Financial year climate and water statement 2023–24

Australia's temperature, rainfall, water, oceans, atmosphere, significant weather from 1 July 2023 to 30 June 2024

Issued **26 July 2024**

Second-warmest financial year on record and driest start to spring

The 2023–24 financial year (1 July 2023 to 30 June 2024) was the second warmest on record. Rainfall was above average for much of northern Australia, and below average for much of the south.

Temperature

- Australia's national mean temperature was 1.31 °C above the 1961–1990 average and the second-warmest financial year on record since 1910–11.
- July to December 2023 was Australia's warmest such period on record, 1.69 °C above average, and all months except April 2024 had above average temperature.
- The national mean maximum and mean minimum temperatures were 1.56 °C and 1.06 °C above average, respectively.
- Maximum temperatures were above average for most of Australia except for an area of inland Northern Territory.
- Minimum temperatures were above average for most of Australia except for parts of the south.

Rainfall and water resources

- Australia's overall rainfall was 14% above the 1961–1990 average at 532.2 mm.
- August to October 2023 was Australia's driest 3 month period on record since 1900, and September 2023 was the second-driest month on record.
- Rainfall was above average for most of northern Australia, inland areas of Western Australia, western Queensland and inland and coastal areas of New South Wales, with highest on record rainfall for parts of the central Northern Territory.

- Rainfall was below average for parts of southern Australia and the west coast of Western Australia, with the lowest on record rainfall for south-west Western Australia, south-eastern South Australia, south-western Victoria and northern Tasmania.

Water resources

- Soil moisture was above average in the north and below average in the south and west of the country.
- Streamflow across much of Australia was average, with the exception of above average streamflow for northern Australia due to very wet catchment conditions during the northern wet season.
- Surface water storage levels continued to decline across the country, including those in the Murray–Darling Basin Basin, except in northern Australia.
- Groundwater levels recovered to pre-drought condition in the east including in the northern Murray–Darling Basin and southern Queensland, and across northern Australia. Levels continued to decline in the Victoria–South Australia border region and south-west Western Australia.

Tropical cyclones

- There were 8 tropical cyclones in the Australian region in the 2023–24 financial year, compared to the average of 9 since 2000–01.
- Four tropical cyclones (Jasper, Kirrily, Lincoln and Megan) made landfall on the Australian mainland, compared to the average of 3 since 2000–01.

Oceans and atmosphere

- Sea surface temperatures for the Australian region were the warmest on record (since 1900–01), at 0.73 °C above the 1961–1990 average.
- Globally averaged monthly SSTs were warmest on record for every month between April 2023 and June 2024.
- Slow-moving high pressure systems in the Great Australian Bight were prominent for much of the year, particularly in November and December 2023, February 2024, and April to June 2024.
- Other major global oceanic and atmospheric processes that were active in 2023–24 included:
  - El Niño was active in the tropical Pacific from September 2023 to early 2024.
  - A positive phase of the Indian Ocean Dipole was active from late August 2023 until late January 2024.
  - A positive phase of the Southern Annular Mode was active at times during the year, particularly in November and December 2023.

- The Madden–Julian Oscillation was active in the Australian tropical region at times in January, March and April 2024.

Second-warmest financial year on record

Nationally-averaged, the mean temperature for Australia for the 2023–24 financial year was 1.31 °C above the 1961–1990 average and the second-warmest on record (compared to all financial years since 1910–11), behind 2015–16.

Both daytime and night-time temperatures were warmer than average. The national maximum temperature was 1.56 °C above average, the fourth warmest on record. The national minimum temperature was 1.05 °C above average, the second-warmest on record behind 2015–16.

Maximum temperature

Maximum temperatures were above to very much above average for most of Australia. Maximum temperatures were the highest on record for:

- Western Australia's west coast extending inland
- an area of inland South Australia
- northern and eastern Tasmania
- isolated pockets of the New South Wales coast

Maximum temperatures were below average for an area of the central Northern Territory.

Minimum temperature

Minimum temperatures were above to very much above average for nearly all of Australia. Minimum temperatures were the highest on record for:

- south and central coast of Western Australia extending inland
- an area of central and northern South Australia and into adjacent western Queensland
- southern Northern Territory

Minimum temperatures were below average for isolated pockets across southern Australia.

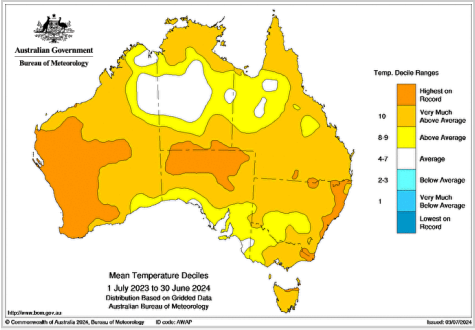
Monthly temperature

The national mean temperature for all months except April were warmer than average. July to September 2023, and November 2023 to February 2024, were all among the ten warmest months on record since 1910.

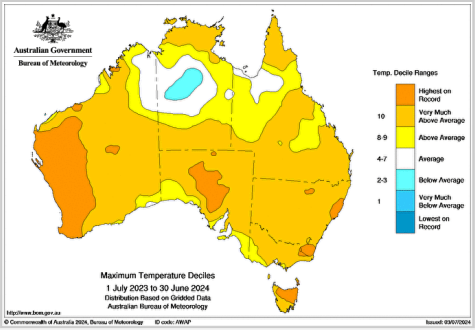
Nationally, 2023 was the warmest winter on record, with the mean national temperature 1.53 °C above the 1961–1990 average and July to December 2023 was the warmest such period on record, at 1.69 °C above average, surpassing the previous record in 2019 of 1.60 °C.

The heat continued throughout summer 2023–24 and early autumn 2024, with frequent low-to-severe intensity heatwaves affecting many areas of Australia. There were extreme heatwave intensity conditions across large areas of Western Australia several times in February 2024, resulting in many stations setting maximum temperature records.

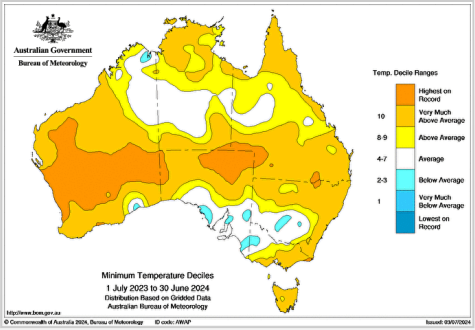
In April 2024, the national mean temperature was -0.51 °C below average and the mean minimum temperature was the coldest since 2011. May and June 2024 saw a return to above average temperatures as the position of the high pressure ridge prevented cold air outbreaks from crossing the country.



Australian mean temperature deciles for the 2023–24 financial year, relative to all years since 1910.



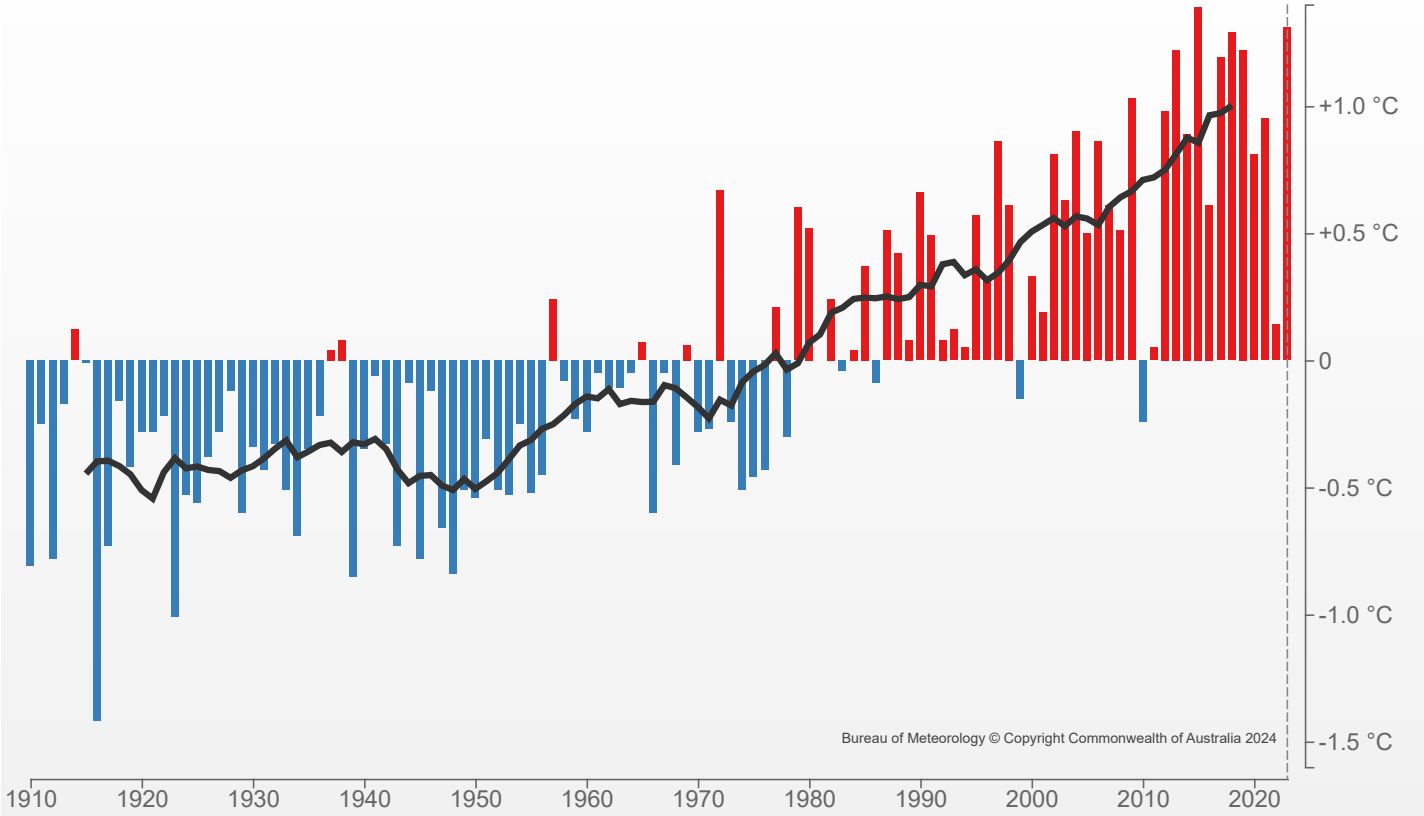
Australian maximum temperature deciles for the 2023–24 financial year, relative to all years since 1910.



Australian minimum temperature deciles for the 2023–24 financial year, relative to all years since 1910.

Australian financial year mean temperature anomaly

2023–2024 **+1.31 °C**



Mean temperature anomalies averaged over Australia (as calculated from the 1961–1990 average). The black line shows the 11-year moving average. The value for the 11-financial-year average is positioned over the middle financial year of each 11-year block. Select each financial year to view the anomaly.

Area-average temperatures

	Maximum Temperature			Minimum Temperature			Mean Temperature		
	Rank (of 114)	Anomaly (°C)	Comment	Rank (of 114)	Anomaly (°C)	Comment	Rank (of 114)	Anomaly (°C)	Comment
Australia	111	+1.56	4th highest	113	+1.06	2nd highest	113	+1.31	2nd highest
Queensland	= 107	+1.33	equal 7th highest	111	+1.46	4th highest	111	+1.40	4th highest
New South Wales	112	+2.02	3rd highest	110	+1.11	5th highest	111	+1.56	4th highest
Victoria	106	+1.15	9th highest	98	+0.56		104	+0.86	
Tasmania	114	+1.09	highest	110	+0.68	5th highest	= 113	+0.89	equal highest
South Australia	111	+1.84	4th highest	= 106	+0.87	equal 8th highest	110	+1.36	5th highest
Western Australia	113	+1.98	2nd highest	114	+1.15	highest	114	+1.57	highest
Northern Territory	92	+0.63		93	+0.57		93	+0.60	

Above average rainfall in the north and below average in the south and west

For Australia overall the total rainfall for the 2023–24 financial year was 14% above the 1961–1990 average at 532.2 mm.

Above average rainfall

Rainfall was above to very much above average (wettest 10% of all financial years since 1900–01) for:

- most of the Northern Territory
- an area extending from north-west to south-east Western Australia
- northern and western Queensland
- inland and coastal areas of New South Wales
- an area of north-eastern South Australia.

For the Northern Territory overall, it was the sixth-wettest financial year on record, with highest on record rainfall for central regions.

Below average rainfall

Rainfall was below to very much below average (driest 10% of all financial years since 1900–01) for:

- Tasmania
- western, central and north-eastern parts of Victoria
- coastal and inland areas of South Australia
- Western Australia's west coast and southern areas

Rainfall was the lowest on record for pockets of south-west Western Australia, south-eastern South Australia; south-western Victoria; and an isolated pocket of north-western Tasmania. For Tasmania overall, it was the third-driest financial year on record.

Monthly rainfall

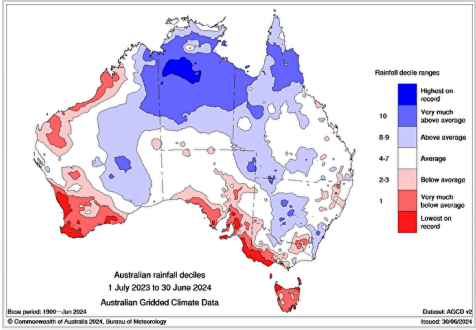
The financial year started with several months of dry conditions, with August to October 2023 Australia's driest three-month period on record since 1900. September 2023 was Australia's second driest month on record, behind only April 1902.

National rainfall in November 2023 was 43% above average, as large parts of the north and east experienced showers and locally severe thunderstorms caused by humid and unstable airmasses moving across the country.

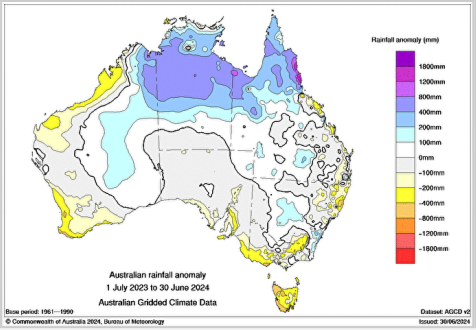
It was the ninth-wettest January on record nationally. Across northern Australia there were widespread storms and heavy rainfall from the onset of the monsoon, tropical lows and ex-tropical cyclone Kirrily. Areas of Queensland, New South Wales and Victoria had frequent outbreaks of daily thunderstorms and heavy rainfall during the month.

Nationally, March 2024 was the third-wettest March on record at 92% above average, with highest on record rainfall across central Northern Territory and inland Western Australia.

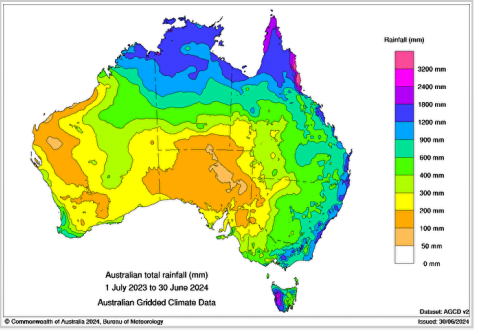
April and May 2024 were drier than average nationally, while June rainfall was close to average. February to June 2024 rainfall was below average for much of southern Australia, particularly parts of south-west Western Australia, the South Australia coastline, western, southern and central Victoria, and in Tasmania.



Australian rainfall [deciles](#) for the 2023–24 financial year, relative to all years since 1900.



