Australian Government
Bureau of Meteorology

Special Climate Statement 74 – extreme rainfall and flooding in eastern and central Australia in March 2021

Updated 21 June 2021

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Version number/type	Date of issue	Comments
1.0	19 April 2021	Released
2.0	21 June 2021	Updated statistics

Published by the Bureau of Meteorology

Cover image: The Washpool, east of Moree, by Tallee Warrener, March 2021.

Summary

- Extreme multi-day rainfall and significant flooding affected many parts of eastern and central Australia from 17 to 26 March 2021.
- This was the result of a blocking high pressure system in the Tasman Sea and a low-pressure system off north-west Australia feeding a large volume of moist tropical air into eastern Australia.
- Coastal New South Wales, including Sydney, experienced multiple days of heavy rainfall, and the week ending 24 March 2021 was the wettest week for the region since national daily records began in 1900.
- Flooding occurred in most coastal catchments in New South Wales, and some adjacent parts of south-east Queensland and eastern Victoria.
- Flooding reached record heights on the Camden Haven and Manning Rivers and the Hawkesbury–Nepean catchment in Sydney experienced its most significant flooding for more than 30 years.
- Heavy rainfall extended from central Australia to northern inland New South Wales during that week resulting in significant flooding on some inland rivers in northern New South Wales and southern Queensland.
- New South Wales had its second-wettest day, third-wettest week and second-wettest March on record since 1900.
- Northern Murray–Darling Basin catchments had two of their three largest one-day increases in water storage levels since 1993.
- The 2020–21 La Niña meant antecedent soil moisture, runoff and water storage levels were higher in March 2021 than for a similar multi-day coastal rainfall event in February 2020.This meant a far greater extent and severity of flooding in 2021 than 2020.

1. Overview of the event

A major rain event affected significant areas of Australia in the second half of March 2021. The heaviest rainfall totals occurred in eastern New South Wales, with almost the whole coastline and adjacent ranges receiving significant falls. Extensive heavy rainfall also occurred over large areas of the inland, particularly in much of inland New South Wales and northern South Australia. Many catchments on the east coast experienced significant flooding, as did numerous inland rivers, especially in northern New South Wales and southern Queensland.

Moist easterly flow became established over coastal New South Wales on 17 March, associated with a strong, slow-moving high pressure system in the southern Tasman Sea between Tasmania and New Zealand (Figure 1). This onshore flow persisted for nearly a week. Troughs formed near the coast from time to time, and a small low pressure system moved slowly south along the New South Wales coast on 19 and 20 March, reinforcing the easterly flow on its southern side. The low did not reach the intensity required to be formally classified as an East Coast Low. Some of the heaviest rain occurred during these two days.

Meanwhile, a separate area of low pressure formed over central Australia on 22 March, with a trough and associated north west cloud band extending from the Kimberley in north Western Australia to the far south-west of Queensland. This occurred despite a relatively inactive monsoon and the Madden–Julian Oscillation being well outside the Australian region. This consolidated over the following 24 hours into a low pressure system over inland areas of southern Queensland and northern New South Wales, which also reinforced north-easterly flow over south-eastern New South Wales. The low then moved south over inland New South Wales, reaching eastern Bass Strait early on 24 March. It continued to move slowly southwards, on a track just east of Tasmania, over the following 24 hours, before accelerating and leaving the Australian region later on 25 March.

Significant rain began along parts of the New South Wales coast on 17 and 18 March, with heavy falls in the Port Stephens area on 18 March. There was also significant thunderstorm activity in northern inland New South Wales and central Queensland during this period, with locally heavy falls. These are not considered as part of this event and are out of scope for this statement. The heaviest rain began on 19 March, focused on the Mid North Coast[1] region, with significant falls covering much of the coast from the Illawarra northwards. Heavy falls extended south to the Sydney region on 21 and 22 March, and northwards to south-east Queensland on 22 and 23 March. The South Coast received regular rain during this period but had its heaviest falls on 24 March as a low approached it from inland. Eastern Victoria also received significant rain on 24 March, while in eastern Tasmania the heaviest rain was on 25 March as the low passed nearby. By 25 March rain had largely cleared from New South Wales, except for isolated, locally severe thunderstorm activity on parts of the South Coast that afternoon.

Widespread inland rain began on 21 March with significant falls in the Kimberley and the western Northern Territory. The heaviest rain shifted to central Australia on 22 March, with extensive falls in northern South Australia and the southern Northern Territory. As this rain area continued to move east, 23 March was a very wet day for most of inland New South Wales apart from the far south-west. The heaviest falls were in the far north of New South Wales, with significant rain also extending to border areas of Queensland. This area of rain cleared to eastern New South Wales on 24 March.

[1] A map of forecast districts in New South Wales is available at **http://www.bom.gov.au/nsw/forecasts/map.shtml**.

