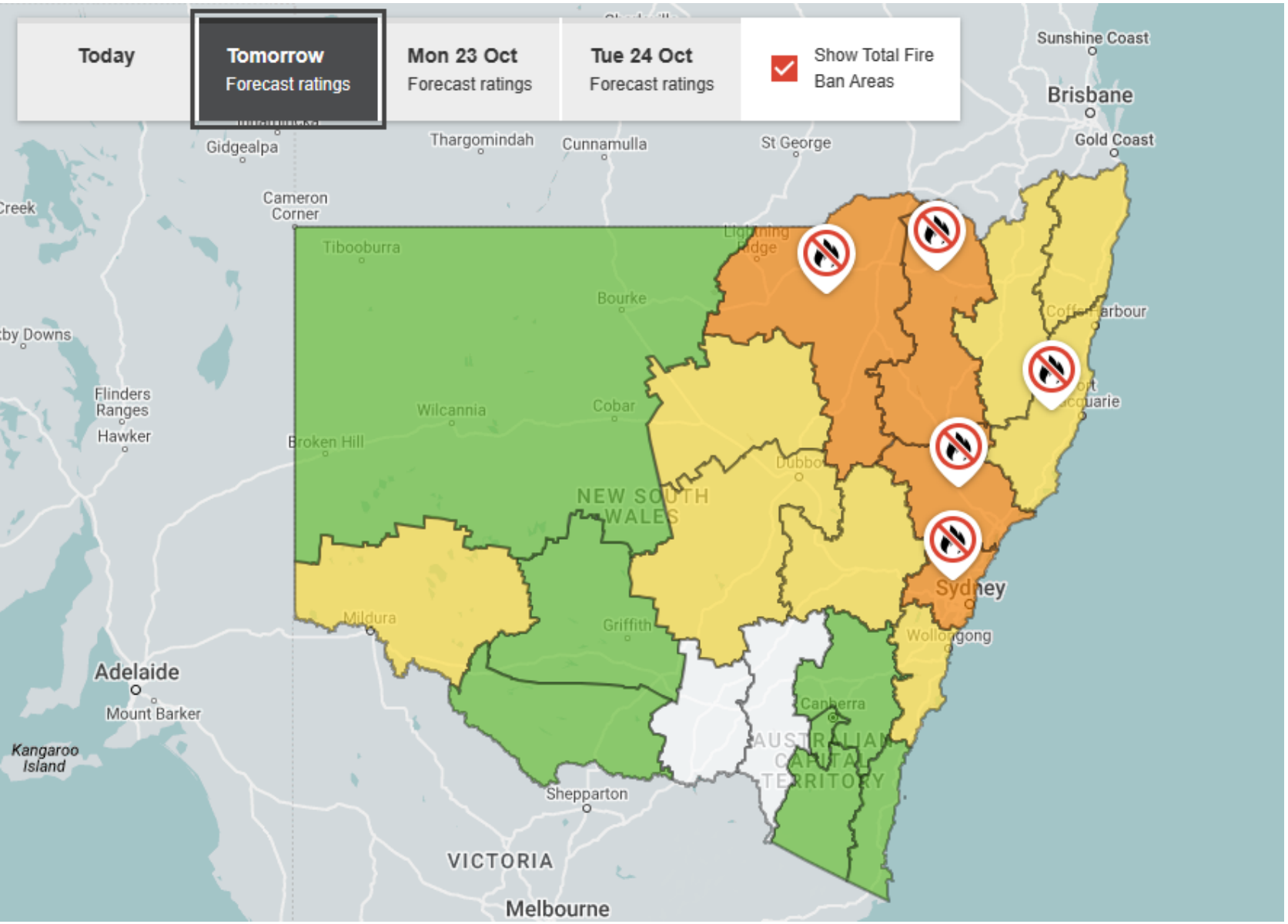
Dignams Ck Jan 23 2020



Remember - winds go anti-clockwise around a *High* and clockwise around a *Low*.
Prompt – the 'L' in Low = 'L' in Clockwise

The BoM site allows you to see the forecast maps 7 days in advance so there is no excuse for being caught out. Regular checking of this site is essential for coping with a fire season.

