



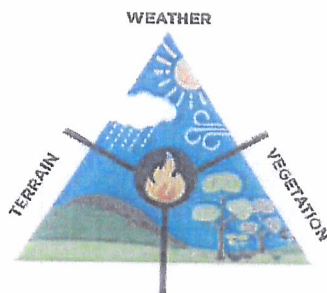
The 2019-20 bushfires explained

So far 10 million hectares* (25 million acres) of land has burned – more than the 2019 Amazon fires and the 2018 California wildfires combined – and more than any other forest fires recorded in Australian history. Tragically, lives have been lost, properties destroyed, millions of native animals killed, and smoke has covered towns and cities for many days. This fact sheet provides a scientific explanation of the contributing factors to this bushfire season.

Bushfires in Australia

Bushfires are a natural part of the Australian landscape. Much of our native vegetation has evolved to tolerate, and in some cases require, bushfires. The bushfire season is different for different parts of the country and varies across states and territories. The southern bushfire season (NSW, Vic, ACT and SA) varies from year to year and is typically most intense in the second half of the summer as vegetation dries out and fire danger increases.

In 2019-20 bushfires have been particularly widespread because much of the east coast of Australia has been experiencing extended drought. For the last 18 months, large sections of eastern Australia have received the lowest rainfall totals on record, meaning that bushfire fuel was already dry early in spring and remained dry into summer.



The three factors that contribute to fire behaviour

Factors influencing the behaviour of bushfires

Many factors influence the behaviour and spread of each individual bushfire and the damage they can cause. The 'fire behaviour triangle' – vegetation, weather and terrain – represents the three key factors that influence fire behaviour.

Bushfires also release large amounts of heat energy into the atmosphere. When large enough, bushfires can generate lightning, tornadoes and fire-storms which can impact on fire behaviour.

Terrain can also complicate fire behaviour and its management – fires that start in remote, rough or hilly terrain can be difficult to access. Fires burn faster uphill and can build in intensity and speed. Fires can also 'spot' ahead and increase the spread of fire across natural or constructed breaks.

A snapshot of the recent bushfires in eastern and southern Australia

- There has been a long-term increase in the occurrence of extreme fire weather and in the length of the fire season across large parts of Australia since the 1950s.
- Climate change means increasing frequency and severity of fire weather in these regions. This in turn may result in an increase in the number and severity of bushfire events.
- The 2019-20 bushfires have so far burned 10 million hectares (25 million acres) of land.
- While the exact circumstances relating to each bushfire differ and should be viewed as specific to that fire, there are a range of broader factors that have contributed to the behaviour observed this season.
- Record low rainfall and high temperatures experienced by southern and eastern Australia have contributed to the severity of the bushfires.
- 2019 was Australia's driest year since records began in 1900. Nationally-averaged rainfall was 40 per cent below average for the year.
- 2019 was also Australia's warmest year since records began in 1910.
- In 2019 the annual national mean temperature was 1.52°C above average (the annual national mean maximum temperature was also warmest on record at 2.09 °C above average).
- There is a long-term demographic trends of more people living, working and holidaying in fire-prone areas increases the potential impacts of bushfires.
- Lightning activity has been a predominant cause of ignition for the 2019 bushfires.

Sources: BoM Annual Climate Statement 2019, CSIRO-BoM 2018 State of the Climate report, www.bnhrc.com.au

*Figure includes all jurisdictions with exception of the Northern Territory

draft

Contributing factors to the current bushfires

In simplest terms, bushfires in Australia are caused by the combined influences of climate and weather on live and dead plant material (or bushfire fuel) and on fire behaviour, together with the presence of an ignition source.

- A region's climate characterises the longer-term weather patterns such as wet and dry seasons. This then influences the rate of vegetation growth and when it dries and becomes flammable which ultimately determines the 'fuel load and condition' for a location.
- Weather refers to the conditions over short periods of time. 'Fire weather' relates to days with a combination of strong winds, low humidity and high temperatures and highlights increased risk of bushfires. Extremes in fire weather increases the speed and intensity at which fires burn.
- Ignition may arise from natural sources - particularly dry lightning - but can also occur by accident or deliberate means.

These factors vary across Australia due to its large size and distinct regional climates, and because of this the timing of the fire season is different for locations around Australia throughout the year.

The most dangerous bushfire weather conditions typically occur between October and March in southern Australia. Consistent with predictions from more than a decade ago, this pattern has shifted with climate change with an increased length and intensity of the fire season and an increase in the average number of elevated fire weather days, as measured by the Forest Fire Danger Index or FFDI (see Figure 1).



Australians are familiar with the Forest Fire Danger Index (FFDI) sign on roadsides across the country that show the level of fire danger on a given day. The index combines a measure of vegetation dryness with the weather factors characterising 'fire weather' - air temperature, wind speed and humidity. If you add up the FFDI values for every day over a year, you get what's called the 'annual accumulated FFDI'. Last year saw the highest annual accumulated FFDI on record.

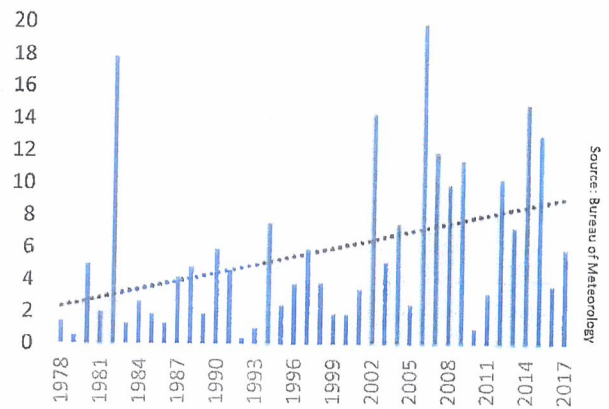


Figure 1: An example of the change in fire weather conditions - area average of the number of days with FFDI greater than 25 (very high fire danger) in Victoria in spring for the years starting in July (1978-2017). Despite interannual variability, there is a clear trend in recent decades towards a greater number of very high fire weather days in spring. Adapted from State of the Climate 2016

Living with bushfires and the role of science

There are a number of steps we can take to minimize the potential damage done by a bushfire. This includes fuel management (including hazard reduction burns) before the fire season, ignition prevention (e.g. total fire bans) before the onset of a bad fire day, and fire suppression (back burning) when a bushfire breaks out. Fire suppression tools can include active fire-fighting using water and fire retardants, but also other tools such as back burning and land clearing for fire breaks.

Where and the way we live and organise our communities also play an important part in how we prepare and respond to bushfire threats, and enable affected communities to recover. Ensuring that Australians living in bushfire prone areas have access to the best available evidence with which to make personal and broader planning, response and recovery decisions continues to be an integral part of our science effort.

This includes how and where we build houses, how we prepare properties, and how we educate ourselves to be fire-ready.

Australian researchers produce some of the world's best climate, weather, fire and disaster research; and work closely with operational agencies, governments and communities to better prepare for, respond and recover from these events.

For more information visit:

www.CSIRO.au

www.bom.gov.au

www.bnhcrc.com.au

This information aims to explain in simple terms our scientific understanding of bushfires in Australia in context of those experienced in recent months. Much research is yet to be done to fully understand the complex interplay of factors that led to the 2019-20 bushfires across eastern Australia. CSIRO has produced this information with input from attendees of the Bushfire Science Roundtable held on Wednesday 15 January 2020.

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