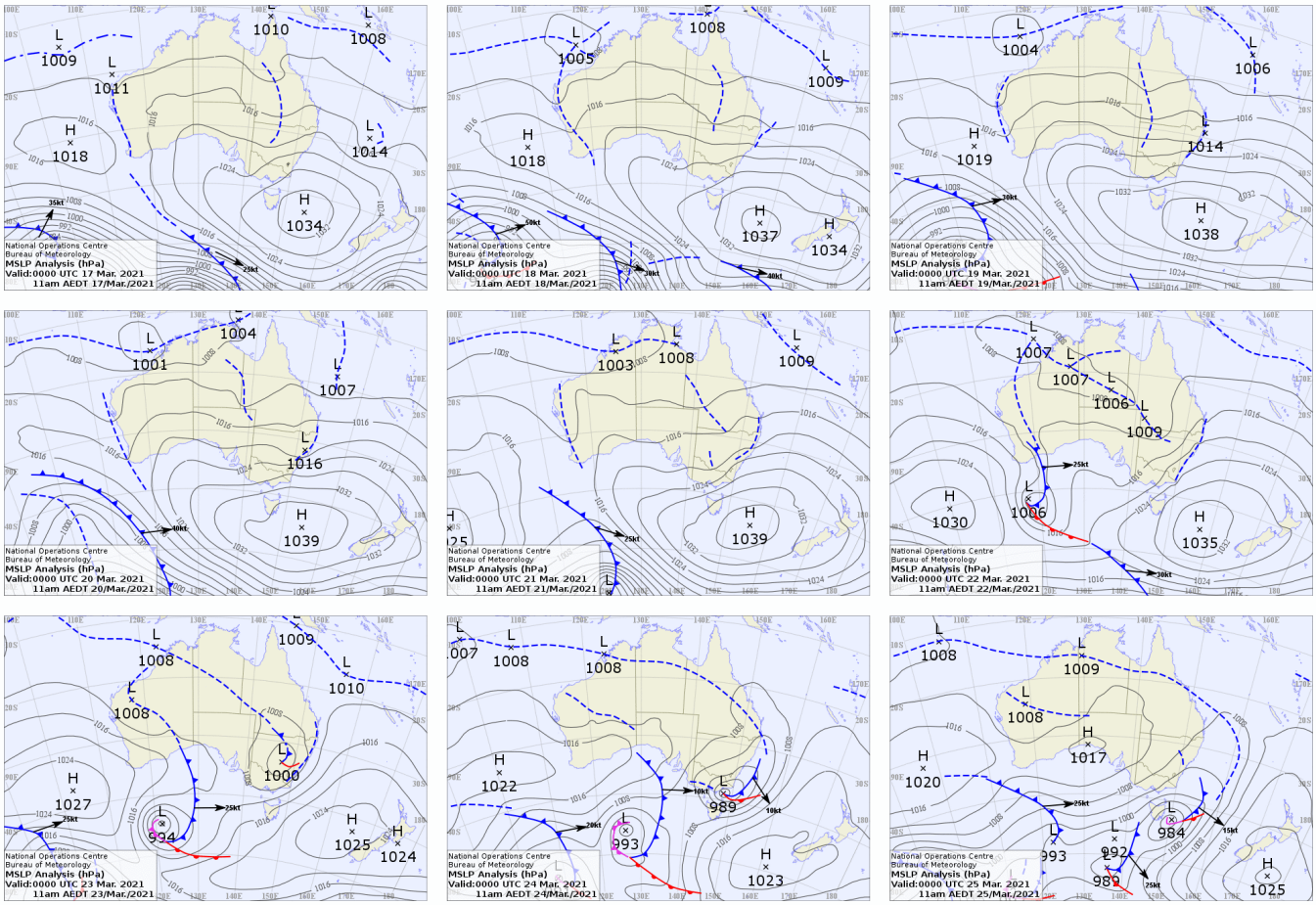

Figure 1: Mean sea level pressure maps at 0000 UTC for each day from 17 to 25 March 2021.

2. Rainfall observed during the event

2.1. Extremes at daily and sub-daily timescales

The influx of moisture from a high pressure system in the Tasman Sea and a low pressure system in the Timor Sea (Figure 1) led to very high daily rainfall totals on several days during the event (Figure 2) across south-east Australia. Daily totals exceeded 150 mm somewhere in New South Wales on each day from 18 to 24 March, with similar totals also occurring in southern Queensland on 22 and 23 March, Victoria on 24 March and Tasmania on 25 March. Two at sites at Gray, on the Tasmania East Coast, received 295.4 mm and 275.4 mm on 25 March, respectively the third and fourth-highest daily rainfall totals on record in March for Tasmania.

