

SOUTHERN AUSTRALIA SEASONAL BUSHFIRE OUTLOOK 2017

OVERVIEW

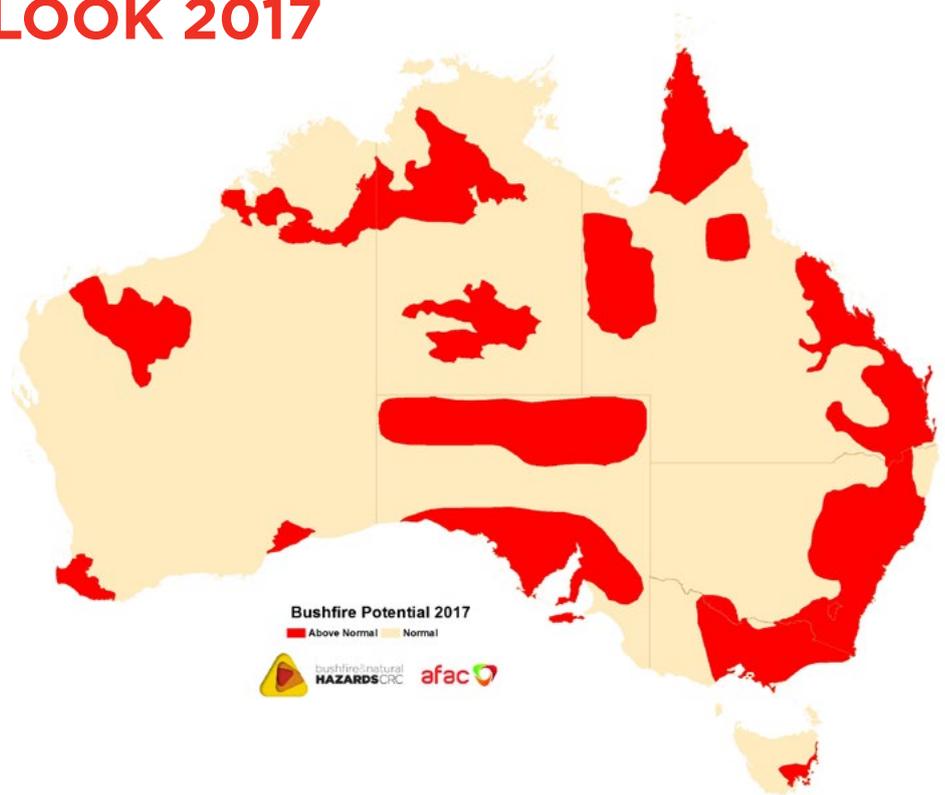
The *Southern Australia Seasonal Bushfire Outlook* is used by fire authorities to make strategic decisions on resource planning and prescribed fire management for the upcoming fire season. The Outlook is developed at an annual workshop convened by the Bushfire and Natural Hazards CRC and AFAC.

At the 2017 Southern Seasonal Bushfire Assessment Workshop in August, the Outlook was assessed and a range of broad climate factors were considered. The map to the right shows the bushfire outlook for southern Australia through to the end of 2017. This map has been combined with the outlook for the northern Australia bushfire season, which was released in July, to show the areas of fire potential for all of Australia (see *Hazard Note 36*, July 2017).

Fire season potential depends on several factors. The amount, location and timing of rainfall in the period leading up to the fire season are critically important for estimating fuel loads and dryness. The temperature and rainfall outlooks for the next few months are crucial factors for influencing the development of fire threat.

Of particular importance are the future tendencies of sea surface temperatures in the Pacific Ocean, associated with the El Niño-Southern Oscillation, and those in the Indian Ocean. These are major drivers of climate over much of Australia. Other factors considered include the distribution of firefighting resources to meet potential threats, as well as previous fire activity and the amount of prescribed burning that can reduce the threat.

The workshop discussed the weather, landscape conditions and cross-border implications leading into spring and summer, and determined areas that had the potential for a fire season that was above normal, normal or below normal.



▲ **Above:** AREAS BASED ON INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA AND OTHER GEOPHICAL FEATURES.

