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TOPICS IN THIS EDITION | FIRE IMPACTS | FIRE SEVERITY | FIRE WEATHER

## AUSTRALIAN SEASONAL BUSHFIRE OUTLOOK: DECEMBER 2019



### OVERVIEW

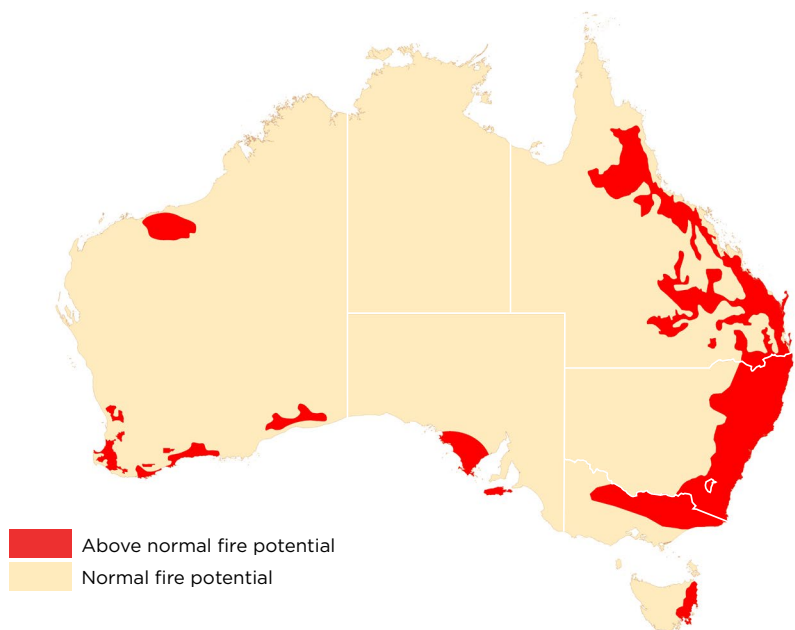
The 2019/20 fire season is well underway with multiple large bushfires occurring since the release of the previous Outlook in August. Queensland and New South Wales in particular have experienced severe fires, but all states have had challenging fire conditions. Catastrophic fire danger ratings have been issued in NSW, Western Australia, South Australia and Victoria, and there has been loss of human lives and animals, and damage to property and the environment.

2019 has seen the second warmest January to November period on record for Australia, 0.01°C behind 2013, coupled with the second-driest on record for the same period. Looking forward into the Outlook period, it is these conditions that lead to the continued above normal fire potential across most states and territories into 2020. A long and challenging fire season is expected, and all states and the ACT are warning of increased fire danger as the fire season progresses.

This December 2019 *Australian Seasonal Bushfire Outlook* covers all states and territories through summer 2019/20. It provides information to assist fire authorities in making strategic decisions such as resource planning and prescribed fire management to reduce the negative impacts of bushfire.

Bushfire potential depends on many factors. The volume, location and timing of rainfall are critically important when estimating vegetation (fuel) volumes and growth. The climate outlook for the next few months is also a crucial factor.

The *Australian Seasonal Bushfire Outlook: December 2019* is developed by the Bushfire and Natural Hazards CRC, AFAC, the Bureau of Meteorology, Queensland Fire and Emergency Services, the New South Wales Rural Fire Service, ACT Emergency Services Agency, ACT Parks and Conservation Service, Country Fire Authority, Department of Environment, Land, Water and Planning Victoria, Tasmania Fire Service, Country Fire Service, Department of Fire and Emergency



▲ Figure 1: AUSTRALIAN SEASONAL BUSHFIRE OUTLOOK DECEMBER 2019. AREAS ARE BASED ON THE INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA AND OTHER GEOGRAPHICAL FEATURES.

Services and Department of Biodiversity, Conservation and Attractions Western Australia, and Bushfires NT.