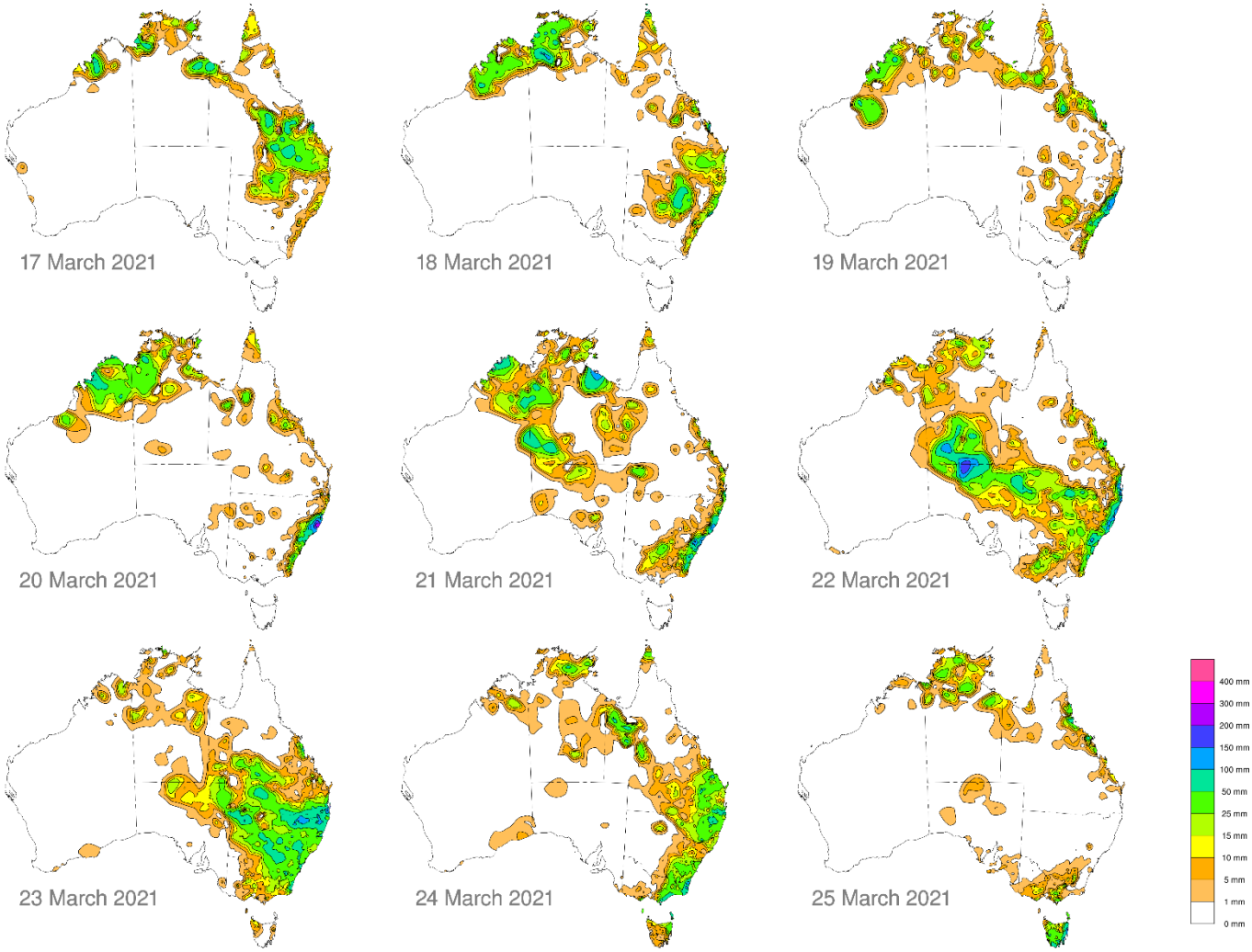

Figure 2. Daily rainfall totals to 9am local time for each day from 17 to 25 March 2021.

The highest daily totals of the event were on the Mid North Coast on 19 and 20 March (Figure 2), when numerous sites exceeded 200 mm one or both days. The most extreme sub-daily totals occurred also on 19 March, including rainfall of 125.0 mm in one hour at Bowraville. The highest total in the Bureau climate network was 370.0 mm on 20 March at Hannam Vale (Table 1, see Figure 3 for location), while a flood warning gauge 6 km from Hannam Vale recorded 405.5 mm. While these falls are significant, coastal New South Wales is prone to extreme rainfall; a daily total in excess of 400 mm was observed at least once in 5 of the 12 years from 2009 to 2020. South of Newcastle, daily totals between 150 and 210 mm were recorded at several locations, with notable totals listed in Table 1.

Figure 3: Map of selected sites across southeast Australia referred to in the text or Tables 1 and 3.

In south-east Queensland, daily totals exceeding 200 mm occurred on 22 and 23 March (Figure 2, Table 1). Brisbane's 125.0 mm on 22 March was its wettest March day since 2001. As the system tracked down the coast (Figure 1) daily rainfall totals exceeded 100 mm on 24 March in parts of East and South Gippsland and on 25 March for the Tasmania East Coast region.

The heaviest falls away from the coast occurred on 23 March, with daily totals exceeding 100 mm in the North West Slopes and Upper Western regions of New South Wales (Figure 2, Table 1). Daily totals above 50 mm were widespread through other parts inland New South Wales and southern border areas of Queensland (Figure 2). On 22 March many sites in northern South Australia and the southern Northern Territory had more than 50 mm, including Alice Springs which had its wettest day (50.0 mm) since January 2015.

Single-day rainfall totals in the event were significant, but mostly not record-breaking. Two sites in south-east Australia with 50 years or more of data had their wettest day on record, although a considerable number of March records were set (Table 2, see Figure 4 for locations), with the largest concentration in the New South Wales North West Slopes. Moree received more rain (150.0 mm) on 23 March than it did in all of the severe drought year of 2019 (125.4 mm), and this was the second-wettest day on record for any month behind February 1888.

Figure 4: Map of long-term sites across southeast Australia that set March daily rainfall records between 17 and 25 March 2021.

2.2. Multi-day rainfall totals

One of the most significant aspects of this event in coastal New South Wales was its persistence, which resulted in many very high multi-day rainfall totals. Many locations received several days of heavy rain, particularly on the Mid North Coast, where a number of sites had 4 consecutive days with 100 mm or more from 19 to 22 March. Comboyne, in the hills southwest of Port Macquarie, had 3 consecutive days with 200 mm or more from 19 to 21 March. This has only occurred once previously at this location, from 7 to 9 February 1929, and the last instance anywhere in New South Wales was at Numinbah Gate in the Northern Rivers from 3 to 5 May 1996.

Comboyne had a four-day total of 853.0 mm from 19 to 22 March, and Yarras (Mount Seaview), to the west of Port Macquarie, 732.0 mm. Both were records for their respective locations. Comboyne went on to receive 943.0 mm for the week ending 24 March and was one of several long-term sites that set weekly records (Table 3). Numerous Mid North Coast locations had four-day totals exceeding 600 mm and most of coastal New South Wales had weekly totals above 200 mm (Figure 5).