ANTECEDENT CONDITIONS

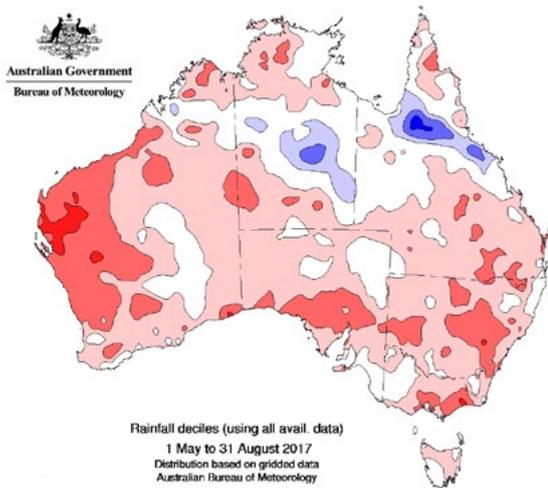
Most of Australia has experienced drier and warmer than average conditions since autumn 2017. The four months from May to August (Figure 1, page 2) saw below average to record dry conditions for most of southern Australia. August has seen somewhat better rainfall in some southern areas, particularly in the far south west of Western Australia and across parts of South Australia and Victoria, but this rainfall has not been sufficient to compensate for earlier dry conditions. New South Wales and southern parts of Queensland have remained unusually dry, meaning that rainfall deficiencies have continued to expand across these states.

Below average rainfall in 2017 adds to much longer-term drying trends that are affecting parts of southern Australia during the cool season. For example, the south west of Western Australia has now experienced 11 consecutive cool seasons (April-October)

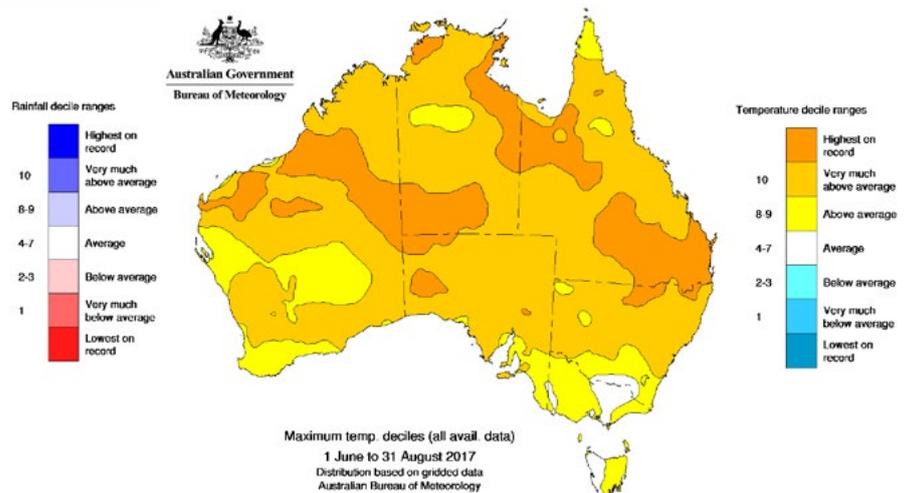
with below average rainfall, while Victoria has experienced below average cool season rainfall in 17 of the past 20 seasons. Very long-term deficiencies like these are not matched in the historical record, and have been associated with a marked increase in fire weather severity in the past decade. The combination of short and long-term rainfall deficits serves to increase the fire risk in the coming spring and summer seasons.

Climate change now means that Australian temperatures are usually above average. Recent dry conditions in combination with the trend have seen large areas experience their hottest June to August daytime temperatures on record, with a national anomaly near +1.9°C above the 1961-1990 average (Figure 2, page 2). In some contrast, clear skies and dry soils have allowed cooler than average temperatures at night in parts of inland southern Australia.

The below average rainfall has seen poor



▲ Figure 1: RAINFALL DECILES FOR 1 MAY TO 31 AUGUST 2017.



