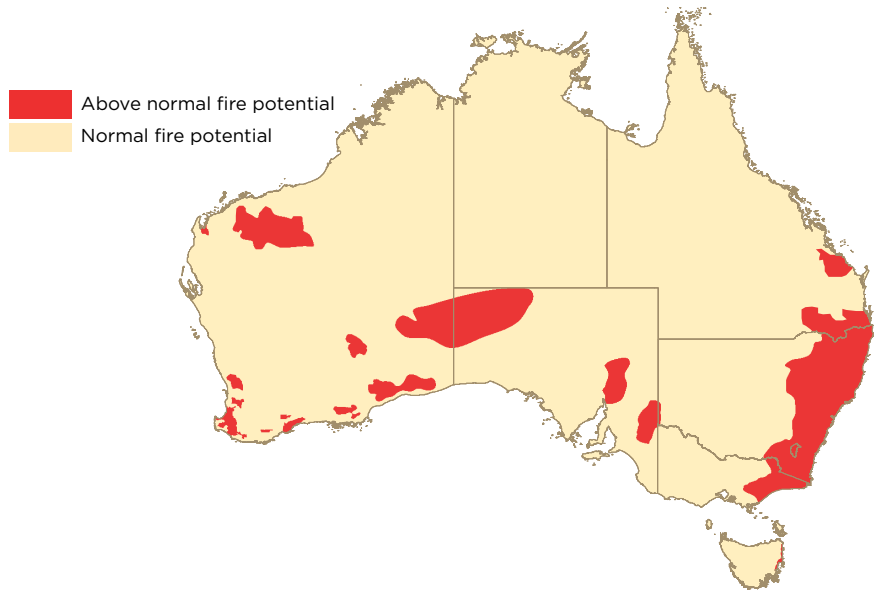


SOUTHERN AUSTRALIA SEASONAL BUSHFIRE OUTLOOK 2018



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. At the 2018 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 2018. 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* 49, July 2018).



ANTECEDENT CONDITIONS

Most of eastern and parts of south west Australia have experienced a dry 2018 to date (Figure 1, page 2). The focus of the dry conditions has been New South Wales, where almost the entire state has experienced rainfall in the lowest decile (driest 10 per cent of recordings), representing serious to severe rainfall deficiencies. Rainfall deficiencies also affect most of northern and eastern Victoria, parts of southern and central Queensland and eastern South Australia. Across southern Australia above average rainfall is limited to the arid regions of western South Australia and adjacent parts of Western Australia, as well as western areas of Tasmania. While August has seen some rainfall in drought affected inland areas, this has fallen well short of that required to remove the longer-term deficiencies which remain extensive.

The combination of dry weather and the background warming trend has resulted in much warmer than average temperatures. Daytime maximum temperatures have been unusually warm in 2018, with a year-to-date maximum temperature anomaly of +1.36°C, the warmest on record (Figure 2, page 2). High daytime temperatures add to the impact of reduced rainfall, and act to increase

▲ ABOVE: AREAS BASED ON INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA AND OTHER GEOGRAPHICAL FEATURES.

evaporation, further drying the landscape and vegetation.