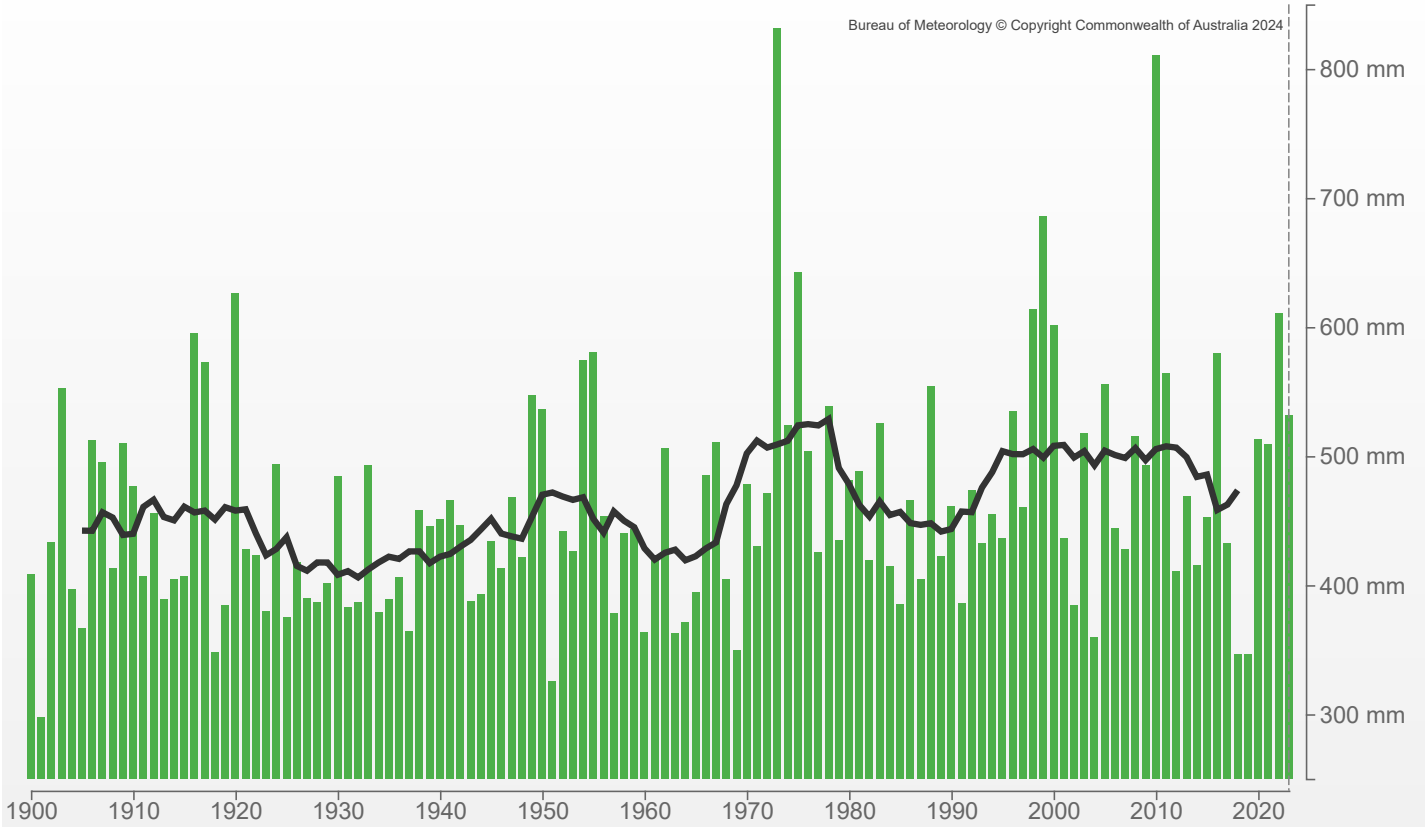
Australian rainfall anomalies for the 2023–24 financial year, relative to all years since 1900.



Australian rainfall totals for the 2023–24 financial year.

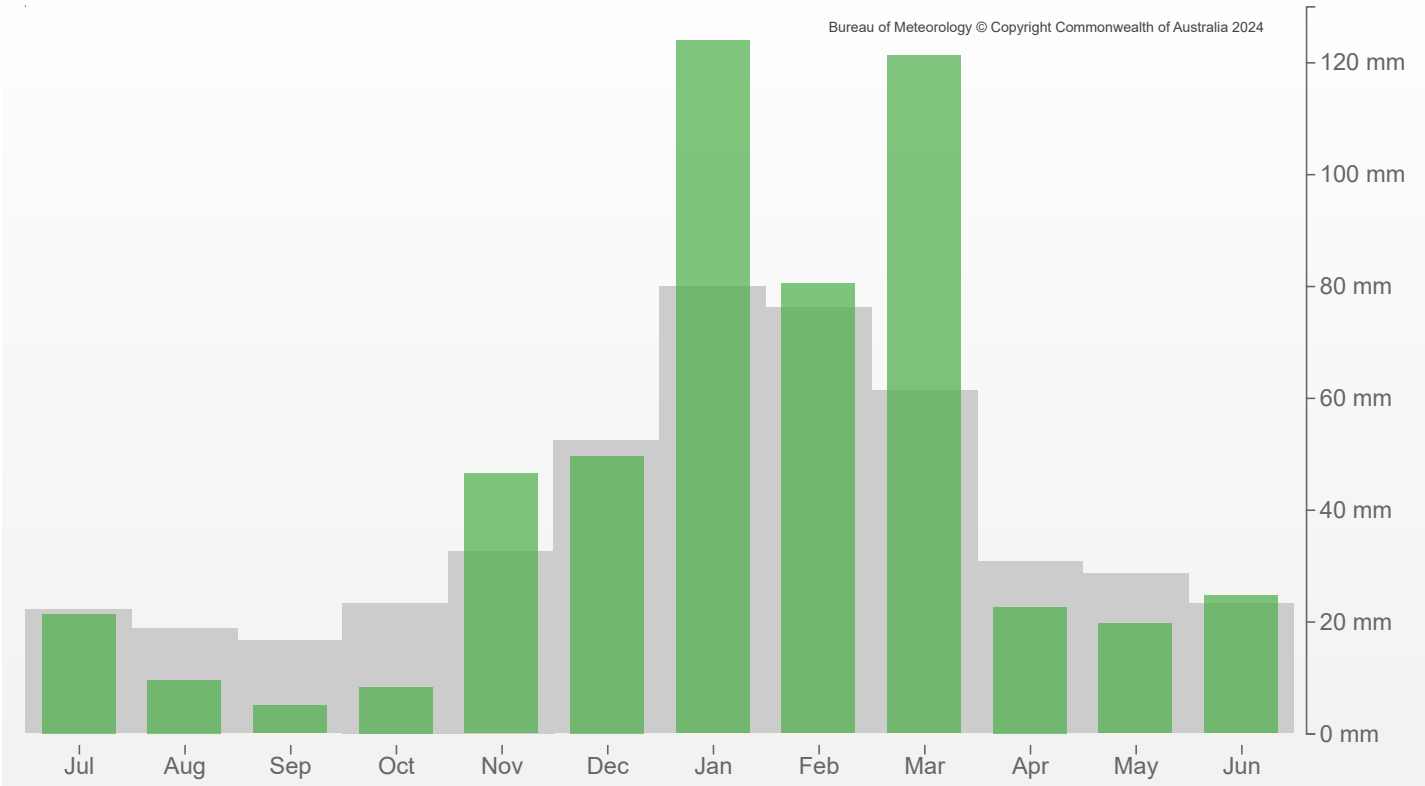
Australian financial year mean rainfall

2023–2024 **532.16 mm**



Financial year mean rain for Australia. The black line shows the 11-financial-year moving average. The value for the 11-year average is positioned over the middle year of each 11-year block. Select each year to view the value.

Australian mean monthly rainfall



Monthly area-average total rainfall for Australia. The green bars are the total for the 2023–2024 financial year, and the grey bars show the mean monthly total for the 1961-1990 period. Select each month to view the value.

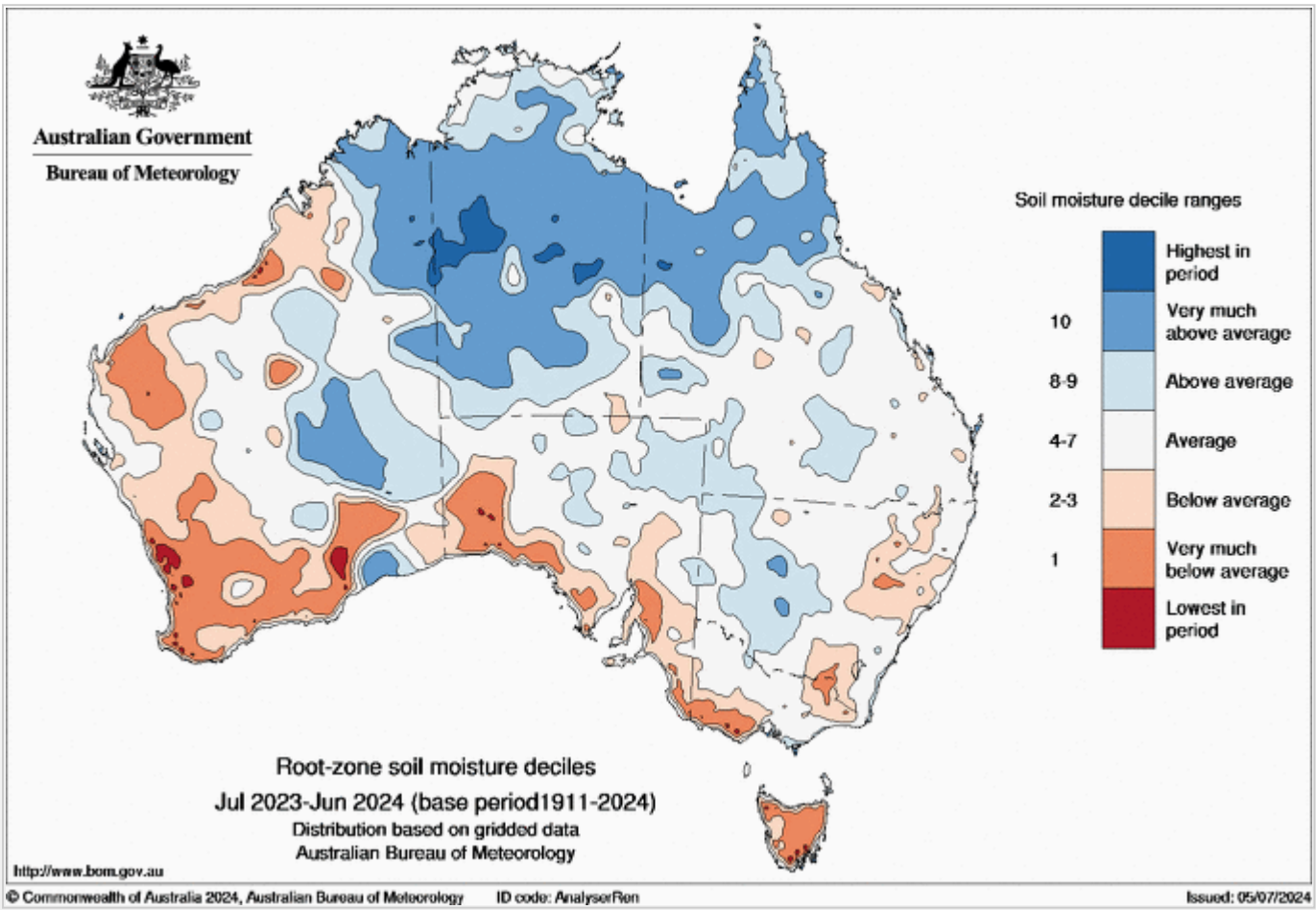
Area-average rainfall

	Rank (of 124)	Average (mm)	Departure from mean	Comment
Australia	103	532.2	+14%	
Queensland	103	749.7	+20%	
New South Wales	76	538.4	−3%	
Victoria	22	549.9	−17%	
Tasmania	3	1018.9	−25%	3rd lowest
South Australia	33	174.7	−22%	
Western Australia	70	347.4	+2%	
Northern Territory	119	835.8	+53%	6th highest
Murray-Darling Basin	75	479.9	−3%	

Above average soil moisture in the north and below average in the south and west

In 2023–24, soil moisture in the root zone (in the top 100 cm) was above average for much of northern Australia. It was very much above average (in the highest 10% of all years since 1911–12) for most parts of the Northern Territory, and parts of the northern Queensland and north-east of Western Australia. This was largely due to above average rainfall across much of northern Australia during the wet season (October 2023 to April 2024), particularly in January (tenth wettest on record since 1900 for northern Australia) and March (second wettest on record).

In contrast, soil moisture was below to very much below average (in the lowest 10% of all years since 1911–12) for large parts of western and south-west of Western Australia, southern parts of South Australia, south-west of Victoria, Tasmania, and eastern New South Wales. This was due to very much below average rainfall (in the lowest 10% of all years since 1900) from July to October across much of southern Australia, including lowest on record low rainfall in September.



Root-zone soil moisture distribution for 2023–24 relative to all years since 1911–1912.

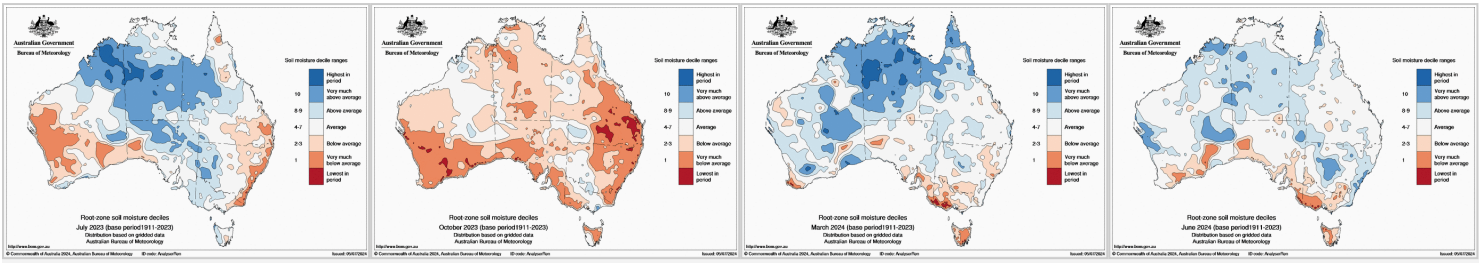
Second half of 2023

At the start of 2023–24, root zone soil moisture was very much above average across most parts of northern and central Australia, and western parts of New South Wales and Victoria. However, Australia experienced its driest three-month period (since 1900) from August to October. Consequently, by the end of October, soil moisture had decreased to very much below average across much of southern, eastern, and parts of central Australia.

In contrast, above average rainfall in November and close to average rainfall in December helped in soil moisture recovery, resulting in average to very much above average soil moisture conditions across much of Australia except in parts of Western Australia and Tasmania in December.

First half of 2024

Heavy rainfall from January to March across the Top End and central Western Australia associated with monsoonal activity helped recover the below average soil moisture conditions across areas in the Pilbara and Kimberly districts. However, at the end of the financial year, soil moisture declined to below average across southern parts of Western and South Australia, parts of Victoria and Tasmania due to below average rainfall in April and May 2024 across southern Australia.