### RECENT CONDITIONS

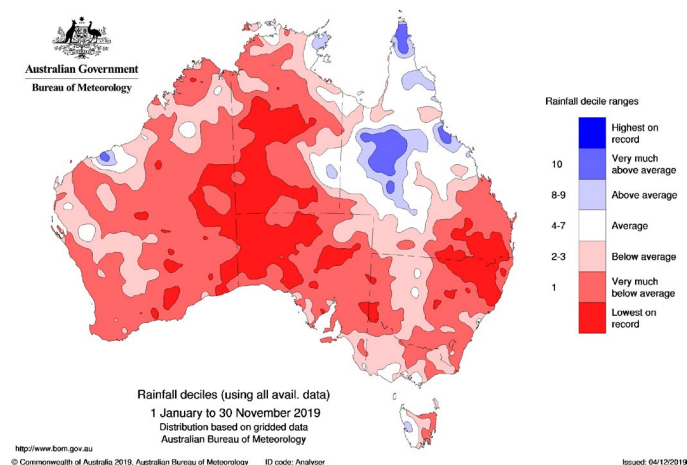
Seasonal fire conditions are a function of fuel amount and state, and seasonal weather conditions. The year to date has been unusually warm and dry for large parts of Australia (Figures 2 and 3, page 2), with many records set.

For January to November, rainfall has been below to very much below average over much of Australia. It has been the second-driest January to November on record for Australia (rainfall records begin in 1900), and the driest since the peak of the Federation Drought in 1902. It has been especially dry over the southern half of Australia (south of the Northern Territory/South Australia border), which had the driest January to November period on record. At a state level, rainfall deficiencies affect large areas, especially south eastern Queensland through eastern New South Wales, the ACT, South Australia,

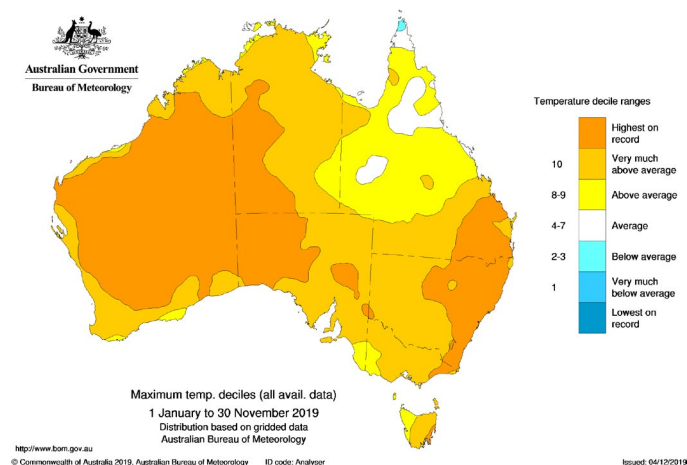
eastern Tasmania, south western WA, north western Australia and parts of eastern Victoria on a range of timescales. Areas of above average rainfall are largely confined to central Queensland, extending to the coast where heavy rainfall occurred early in the year.

Some areas, such as NSW extending into south eastern Queensland, are into their third year of dry conditions. It will take a prolonged period of above average rainfall to remove the deficiencies which are in place, meaning that general landscape dryness is likely to persist for many areas for some months. The combination of severe dry conditions over the long and short-term, coupled with high temperatures and record low humidity have contributed to the dangerous start to the southern fire season.

The warming trend means that above average temperatures now tend to occur in most years, and 2019 has followed this pattern. Temperatures in Australia for January to November have been the second warmest on record (1.37 °C above the 1961-1990 average, behind 1.38 °C for the same period



▲ Figure 2: RAINFALL DECILES FOR JANUARY TO NOVEMBER 2019 SHOWING DRY CONDITIONS OVER MUCH OF AUSTRALIA.



▲ Figure 3: MAXIMUM TEMPERATURE DECILES FOR JANUARY TO NOVEMBER 2019 SHOWING WARM CONDITIONS ACROSS AUSTRALIA.