▲ Figure 2: MEAN MAXIMUM TEMPERATURE DECILES FOR 1 JUNE TO 31 AUGUST 2017.

vegetation growth for most of southern Australia. Further north, the dry conditions now mean that vegetation is already dry with very low greenness evident in satellite data. The dry state of vegetation means that warm, windy conditions are likely to see more elevated fire risk than is normal for the time of year.

While climatic conditions over Australia have been unusual in recent months, they have occurred without a stronger natural driver, with the El Niño—Southern Oscillation (ENSO) currently neutral. All international climate models surveyed by the Bureau suggest the tropical Pacific Ocean is likely to stay ENSO neutral for the remainder of 2017. This means that the Pacific Ocean is not likely to play a significant role in the coming fire season.

The Indian Ocean Dipole (IOD) also remains neutral, with consensus amongst climate models suggesting neutral conditions are likely to persist. However, the ocean temperatures off the north west coast are somewhat cooler than average, which has suppressed rainfall in recent months. This also leads to below average rainfall forecasts in western areas. Some models suggest positive IOD thresholds could be reached in the coming months, but these values are unlikely to be sustained long enough to classify as a positive IOD event. Positive IOD events are typically associated with below average winter and spring rainfall over central and southern Australia.

CLIMATE OUTLOOK

The climate outlook for spring is influenced by both the Pacific and Indian Oceans, together with other factors including long-term climate change. As noted previously, the ocean patterns in the broader Pacific Ocean are currently neutral and this region is having little effect on outlooks. More localised effects are influencing this outlook, including cooler than average

waters off the WA coast reducing available moisture for rain systems, and warmer waters off the north and east coasts driving the warmer than average spring temperatures. The cool waters are not extensive enough to reach the threshold for a positive IOD, but they are acting to suppress rainfall. The tendency for above average temperatures for Australia also reflects the global warming trend by increasing the warmth of the global oceans and atmosphere.

The outlook for spring (Figure 3, page 3) shows that below average rainfall is likely for much of Western Australia and small areas of the tropics. In these regions, there is generally a 60% to 65% chance that rainfall will be below average. Along the east coast, from Tasmania to north of Brisbane, the outlook favours above average rainfall (typically 55% to 65%). Through inland areas, probabilities are generally close to 50:50, implying little shift in the rainfall odds from the long-term average. The exception to this is a strip to the east and north east of Adelaide, where wetter conditions are slightly favoured. Historical outlook accuracy for September to November is moderate to high over most of Australia.

The outlook for spring maximum temperatures favours above average conditions for most parts of northern and eastern Australia (Figure 4, page 4). The probability that temperatures will be above average is typically in the range of 60% to more than 80%. The outlook for minimum temperatures (not shown) is very similar, with warmer conditions generally favoured. Maximum temperature accuracy is moderate to high over most of Australia, except for some small patches in WA, where accuracy is low to very low. Minimum temperature accuracy is moderate over much of the country but patchy in WA and parts of the northern tropics.

Taken as a whole, the current warmer and

drier than average climate conditions and the outlooks suggest that the southern fire season is likely to commence earlier than usual and be more active than normal.

Updates to forecasts and the outlook for the IOD and ENSO will continue to be published at www.bom.gov.au/climate/ahead.

REGIONAL SUMMARIES

QUEENSLAND

Coastal areas south of Rockhampton to the NSW border have received above average rainfall, due to Severe Tropical Cyclone *Debbie* in March and a subsequent coastal low in May. This rain has increased fuel growth, and in some areas these fuels have already dried out and are available to burn as fine fuels. Additionally, winds associated with *Debbie* have stripped canopies of leaves, leaving the fuels below exposed to sunlight where they would normally be in shade. These leaves are now suspended as elevated and near surface fuels. This damage to the canopy also changes the wind field, so that any fires in these areas will be exposed to higher velocity winds, as well as drier air, compared to normal. This has led to above average fuel growth in this coastal strip, up to several hundred kilometres inland, as well as for a majority of south east Queensland. Queensland Fire and Emergency Services have worked closely with Queensland Parks and Wildlife in the central region to assess the changes to the vegetation and quantify any increase in risk. This has built on successful work conducted with the Bushfire and Natural Hazards CRC following Severe Tropical Cyclone *Marcia* in February 2015.