Remember the RFS website has current and immediate projection of Fire Danger Ratings



Key to Fire Danger Ratings

NO RATING	No rating issued
MODERATE	Plan and prepare
HIGH	Be ready to act
EXTREME	Take action now to protect your life and property
CATASTROPHIC	For your survival, leave bush fire risk areas

Total Fire Ban – There is total fire ban in place

Define the circumstances you are protecting against

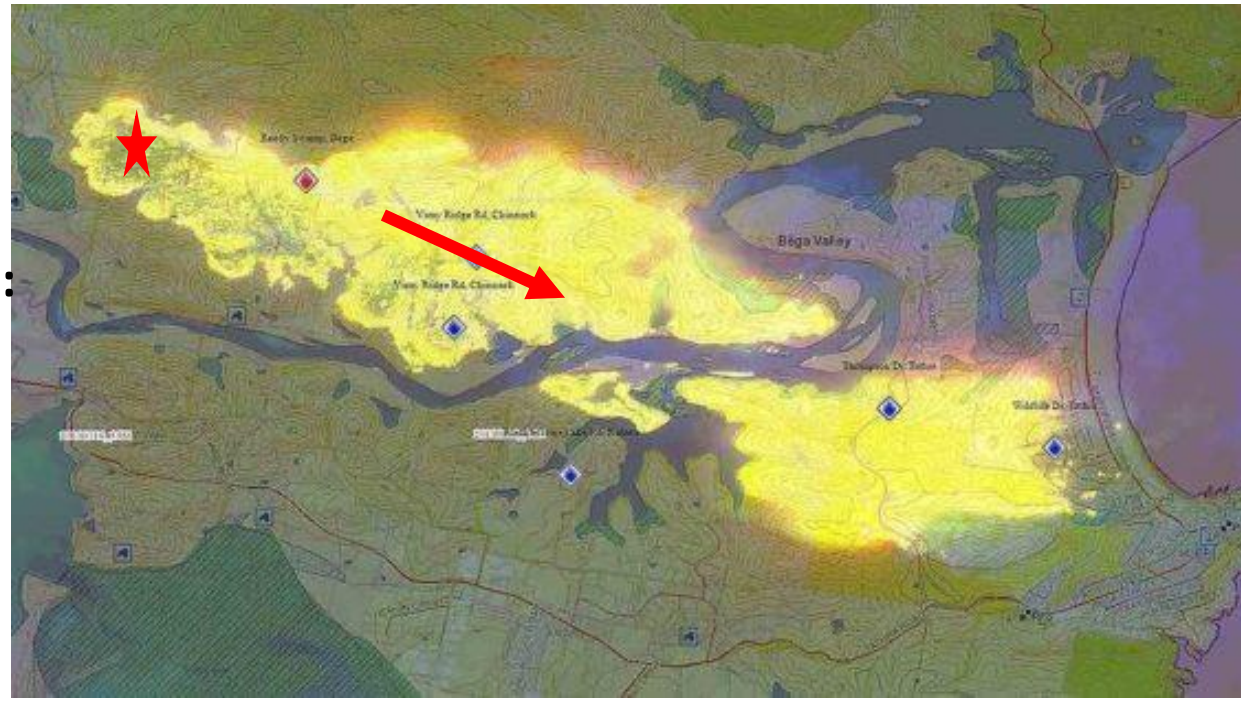
It will be a characteristic 'bad fire day' in a period of high forest fire danger index. For this region, probably late February to mid March, for example Tathra 18 March 2018:

Temp 37°C+

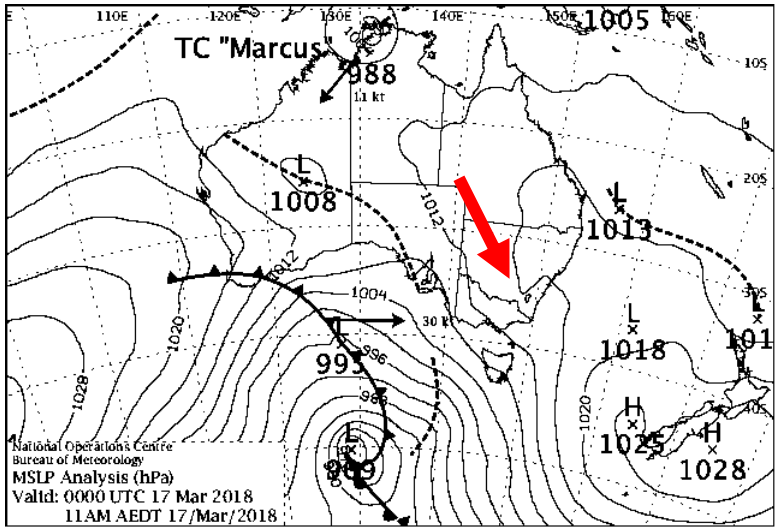
Relative humidity below 20%

Wind NW at + 50kmph

Forest Fire Danger Index 50+



I call this a 'design day' for fire planning purposes

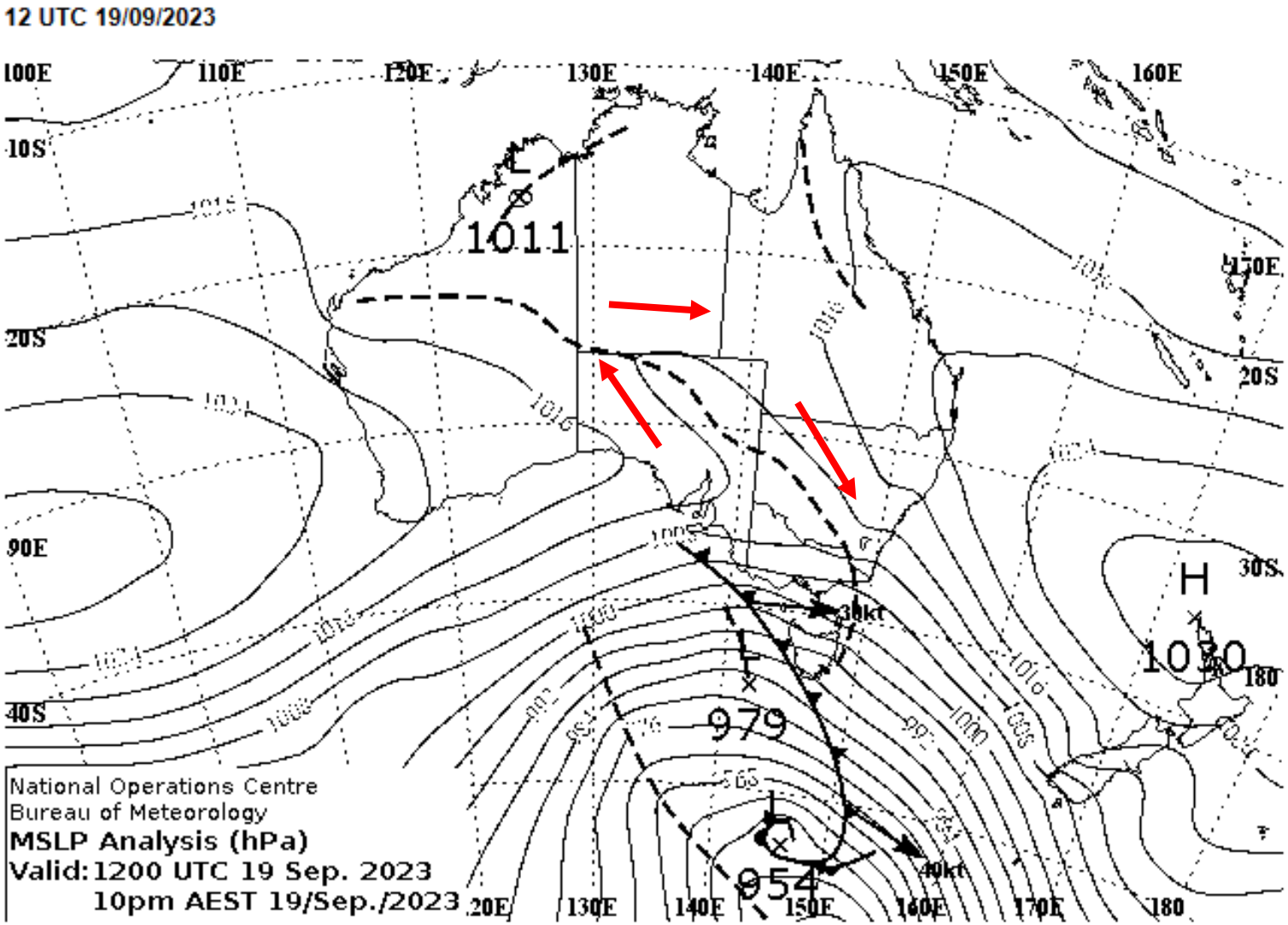


69 houses lost, 30 caravans and cabins, 39 houses damaged

This severe fire weather extended across the region. A similar fire could have erupted anywhere there was ignition.

Note these were similar conditions to 23 January 2020.