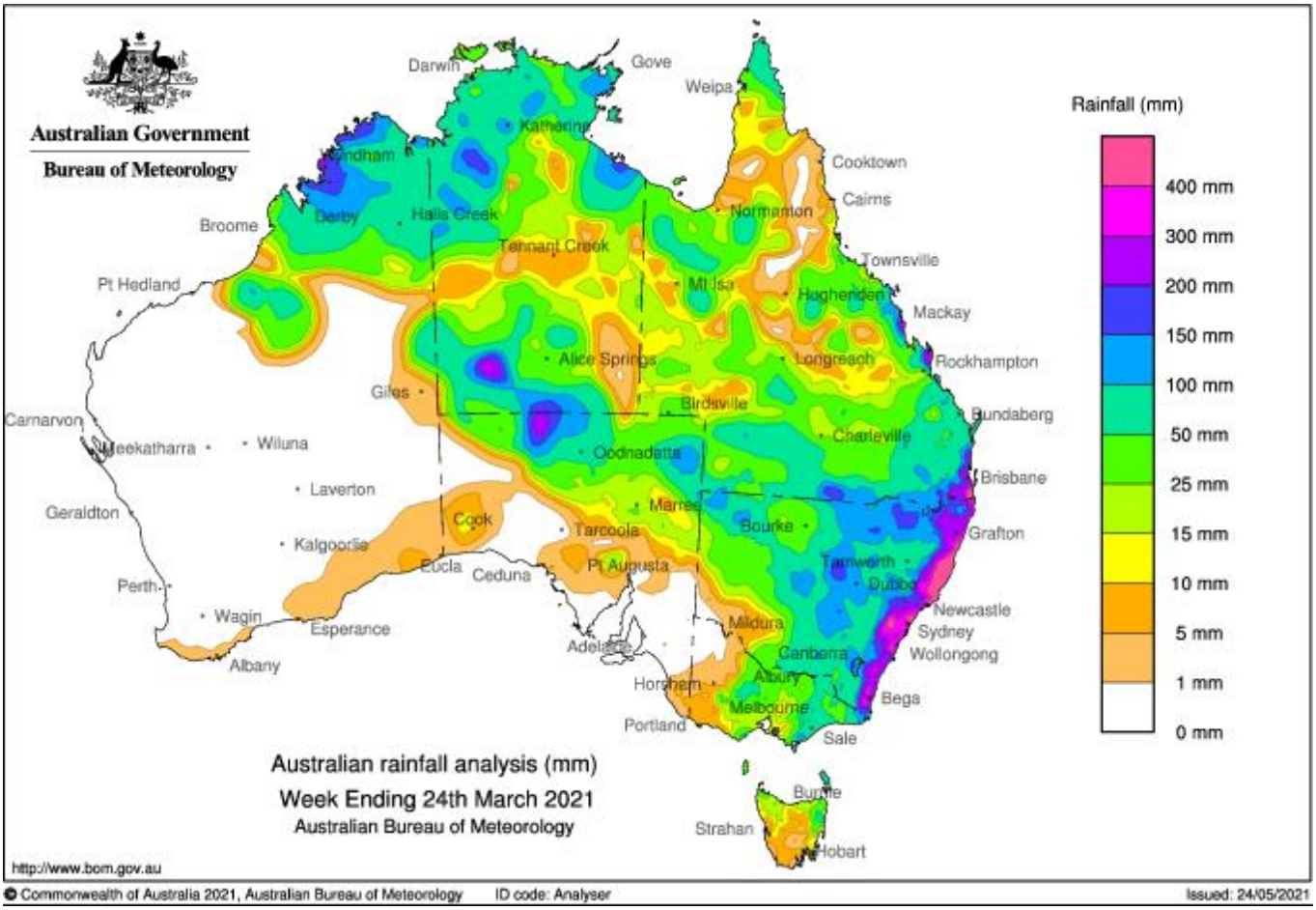

Figure 5: Weekly rainfall totals for the week ending 24 March 2021.

The heavy rains contributed to record March rainfall totals in many locations. Yarras (Mount Seaview), Comboyne and Hannam Vale all recorded over 1000 mm for March, with 1102.6 mm 1065.0 mm and 1061.0 mm respectively. These were records for any month at Yarras (Mount Seaview) and Hannam Vale, but the third time Comboyne has received more than 1000 mm in a month, although behind the 1233.2 mm in February 1929.

At the catchment level, the Karuah catchment[2] had its wettest multi-day period, since national records began in 1900, at timescales from 4 to 7 days (Table 4). The Hastings and Manning River catchments had their second-wettest period on record at timescales from 5 to 7 days, with the Hastings also recording their second-wettest 4-day period on record. For both catchments, March 2021 is ranked behind the February 1929 event while the Manning catchment was just above the March 1978 event. For the Hawkesbury–Nepean, the 4-day catchment average of 200.5 mm ranks as the eighth-highest on record, with the record of 258.7 mm set in February 2020, whilst the 6- and 7-day averages both rank as the third-highest on record, also behind February 2020.

2.3. The spatial extent of the heavy rainfall

The most exceptional aspect of the event was the spatial extent of the heavy rainfall, both in coastal and inland areas. Almost the entire New South Wales coast experienced heavy rain (Figures 2 and 5). This contrasts with typical rainfall patterns associated with either coastal lows or East Coast Lows, which normally bring heavy rain in a relatively small area near the southern flank of the low but are relatively dry to the north.

[2] Maps of catchment regions are available at: http://www.bom.gov.au/hydro/wr/basins/

An indicator of the spatial extent of the event is rainfall averaged over the full coastal region of New South Wales, defined as that part of the state which drains into the Tasman Sea. For this region the week ending 24 March was the wettest on record, with a regional average of 255.1 mm, surpassing the previous record of 240.4 mm set in the week from 7 to 13 February 2020 (Table 5). There are 53 days since national daily records began in 1900 where the New South Wales coastal region has had an average rainfall in excess of 50 mm, with the record being 96.4 mm on 5 June 2016. However, the occurrence of 5 consecutive days between 30 and 50 mm is exceptional and resulted in the record weekly total. The unusually widespread nature of the event is also demonstrated by the relatively small number of individual locations (Table 3), and only one catchment (Table 4) that had their wettest week on record in this event.

The extensive inland rains, particularly on 23 March, also resulted in very high area averages for New South Wales as a whole. Averaged over the state, 23 March recorded 36.9 mm, which made it the second-wettest day on record after 40.3 mm on 20 January 1995, whilst the two- and three-days totals were also the second highest on record. The weekly average total of 100.4 mm was the third-highest on record, after events in January 1974 and February–March 2012. At the monthly level, March rainfall (Figure 6) was very much above average (decile 10, the wettest 10% of all years since 1900) for most of New South Wales except for the southwest of the state. It was the wettest March on record for parts of the Mid North Coast, Sydney and the North West Slopes regions. March rainfall overall for New South Wales was 137.4m, 155% above the 1961−1990 average, making it the state's second-wettest March on record after 1956, and the wettest month since January 1995.