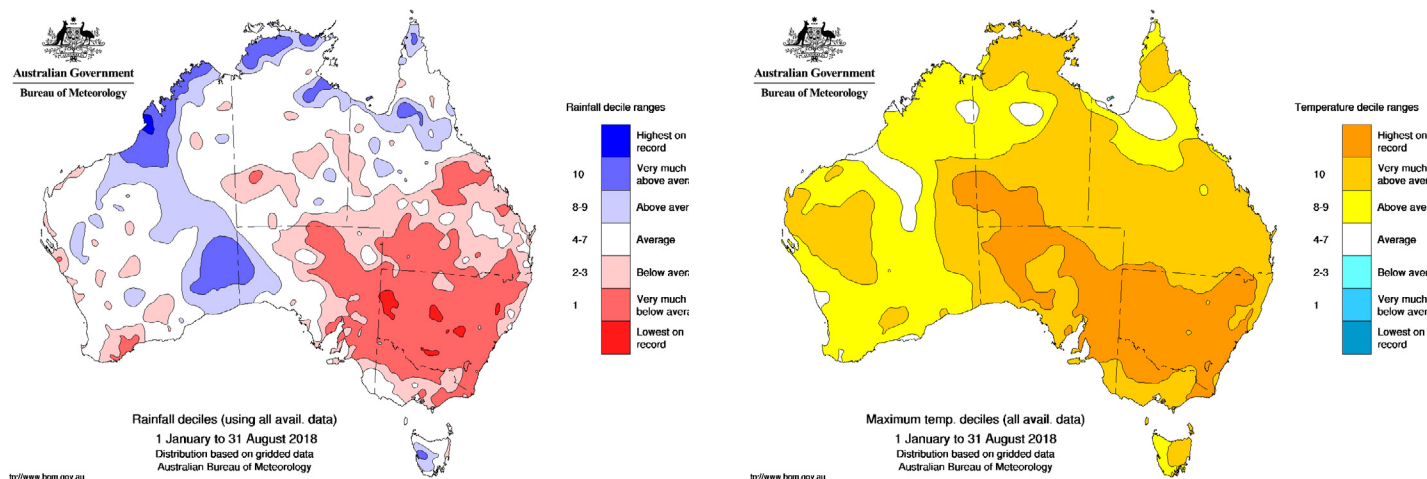
Dry and warm weather has seen poor vegetation growth for most of southern Australia. The general landscape dryness means that warm, windy conditions are likely to see elevated fire risk, and make an early start to the fire weather season likely. Countering this risk, the poor growth of grass and annual plants means that vegetation loads are reduced in drought affected areas. Further north, low rainfall conditions since March mean that vegetation is dry with very low greenness evident in satellite data, meaning that the northern fire season is well underway.

Fire season severity is increasing across southern Australia as measured by annual indices of the Forest Fire Danger Index. The increases are tending to be greatest in inland eastern Australia and coastal Western Australia. For example, the Victorian annual Forest Fire Danger Index has increased by about 50 per cent since 1950, with particularly high values during the severe fire seasons of 2002/03, 2006/07, 2008/09 and 2015/16. The increases reflect

rising temperatures and below average rainfall during the cool season (April to October). Southern Australia has now experienced above average temperatures in 22 consecutive years, with the last below average season back in 1995.

The combination of short and long-term rainfall deficits serves to increase the fire risk in the coming spring and summer. A shift towards below average rainfall first affected south west Australia around the 1970s, and has largely dominated the south east since the mid-1990s. For south west Australia and Victoria, 17 of the past 20 years have now seen below average cool season rainfall, while the Murray-Darling Basin has experienced below average rainfall in 15 of the past 20 years. It is very likely that Victoria and the Murray-Darling Basin will see a 2018 total which is substantially below average, adding to this pattern. The combination of warming and drying has led to extensive and historically unprecedented landscape dryness across much of southern Australia.

The El Niño-Southern Oscillation (ENSO) is currently neutral. However, the overall



▲ Figure 1: JANUARY TO AUGUST 2018 RAINFALL DECILES.

pattern resembles the early stages of past El Niño events, with warmer than average ocean temperatures in central parts of the tropical Pacific, and above average temperatures in the ocean subsurface. The Bureau's *ENSO Outlook* remains at El Niño WATCH. El Niño WATCH means there is approximately a 50 per cent chance of El Niño forming in 2018; about double the normal chance. International climate models surveyed by the Bureau predict further warming of the tropical Pacific is likely as we move into spring. All models suggest El Niño thresholds are likely to be reached by the end of the year, though it is likely that a developing event will be short lived. El Niño typically means below average rainfall in eastern and northern Australia, while daytime temperatures are typically above average over the southern two-thirds of Australia.