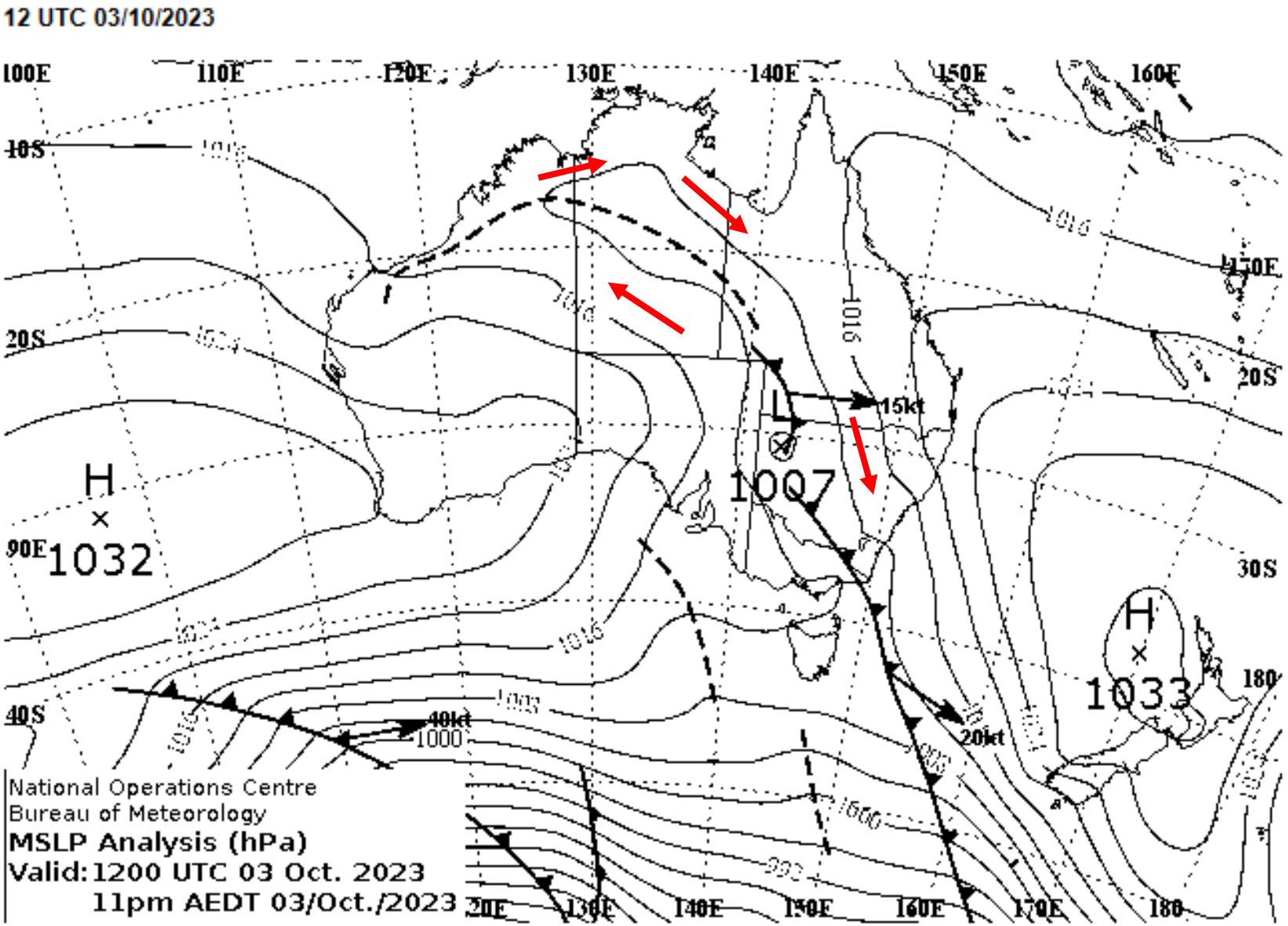
Tuesday 19 September 2023 – a local "*catastrophic*" fire danger rating