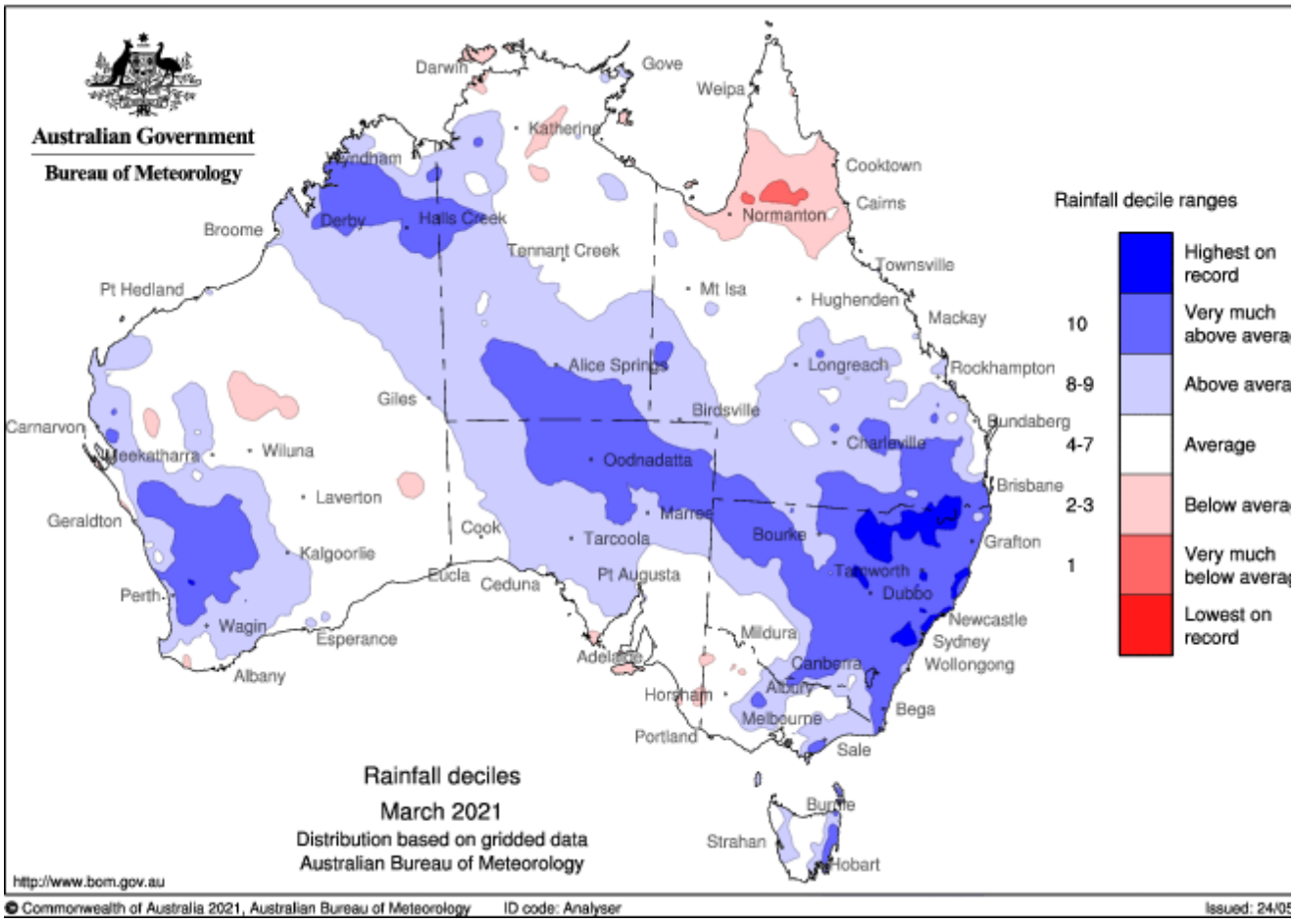

Figure 6: Rainfall deciles for March 2021 compared to historical observations from 1900.

3. Flooding and impacts on rainfall deficiencies and water storage

The heavy rainfall, which mostly fell on relatively wet catchments, contributed to significant and widespread flooding. The flooding was particularly severe on the east coast but also affected several inland catchments. This is reflected in significant increases in northern Murray–Darling Basin water storages in March.

The great majority of coastal catchments in New South Wales experienced at least minor flooding[3], and there was major flooding in the Clarence, Nambucca, Manning/Gloucester, Hastings, Camden Haven, Paterson/Williams and Hawkesbury–Nepean rivers and Wollombi Brook, as well as in the Logan–Albert catchment and in some Brisbane River tributaries in southern Queensland.

Flooding also occurred on several inland rivers. The most significant flooding was in the region on both sides of the New South Wales–Queensland border, with major flooding on the Gwydir, Mehi, Macintyre and Condamine rivers. This flooding moved slowly downstream into the Darling catchment over April and May 2021.

Minor to moderate flooding also occurred on a number of rivers in southern and central inland New South Wales and in the ACT, as well as on the Snowy, Bombala and Genoa rivers in far southeast New South Wales and eastern Victoria. Several eastern Tasmanian rivers experienced flooding, with the South Esk approaching major flood levels in places.

The most significant flooding was in the Hastings, Camden Haven and Manning rivers. Record flood heights were observed at Logans Crossing on the Camden Haven River and Gloucester on the Manning River (Table 6). The Manning River at Taree equalled its 1929 record and at Wingham reached its highest levels since 1978. In the Hawkesbury–Nepean system, peaks at Menangle, North Richmond, Windsor and Sackville were the highest since 1990. In inland areas, the Gwydir River at Pallamallawa and Yarraman Bridge was 0.2 m short of its 1955 record, while the Mehi River at Moree was 0.4 m below its 1955 peak.

The widespread rainfall also affected water storages**,** with storage levels in the northern Murray–Darling Basin reaching 27.9% on 17 March but rising to 46.0% on 28 March and reaching 47.1% of capacity at the end of March. This included the highest and third highest daily increases in combined storage volumes since 1993. Northern Murray–Darling Basin water storages increased further to 48.9% by the end of April (Figure 7), compared to 16.7% in April 2020. In addition, floodwaters from the March rainfall in the northern Murray-Darling Basin started to reach the Menindee Lakes during April and the storage volume increased by 13.5% to 30.7% of capacity over April and reached 57.7% by late May.