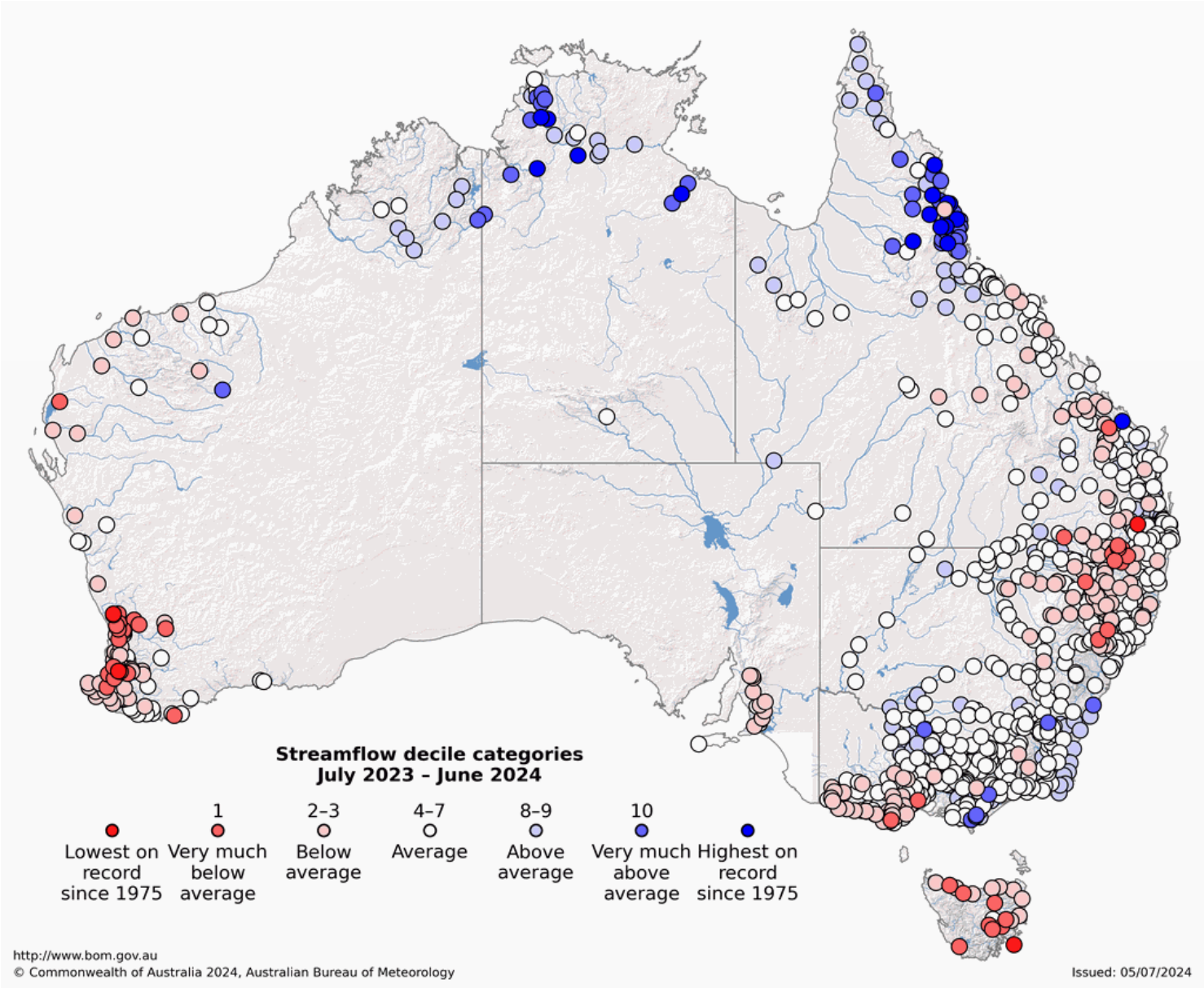


Root-zone soil moisture distribution July 2023, October 2023, March 2024, and June 2024. Monthly distributions are relative to their respective months for all years since 1911.

Mostly average streamflows across Australia with above average in the far north

In 2023–24, streamflow was mostly average (based on records since 1975) across the Murray–Darling Basin and below average in the parts of north-eastern New South Wales, south-west of Victoria and Western Australia, and Tasmania. In contrast, above to very much above average streamflow (highest 10% since 1975) was observed in northern Australia, including the Kimberley (Western Australia), Northern Territory and across tropical north Queensland. This was due to the above average rainfall and wet catchment conditions in much of northern Australia.

Highest on record streamflow was observed at only 2.4% of the 876 sites where streamflow is measured and analysed. Analysis was performed with those stations where more than 80% of daily records were available during 2023–24. Higher than average streamflow was measured at around 20% of sites, mostly in the Kimberley region, northern parts of the Northern Territory and Queensland. In contrast, lower than average streamflow was measured at around 25% sites, mostly in Western Australia, South Australia, Tasmania, southern part of Victoria, and east coast of Queensland and New South Wales.



Streamflow deciles for the 2023–2024 financial year, relative to all years since 1975. The analysis includes 876 sites which had at least 80% of daily observations available during the 2023–2024 financial year.

Table of the number of streamflow sites in each decile category. Observations from 876 sites where streamflow is measured and which had at least 80% of daily observations available during the financial year.

Streamflow decile categories	No of sites	Percentage of sites (%)
Highest on record	21	2.4
Very much above average	38	4.3
Above average	115	13.1
Average	486	55.5
Below average	169	19.3
Very much below average	43	4.9
Lowest on record	4	0.5

Major flooding in the north and minor to moderate flooding in parts of the south-east

Heavy rainfall in early October brought some moderate flooding for Victoria and south-western New South Wales. Prolonged moderate to heavy rainfall in November resulted in minor to major flooding in south-western Queensland, south-eastern New South Wales and parts of Victoria's Gippsland.

In early December, northern Queensland was affected by damaging major flooding due to Ex-Tropical Cyclone Jasper. Severe thunderstorms also affected parts of New South Wales and south-eastern Queensland at the end of December with flash flooding.

In January with the onset of the monsoon, widespread heavy rain resulted in flood warnings in some northern rivers such as Katherine River, Daly River and Victoria River in the Northern Territory. Heavy rainfall due to ex-Tropical cyclone Kirrily also brought flooding to Nicholson, Gregory and Flinders rivers in north-west Queensland. The wet conditions in western Queensland and central Northern Territory continued into February and March, with heavy rainfall from ex-tropical cyclones Lincoln and Megan. Major Flood Warnings were current in February for the Flinders River and Eyre Creek and numerous catchments were at flood watch across Queensland.

At the beginning of April a series of low pressure troughs drew tropical moisture south across Queensland, resulting in heavy rain and widespread flooding of western and southern Queensland that lasted for weeks as the water made its way south.

In early June a low pressure system and associated trough brought several days of heavy rain to the New South Wales coast. Minor to moderate flooding were observed as various sections of the Nepean River in New South Wales, while the Warragamba Dam reached capacity several times during the April to June period.

Surface water volume continued to decline across the major water storages

Overall, total surface water storage volume across Australia decreased from 78.0% to 73.6% of accessible capacity at the end of 2023–24. This was due to dry catchment conditions across much of southern parts of Australia.

Murray–Darling Basin

The major storages in the Murray–Darling Basin have been in decline since late 2022. Collectively, major storages across the Murray–Darling Basin ended the financial year with a total volume of 77.7% of accessible capacity, a significant 15.0% decrease from the start (92.7%). Major storages also significantly decreased in the northern Basin from 92.7% to 67.3% (25.4% decrease), and in the southern Basin from 92.8% to 80.0% (12.8% decrease).

Menindee Lakes

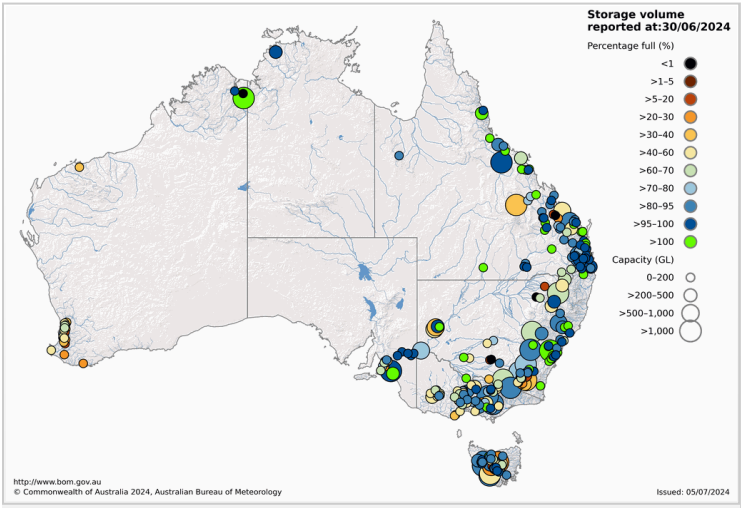
Below average rainfall and lower inflows from the Darling River caused water levels in the Menindee Lakes to significantly decrease from 80.2% to 57.2 % of accessible capacity over the financial year. In late April, storage level reached at a low of 43.8%. However, higher than average rainfall from April to June 2024 across New South Wales increased the storage volume to 57.2% by the end of 2023–24.

South East Queensland

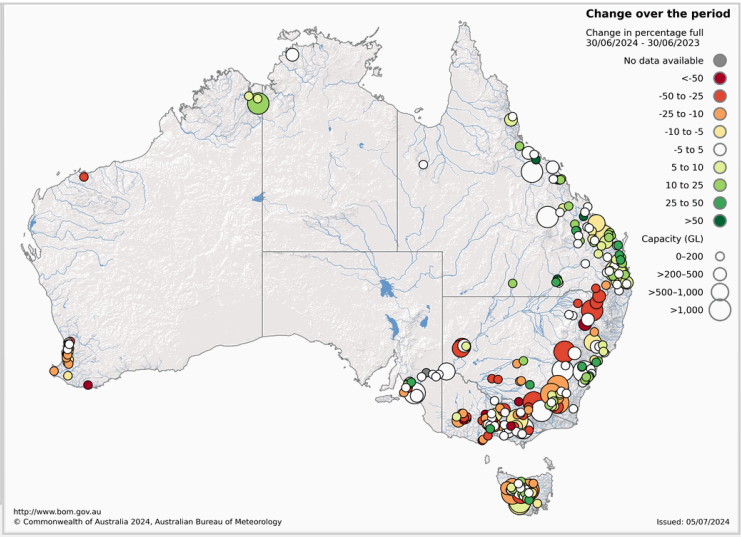
Water levels in the South East Queensland storages continued to decline till late 2023 while levels slightly increased in early 2024 due to inflows from above average rainfall during the northern wet season (October to April). Wivenhoe, the largest storage in South East Queensland, which was at 71.4% of accessible capacity at the start of financial year, declined to around 62% by late December, and then increased to 80.4% by the end of the financial year. However, the Nogoa Mackenzie rural system, which has been steady over the last two years after consistent decline over the past decade, finished the financial year at 36.6% of accessible capacity, a slight decrease of 3.7% from the same time last year.

Northern Australia

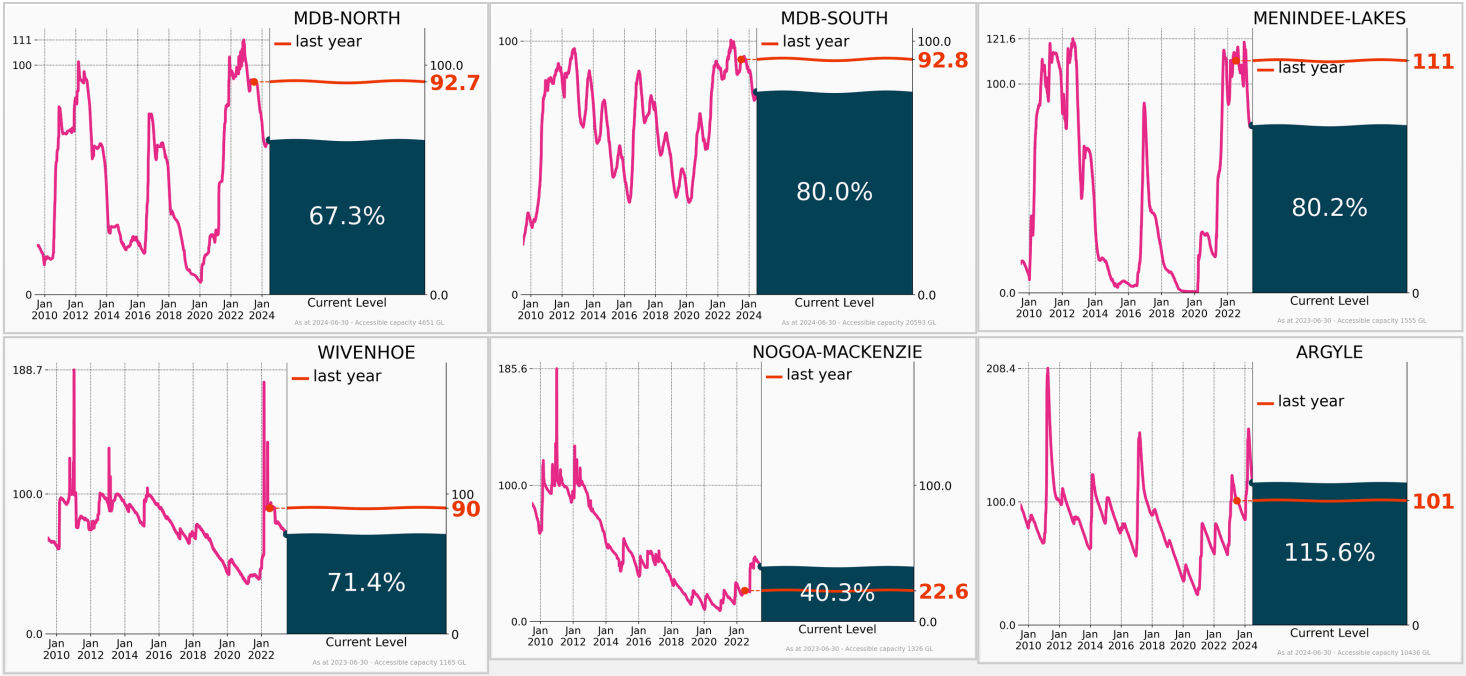
In northern Australia, above to very much above average rainfall in early 2024 resulted in high soil moisture and inflows to Lake Argyle, the largest water supply storage in Australia. At the start of the financial year, the storage volume was at 101.0% of accessible capacity, which then declined to 85.4% in January. Very much above average rainfall from January to March across the Top End, associated with monsoonal activity, helped produce inflows to the water storages. By late March, storage volume in Lake Argyle reached at 159.0% of its accessible capacity – the highest level since 2011. However, its storage volume steadily declined from late-March and finished the financial year at 115.6%.



Percentage full of storages as of 30 June 2024.



Percentage change in storages over the financial year.



Percentage full of storage on 30 June 2024 compared to the same time last year (and back to 2010), for Murray–Darling Basin North, Murray–Darling Basin South, Menindee Lakes, Wivenhoe, Nogoa–Mackenzie and Argyle, systems.

Water availability in major capital cities was high, but low in Adelaide and Perth

In major capital cities, water availability is influenced by levels in surface water storages and groundwater. Where storage volumes are not adequate, water is added through alternative sources such as desalination or recycled water schemes.

Surface water storages that supply the major capital cities finished the financial year with volumes greater than 80% of accessible capacity, with the exceptions of Adelaide and Perth. This was down from the previous financial year for most locations, excluding Brisbane and Sydney, due to below average rainfall across most areas in 2023–24.

Adelaide received below average rainfall, which resulted in a decrease in its storage volumes to 44.2% of accessible capacity from 68.3%. Adelaide's water supply needs are augmented by alternative sources, mostly water transfers from the River Murray, with some supply from desalinated water and groundwater.

Perth's surface water storages were 36.9% of accessible capacity, down from 42.2%. Perth's water supply is more reliant on desalinated water and groundwater than surface water. The city's water supply strategy involves 'banking' of groundwater and desalinated water in its surface water storages during low demand periods to buffer peak supply period requirements.