The Indian Ocean Dipole (IOD) is neutral. However, the ocean to the north west of Australia remains cooler than normal, which is likely contributing to suppressed rainfall over southern and south east Australia in recent months. Three of six international climate models suggest a short-lived positive IOD event may develop. A positive IOD during spring typically reduces rainfall in central and southern Australia and can exacerbate any El Niño-driven rainfall deficiencies.

CLIMATE OUTLOOK

The climate outlook for spring is mainly influenced by the Pacific and Indian Oceans, together with other factors including long-term trends. As previously noted, the Pacific and Indian Ocean are neutral, though the development of an El Niño and positive IOD is possible.

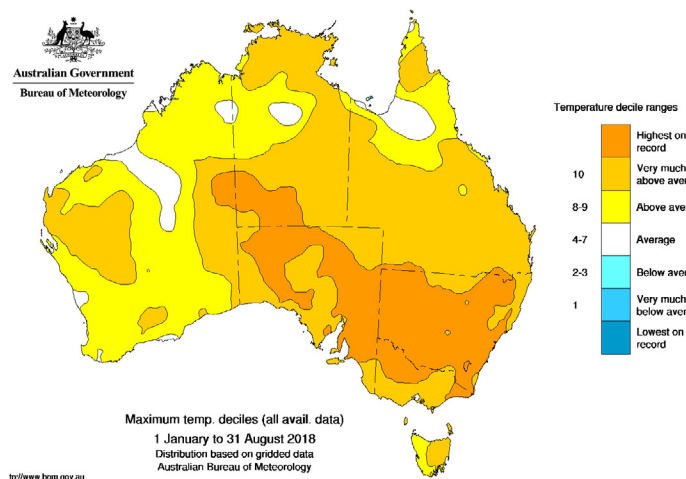
The outlook for September and spring rainfall (Figures 3 and 4, page 3) shows an increased likelihood of below average rainfall

in the south west, south east and much of Queensland. This is particularly so for September, when large areas have a less than 35 per cent probability of exceeding median rainfall. In the arid interior and parts of the north west, probabilities are close to 50 per cent; however it is seasonally dry over these regions at this time, so low rainfall totals are expected. Historical outlook accuracy for September to November is moderate to high over most of the country, except for the west of Western Australia, where accuracy is low to very low.

The outlook for spring maximum temperatures favours above average daytime temperatures for nearly all of Australia. Probabilities are particularly high in northern and western areas where they exceed 80 per cent. Probabilities in the south east are typically in the range of 60 to 75 per cent (Figure 5, page 4), implying that above average daytime temperatures are favoured. The outlook for minimum temperatures (not shown) is similar to that for maximum temperatures, though the overall shift towards likely warmer than average temperatures is less strong. Historical accuracy for September to November maximum temperatures is moderate to high for most of the country. Minimum temperature accuracy is moderate for eastern Australia, the Top End, and parts of central Australia. Elsewhere, accuracy is either patchy or low to very low.

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 climate forecasts 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.



▲ Figure 2: JANUARY TO AUGUST 2018 MAXIMUM TEMPERATURE DECILES.