[3] Flood levels and definitions are available at: **http://www.bom.gov.au/australia/flood/knowledge-centre/about-warning-service.shtml**

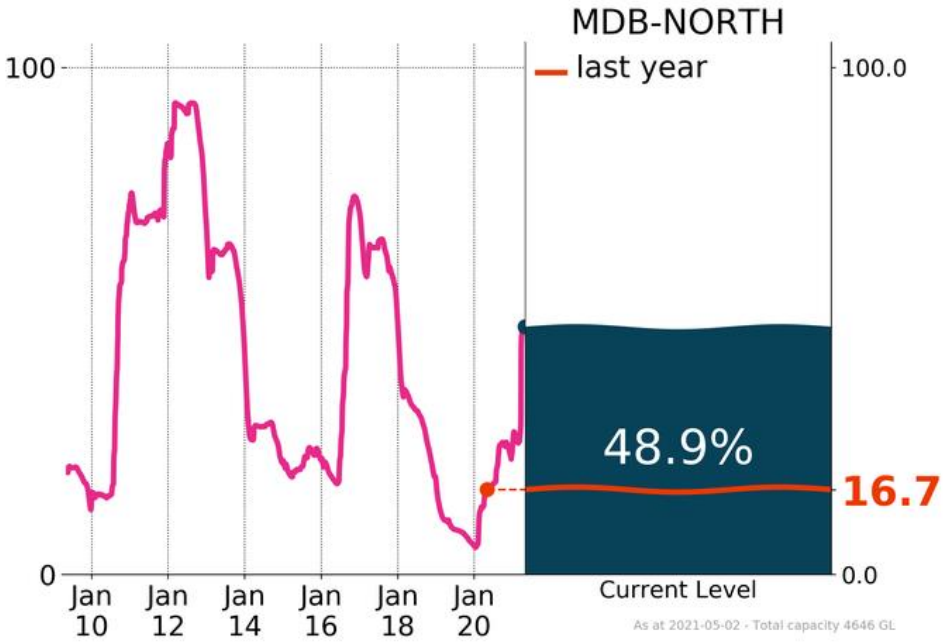

Figure 7. Northern Murray–Darling Basin combined storage levels to the end of April 2021.

Much of the region affected by the March 2021 rainfall event experienced severe drought in 2019 and preceding years. Whilst above-average rainfall over most of eastern New South Wales eliminated short-term rainfall deficiencies, substantial long-term deficits remained in inland areas of northern New South Wales and southern Queensland.

4. Antecedent rainfall and seasonal climate drivers

The heavy rain fell against a backdrop of relatively wet antecedent conditions across most of the affected regions, associated with a La Niña which developed in the second half of 2020. Soils became more saturated during 2020, and water storage levels generally increased. This contributed to flooding being more widespread and severe than had been the case during a broadly comparable rain event in February 2020.

Rainfall for the 2020−21 summer was above average (decile 8 or higher) over large parts of New South Wales (Figure 8). Most of the coastal region from the Hunter north to the Queensland border had very much above average (decile 10) summer rainfall. This includes the Hastings and Manning catchments most affected by the March 2021 floods. In many locations it was the wettest summer since the 1970s, and a few sites had their wettest summer on record, with the bulk of the region having summer rainfall 50% to 100% above the 1961−1990 average.

However, from the Sydney region southwards, summer rainfall was close to average in most areas. Soil moisture as of February was generally average to above average, but not exceptionally high in coastal areas (Figure 9).

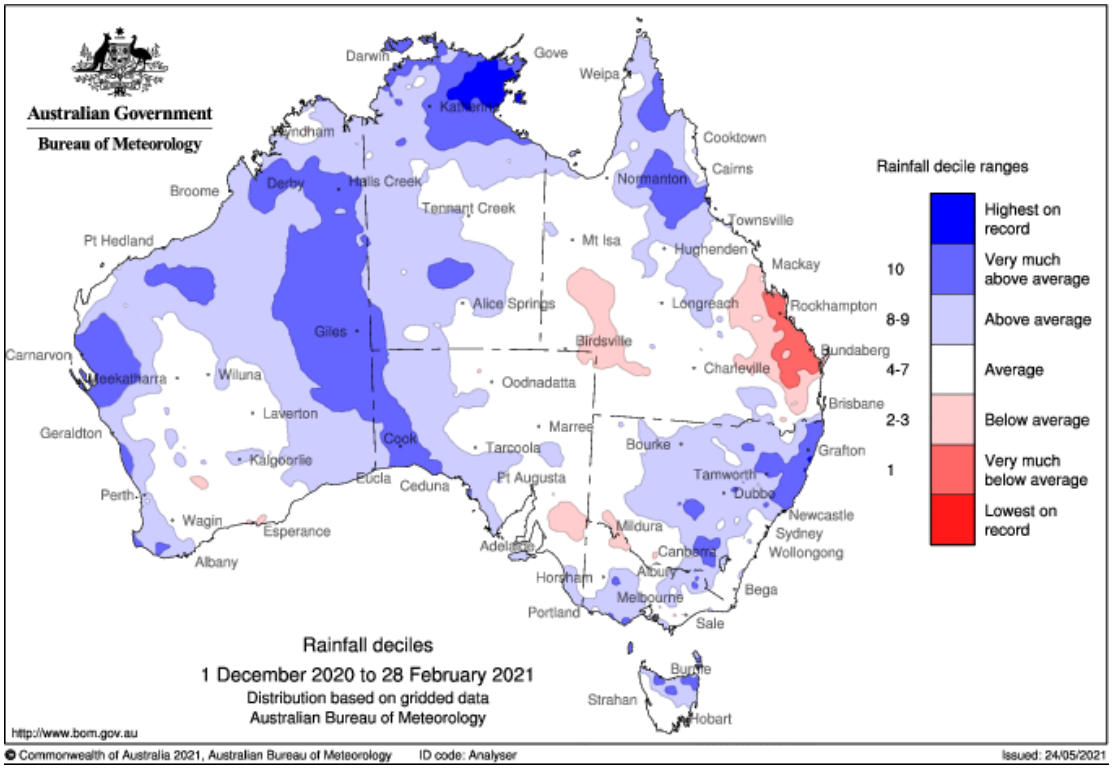

Figure 8: Rainfall deciles for summer 2020-21 compared to historical observations from 1900.