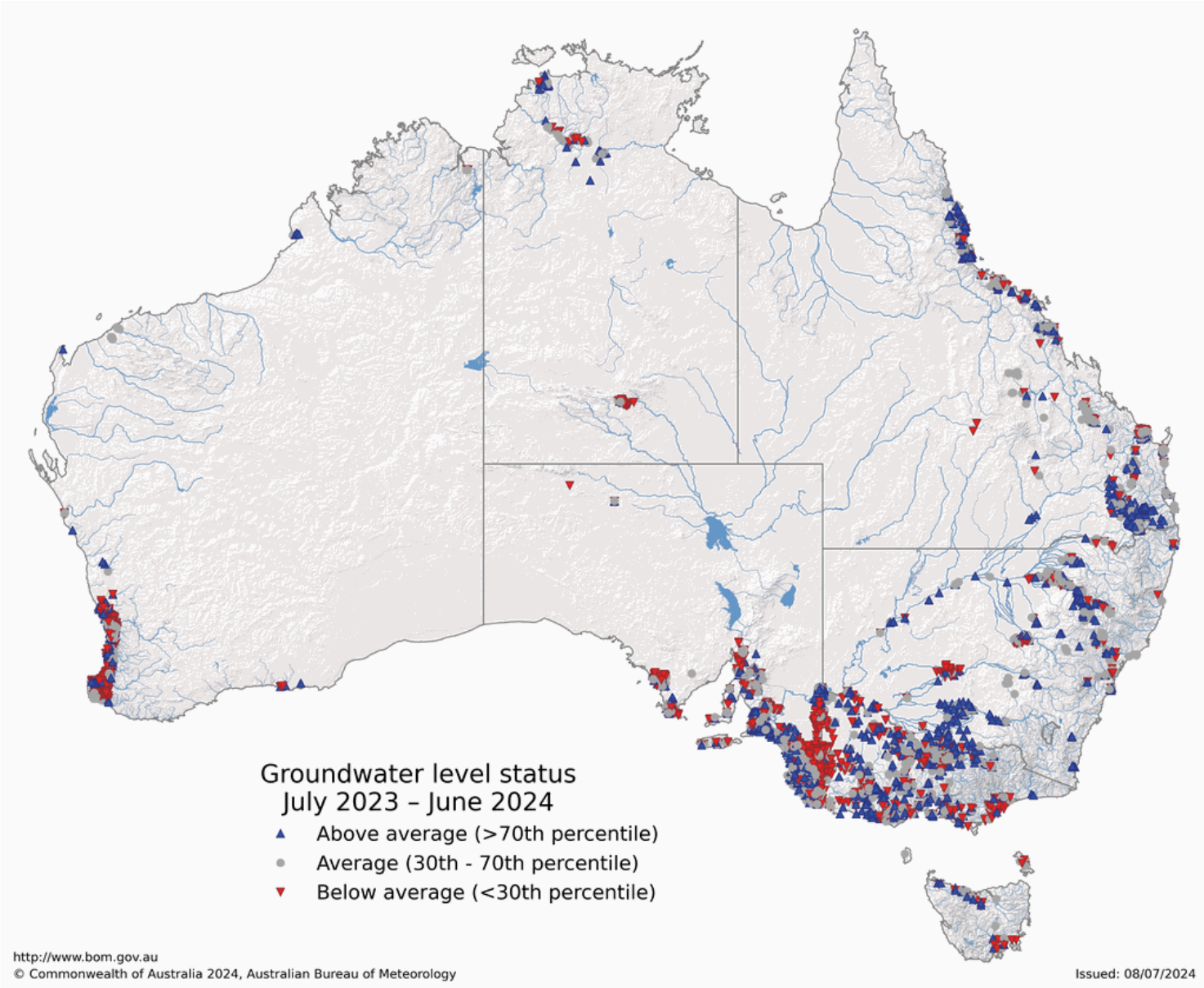
Rainfall around Brisbane was below average in the first half of 2023–24 and subsequently storage volume declined from 74.0% at the start of financial year to 65.1% of accessible capacity by late December. However, rainfall in the second half of 2023–24 was above average which has helped inflows to water storages. As a result, Brisbane storage volumes increased to 82.5% of accessible capacity at the end of the financial year.

Percentage full of storages (accessible capacity) as of 30 June 2024 compared to same time last year (and back to 2010) for Australia's capital cities.

Groundwater recovered in the east but continued to decline in the south-west and parts of the south-east

Groundwater levels across Australia varied widely in 2023–24, with 31% of bores below average, 36% average and 33% above average. Compared to 2022–2023, there has been a significant drop (about 10%) in bores classified as 'above average'.

The groundwater trends in 2023-24 calculated over 5-, 10- and 20-year periods are similar to 2022–23. Over the 5-year period to June 2024, 42.3% of bores showed rising trend, while only 10.1% of the bores showed a decline. The trends in groundwater levels over this 5-year period reflect the effects of three years (2020–2022) of high rainfall and flooding. Over the 10- and 20 years periods to June 2024, the highest proportion of bores are stable (64.9% and 74.4% respectively), which is similar to 2022–23.



Australian Groundwater level status for the 2023–2024 financial year, based on data records since 1997, except for Tasmania where records start in 2008.

Table of the percentage of bores each trend category over 5-, 10-, and 20-year periods ending in 2023–24. Data are from 6624 bores where groundwater level is measured.

Trend category	5-year trend	10-year trend	20-year trend
Rising	42.30%	19.70%	12.10%
Stable	47.30%	64.90%	74.40%
Declining	10.10%	14.90%	13.30%

Murray–Darling Basin and south-eastern Queensland

In the northern Murray–Darling Basin and south-eastern Queensland, groundwater levels continued to recover, following periods of heavy rainfall and flooding during 2021–23. Even though rainfall has returned to average conditions in 2023–2024, the effect of the preceding three years of high rainfall and flooding can still be observed in elevated groundwater levels. In contrast, many of the bores in the Victoria–South Australia border region remained average to below average, reflecting both low rainfalls throughout recent years and long-term consequences of groundwater extraction.

South-west Western Australia

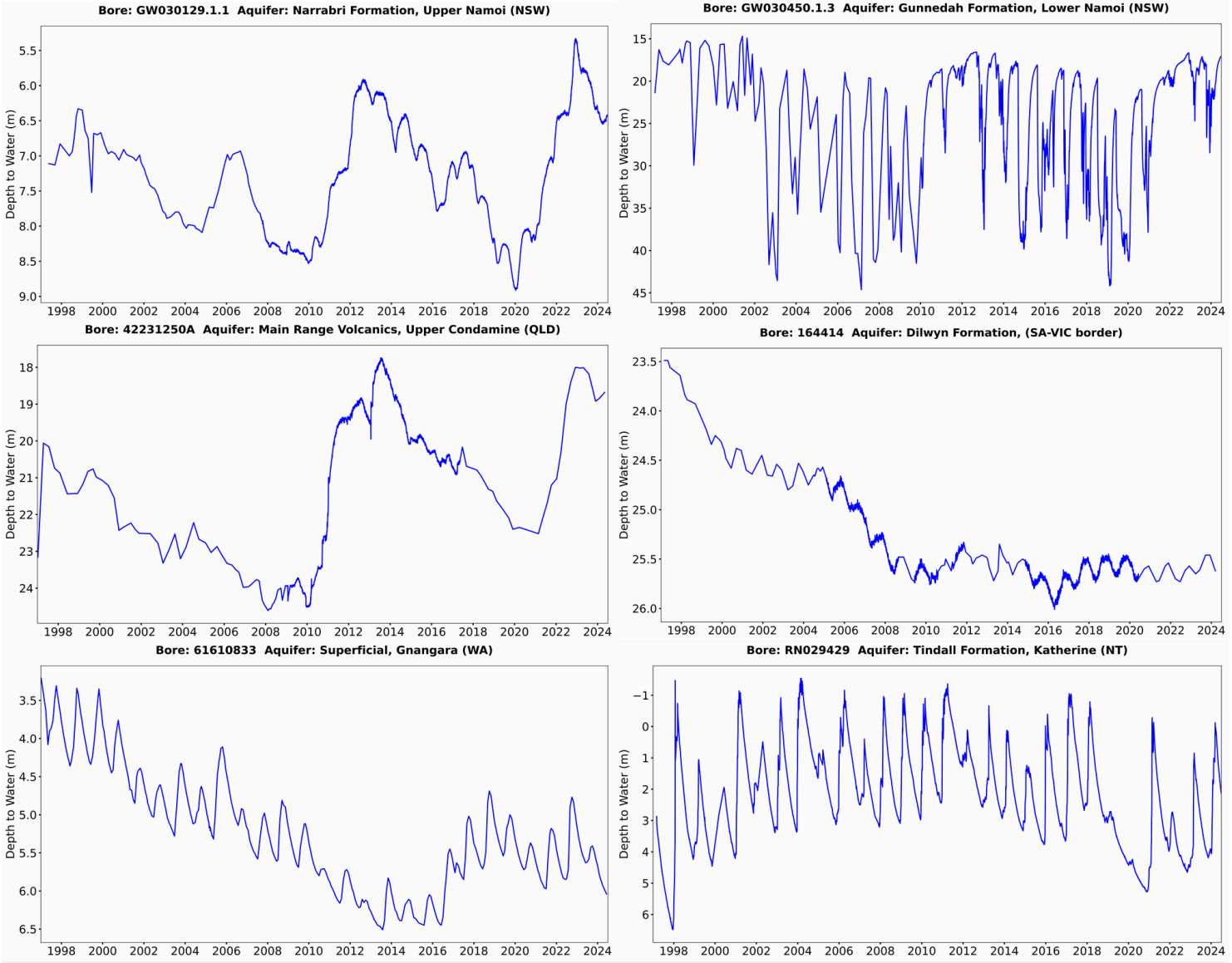
In south-west Western Australia, groundwater levels have generally been in decline over the past 40 years due to the decreasing rainfall and increasing groundwater demands. Lowest on record rainfall in 2023–24 across south-west Australia resulted in less recharge to surficial aquifers of the Gnangara Mound. This is a regression from the previous two years when the high winter rainfall resulted in higher groundwater recharge and comparatively higher groundwater levels.

Top End

In the Top End of the Northern Territory, where groundwater recharge is reliant on wet season rainfall and streamflow, groundwater levels showed some improvement since 2021. Groundwater levels in the Northern Territory are at average to below average levels at around 36% of bores in 2023–24, compared to 56% in 2022–23. Due to high rainfall and flooding along the north tropical coast and Gulf of Carpentaria, the bores in north-eastern Queensland and the Katherine region have seen a rise in groundwater levels.

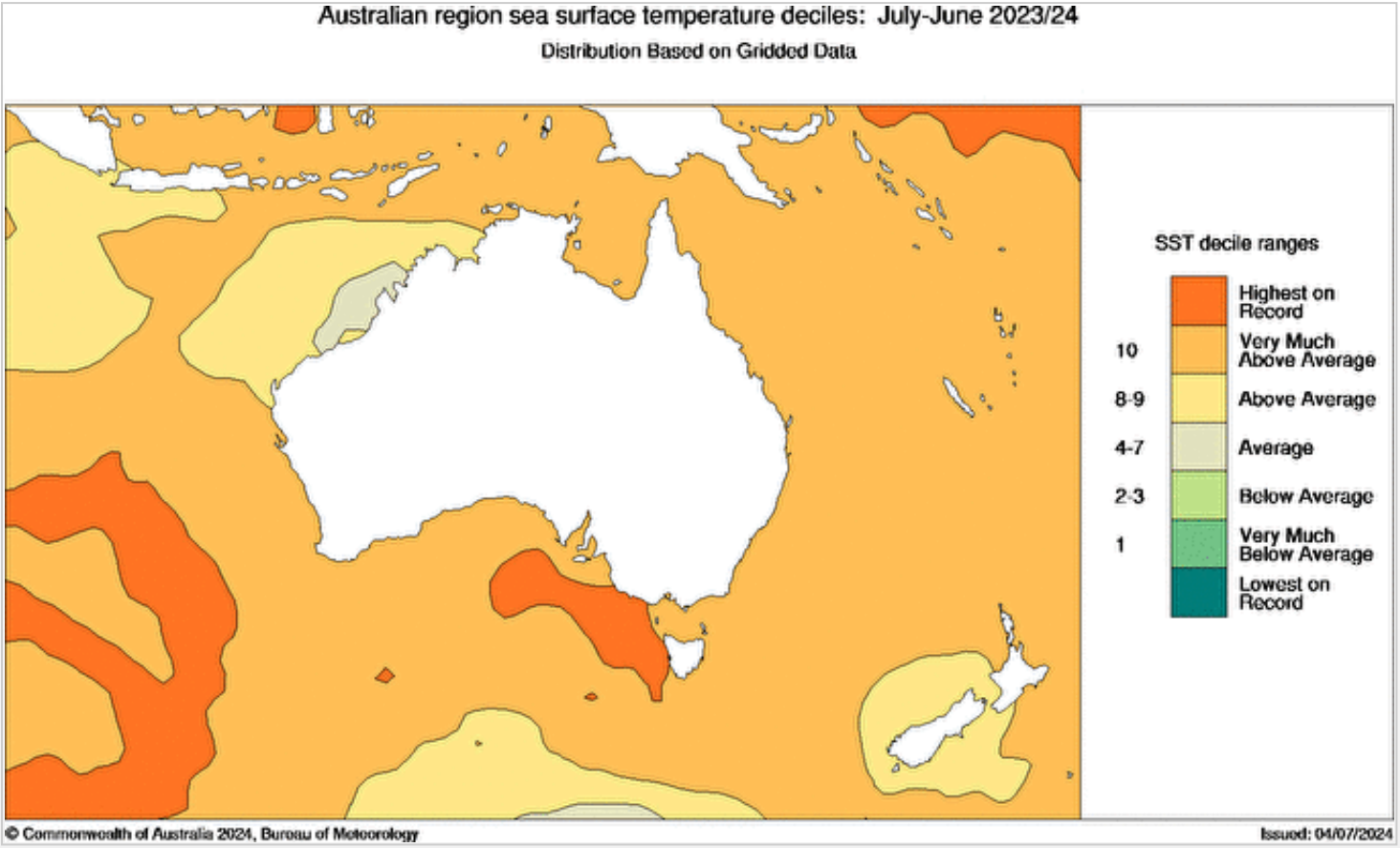
Tasmania

In Tasmania, the impact of low rainfall is noticeable in groundwater levels with 38% observed to be below average.



Groundwater levels in monitoring bores in the Narrabri and Gunnedah Formations in the Namoi catchment in the northern Murray–Darling Basin (top left and right), Main Range Volcanics in Upper Condamine, Queensland (middle left), Dilwyn Formation, South Australia-Victoria border (middle right), Gnangara Mound, Western Australia (bottom left), and Tindall aquifer in the Katherine region, Northern Territory (bottom right).

Warmest on record sea surface temperatures



2023–24 sea surface temperatures compared to historical records.
(From the NOAA Extended Reconstructed Sea Surface Temperature dataset, ERSST v5). About sea surface temperature regions and deciles.

Sea surface temperatures (SSTs) in 2023–24 for the Australian region* were the highest on record (since 1900–01), at 0.73 °C above the 1961–1990 average. This exceeded the previous record of 0.72 °C above average in 2015–16 and 2021–22. SSTs in the southern Australian region were also the warmest on record, at 0.80 °C above average.