REGIONAL SUMMARIES

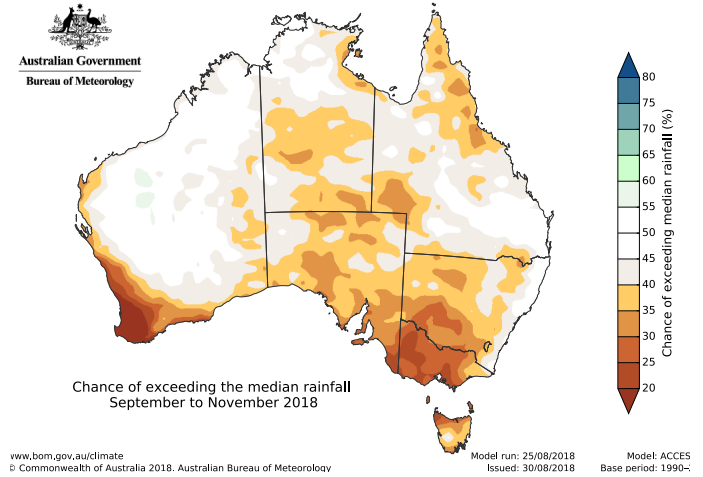
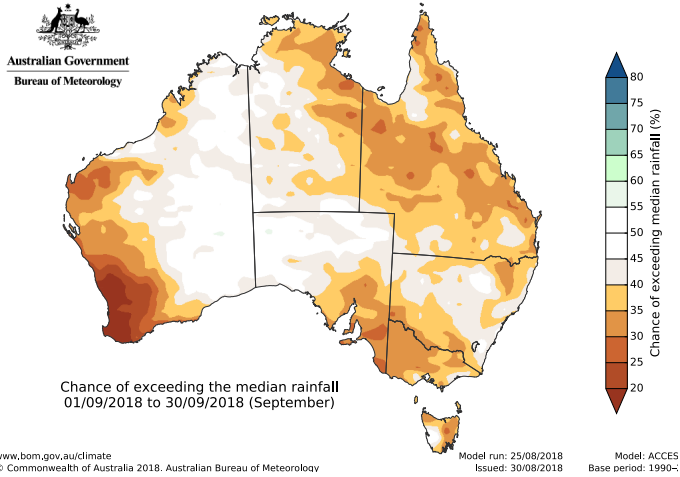
QUEENSLAND

While October 2017 saw record rainfall across the southern part of Queensland, summer was relatively dry. This changed during autumn, which was the wettest autumn state wide since 2012. Much of this rain fell during March in central and southern Queensland. Locally, areas that missed this rain experienced their driest autumn in several decades. It was hot too, with Queensland's summer being the second warmest on record.

These conditions have led to areas south and west of Dirranbandi, Bollon, Boulia enduring one of the most severe droughts in decades. As a result, almost all of inland southern Queensland has very sparse vegetation and fuel loads. While this reduces the potential for high intensity grassfires it should be noted that fully cured grass even with low fuel loads can carry fast moving fires in hot, dry and windy conditions.

Vegetation along the Coral Coast around Hervey Bay and Bundaberg, north to the Capricornia around Rockhampton, has experienced below average rainfall over the past 12 months. This drying trend is forecast to continue through September and October, with above normal fire potential expected.

Further south, both the forest and grassy fuels around Toowoomba, north to Kingaroy, south to Warwick and Stanthorpe, east to Gatton and south to Boonah and Beaudesert have very much below average soil moisture. Fuel loads in these areas are above the long term average. With the outlook for hotter, and average or drier than average conditions, there is little chance that the fuel availability will return to the long term average during the bushfire season. Grassland curing rates are more advanced than normal for this time of year



▲ Figure 3: THE OUTLOOK FOR SEPTEMBER RAINFALL.

▲ Figure 4: THE OUTLOOK FOR SPRING (SEPTEMBER TO NOVEMBER) RAINFALL.

following the very cold clear nights in these areas during winter. With a drier and hotter outlook for September, and generally average conditions for the remainder of spring, these areas are likely to have above normal fire potential for the 2018 bushfire season.

Queensland's fire season is already well underway, with August seeing record fire danger in the south east. The amount and severity of fires was above normal in this area, with the Queensland Fire and Emergency Services increasing its community engagement and preparedness levels around fire preparation.

NEW SOUTH WALES

Weather conditions have been exceptionally dry over New South Wales during 2018, with the Murray Darling Basin recording its driest January-July since 1965 (over 50 years). This has allowed severe rainfall deficiencies to accumulate in many areas west of the Great Dividing Range, but also through the Greater Sydney region. At the end of August, the Department of Primary Industries mapped nearly all of NSW being in some state of drought, with 21 per cent classified as in intense drought, 49 per cent experiencing drought conditions, and a further 30 per cent as drought affected.

Widespread significant soil moisture deficit has resulted in an early start to the fire danger period for many local government areas in NSW. Windy conditions in August resulted in many significant bushfires in forested areas up and down the east coast. With the short to medium-range climate outlooks favouring warmer and drier than average conditions across much of the state, there is significant concern for the potential of an above normal fire season in forested areas on and east of the Divide.