Inland, a wetter than average 2016 winter and spring has resulted in large areas returning to average fuel loads.

Coastal areas south of Rockhampton also

have a high likelihood of exceeding median maximum and minimum temperatures, with an average to slightly above average chance of spring rainfall expected. These factors indicate an increased potential for bushfire activity in the indicated area. July and August saw record temperatures for Queensland, along with frosts in inland parts, increasing fuel availability for the fire season.

Gladstone, Biloela, all of the North Coast region including Maryborough, Kingaroy and Monto, as well as Chinchilla, Toowoomba, Inglewood, and the South East are expecting above normal fire potential. The remainder of southern Queensland is expecting normal potential for fire season.

NEW SOUTH WALES

Rainfall for much of NSW has been below to very much below average over winter.

The rainfall outlook through to November is indicating a likelihood of slightly less to even odds of drier conditions, and in the case of the south west of the state, very unlikely of receiving above average rainfall.

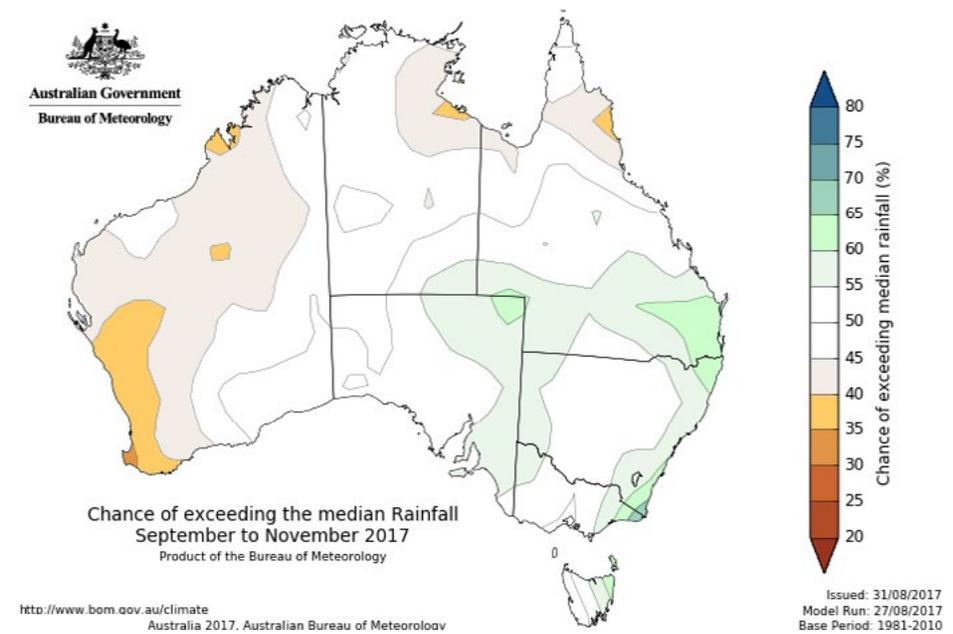
Although minimum temperatures have been mostly cooler than average, maximum temperatures have been warmer than average over the last three months. This has the effect of pre-conditioning fuels to be more susceptible to fire. In the case of forests, this dries the fine fuels, and in the case of grasslands, frosts cause grass to cure early. Both maximum and minimum temperature outlooks through to November indicate conditions are likely to be much warmer than average.

The El Niño outlook is for neutral conditions through to the end of 2017, and while El Niño events are traditionally associated with bad fire seasons, some of the most significant bushfires in NSW in recent history have occurred during neutral El Niño conditions. With another neutral El Niño outlook, warmer and potentially drier conditions forecast, it is expected that significant fires could occur this fire season.

Current soil moisture deficits (particularly west of the ranges) and the likelihood of higher than average temperatures through to November have led to the conclusion that forest fuels have above normal fire potential.