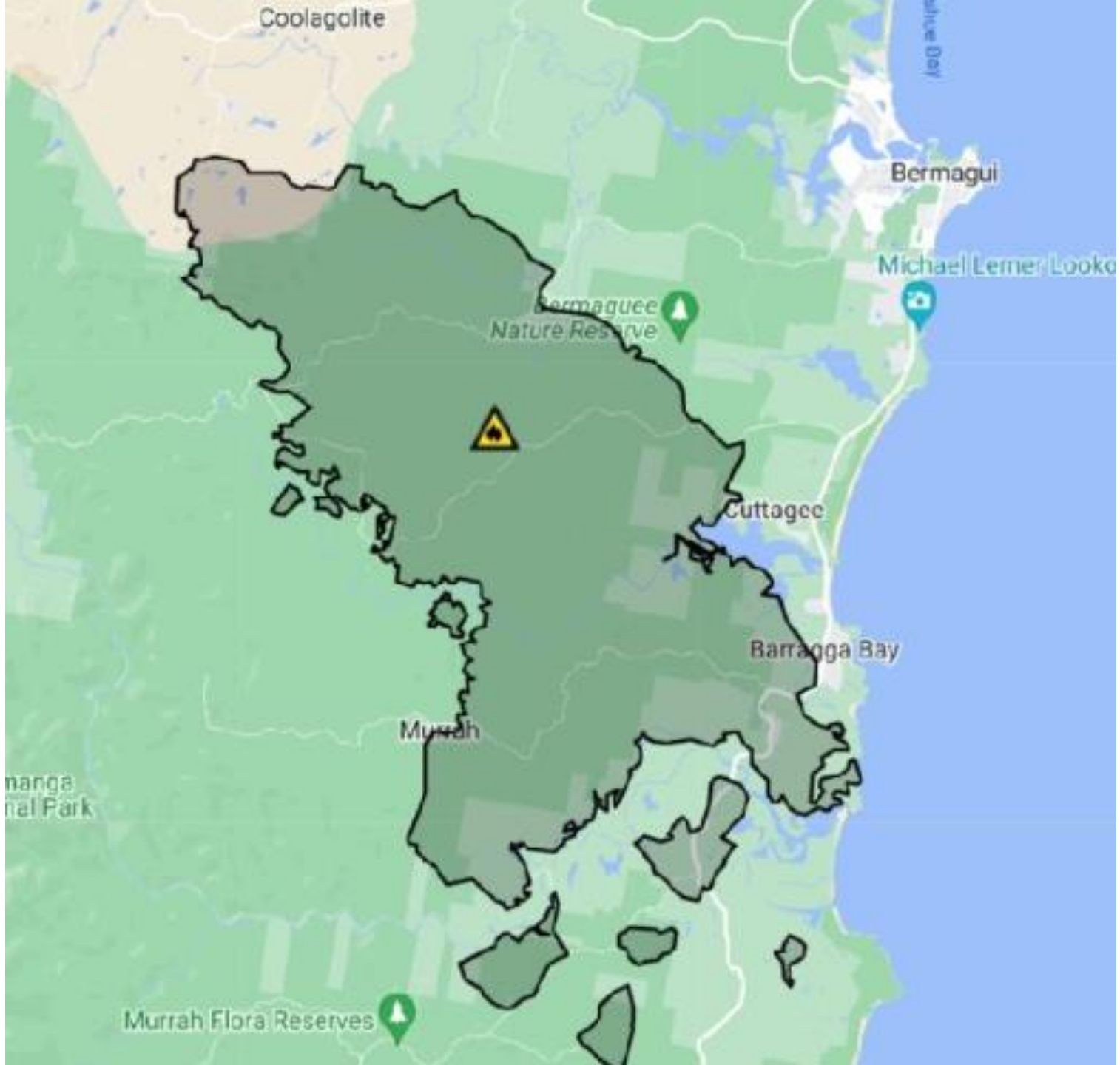


Previously unthinkable for this time of year. We were warned.

Deputy Premier says climate change talk amid fire crisis a 'disgrace'