## DEFINITIONS

**Bushfire potential:** The chance of a fire or number of fires occurring of such size, complexity or other impact (such as biodiversity or global emissions) that requires resources (from both a pre-emptive management and suppression capability) beyond the area in which it or they originate. Fire potential depends on many factors including weather and climate, fuel abundance and availability, recent fire history and firefighting resources available in an area.

in 2013), with daytime temperatures clearly the warmest on record (1.9 °C above 1961-1990 average, temperature records begin 1910). These high temperatures add to the impact of reduced rainfall by increasing evaporation, further drying the landscape and vegetation. However, it should be noted that poor growth of grass and annual plants means that vegetation loads are reduced in many drought-affected areas. Dust storms may be a common occurrence.

With the combined hot and dry conditions in place it is not surprising that the southern fire season started early and has been severe to date. Large areas have seen record fire danger overall, as well as a very early start to the high fire danger period. In area average terms, the fire weather as measured by the Forest Fire Danger Index (FFDI) for spring was record high for Australia, as well as all states and territories apart from South Australia (second) and Victoria.

The tendency for fire seasons to become more intense and fire danger to occur earlier in the season is a clear trend in Australia's climate, reflecting reduced and/or less reliable

cool season rainfall and rising temperatures (see State of the Climate 2018). Fire season severity is increasing across much of Australia as measured by annual (July to June) indices of the FFDI, with the increases tending to be greatest in inland eastern Australia and coastal Western Australia.

## CLIMATE OUTLOOK

The climate outlook for summer is mainly influenced by the Indian Ocean, together with other factors including long-term trends. Ocean temperatures in the tropical Pacific remain close to average, with El Niño or La Niña unlikely to develop in the coming months.

The positive Indian Ocean Dipole pattern which has brought dry conditions to Australia in recent months is forecast to decay by mid-summer. Temperatures in Australia for January to November have been the second warmest on record (1.37 °C above the 1961-1990 average, behind 1.38°C for the same period in 2013), with daytime temperatures clearly the warmest on record (1.90 °C above 1961-1990 average, temperature records begin 1910). Usually Indian Ocean Dipole events break down at the end of spring or early summer with the arrival of the monsoon into the southern hemisphere. However, this year the monsoon has been slow to move south—in fact it was the latest retreat on record from India—and international climate models suggest the positive Indian Ocean Dipole is likely to last longer than usual.

The other unusually persistent climate driver is a negative Southern Annular Mode. A negative Southern Annular Mode means Australia's weather systems are further north than usual. At this time of the year, this means stronger westerly winds for Tasmania and the southern mainland. In areas where those winds are coming off the ocean, it's been cooler and wetter, but in parts where westerlies blow

across long fetches of land, this air becomes dry and hot with reduced rainfall.

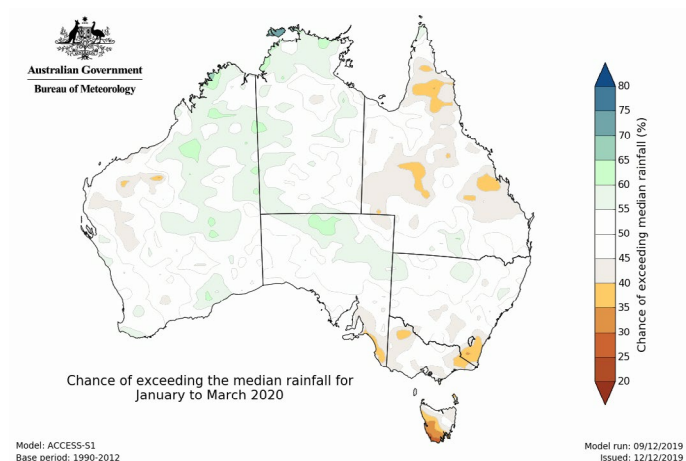
While both climate drivers are likely to decay by mid-summer, their legacy will take some time to fade. The positive Indian Ocean Dipole and the dry conditions experienced in winter and spring are known to be associated with a more severe fire season for south east Australia in the subsequent summer.