Grassland curing is significantly higher at this stage in comparison to last year due to significant frost, although grass fuel loads are significantly reduced west of the divide. The potential for grass growth is significantly reduced due to the rainfall deficit, although this could change dependent on spring rainfall.

The current NSW outlook is for above normal fire potential for eastern forested areas of the



▲ **Figure 3:** THE PROBABILITY OF EXCEEDING THE MEDIAN RAINFALL, SEPTEMBER TO NOVEMBER 2017.

state. The exception to this is the Far North Coast, where a normal fire season is predicted. Grassland areas are predicted to have normal fire potential due to reduced fuel loads.

ACT

After three dry months the upper soils in the ACT are drier than average for this time of year, with average to slightly above average rainfall expected to at least November. It is unlikely that the ACT will receive enough rain during this period to recover from the existing soil moisture deficit. Forest fuels are drier than usual for this time of year. Frost curing of grasslands has been above average over winter and due to the prolonged frost period, a greater than average area has been affected. The bushfire potential for this outlook period is assessed as above normal, as with surrounding NSW areas. As summer approaches, conditions will be closely monitored, particularly if there is a change to wetter conditions.

VICTORIA

Signals of sufficient strength and confidence are beginning to emerge that lead to an expectation for an early start to fire season in some parts of Victoria. This will be reviewed by Victorian fire authorities throughout September and October. Over the last three months, rainfall in south eastern Australia has been dominated by a contracting belt of westerly winds and anomalously high atmospheric pressure. These weather patterns have removed some triggers for rainfall, as well as suppressing others. Record warm ocean temperatures create a vital link for weather systems to tap into either high

amounts of moisture, heat, or both, so there is little established precedent on which to base expectation. This, coupled with longer term severe rainfall deficiencies in southern forests and the Bureau of Meteorology's outlook for drier and warmer conditions, gives rise to an expectation of above normal fire potential.

Good prospects for spring growth in the northern and central western grain growing areas present a risk of an early fire season, as these areas are expected to increase biomass during spring and cure during October. This will occur as available soil water becomes depleted. Closer to the north east alpine areas, the rate of pasture curing will depend on September rain.

Severe rainfall deficits persist along the Great Dividing Range in Victoria. Forests in these areas may experience sudden changes in fire activity with the onset of warmer or windier weather. Melbourne's water catchment areas and higher value forests along the southern slopes of the Great Dividing Range have a long-term history of dryness, with expected weather patterns looking set to continue this trend. Westerly winds continue to dry out undergrowth despite their very low temperatures. This may be creating a moisture differential between west facing and east facing slopes, in addition to the existing differential between northern and southern slopes.

The severity of early bursts of heat on north westerly winds across Victoria depends on rainfall and daily maximum temperature in South Australia's northern pastoral districts during spring. As soils in the interior warm

and dry, any moisture bearing air is heated and dried by the time it reaches Victoria. These bursts of heat, combined with forecast average rainfall and temperatures to the end of October, may be enough to move drought indices in some tall forests up to 100 by the commencement of summer. This is a critical threshold for these forests, allowing them to support fire growth. These areas will be closely monitored for emerging trends in the coming months.