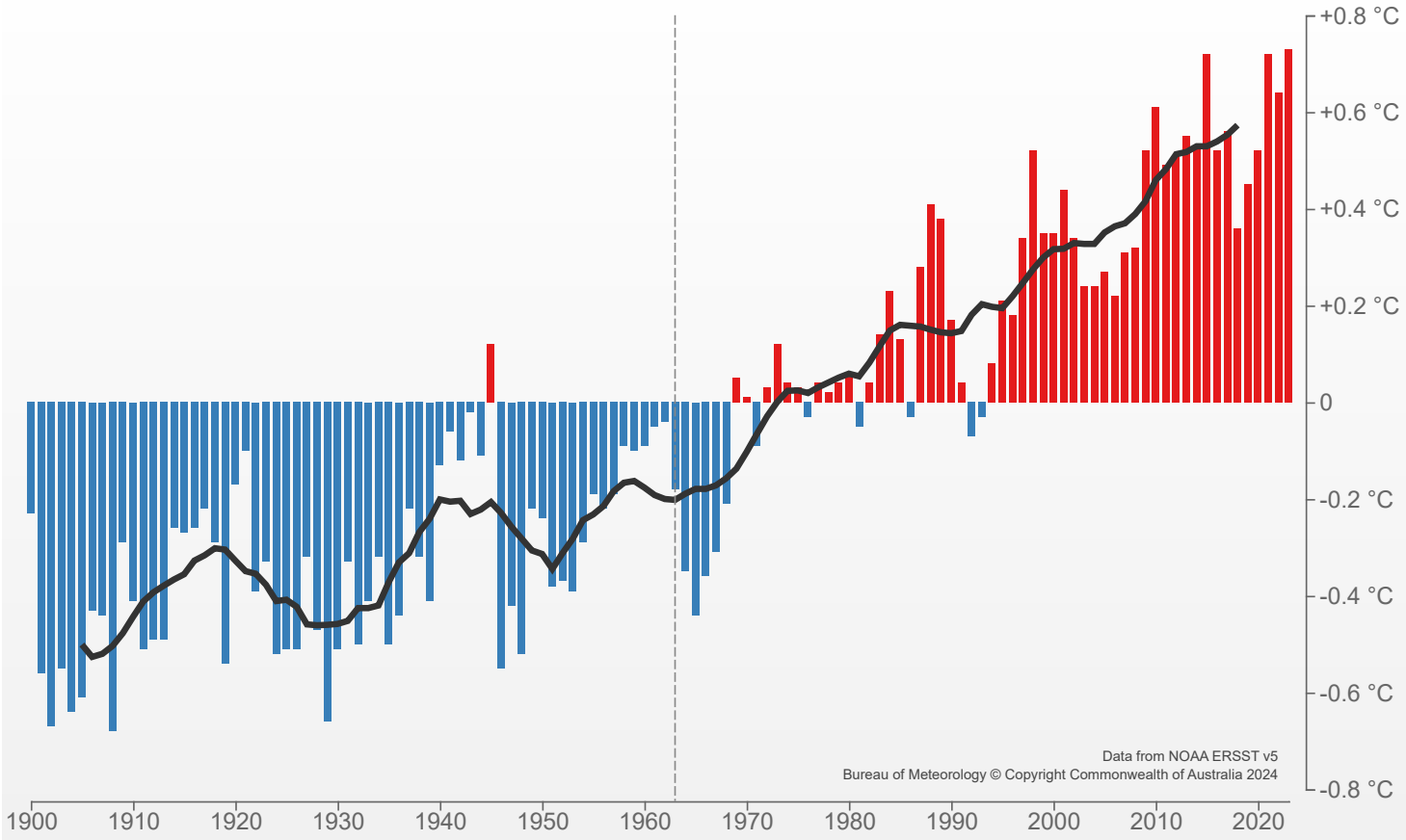
SSTs were very much warmer than average (in the highest 10% of historical observations since 1900–01) for most of the Australian region. SSTs were the highest on record along the south-west coast of Victoria and the west coast of Tasmania and extending towards waters south of South Australia.

Oceans in the Australian region were warm throughout the financial year. Area-averaged SSTs were warmest on record (since 1900) for January and February and within the warmest 10% on record for all other months except August and September. Coral Sea SSTs were warmest on record for January, March and April. They were second-warmest on record for February and equal second-warmest on record for May.

(*) The Australian region is defined as the waters around Australia from 4°S to 46°S and from 94°E to 174°E. The southern Australian region is the sub-region south of 30°S.

Australian region sea surface temperature anomaly

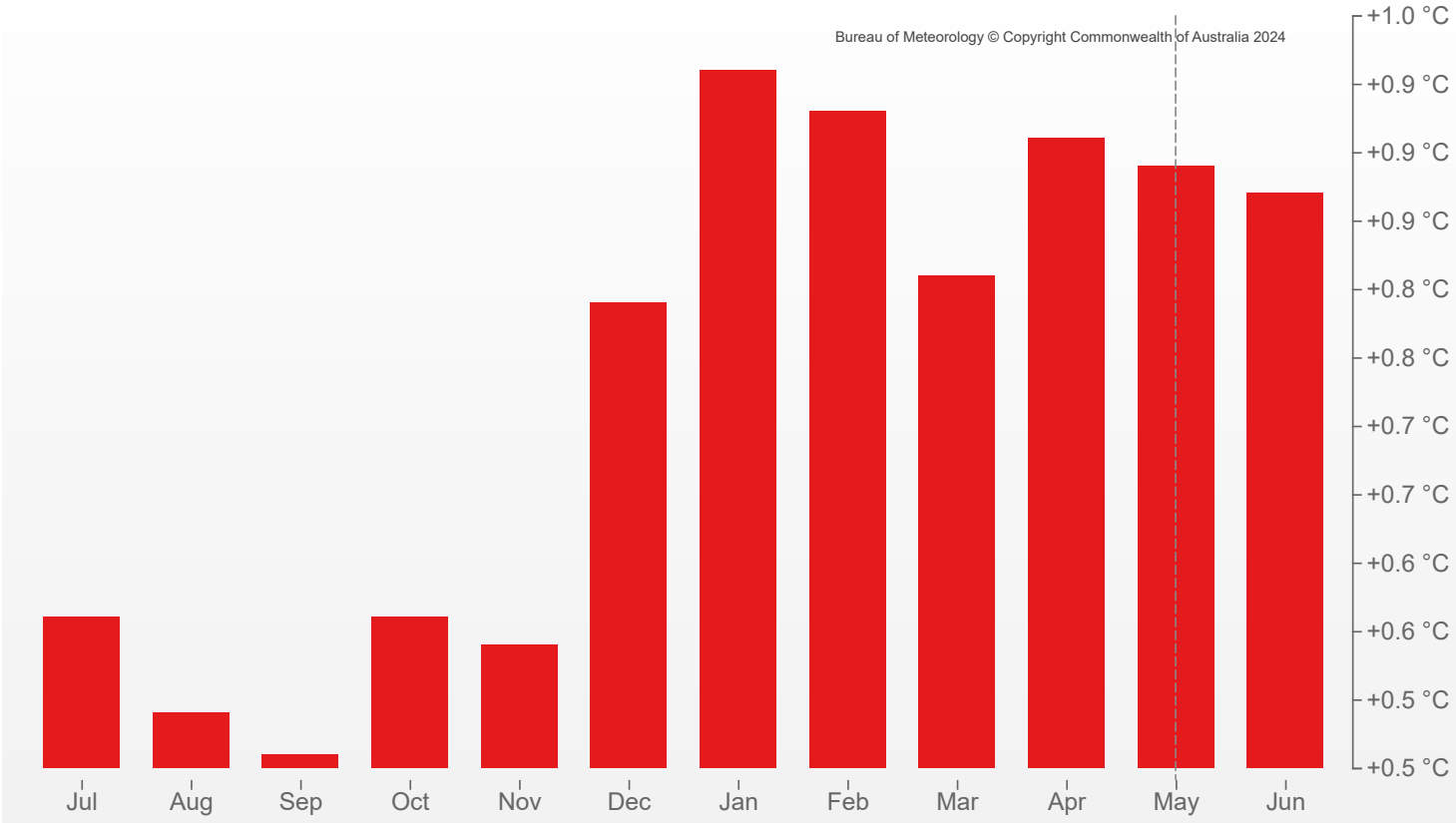
1963–1964 **-0.18 °C**



Annual mean sea surface temperature anomalies in the Australian region (as calculated from the 1961–1990 average), derived from the NOAA Extended Reconstructed Sea Surface Temperature Version 5 (ERSST v5) dataset. The black line shows the 11-year moving average. The value for the 11-year average is positioned over the middle year of each 11-year block. Select each year to view the anomaly.

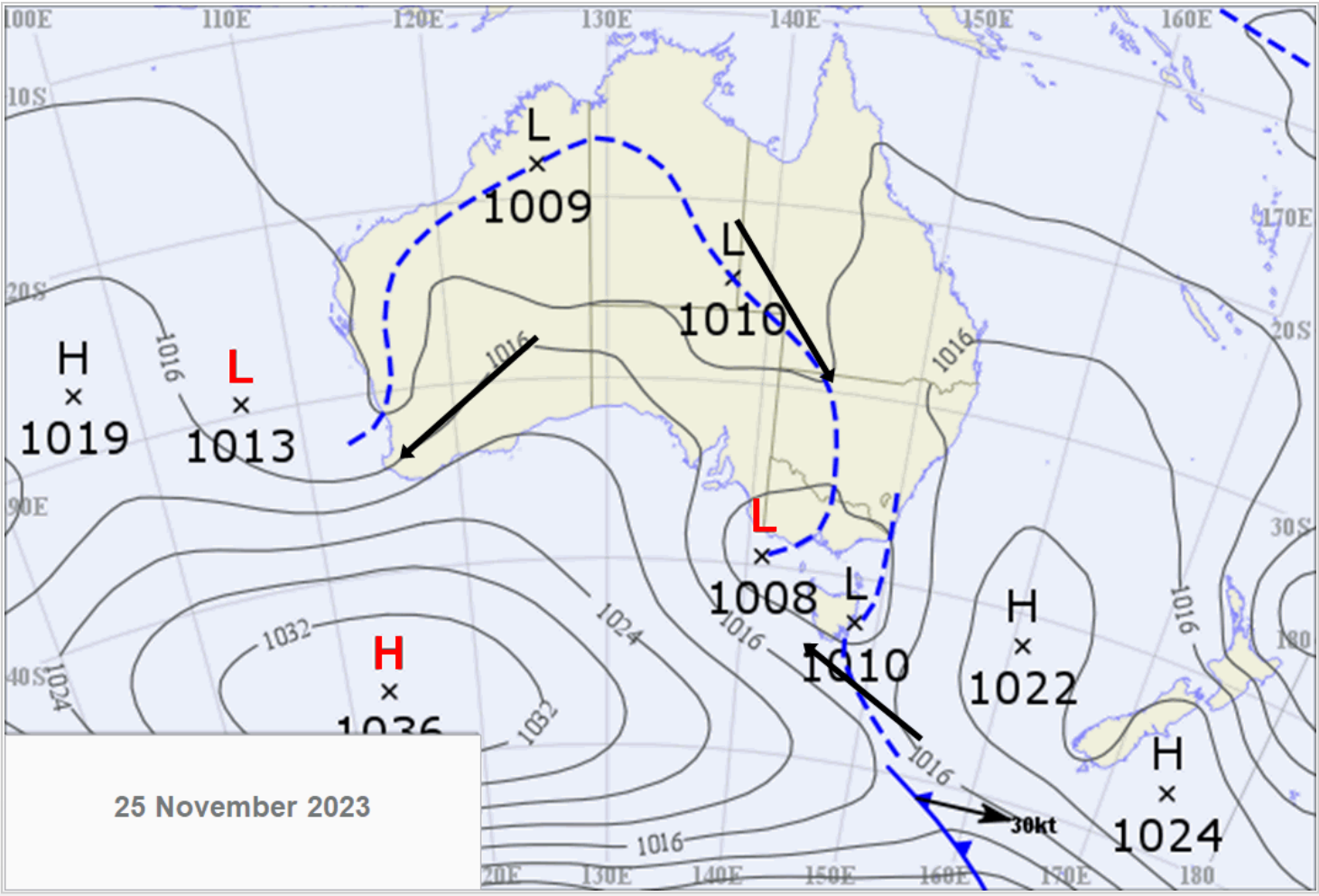
Australian region monthly sea surface temperature anomaly

May **0.89 °C**



Monthly mean sea surface temperature anomalies for the Australian region. The bars are the monthly temperature anomaly for the 2023–2024 financial year. Select each month to view the value.

Persistent high pressure systems in the Great Australian Bight



Bureau Mean Sea Level Pressure (MSLP) analysis at 11 am AEDT 25 November 2023. Red 'L' and 'H' respectively denote centres of low and high pressure systems, long black arrows indicate the approximate wind direction. The high pressure system in the Great Australian Bight has directed easterly flow of hot air from the interior over south-west Western Australia. At the same time, a low pressure system sits over Bass Strait, and is bringing moist air down from the tropics generating rain and thunderstorms.

A major feature of atmospheric circulation in the Australian region in 2023–24 was persistent, slow-moving high pressure systems in the Great Australian Bight. This pattern was dominant in November and December, February, and from April to June. This affected the weather for southern and eastern Australia in several ways:

- In combination with surface troughs off the west coast of Western Australia, hot air from the interior was directed over the south-west of the state, particularly in November and February.
- Over eastern Australia there was moist onshore easterly flow. In November and December, this combined with moist tropical air to generate widespread rain and thunderstorms, and from April to June there was heavy rain along the New South Wales coast on several occasions.
- From February to June, cold fronts and rain-bearing systems were prevented from reaching southern coastal areas, including south-west Western Australia, south-east South Australia, western Victoria and Tasmania.

Global climate

Sea surface temperatures

Underlying Australia's climate throughout the financial year were record-warm global sea surface temperatures (SSTs). Globally averaged monthly SSTs were at record warm levels for every month between April 2023 and June 2024. For the July 2023 to June 2024 period, globally averaged SSTs were 0.83 °C above the 1961–1990 average, exceeding the previous record of 0.65 °C above average in 2015–2016. SSTs were particularly warm in the tropics, with large areas of the Western Pacific, Western Indian and North Atlantic oceans warmest on record for all years since 1900–1901.

Winter and spring

Over winter and early spring oceans warmed in the central and eastern tropical Pacific, indicating that an El Niño phase of the El Niño–Southern Oscillation (ENSO) was developing. By September atmospheric indicators including cloudiness, trade winds and the Southern Oscillation Index (SOI, a measure of the tropical Pacific pressure pattern) showed sustained changes in the atmospheric circulation in the tropical Pacific. This combination of indicators showed that the El Niño was active.

At the same time, a positive Indian Ocean Dipole (IOD) was developing in the Indian Ocean, as the western Indian Ocean warmed while the eastern Indian Ocean remained relatively cool. Based on weekly SST indicators, the positive IOD was considered active from late August.

By early October, the positive IOD reached its peak strength as the second strongest on record, after 2019. From October to December, oceans continued to warm in the tropical Pacific, although the El Niño atmospheric indicators remained relatively weak throughout. The positive IOD slowly weakened in the Indian Ocean over this period.