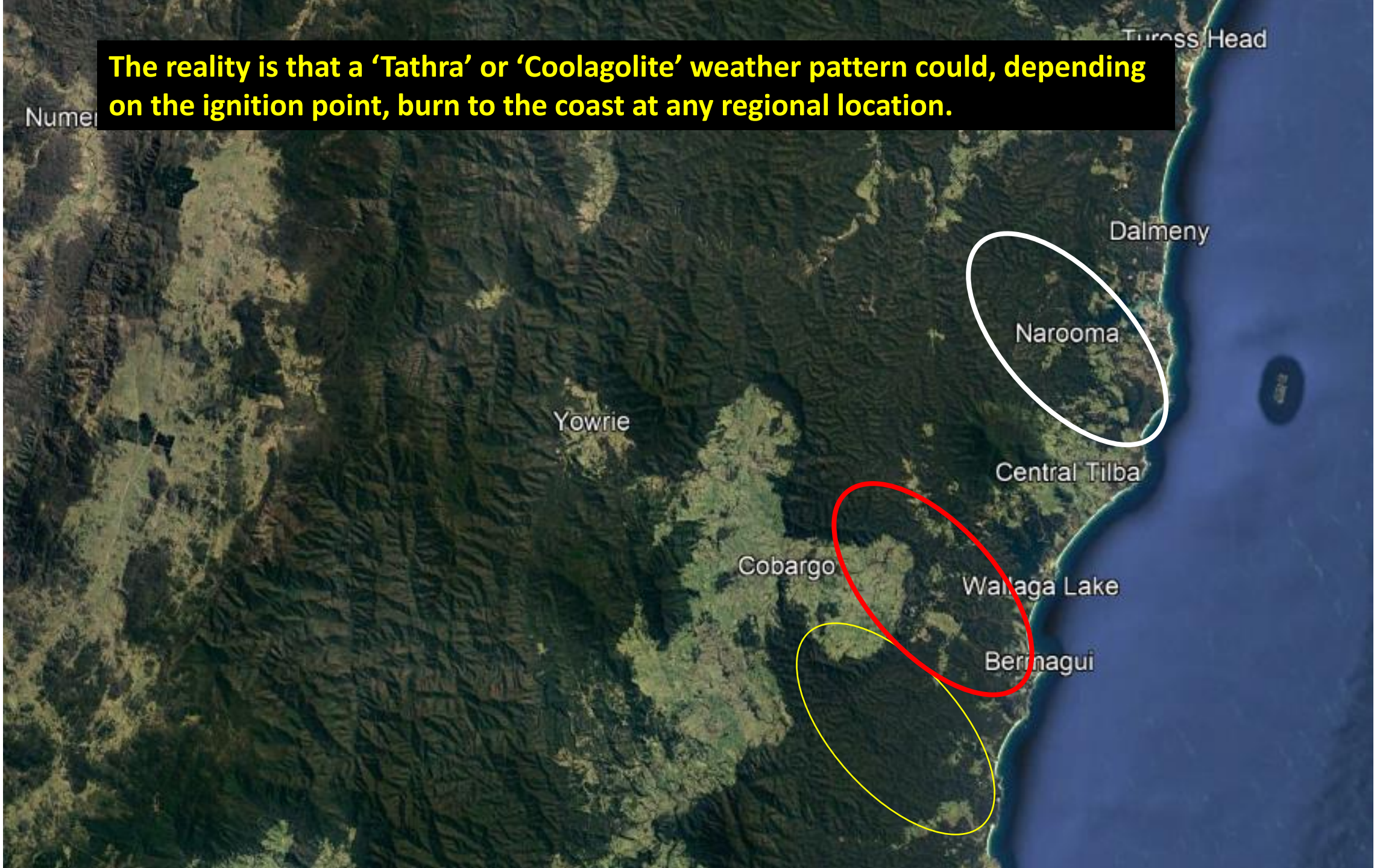
Tuesday 3 October 2023 – Coolagolite Fire




Coolagolite
Bermagui
Michael Lerner Looko
Bermaguee
Nature Reserve
Cuttagee
Barragga Bay
Murrah
Murrah Flora Reserves

View from our front garden


Tuross Head
Bodalla
Numeralla
Nerrigundah
Dalmeny
Narooma
Cobargo Fire
Yowrie
Central Tilba
Cobargo
Wallaga Lake
Bermagui
Coolagolite Fire


The reality is that a ‘Tathra’ or ‘Coolagolite’ weather pattern could, depending on the ignition point, burn to the coast at any regional location.
Tuross Head
Dalmeny
Narooma
Yowrie
Central Tilba
Cobargo
Wallaga Lake
Bermagui


It is never too late to start preparing
Mr Mulch is no longer your friend

Garden mulch contains enough energy to break a window and ignite curtains in a blink of an eye (glass breaks at about 200°C, melts at 750°C – wood burns 1270°C).

Take away *Staying Alive* messages

If you are within 50m of a forest edge your property is undefendable against radiation threat

Assume you will be impacted by embers – up to 30km

Remove fuel in proximity to your assets – even your beloved Australian natives (they are arsonists)

Plant fire impact mitigating vegetation (succulents, deciduous trees etc)

If you are going to evacuate – do it early, delay can be fatal

Inform yourself of risk over the next week and plan accordingly – good information is available


QUESTIONS