The rainfall outlook for January to March (Figure 4, page 3) suggests that rainfall is likely to be above average in western areas, while eastern Australia generally sees odds which are close to 50:50. The decay of the Indian Ocean Dipole means that probability swings are less strong than earlier in the season for eastern areas, suggesting that some relief in dry conditions is possible in the coming months.

Historical outlook accuracy for January to March is moderate across western and southern mainland Australia, as well as the northern NT and northern Queensland. Elsewhere, accuracy is low to very low.

The outlook for January to March maximum temperature outlook (Figure 5, page 3) favours above average daytime temperatures for nearly all of Australia, exceeding 80 per cent across much of the eastern half of the country. The outlook for minimum temperatures (not shown) also strongly favours above average temperatures across much of Australia, excluding the south east. Historical accuracy for January to March maximum temperatures is moderate to high across most of Australia, but low surrounding the Great Australian Bight, and to the south of the Gulf of Carpentaria. Minimum temperature accuracy is moderate to high for most of Australia, except the central NT and central to western parts of Queensland, where accuracy is low to very low.

Updates to climate forecasts, including forecasts of monthly, fortnightly and weekly



▲ Figure 4: CHANCE OF EXCEEDING THE MEDIAN RAINFALL FOR JANUARY TO MARCH 2020.

outlooks and the outlook for the Indian Ocean Dipole and the El Niño-Southern Oscillation will continue to be published at [www.bom.gov.au/climate/ahead](http://www.bom.gov.au/climate/ahead)

## REGIONAL SUMMARIES

### QUEENSLAND

Following a record fire season in Queensland in 2018/2019, the 2019/2020 fire season started in late August. Since then Queensland has seen several intense pulses of fire weather affecting an already chronically dry and hotter landscape, mainly in the south east - from Rockhampton to the NSW border and extending inland to around St George.

As this season has progressed, the drought has intensified in many areas, particularly in the south east, with the Main/Border Ranges area, and the area bounded by Warwick, Toowoomba and the Lockyer Valley standing out. These areas are showing the lowest one per cent on record for the monthly relative root zone soil moisture deficit for November. The long-term, and recently more intense, drought has seen significant additional surface fuels (vegetation) added in forest areas due to stressed trees dropping significant amounts of branches and leaves over winter and spring. As a result, these areas are seeing fires continuing to carry more widely and with more intensity than usual, even when humidity increases overnight.

Normally wet and fire-resistant rainforest and wet forests are becoming available and burning for the second season in a row, with this phenomenon now extending into southern Queensland to areas such as the Lamington and Main Range National Parks. The rainfall deficit has also increased inland of Bowen, Townsville and Cairns over the past two months, and as a result the northern forests and heavier woodlands are showing

above normal bushfire potential and will continue to do so until these areas experience significant rainfall.

Large areas of inland Queensland have been drought effected since 2013, and as a result there has been very little grass fuel available, with the exception of sporadic and short-lived growth due to irregular inland rain. The Darling Downs and Granite Belt districts are continuing to face severe water shortages as a result of the drought. This has impacted the availability of water for fire suppression. QFES continues to work closely with their partners to manage this risk. The longer the delay in the arrival of the monsoon, the likelihood of campaign fires in northern forest areas will continue to build.