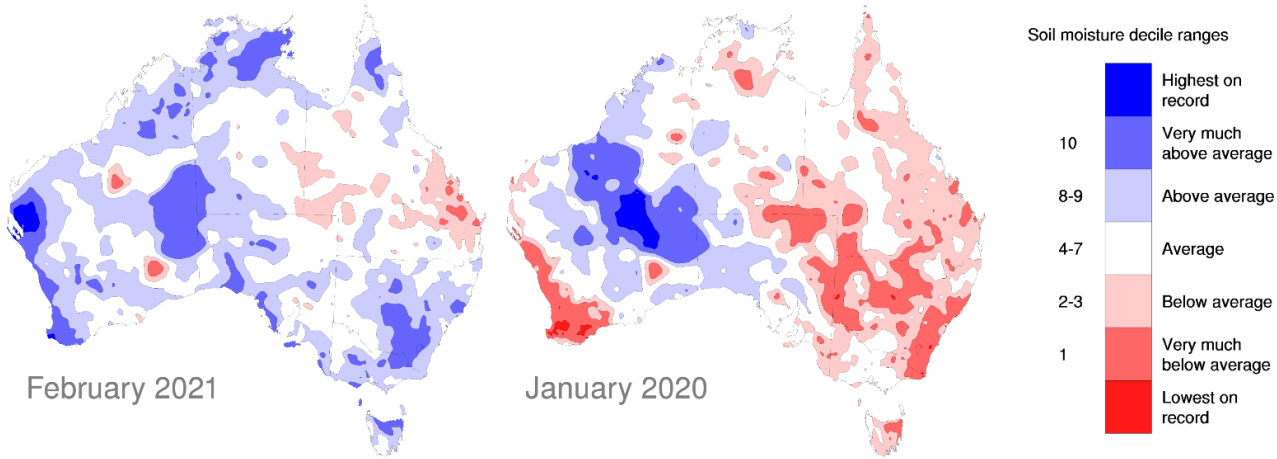

Figure 9: Root-zone soil moisture decile maps for February 2021 (left) and January 2020 (right) compared to historical observations from 1911**.**

Several climate drivers influenced the weather and climate of eastern Australia in the months preceding the 2021 floods. A La Niña event in the tropical Pacific Ocean was declared by the Bureau on 29 September 2020 and persisted at weak to moderate levels until the end of March 2021.

The 2020−21 La Niña increased the likelihood of rain-bearing weather patterns over eastern Australia and reduced evaporation due to increased cloudiness and reduced temperatures. These conditions resulted in an increase in soil moisture during the spring and summer, meaning any heavy rainfall on the wet catchments would see less water being soaked up by the ground and a tendency for the rivers to respond more quickly and reach higher levels compared to dry catchments.

The Southern Annular Mode (SAM) was in its positive phase for most of summer, although it was neutral in March. A positive SAM phase in summer is typically associated with enhanced easterly flow over eastern Australia and is favourable for above-average seasonal rainfall in most of New South Wales. The positive SAM reinforced the La Niña impacts and wetting of the catchments prior to the rainfall event.

The Madden-Julian Oscillation was well outside the Australian region during the second half of March 2021, while the monsoon was also relatively inactive during this period. However, relatively warm waters off northern Australia and the remnants of the La Niña pattern across the Pacific is likely to have added extra moisture to the tropical atmosphere available for transport over eastern Australia during this event.

These natural climate drivers were set against the background of the long-term trend. As the climate warms, Australia's heavy rainfall events are expected to become more intense as moisture in the atmosphere increases by about 7% per degree of warming. Rainfall changes in specific locations, especially areas with complex topography such as coastal New South Wales, will also be influenced by changes in the occurrence, strength and position of synoptic weather systems, increasing the level of uncertainty. For the Australian continent, there is evidence that a higher proportion of total annual rainfall has come from heavy rainfall days in recent decades, see State of the Climate 2020.

5. How does this event compare with previous events?

Events in which the full length of the New South Wales coast experiences significant heavy rain are rare, reflected by the fact that the week ending 24 March 2021 was the wettest on record averaged over coastal New South Wales. Two broadly comparable events occurred in February 2020 and March 1978, while February 1929 saw multi-day extreme rainfall and significant flooding in the Mid North Coast region.

As in March 2021, the 2020 and 1978 events saw heavy rainfall along the full length of the New South Wales coast for an extended period (Figure 10). Prior to 2021, the two wettest weeks on record for coastal New South Wales had occurred in these events, with February 2020 ranking first and March 1978 second (Table 5). Widespread flooding occurred in both years, particularly in 1978, which prior to 2021 was the second-highest flood on record in the Manning River at Taree.