Spring and summer

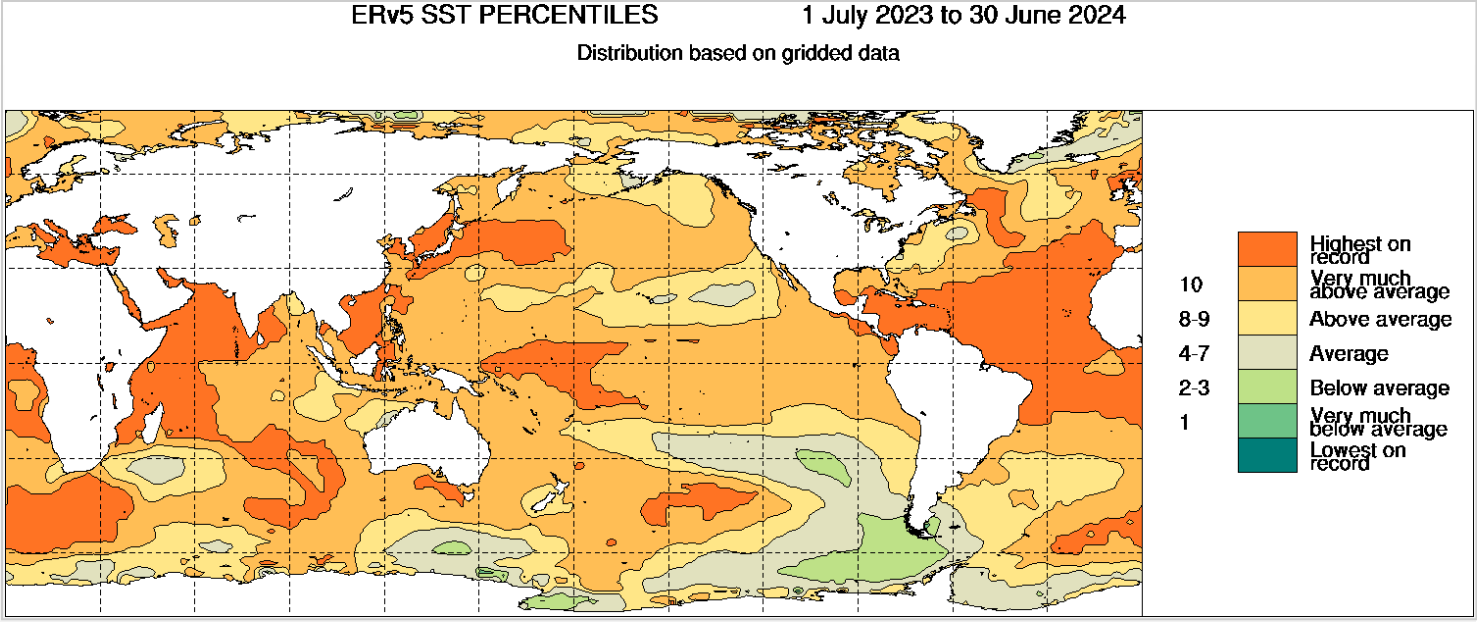
A positive phase of the Southern Annular Mode (SAM) was active for much of September to February. A relatively large and long-lasting Antarctic ozone hole in spring supported a strong polar vortex, which in turn supported the positive phase of SAM, particularly in November and December.

In January, an active phase of the Madden–Julian Oscillation (MJO) was in the Australian tropical region. This coincided with the onset of the monsoon over northern Australia. The positive IOD was relatively long-lived but became inactive (neutral SST indicators) by late January. Atmospheric indicators of ENSO returned to neutral from mid-December, and the tropical central and eastern Pacific Ocean started to cool, indicating that the El Niño was weakening.

Autumn and winter

By April, ENSO became inactive (returned to neutral) as waters in the tropical central and eastern Pacific Ocean cooled further. March and April saw further MJO activity in the Australian tropical region, with periods of monsoon bursts and tropical cyclone development.

The SAM was in a positive phase at times from April to June, particularly in April. There were some indications of a positive IOD developing in March and April, but these returned to neutral (inactive) by early May.



2023–24 global sea surface temperatures compared to historical records.
(From the NOAA Extended Reconstructed Sea Surface Temperature dataset, ERSST v5). About sea surface temperature regions and deciles.

Global warming

Australia's climate is increasingly affected by global warming. State of the Climate 2022 documented the following impacts:

- Australia's climate has warmed by an average of 1.50 ± 0.23 °C between 1910 and 2023.
- SSTs in the Australian region have warmed by an average of 1.05 °C since 1900.
- There has been an increase in extreme fire weather, and a longer fire season, across large parts of the country since the 1950s.
- Heavy rainfall events are becoming more intense, as a warmer atmosphere can hold more water vapour than a cooler atmosphere.
- Increased atmospheric moisture can also provide more energy for some processes that generate extreme rainfall events, such as severe storms and tropical cyclones.
- There has been a decline of around 15% in April to October rainfall in the south-west of Australia since 1970, and around 10% in the south-east since the late 1990s.
- The declining trend in south-western and south-eastern Australian April to October rainfall is associated with a trend towards higher surface atmospheric pressure in the region and a shift in large-scale weather patterns, with a reduction in the number of cold fronts that produce rainfall.

Notable events

Regions

All None NSW & ACT VIC QLD WA SA TAS NT

Event types

All None Heat Cold Snow Rainfall Flood Storms Wind Tropical cyclones

East Coast Lows Bushfire Coast Sea surface temperature

July

Northerly airflow brought warmer than average daytime temperatures across Tasmania on 1, 2, 3 and 13 July. Some stations had their highest July maximum and minimum temperatures on record. Hobart had its highest July mean minimum temperature on record at 13.0 °C (137 years of record).

July

On 7 and 8 July, south-east Australia was impacted by a strong cold front and deep low pressure system, producing damaging winds, widespread rainfall, below average temperatures, hazardous surf, and snow on elevated areas. More than 20 mm of snowfall was recorded in alpine areas in Victoria, Tasmania and New South Wales. Daily rainfall totals of more than 40 mm were recorded at many stations across western and central Tasmania and northern and eastern Victoria to 9 am on 8 and 9 July, with Minor to Moderate Flood Warnings issued for catchments in north-east Victoria and north-west Tasmania.

July

Throughout July, frequent high pressure systems dominated most of the country, bringing settled and dry conditions. Clear skies and light winds resulted in low daily minimum temperatures across southern and eastern parts of the country, and many stations in southern Queensland, eastern New South Wales, south-eastern South Australia and Victoria recorded their lowest minimum temperature for July on record. Glen Innes Airport (New South Wales) set a minimum temperature record of -10.8 °C on 20 July. This was Australia's lowest temperature outside the south-east alpine regions since 2019. For the first time since 1994, Canberra experienced 12 consecutive nights (16 to 27 July) of sub-zero minimum temperatures.

July

From 23 July, a surface low near the south-eastern Queensland coast slowly drifted northwards, and a cut-off low in the upper atmosphere generated showers around parts of the east coast and adjacent inland areas. On 27 July, many stations around Queensland's Capricornia, Central and North Tropical Coast and Tablelands districts recorded four-day rainfall totals of more than 100 mm, greatly exceeding their July average rainfall of between 25 and 50 mm.

July

Very strong north-westerly winds associated with a cold front impacted southern Tasmania over several days at the end of the month. Many sites recorded wind gusts of more than 100 km/h. The strongest wind gusts were recorded across south-western Tasmania. Several sites had their highest daily wind gust on record for July or for any month. This included 200 km/h at Maatsuyker Island, 169 km/h at Scotts Peak Dam and 146 km/h at Low Rocky Point.

August

A strong cold front crossed south-west Western Australia on 2 August and brought strong winds and heavy rainfall. The Busselton coast was impacted with heavy rainfall and isolated thunderstorms. In the 24 hours to 9 am on 3 August, falls of 40 to 80 mm were recorded around Bunbury and a daily rainfall total of 73.0 mm at Busselton Shire set an August record for the station. The Carbunup River at Lennox Vineyard and the Wellesley River at Juegenup reached minor flood levels.

August

Warm conditions and strong winds on 18 August resulted in a number of grass and bushfires across New South Wales. The New South Wales Rural Fire Service issued Watch and Act alerts for 2 fires in the Clarence Valley.

August

On 22 August, severe thunderstorms impacted parts of New South Wales and the Australian Capital Territory, with hail hitting parts of Gunghalin (ACT) and storms lashing Canberra in the early evening. Severe thunderstorms hit areas of the Riverina district of New South Wales, bringing hail and strong winds. There were reports of small hailstones of around 3 cm in diameter in the Junne and Tumut areas of New South Wales, and marble sized hail at Lake Albert in New South Wales.

September

During September and October 2023, conditions across northern and eastern Australia were generally dry and warm. Easterly winds were stronger than average across northern Australia, particularly during September. Under the Australian Fire Danger Rating System (AFDRS), fire dangers ratings reached Extreme to Catastrophic at times. There were grassfires and bushfires in multiple regions, with Northern Territory, New South Wales and Queensland Emergency Services issuing Emergency warnings during this period. The fires across the Northern Territory were of significant scale. Reported estimates of the area burnt by the end of October included 2.8 million hectares in the Barkly Tablelands, and 14 million hectares across the whole of the Territory including the Tanami and the southern regions.

September

Severe winds affected broad areas of south-east Australia on 7 and 8 September, as a strong cold front and low pressure trough crossed southern and south-eastern Australia. Maximum daily wind gusts greater than 100 km were recorded across elevated and coastal areas of Victoria and New South Wales and a few stations across South Australia, Victoria and New South Wales recorded their highest daily wind gust on record for September. There were reports of swells of more than 9 meters at Port Fairy (Victoria) and 8 meters at Portland (Victoria).

September

A strong cold front and low pressure trough moved over southern Western Australia with damaging to locally destructive winds, severe thunderstorms and heavy rain that resulted in flash flooding. Wind gusts exceeded 80 km/h at many locations and damage was reported across Perth and the south-west. Rottnest Island recorded a maximum daily wind gust of 128 km/h, this was the strongest wind gust on record in September. In the Busselton region rainfall totals in the 24 hours to 9 am on 13 September were 30 to 60mm, with the highest total of 91.4 mm at Busselton Aero. Some stations had their record highest September daily rainfall in the 24 hours to 9 am on 13 or 14 September.

September

Unusually warm conditions developed across southern Australia during September. On 14 September many sites in elevated and alpine areas of Tasmania, Victoria and southern New South Wales set records for their highest maximum temperature for September. From 15 to 20 September, very warm to hot conditions persisted over New South Wales and far eastern Victoria.

September

A low-to-severe intensity heatwave warning was issued by the Bureau for the South Coast district of New South Wales, along with Greater Sydney's first Total Fire Ban issued by the state since November 2020 from 17 to 20 September.

October

A low pressure system and associated cold front moved over south-east Australia early in October and brought heavy rainfall, damaging winds and severe thunderstorms. In the 24 hours to 9 am on 4 October, many stations in Victoria had their highest October daily rainfall on record including Mount Hotham which received 198.8 mm. Heavy rainfall led to flash flooding and widespread minor and moderate riverine flooding across north-eastern and eastern Victoria.

October

There was hot and dry weather across Queensland and northern New South Wales in the last week of October. Maximum temperatures in the south of the state were more than 8 °C above the 1961–1990 October monthly average for several days, reaching more than 10 °C above average on 25 and 31 October in some areas. AFDRS fire dangers ratings reached Extreme on 31 October in south-eastern Queensland and north-eastern New South Wales. In a Social Media post, the Queensland Fire and Emergency Service reported that their crews responded to more than 700 vegetation fires across the state by the end of October. There were periods of poor air quality across Queensland and New South Wales, including for Greater Brisbane and Sydney.

November

Showers and thunderstorms were widespread across large parts of Australia during November and a large number of daily rainfall records were set. On 15 November, thunderstorms across central Australia brought lightning, strong winds and rain with Coober Pedy Airport recording a maximum daily wind gust of 119 km/h, the site's strongest wind gust on record. On the same day, a storm hit Western Australia's wheatbelt with large quantities of hail covering the ground around Hyden and damaging crops in the middle of the harvest. Between 21 and 29 November more than 100 mm of rain was recorded at many locations in southern Queensland and northern New South Wales with persistent showers and thunderstorms leading to localised river rises across the southern interior. Between 27 and 30 October heavy rain, hail and lightning impacted South Australia, Victoria, New South Wales and Queensland as an upper level low pressure system merged with warm and moist air from the north. There were reports of flash flooding in many Adelaide suburbs with more than 50 mm of rain falling in a few hours.

November

A low pressure system that developed over New South Wales on 28 November moved eastwards and brought heavy and locally intense rainfall to the Victoria and New South Wales. The highest rainfall totals in the 24 hours to 9 am on 29 November was recorded in the Illawarra and South Coast districts (New South Wales) with 226.8 mm at Jervis Bay (Point Perpendicular AWS), 225.0 mm at Moruya and 196.4 mm at Ulladulla AWS, while in the 24 hours to 9 am on 30 November some stations in eastern Victoria had daily rainfall totals of more than 100 mm.

November

Between 20 and 27 November, the west coast of Western Australia including Greater Perth was affected by a low to severe intensity heatwave, as a near stationary surface low pressure trough close to the Western Australian coast directed heat from the interior of the continent towards the west coast. Perth set a new record for 10 consecutive days with temperatures equal or above 30°C, and a number of other stations in south-west Western Australia also set November records for consecutive days above a threshold. On 21 and 22 November, the hot conditions combined with strong winds resulted in AFDRS Extreme to Catastrophic fire danger ratings. By the morning of 23 November, several fires had affected the northern suburbs of Perth, with the Western Australia Department of Fire and Emergency Services (WA DFES) issuing an Emergency warning. For more information see Special Climate Statement 78.

December

On December 5, tropical low 02U formed near the Solomon Islands and developed into Tropical Cyclone Jasper. Tropical Cyclone Jasper tracked towards the Queensland east coast and made landfall near Wajul Wajul, just north of Cape Tribulation, as a Category 2 system on 13 December (around 8 pm EST). Significant widespread and heavy rainfall accompanied ex-Tropical Cyclone Jasper as it moved inland and weakened, stalling over the Cape York Peninsula. From 13 to 18 December daily rainfall totals ranged between 100 to 600 mm with many sites across northern Queensland recording their highest daily rainfall for December. The highest daily rainfall total, at a Bureau rain gauge, was 861.2 mm at Cape Tribulation Store to 9 am on 18 December. This was the third-highest daily rainfall total (to 9 am local time) ever measured by a Bureau rain gauge anywhere in Australia. Many sites recorded more the 1000 mm of rainfall over the 5-day period The highest 5-day total, at a Bureau rain gauge, was 1933.8 mm at Whyanbeel Valley. After several days of heavy and persistent rainfall Major Flood Warnings were issued for parts of the Daintree, Barron, Murray and Herbert rivers, and there were reports of widespread damage.

December

Storms moved across southern parts of South Australia on the evening of the 12th and a reported tornado impacted the town of Millicent in south-east South Australia that damaged properties, uprooted trees and tore down power lines.

December

During the second half of the month a series of low pressure troughs brought widespread rainfall to eastern and south-eastern parts of Australia with also frequent episodes of localised daily thunderstorms particularly across south-eastern Queensland and north-eastern New South Wales. Daily rainfall totals of 50 to 100 mm were recorded in the 24 hours to 9 am between 25 and 27 December across parts of Victoria and with minor to moderate flooding across catchments in north-western, central and eastern Victoria. In the 24 hours to 9 am on 26 December the New South Wales South Coast district recorded rainfall totals between 50 to 100 mm and leading to minor flooding. Severe thunderstorms also impacted areas of southern and central Queensland between 24 and 26 December, with the Bureau noting the following reported impacts.

- intense rainfall on multiple occasions, with flash flooding and minor riverine flooding around midday on 24 December and giant hailstones between 8 to 15 cm were observed at Morayfield, Burpengary, Dayboro and Narangba
- on 25 December, strong winds across the Gold Coast, up to 106 km/h at Gold Coast Seaway
- on 26 December, strong winds on Moreton Bay, with up to 119 km/h winds at Hope Banks Beacon
- on 26 December large (5 cm) hail at Scarborough around 5.30 pm, and 1 to 3.5 cm hail at Chermside, Geebung and Zilmere.
- In the evening of 25 December, there were damaging to locally destructive wind gusts resulting in a 3–4 km wide and 30–50 km long area of damage on the Gold Coast and Scenic Rim. There is some evidence on the Bureau rain radar suggesting tornado-inducing rotation within this system. On 30 December, thunderstorms developed in areas north of Brisbane, with reports of flash flooding, large hail and damaging winds.

December

Much of northern and central Australia was affected by low-to-severe intensity heatwaves during the last week of December including extreme heatwave conditions in north-west Western Australia. Several stations in northern Australia had their highest daily maximum temperature on record for December on the last two days.

January

During the first week of January humid and unstable weather in eastern Australia triggered thunderstorms and heavy rainfall across eastern Queensland and north-eastern New South Wales. The highest daily rainfall totals recorded to 9 am on 1and 2 January were 351.0 mm at Springbrook Road and 252.0 mm at Mt Tamborine (both in Queensland) respectively. On 4 January, thunderstorms affected New South Wales and central parts of the mainland. Severe thunderstorms in north-eastern South Australia generated a wind gust of 137 km/h at Moomba Airport, a record highest daily wind gust for this station for any month.