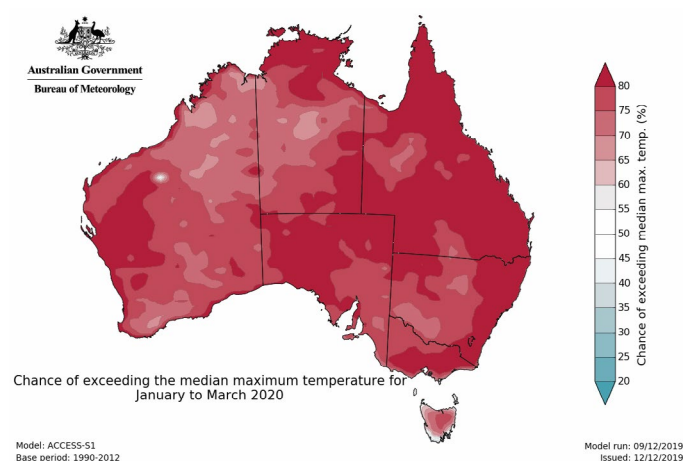
### NEW SOUTH WALES

The start to this fire season has been unprecedented for New South Wales, with large fires occurring across the state. Since July, more than 8,000 bush and grass fires have occurred, burning over 2.8 million hectares. Six human lives have been lost, more than 700 homes destroyed and more than 1,600 other buildings. Resources have been drawn from around NSW, other states and from overseas.

Much of the state has experienced very much below average rainfall during the last three months, with a small percentage of areas in northern NSW experiencing driest on record conditions. Long-term rainfall deficiencies, record-low for some areas in the north of the state, have severely impacted on water resources.

At the end of September, the NSW Department of Primary Industries mapped nearly all of NSW into one of three drought categories - intense drought, experiencing drought or drought affected.

With the short to medium-range climate



▲ Figure 5: CHANCE OF EXCEEDING THE MEDIAN MAXIMUM TEMPERATURE FOR JANUARY TO MARCH 2020.

outlooks forecasting warmer and drier than average conditions across the state, above normal fire potential will continue in forested areas on and east of the Great Dividing Range. Under these conditions, existing large fires will continue to remain a threat.

West of the Divide there is minimal grass fuels available due to the drought, and as a result reduced fire potential.

### ACT

The ACT has received less than average rainfall for nearly three years, leading to a persistent and high level of drought. The lowland forests have been very dry for some time, while highland forests are now dry as well. This indicates that fuel flammability in the forests is high and could remain so. The forest fire risk is elevated. The dry conditions and grazing by farm stock and wildlife have led to lower levels of grass growth, resulting in reduced overall grass fire risk. On bad days grass fires may still reach and impact on unprotected property. This situation should persist until rains return. Heatwaves and dust storms may make bushfire detection and suppression more challenging at times during the season.

The overall bushfire risk for the ACT is above normal. Community members should continue to prepare for fire by taking actions to reduce the bushfire risks around and within their property and to review their bushfire survival plans.

### VICTORIA

The potential for above normal bushfire activity continues across the coastal and foothill forests of East Gippsland, extending into parts of West Gippsland, Great Dividing Range, and into the central Goldfields. This is due to the above average temperatures and continuation of drying trends observed in these regions over the last three months,

coupled with three years of significant rainfall deficit across much of East Gippsland and across the Divide. During spring, cold fronts generated rainfall in southern Victoria, however much of inland Victoria received insufficient rainfall. In these inland areas soil moisture is lower compared to the long-term average. This is likely to cause moisture stress on live vegetation thereby increasing the quantity of dead fuel components and result in higher flammability in live vegetation. Wet forests (such as the Central Highlands and Otway Ranges) are generally close to average conditions for this time of year.

Across the rest of Victoria, mostly normal conditions are expected. In the west of the state, grassland fuel conditions indicate that curing is average for this time of year, and that there is average to above average quantities of grass and crop loads. When grasses and crops are close to or fully cured, there is potential in the coming months for fire behaviour that can rapidly escalate under elevated fire weather conditions.

#### TASMANIA

Tasmania experienced an early start to the fire season with serious fires in the north and south of the state in October. While there was easing in the fire weather during November, by the end of the month a very strong continuous westerly airstream coincided with a number of ignitions in the north and east, resulting in a continuing campaign fire west of Swansea in the Eastern Tiers. The weather conditions were very unusual and effective fire suppression was impossible during the conditions experienced.