Reports of grassland fuel conditions west of the divide have indicated that whilst

grassy vegetation is cured, it is below average in quantity or load. With the chances of above median rainfall west of the divide below 50 per cent to well below 50 per cent in the next three months, the balance of this situation has resulted in an assessment of normal fire season potential for grassland areas west of the divide. It should be noted that while grass load is reduced and therefore the potential intensity of grass fires may be reduced, highly cured grass creates the potential for grassfire to spread rapidly.

ACT

Along with many parts of Australia, the ACT has for some months experienced below average rainfall. As a result, there is severe soil dryness across the ACT, which could reduce spring grass growth and dry out the forests. The seasonal weather outlooks issued by the Bureau of Meteorology indicate there will be insufficient rain in the coming months to relieve the underlying dryness.

Because of this dryness, there is an expectation that grasslands and forests will become flammable earlier than is typical. This resulted in the ACT bushfire season being declared a month early, on 1 September. Nearby fire activity in NSW during August reinforces the need to be prepared early. Large fires requiring regional-level bushfire suppression operations can be expected. While lower than average grassland fuel loads can also be expected, grass fires could still be a problem in rural and metropolitan areas due to the ongoing drought conditions. It is too early to anticipate the chance of major rain occurring prior to summer.

The community is advised to begin preparations for the coming bushfire season. A high level of preparedness will be needed to mitigate the elevated bushfire risks.

VICTORIA

Much of East Gippsland has experienced two consecutive years of record low rainfall during autumn and winter. As a result, forests are significantly more flammable than normal, due to an increase in dead material in the near surface and elevated fuels. Unusually early bushfire activity occurred in East Gippsland during July and August, highlighting the severe level of dryness in forests. These dry conditions are likely to be exacerbated during spring and summer with the climate outlook for drier and warmer conditions. These areas can expect above normal fire potential from August right through summer.

Further north, the Great Divide and Alpine regions are experiencing good levels of streamflow and snowfall, with the spring forecast for continuing average streamflow in the Alpine region. As a result, normal bushfire potential is expected across these regions.

In the west and central regions, normal bushfire potential is also expected as rain has kept soil moisture at relatively high levels, but there is some uncertainty around how much dryness may carry over from previous seasons, as well as how quickly warm and dry conditions expected in spring may increase flammability in forests. The far South West region, extending to the Barwon Otway region, is currently experiencing above average rainfall, which has led to saturation in the soil moisture profile. Current expectations are for average to above average pasture growth in south west and western Victoria. The timing and severity of grass fires will depend strongly on rainfall patterns during late summer - as a result, a normal fire season expected in these areas.

North and North Western Victoria has experienced below average rainfall during autumn and winter, resulting in reduced cropping activity and pasture growth. These

areas are likely to experience a normal fire season. It should be noted that due to the uncertainties in the longer term climate outlook, areas of normal fire potential may still experience unpredicted severe bushfire activity during late summer.

TASMANIA

For the early part of Tasmania's fire season, most of the state has normal fire potential. The western half of the state is very wet, and only the strip between Orford and St Helens on the east coast is drier than average. This dry strip has above normal fire potential, and this area may expand without significant rain in the coming months. As in recent years, increased fire activity will probably occur in this dry strip before December and will require considerable response efforts. The fire season in the remainder of the state will commence more normally, in late spring or early summer, and provide good conditions for planned burning.

SOUTH AUSTRALIA

Large parts of South Australia have experienced drier than average conditions since the start of 2018. Late winter rains have helped reduce the soil dryness indices in some parts of the state, however, the rainfall has not been enough to overcome the total moisture deficits in these areas. Rainfall from now will also promote vegetation growth before summer, which will increase the available fire fuels during the fire season. The current Bureau of Meteorology forecast is for dry conditions to persist through spring which may also erode any benefits from recent rainfall.