TASMANIA

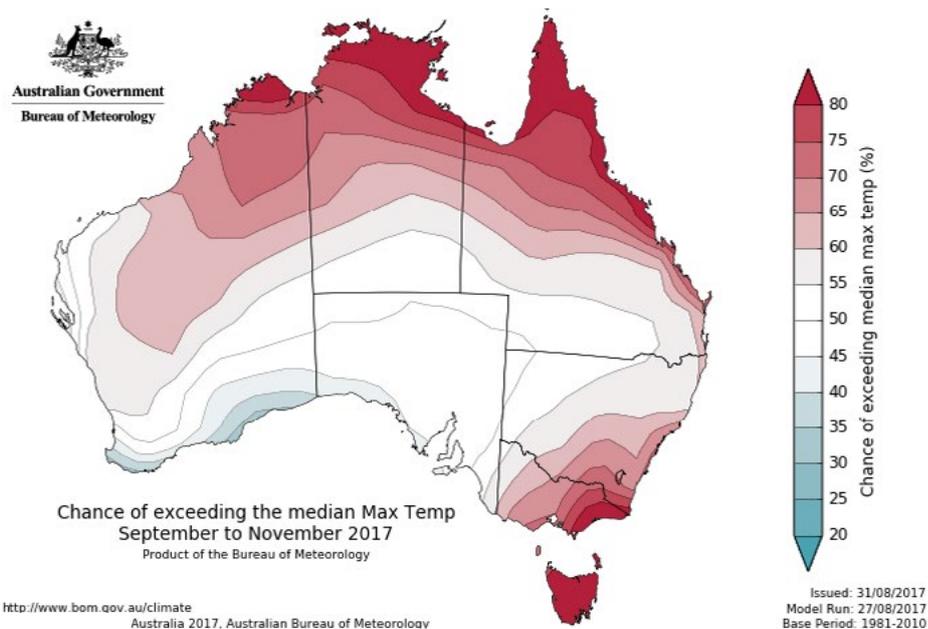
Despite significant floods during the winter of 2016 in many catchments, long term underlying dryness continues in some parts of Tasmania. Most of the state has received below average rainfall during 2017, with recent months very dry, especially in the south and east. Soil moisture levels are still well below normal in some places and significant rain would be required to recharge these soils.

Tasmania is expecting above normal fire potential in the South, in the Derwent Valley and in the East, along the coastal strip. The fire season will commence early in these areas, and subject to spring conditions, may produce significant fires. The remainder of Tasmania is classified as normal fire potential.

SOUTH AUSTRALIA

While 2016 saw South Australia's second wettest winter on record, 2017 has seen very different conditions, with a period of below average rainfall recorded across large parts of the state. The May to July rainfall deciles and the soil dryness indices (SDIs) highlight the areas that are considerably dryer than they would normally be in an average year.

This period of reduced moisture, combined with the abundant growth of fine fuel caused by last year's rain, has resulted in areas of above normal fire potential. This area of increased risk includes the APY Lands and Northern Pastoral areas, as well as parts of the Riverland, the Clare Valley, the Yorke Peninsula, the Eyre Peninsula, and the West Coast.



▲ **Figure 4:** THE PROBABILITY OF EXCEEDING THE MEDIAN MAXIMUM TEMPERATURE, SEPTEMBER TO NOVEMBER 2017.

In addition, Kangaroo Island has also experienced well below average rainfall, with parts of the island recording the driest June since records began in 1887. Unless significant rainfall is received, the current deficit will contribute to above normal fire potential on Kangaroo Island.

The remainder of South Australia, including the Upper and Lower South East, has experienced average or just above average winter rainfall. These areas can expect normal fire potential. In addition, the reduced rainfall in some agricultural areas has resulted in less cropping activity, with South Australia forecast to record a decrease in areas planted and in yields from sown crops. This may reduce the risk of fires from agricultural activity.

It is unlikely that spring and early summer will provide any substantial rainfall. Significant bushfires have occurred in similar conditions. It should be noted that even areas of normal fire potential can expect to experience dangerous bushfires as per a normal South Australian fire season.

WESTERN AUSTRALIA

On top of persistent soil moisture deficits, the South West recorded its driest autumn for five years. This has resulted in forest vegetation experiencing additional water stress, with dead surface leaf litter and woody materials also continuing to dry out. Consequently, there is potential for above normal bushfire activity within the southern parts of the Swan Coastal Plain, the majority of the Southern Jarrah Forest and the Warren biogeographic regions.

A record wet 2016/2017 summer period for Western Australia, from the Midwest to the South Coast, has seen high perennial grassland fuel loads develop. However, the pattern of rainfall, recent bushfires, prescribed burning, cropping and grazing activities have constrained potential above normal grass fuel loads in many areas, with the exceptions being the Eastern Gascoyne, Pilbara and Eucla regions. Higher than average perennial grassland fuel loads, combined with drying soil moisture as summer approaches, have resulted in some areas in these regions being assessed as having an above normal fire potential for the southern bushfire season.

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