The area of above normal fire potential in eastern Tasmania continues to expand, while the west of Tasmania is receiving good rains which are replenishing water tables and the moisture in organic soils. The area of above normal fire potential includes the far north east, the Fingal and Royal George valleys and the Midlands, the east coast from St Helens to Tasman Island and the lower Derwent Valley. The remainder of the state has normal fire potential, noting the dominance of fuels in the

west for which soil moisture is less important than in forests.

#### SOUTH AUSTRALIA

Minimal rainfall, and predominately warmer than average temperatures have persisted across South Australia through spring. As a result, the fire danger season was brought forward, with most areas commencing two weeks early.

The early start to the fire danger season has coincided with a number of total fire bans, and several significant fires have occurred. The Eyre Peninsula experienced Catastrophic fire danger conditions twice in November alone.

On 20 November Catastrophic fire danger was predicted for seven of the 15 weather districts across the state. A total fire ban was declared statewide, with Catastrophic fire danger recorded simultaneously across half the state. Temperature records were broken and 45 new bush and grass fires occurred. Eleven homes were lost on the Yorke Peninsula.

The current three month outlook for January to March 2020 indicates that South Australia is highly likely to experience above average day and night time temperatures, and there is little chance of above average rainfall during this period. This would indicate that the current dry conditions, which have supported major fires, are likely to continue throughout summer.

Based on the current climate outlook, and observed fire behaviour, parts of the Lower Eyre Peninsula and Kangaroo Island continue to have above normal fire potential. Forecast and observed conditions have also demonstrated the rest of South Australia maintains the potential for significant bushfires, including in the populated areas of the Mount Lofty Ranges.

The prolonged dry conditions are also likely to create increased occurrences of raised dust during the windy conditions that often accompany high fire risk days. The dust may affect the operational capabilities of aerial firefighting assets and limit their effectiveness. Fire managers will carefully monitor this issue, noting that without rainfall, dust suppression

is impossible on the scale required.

The fire danger season may be prolonged across parts of South Australia. Significant bushfires have occurred in similar conditions, and even areas of normal fire potential can expect to experience dangerous bushfires as per a normal South Australian fire season.

#### WESTERN AUSTRALIA

With the positive Indian Ocean Dipole delaying the onset of the monsoon, high temperatures and dry lightning in the northern part of Western Australia have resulted in heightened bushfire risk for the Kimberley until rain arrives. Above normal fire potential continues for parts of the south west, south coast, Nullarbor and Pilbara.

#### NORTHERN TERRITORY

The Top End's bushfire season started two months earlier in 2019 due to the preceding poor wet season. Large, long duration fires occurring from early in the season that typically would have pulled up in temporary watercourses.

The bushfire risk remains across the Top End in areas of the Gregory and Carpentaria Regions, with localised and patchy rainfall occurring in coastal areas. This risk will continue until the effects of the monsoon occur inland.

In central Australia, below average rainfall over the last 12 months has led to reduced growth of vegetation. Due to these dry conditions, mitigation programs conducted by pastoral enterprises has reduced as the need for retention of standing vegetation increases for cattle production. Despite this, the Northern Territory is expecting normal bushfire potential to continue for the remainder of the central Australian fire season. However, significant bushfires have occurred in similar conditions, and even areas of normal fire potential can expect to experience dangerous bushfires. This will be particularly relevant in areas that surround unmanaged land with remanent vegetation growth, particularly remote communities and outstations.

The Bushfire and Natural Hazards CRC is a national research centre funded by the Australian Government Cooperative Research Centre Program. It was formed in 2013 for an eight-year program to undertake end-user focused research for Australia and New Zealand.

*Hazard Notes* are prepared from available research at the time of publication to encourage discussion and debate. The contents of *Hazard Notes* do not necessarily represent the views, policies, practises or positions of any of the individual agencies or organisations who are stakeholders of the Bushfire and Natural Hazards CRC.

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