January

On 7 and 8 January, a broad band of rain with embedded thunderstorms, associated with a slow-moving low pressure trough, moved across south-eastern Australia. Heavy rainfall impacted central Victoria and many stations had their highest daily rainfall on record for January in the 24 hours to 9 am on 8 January, with the highest daily rainfall total of 154.4 mm recorded at Heathcote. Flood warnings were issued for a number of catchments across Victoria, including Major Flood Warnings for the Campaspe, Goulburn and Yea rivers.

January

Mid-month heavy rainfall from a tropical low and a monsoon trough, which stretched across the Top End of the Northern Territory to Cape York Peninsula in Queensland, brought many days of widespread rainfall and thunderstorms with areas of heavy to locally intense rainfall. This led to

flooding of large parts of the Northern Territory and Queensland including Major flooding of the Herbert River at Gleneagle (Queensland) and Magnificent Creek at Kowanyama Airport (Queensland).

January

A widespread low to severe intensity heatwave, with locally extreme conditions in parts of Western Australia's Pilbara, affected large parts of the country between 20 and 26 January. Large areas of New South Wales, north-eastern South Australia and south-western Queensland had maximum temperatures above 40 °C. On 25 January, Birdsville Airport (Queensland) recoded 49.4 °C and on 26 January, a number of sites in northern and eastern New South Wales had daytime temperatures above 40.0 °C, including 40.6 °C at Sydney Airport. The New South Wales Rural Fire Service issued an Extreme Fire Danger for the Greater Hunter district, as high temperatures combined with strong and dry northerly winds ahead of the cold front.

January

Tropical Cyclone (TC) Kirrily formed on 24 January from a tropical low in the Coral Sea. It intensified and reached Severe Tropical Cyclone strength (Category 3) on 25 January and crossed the north Queensland coast as a Category 2 system around 11 pm AEDT on 25 January just north of Townsville. After landfall, it continued moving south-west towards Queensland's interior and stalled over western Queensland bringing heavy rain and flooding

January

Moisture from ex-Tropical Cyclone Kirrily was advected over much of Queensland, resulting in high dew point temperatures and contributed to high daily minimum temperatures. Many stations in south-eastern Queensland reported night-time temperatures over 26 °C, including 36.4 °C at Birdsville Airport on 26 January. This was the station's annual highest daily minimum temperature on record, an annual daily minimum temperature record for Queensland and the second-highest daily minimum temperature for Australia (0.2 °C behind 36.6 °C observed at Borrona Downs in New South Wales on 26 January 2019).

January

On 29 January, thunderstorms developed over south-eastern Queensland, with the heaviest rainfall north and west of Brisbane. Heavy rainfall led to some rivers and streams in the area reaching major flood levels, with major flooding at Laidley Creek in Lockyer Valley and Major Flood Warnings issued for Condamine and Moonie rivers. On the following day, the thunderstorms and heavy rain gradually moved northwards through the Sunshine Coast, Wide Bay and Burnett, Capricornia, Central Coast and Central Highlands district. The highest daily rainfall totals of 169.4 mm and 107.4 mm in the 24 hours to 9 am on 31 January were recorded at Caloundra Airport and Sunshine Coast Airport respectively.

February

A tropical low (07U) embedded into the monsoon trough started to develop over the Top End on 13 February and moved eastwards across the Top End of the Northern Territory and developed into Tropical Cyclone (TC) Lincoln on the morning of 16 February. It crossed the southern Gulf of Carpentaria coast as a Category 1 system in the evening on 16 February, west of the border between Northern Territory and Queensland. After making landfall, it rapidly weakened below tropical cyclone intensity while moving west through central Northern Territory and northern Western Australia, bringing gale force winds and heavy rainfall to areas near its path. Heavy rainfall resulted in renewed flooding across parts of north-western Queensland and north-eastern Northern Territory and numerous flood warnings were issued with Major Flood Warnings for the Nicholson, Gregory and Flinders rivers (Queensland)

February

On 13 February, a cold front moved across Victoria and brought thunderstorms (some severe), dry lightning, locally heavy rainfall and hail, as well as damaging wind gusts. Wind gusts in excess of 90 km/h were recorded at many stations. A number of stations set records for February wind gusts and some approached or exceeded their annual record, including 130 km/h at Mount Gellibrand (Colac), 126 km/h at Yarram Airport and 122 km/h at Avalon Airport. Hot daytime temperatures combined with strong gusty winds led to Victoria's worst fire weather conditions since the 2019–20 fire season. The Victoria State Emergency Service issued a Catastrophic Fire Danger Warning

for the Wimmera and Extreme Fire Danger Warnings for the Mallee, Northern Country and Central districts and with a Total fire ban across all western and central districts.

February

From mid-February, moist onshore airflow brought daily showers and thunderstorms to parts of eastern Queensland and New South Wales and when combined with low pressure troughs, this resulted in heavy rainfall events. In the 24 hours to 9 am on 16 February, Brisbane recorded 183.6 mm and flash flooding was reported in some parts of Greater Brisbane. On 19 February, slow-moving thunderstorms developed around eastern New South Wales and south-eastern Queensland, bringing heavy rain that resulted in flash flooding at a number of locations and about 75,000 lightning strikes were recorded across Greater Sydney. Thunderstorms also brought heavy rain to parts of the North Tropical Coast between Cairns and Townsville. In the 24 hours to 9 am on 24 February, daily rainfall totals of more than 300 mm were recorded at multiple locations, causing flash and riverine flooding.

February

On 21 and 22 February, heat that built up over southern Western Australia extended eastwards across South Australia to Victoria, Tasmania and New South Wales. The heat further intensified due to hot northerly airflow ahead of a cold front that crossed south-eastern Australia on 22 and 23 February. Daytime temperatures were more than 10 °C above the 1961–1990 February average in some areas; nights were also warm with minimum temperatures 6 to 10 °C above the 1961–1990 average. Hot and dry weather with strong, gusty winds ahead of the cold front resulted in extreme fire danger conditions for some districts in south-eastern South Australia, western and central Victoria and eastern Tasmania.

February

Western Australia experienced several low-to-severe heatwaves during February. These conditions were generally associated with a stationary deep trough off the west coast which directed easterly winds and a hot airmass from Australia's interior towards the coast. Extreme heatwave conditions impacted the western Kimberley on 18 and 19 February and several stations had their highest daytime temperature for February or for any month (annual) including 49.9 °C at Carnarvon Airport and 49.8 °C at Shark Bay Airport, respectively the equal 8th-highest and equal 10th-highest ever recorded in Australia. Perth Metro had 7 days with daily maximum temperatures above 40.0 °C, exceeding its previous February record of 4 such days. The hot, dry and windy conditions caused elevated fire danger across much of southern and central Western Australia, with AFDRS fire danger ratings reaching Extreme in some areas

March

During the first week of March, a series of troughs moved across most of the mainland, generating widespread showers and some isolated thunderstorms. Severe thunderstorms were observed through parts of Western Australia's Kimberley and interior, the Top End in the Northern Territory, central Queensland and along the North Tropical Coast. On 5 March, severe thunderstorms developed over parts of Western Australia. In the 24 hours to 9 am on 6 March, some sites in the Gascoyne and Southern Interior districts had rainfall totals generally between 30 and 50 mm, with isolated higher totals. The average March rainfall for these areas is between 25 and 50 mm.

March

From 8 March, a slow-moving high pressure system centred over the Tasman Sea directed hot air from central parts of the mainland towards south-eastern Australia and a low-to-severe intensity heatwave persisted between 8 and 11 March over most of south-east Australia. Daytime temperatures peaked on 9 March, with temperatures 10 to 16 °C above the 1961–1990 March average through south-eastern South Australia, western and southern Victoria and southern Tasmania. Night-time temperatures peaked on 10 March, at 10 to 12 °C above the 1961–1990 March average. Some stations set March or late season maximum and minimum temperature records. On 9 March, the highest daily maximum temperature during this event was 42.8 °C at North Shields (Port Lincoln AWS) (South Australia) and the highest daily minimum temperature was 29.3 °C at Cleve Aerodrome (South Australia).

March

A near-stationary low pressure trough across central and eastern Western Australia interacted with tropical moisture that was advected from the Timor Sea, resulting in frequent showers, heavy rain and thunderstorms mainly over south-eastern Western Australia. Four-day rainfall totals ending at 9 am on 12 March were two to five times the March average (of 20 to 30 mm) across a large area in the Western Australia's interior. Eyre, on the Nullarbor coast, received 325.4 mm of rainfall in the 4 days to 9 am on 12 March, exceeding its annual average rainfall of 314.9 mm. This triggered significant flooding through parts of southern and south-eastern Western Australia.

March

A monsoon trough that developed across the Top End (Northern Territory) and far north Queensland on 11 March and persisted until 20 March brought rain, widespread showers and localised thunderstorms over parts of northern Australia. Heavy rainfall impacted Queensland's North Tropical Coast where many stations recorded daily rainfall totals above 100.0 mm on multiple days. Daily rainfall totals of 100 mm to 150 mm were reported near the Northern Territory Top End coast during the passage of tropical low 09U before it developed into Tropical Cyclone Megan. Heavy rainfall resulted in flash and riverine flooding across parts of northern Queensland, the Northern Territory and northern Western Australia.

March

Tropical low 09U developed into Tropical Cyclone (TC) Megan on the afternoon of 16 March and brought heavy rainfall to parts of the eastern Arnhem district (Northern Territory), Groote Eylandt Airport reported 431.0 mm in the 24 hours to 9 am on 17 March (the annual highest daily rainfall record for this station). TC Megan made landfall on 18 March around 4 pm AEST on the south-western Gulf of Carpentaria coast, south-east of Port McArthur. Severe TC Megan brought heavy rainfall and strong winds to coastal regions of the Northern Territory and Queensland and to several nearby islands. To 9 am on 19 March, Borroloola Airport and McArthur River Mine Airport (both in the Northern Territory) had daily rainfall totals of 256.6 mm and 274.4 mm respectively, their highest daily rainfall for any month. This caused major flooding along the McArthur River at Borroloola, which exceeded the record flood level of 15.0 m from 2001. Ex-TC Megan continued to move westwards across the Northern Territory towards the Kimberley in Western Australia, bringing gale force winds and heavy rainfall to areas near its path.

March

A strong cold front crossed south-eastern Australia on 19 and 20 March, bringing gusty winds and daily maximum and minimum temperatures up to 10 °C below the 1961–1990 March average. Associated clouds and embedded thunderstorms resulted in rain and showers for much of eastern Victoria, Tasmania, eastern New South Wales and south-eastern Queensland. On 19 March, many stations in Victoria and Tasmania recorded wind gusts of more than 80 km/h in a northerly airflow preceding the approaching cold front. The passage of the front was followed by gusty south-westerly winds with Wilsons Promontory Lighthouse and Hogan Island (both in Victoria) recording on 20 March wind gusts of 120 km/h and 122 km/h respectively. Many stations across south-eastern South Australia, Victoria, southern New South Wales and Tasmania observed low minimum temperatures on 21 March. Cleve (South Australia) recorded the lowest daily minimum temperature for March at 6.8 °C and Thredbo AWS (New South Wales) recorded -4.4 °C, its lowest minimum temperature in March since 2001. A dusting of snow was observed over some elevated areas of Tasmania on 20 March.

March

From 23 to 26 March, showers and thunderstorms impacted parts of central and southern Northern Territory, western and southern Queensland and north-western New South Wales as a low pressure trough advected moisture that was left by ex-Tropical Cyclone Megan. Alice Springs Airport had a three-day rainfall total (to 9 am on 25 March) of 153.8 mm, nearly five times its March average of 30.9 mm. Cloud cover and rainfall led to low daily maximum temperatures especially in southern parts of the Northern Territory and much of Queensland. Several stations had their lowest daily maximum temperature records for March, including Brisbane Aero which recorded 21.1 °C on 24 March and Alice Springs had maximum temperatures below 18 °C on two consecutive days (22 and 23 March), which has not occurred in March since 2001.

April

A trough and associated cold front moved across Victoria and northern Tasmania at the start of April bringing widespread showers and localised thunderstorms with heavy falls and strong damaging winds. In the 24 hours to 9 am on 2 April, 25 to 100 mm of rainfall was recorded across central and southern parts of Victoria most of Tasmania. Many sites across central and south-eastern Victoria and northern Tasmania set records for their highest daily April rainfall and heavy rainfall caused flash flooding across the Melbourne metropolitan area.

April

In early April coastal areas of the New South Wales experienced several days of widespread and heavy rainfall as a deep coastal trough with an embedded low pressure system and a strong easterly flow moved southward along the coast. In the 24 hours to 9 am on 5 April, widespread daily rainfall totals of 25 to 50 mm were recorded along the New South Wales coast, and the Mid North Coast and Sydney Metropolitan area received 50 to 100 mm of rainfall with most of the rain falling overnight. In the 24 hours to 9 am on 6 April, the Mid North Coast, Hunter, Illawarra and Sydney Metropolitan districts received more than 100 mm of rainfall with some isolated falls over 200 mm. Many daily April rainfall records were set, and flood warnings were issued across coastal and inland areas of New South Wales. There were media reports of flash flooding, coastal erosion and road and rail closures.

April

On 8 April, a cold front moved across southern South Australia, Victoria and Tasmania. This front was associated with a cold southerly airstream and brought cooler conditions to south-east Australia with mean maximum temperatures 2 to 4 °C below the 1961–1990 April average on 9 April. Snow was reported across New South Wales and Victoria, with 10 cm of snow around Perisher in New South Wales and several centimetres of snow across alpine areas of Victoria. The cold front then moved up the New South Wales coast and generated damaging, gale force winds with wind gusts in excess of 100 km/h.

April

Parts of Queensland's tropical north received several days of heavy rainfall and isolated thunderstorms between 15 and 19 April, as an easterly surge and trough with an embedded tropical low (15U) extended across the northern Peninsula district and Gulf of Carpentaria. The highest daily rainfall totals were recorded along the North Tropical Coast and Tablelands district in the 24 hours to 9 am on 16 April. This resulted in flash and riverine flooding with flood warnings issued including a Moderate Flood Warning for the Daintree and Mossman Rivers.

May

On 2 May, an upper low pressure system developed over western New South Wales, moving eastwards towards the coast and generating up to 50 mm of rainfall in central areas in the 24 hours to 9 am on 4 May. The low pressure system, combined with onshore flow, produced daily rainfall totals of 50 to 100 mm in the 24 hours to 9 am on 5 May across the Illawarra, Sydney Metropolitan and Hunter districts, with the highest rainfall totals of over 100 mm in the Illawarra district. Several sites had their highest daily May rainfall on record. On 6 Maythe system moved north, and the Central Coast recorded daily rainfall totals of 50 to 100 mm.

May

In mid-May, an upper trough moved eastwards across western New South Wales, combined with onshore flow and generated widespread rainfall along the coast. Over 3 days, from 9 am on 11 to 13 May, the South Coast and Illawarra districts received 100 to 150 mm of rainfall, and isolated falls greater than 200 mm in the South Coast district. Heavy rainfall lead to Minor Flood Warnings issued for the Deau River, Hawkesbury River and St Georges Basin.

May

In early May, a cold front and low pressure trough triggered thunderstorms and heavy rainfall as it moved across south-west Western Australia with isolated daily rainfall totals on 2 and 3 May of 25 to 50 mm in the South West and Lower West districts. The South West Land Division experienced strong winds, showers and severe thunderstorms, as a trough ahead of a cold front crossed south-west Western Australia on 10 May. A confirmed tornado impacted Bunbury and surrounding suburbs that afternoon.