The recent El Niño watch also suggests that the dry spring conditions are likely to continue throughout summer. On the basis of the forecast dry conditions, and the cumulative effects of the long term moisture deficit, several areas have been identified as having above normal fire potential. Parts of the Riverlands, Murraylands, and the Flinders Ranges are particularly dry, which means that areas of scrub and woodland have increased fire potential.

Populated areas of the APY Lands, particularly those parts infested with buffel

grass, also have above normal fire potential. Without effective control mechanisms to limit the spread of buffel grass, the abundance of fuel it creates could create an increased and ongoing risk.

Despite average winter rainfall, the fuel growth and forecast dry conditions indicate that the potential for bushfire across the populated areas of the Mount Lofty Ranges remains.

The dry conditions in agricultural areas have 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 in some areas.

It is important to note that no forecast models are indicating any likelihood of increased rainfall across South Australia, which means the fire danger season has the potential to commence early and finish late in parts of the state. Significant bushfires have occurred in similar conditions, and areas of normal fire potential can expect to experience dangerous bushfires as per a normal South Australian fire season.

WESTERN AUSTRALIA

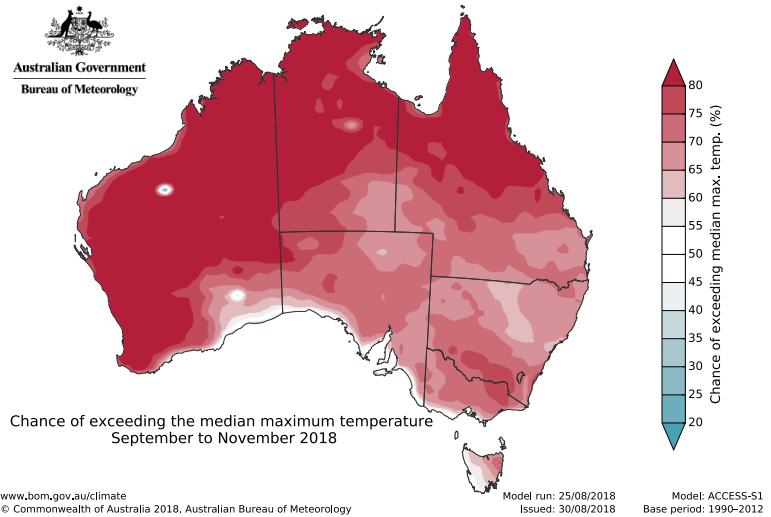
As a result of bushfires in previous seasons, and mitigation achieved by prescribed burning, higher fuel loads in the forests and shrublands across the Darling Range have been fragmented into smaller parcels. This has resulted in the break up and reduction of above normal fire potential areas within the

Swan Coastal Plain, Avon Wheatbelt, Jarrah Forest, and Warren regions.

Despite good winter rainfall, the underlying and persistent deep root zone soil moisture deficits along the Darling Range, south west corner, South Coast, Mallee and Esperance Plains have resulted in the forest and shrubland vegetation in these areas being subject to additional water stress. Above normal fire potential is expected in these areas.

Further north, cooler and wetter wet season conditions were experienced in parts of the Pilbara, Gascoyne and Carnarvon regions, which contributed to the accumulation of higher than average grass fuel loads. This has resulted in above normal fire potential in these regions. The Gascoyne Coast missed the subtropical low rain which travelled further to the east and is experiencing a rainfall deficit. This has affected grass growth and therefore the region is expected to experience normal fire potential.

Parts of south eastern Western Australia received significant rain in the early part of the year, which is evident in the elevated surface soil moisture in some areas. This has led to increased growth of the shrubs and grasses in these areas. Due to this increased vegetation growth, and therefore expected fuel loads, above normal fire potential is expected in these parts of the Mallee, Coolgardie, Nullarbor, Hampton and Great Victoria Desert regions.



▲ Figure 5: THE OUTLOOK FOR SPRING (SEPTEMBER TO NOVEMBER) MAXIMUM TEMPERATURES.

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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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