May

In late May, a cold front moved across south-west Western Australia, accompanied by isolated thunderstorms with small hail, strong wind gusts and widespread rainfall. Wind gusts across the Perth Metropolitan region on the morning of 29 May exceeded 100 km/h in some locations and the Perth Metro weather station recorded its highest wind gust for May at 80 km/h.

May

South Australia, Victoria, New South Wales, the Australian Capital Territory and Queensland experienced cooler than average May minimum temperatures for several days mid-month. This was in the wake of a cold front that moved across south-east and eastern Australia and combined with a slow moving high pressure system. This produced a persistent cooler southerly airflow that reached inland areas. Minimum temperatures were 6 °C below the 1961–1990 May average across large areas of south-eastern and eastern Australia from 18 to 23 May and several sites in southern South Australia recorded their lowest May minimum temperature on record on 22 May.

May

A cold front moved across south-eastern Australia on 30 May, with warm northerly winds strengthening ahead of the front brining damaging winds gusts over elevated areas of southern New South Wales, Victoria and Tasmania. Several sites across south-eastern Tasmania, and elevated areas across north-eastern Victoria and south-eastern New South Wales, recorded wind gusts exceeding 100 km/h, including Thredbo AWS (New South Wales) with its equal highest wind gust on record for May at 146 km/h. Widespread light to moderate rainfall was associated with the passing of the cold front and associated trough extending from the Kimberley in Western Australia to south-east Australia. Many sites across north-eastern Victoria had their highest daily rainfall for May, including Mount Hotham with 115.8 mm and Mansfield with 61.4 mm.

June

A coastal low developed in early June and deepened off the New South Wales coast generating widespread rainfall across coastal and adjacent inland areas. In the 24 hours to 9 am on 2 June, large areas of coastal New South Wales recorded widespread falls of 15 to 50 mm, with falls greater than 50 mm concentrated across the Sydney Metropolitan district. Several sites had their daily rainfall record for June, including Randwick (Randwick St) with 154.0 mm and Sydney Botanic Gardens with 159.5 mm. The heavy rainfall led to localised flash flooding in areas of Sydney. Significant wave heights exceeded 5 m off the Sydney coast, the largest in the region for more than a year.

A second low pressure system off the New South Wales coast also generated widespread rainfall and localised heavy falls across coastal and adjacent inland areas. Multi-day rainfall totals between 6 and 8 June across Sydney, the Illawarra, Hunter and Southern and Central Tablelands districts exceeded 50 mm with isolated falls over 200 mm in the Illawarra district. Flood watches and warnings were issued for the coast from the Hunter to the South Coast districts including a Moderate Flood Warning for the Hawkesbury and Nepean Rivers. The Warragamba Dam reached capacity several times in the April to June period.

June

Strong to damaging wind gusts impacted Victoria, Tasmania and New South Wales as a strong cold front moved across south-east Australia on 11 June. This front was also associated with widespread showers, cooler than average temperatures and several centimetres of snow on Alpine areas. Wind gusts exceeded 80 km/h across many coastal and alpine areas of Victoria, Tasmania and New South Wales.

June

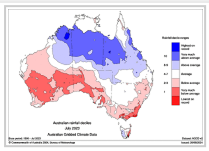
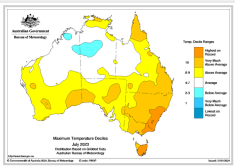
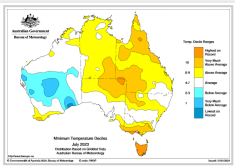
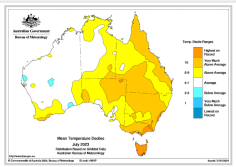
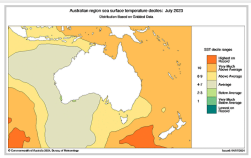
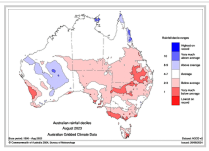
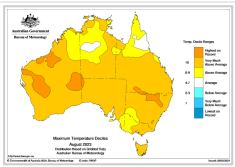
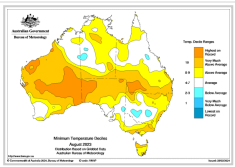
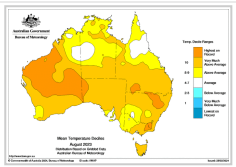
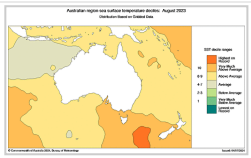
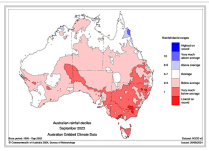
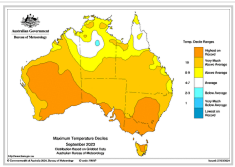
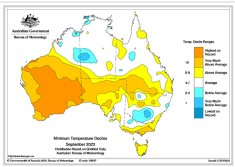
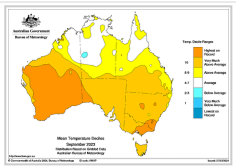
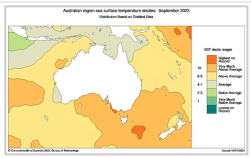
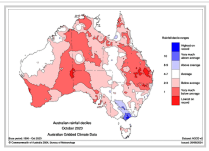
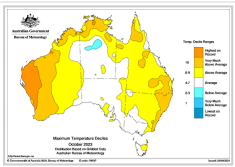
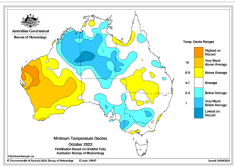
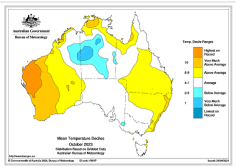
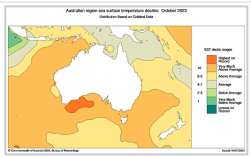
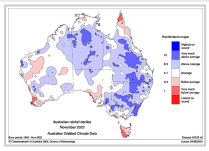
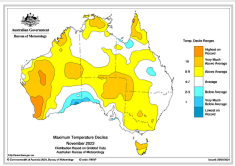
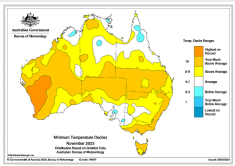
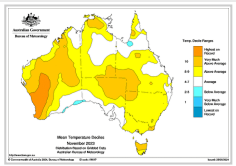
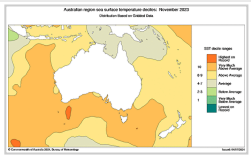
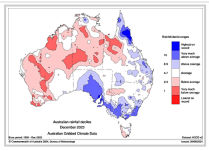
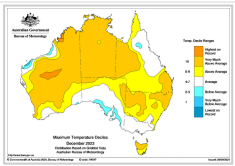
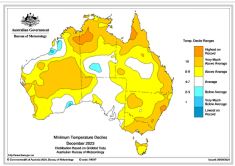
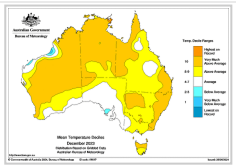
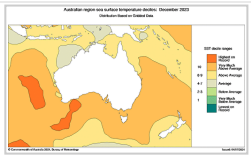
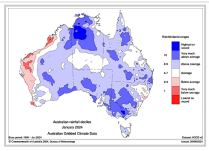
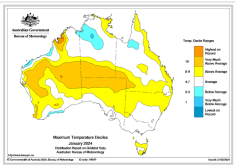
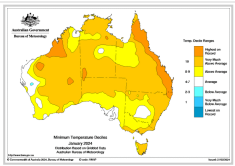
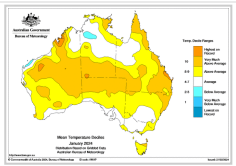
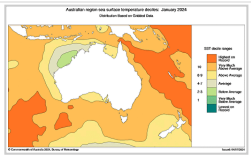
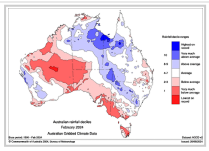
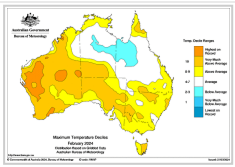
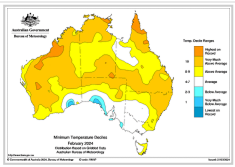
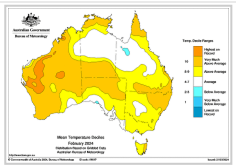
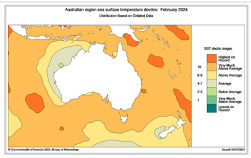
Between 18 and 20 June, clear skies and light winds from a high pressure system in the Great Australian Bight combined with a cooler southerly airflow from a stationary low pressure system in the Tasman Sea generated cooler than average minimum temperatures across eastern Australia for several days. Minimum temperatures on 18 and 19 June were 2 to 6 °C below the 1961–1990 June average for much of Victoria, New South Wales, Australian Capital Territory, Tasmania and Queensland, and with areas in central Queensland 6 to 10 °C below the 1961–1990 June average on 18 June. Several sites recorded their lowest minimum temperature for the month on 18 June, including Tambo

Post Office (Queensland) at -5.6 °C. On 19 June several sites across Victoria and northern Tasmania also recorded their lowest June minimum temperature on record.

June

At the end of June, a low pressure trough extending over central and southern Queensland drew in moisture from the Coral Sea generating widespread and locally heavy rainfall across coastal and central areas. During this time of the year, central parts of Queensland are generally dry with average June rainfall of 10 to 25 mm. However, in the 3 days to 9 am on 28 June, rainfall totals across the area were 25 to 100 mm. Most of the rain fell on 27 June when many sites received more than their average June rainfall. Several records were set including 68.0 mm at Woodbine Station (118 years of record); the average June rainfall for this station is 20.4 mm.

2023–2024 monthly and financial year rainfall, temperature and sea surface temperature maps

	Rainfall deciles	Maximum temperature deciles	Minimum temperature deciles	Mean temperature deciles	Sea surface temperature deciles
July 2023					
August 2023					
September 2023					
October 2023					
November 2023					
December 2023					
January 2024					
February 2024					

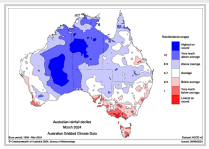
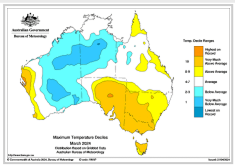
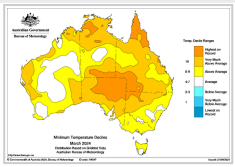
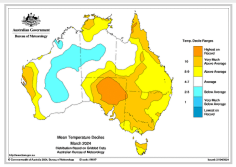
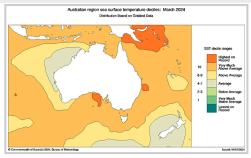
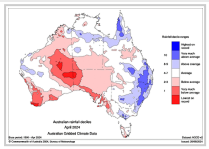
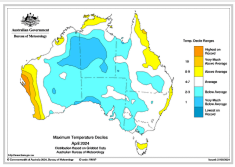
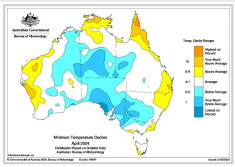
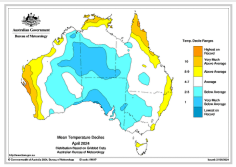
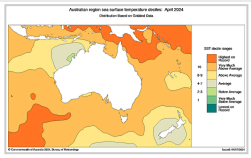
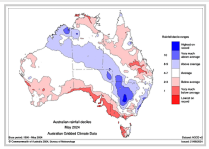
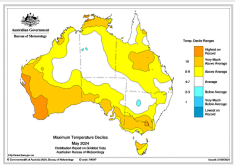
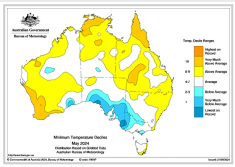
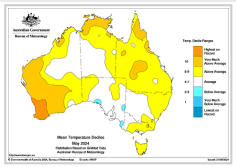
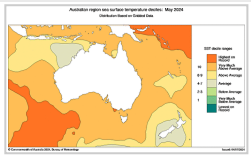
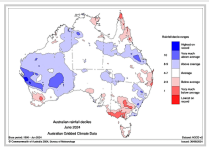
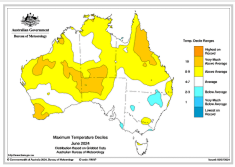
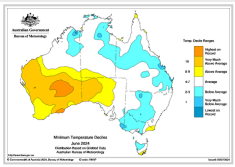
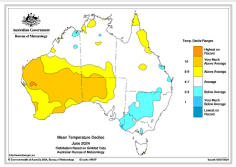
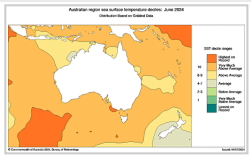
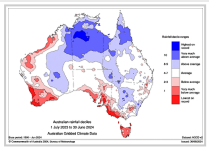
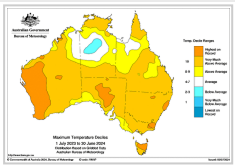
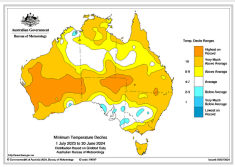
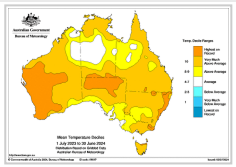
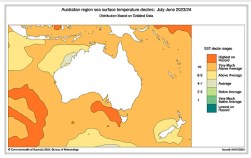
	Rainfall deciles	Maximum temperature deciles	Minimum temperature deciles	Mean temperature deciles	Sea surface temperature deciles
March 2024					
April 2024					
May 2024					
June 2024					
Financial Year					

Table of rainfall, temperature and sea surface temperature maps for each month and the year

Where to find more information

The *Financial year climate and water statement* provides a range of climate and water information at a national level.

Climate summaries are produced for each month and season, for Australia nationally and for the states and most capital cities. Special Climate Statements are produced on an occasional basis, and provide a detailed summary of weather/climate events which are unusual in the context of the climatology of the affected region.

The National Water Account includes detailed water information for eleven nationally significant water management regions. The Groundwater Information Suite provides data on bore water levels and trends, and associated data on hydrogeology and groundwater management.

Data information

For more information, find area average data and timeseries for the financial year period, with maps for the 12-month periods ending June available from recent conditions.

Data currency

All values in this statement were compiled from data available on the issue date. Subsequent quality control and the availability of additional data may result in minor changes to final values. The use of current and historical climate information allows for comparison of climate impacts from one year to the next and aligns with other reporting processes that occur over financial year periods.

Data sources

The Bureau collects, manages and safeguards Australia's climate data archive. Several datasets have been developed from this archive to identify, monitor and attribute changes in the Australian climate.

This statement was prepared using the following sources:

- Rainfall from the Australian Gridded Climate Dataset (AGCD) analyses.
- Temperature from Australia Water Availability Project (AWAP) analyses.
- Area-average time series for the financial year are calculated from the homogenised Australian temperature dataset (ACORN-SAT) and AGCD monthly rainfall.
- Root-zone soil moisture from Australian Water Resources Assessment Landscape model (AWRA-L) 7.0 analyses.
- Water storage information and the Murray-Darling Basin Information Portal.
- Sea surface temperature from the ERSSTv5 dataset.

A note on base periods

In climatology a baseline, or long-term average, is required against which to compare changes in climate over time. The Bureau uses the 1961–1990 period as the climate reference period for the Annual Climate Statement and other climate monitoring products.

A minimum 30 years of data is required to form a robust climatological average, accounting for decadal variability. In general, baseline climatological periods try to make use of the period with the best data coverage. The 1961–1990 period is comparable to the first 30-year period where there is good global coverage of climate data, and is thus used as a benchmark for reporting climate change allowing consistent comparison of national temperature observations across countries. However alternate averaging periods are also used for other purposes, such as facilitating comparison to a more recent period for climate outlooks, or to the pre-industrial period for long-term climate change.

The choice of base period is a convention. It has no bearing on the calculation of trends over time, or the ranking of one year compared to all other years in a dataset.

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