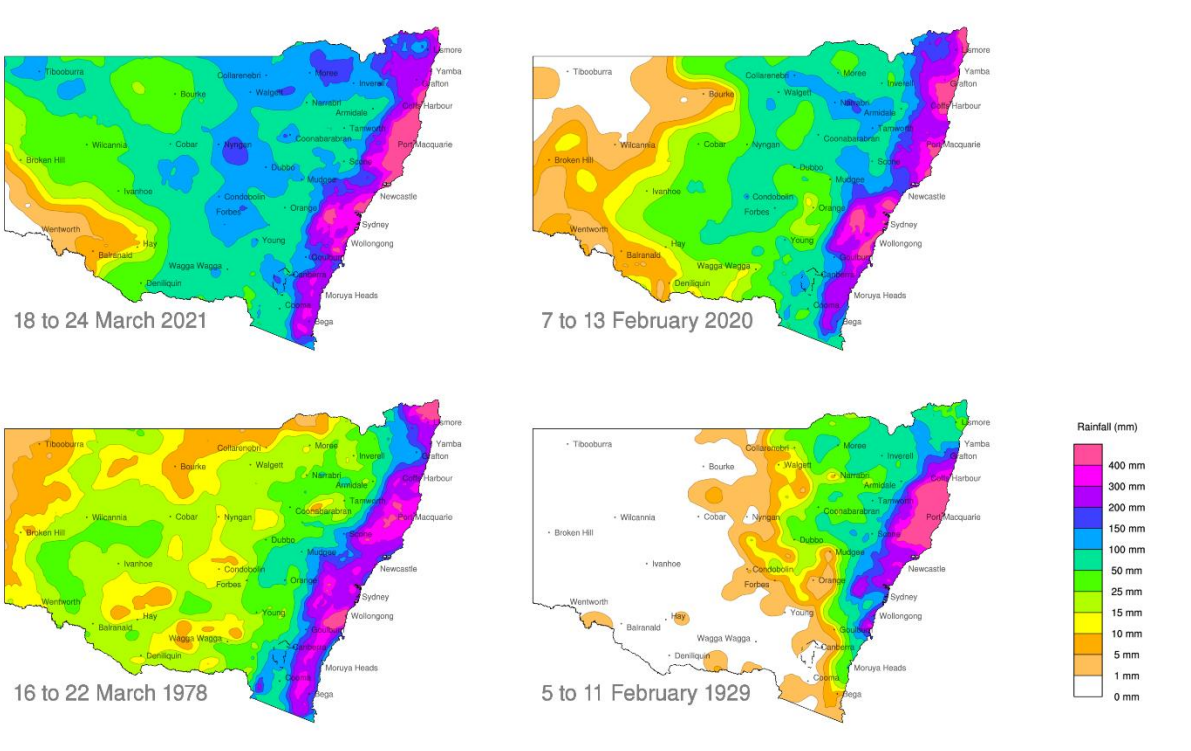

Figure 10: Weekly rainfall totals for New South Wales for the weeks ending 24 March 2021 (top left), 13 February 2020 (bottom left), 22 March 1978 (top right) and 11 February 1929 (bottom right).

Some of the most significant rainfalls in the February 2020 event were in the Sydney region. It was the wettest four-day period on record for the Hawkesbury-Nepean catchment (Table 4), and four-day totals were higher in the February 2020 event than in March 2021 in most of Greater Sydney. The only parts of Greater Sydney which were wetter in the 2021 event than in 2020 were a few locations in the outer west around Penrith and Richmond. However, rainfall amounts further north were generally less extreme than those recorded on the Mid North Coast in the 2021 event.

While the 2020 and 2021 rainfall events were close in size for coastal New South Wales, their impact in terms of flooding were significantly different. The February 2020 event took place at a time when catchments in most of central and southern New South Wales were extremely dry following the 2019 drought, with soil moisture very much below average over most of the region (Figure 8). This resulted in less flooding than would normally be expected for a rain event of this size. The Georges River was the only major river system which had higher flood peaks in February 2020 than in March 2021In the Mid North Coast region, the benchmark multi-day extreme rainfall event occurred in February 1929. This event set records for multi-day rainfall in both the Manning and Hastings catchments (Table 4) and resulted in severe flooding, including a record flood peak at Taree which was equalled in the current event. The rain in the 1929 event was less extensive than in 1978, 2020 or 2021, with only light to moderate falls from the Illawarra southwards, and in the Northern Rivers region. Nonetheless, weekly rainfall totals in the 1929 event averaged over coastal New South Wales still rank amongst the highest on record after the 1978, 2020 and 2021 events (Table 5).

The size and extent of the March 2021 event compared with previous events is also evident when the weekly totals are plotted relative to the 1961-1990 average monthly rainfall (Figure 11). Areas of coastal New South Wales where the weekly total was more than twice the monthly average were similar in 2021 and 2020, and broader in scope than 1978, where there was little rainfall in the Northern Rivers, and 1929 which was limited to the Mid North Coast. But the stand-out difference in March 2021 is the heavy rainfall in inland New South Wales, where many areas received 3 to 4 times their average monthly total during 18 to 24 March.

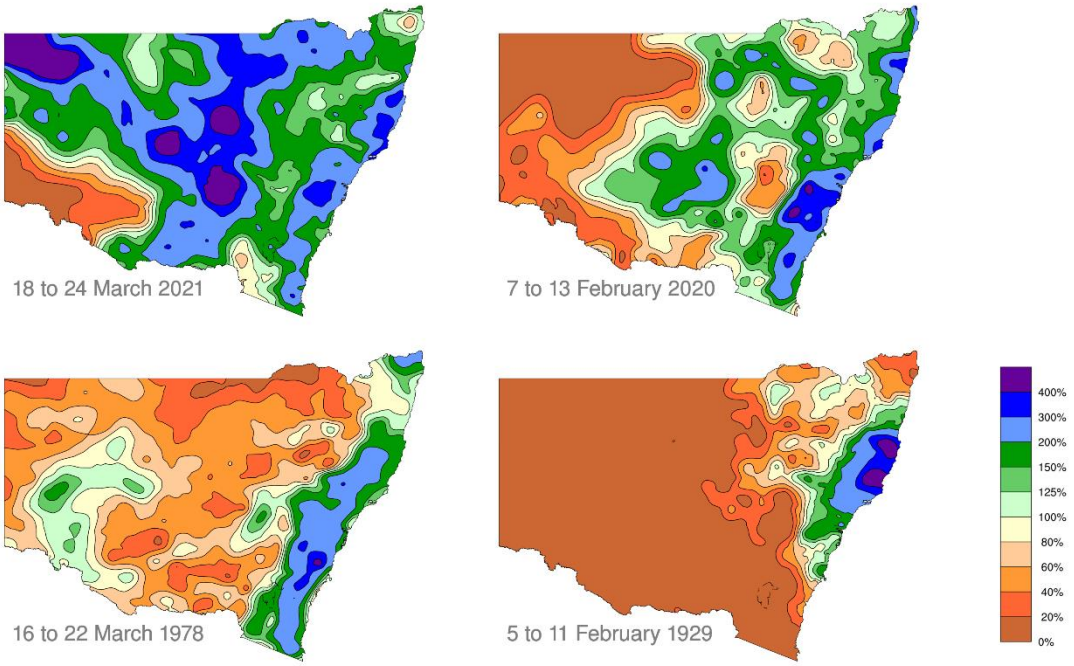

Figure 11: Weekly rainfall totals as a percentage of the 1961-1990 average monthly total for New South Wales for the weeks ending 24 March 2021 (top left), 13 February 2020 (bottom left), 22 March 1978 (top right) and 11 February 1929 (bottom right).

Tables

Table 1: Locations with notable rainfall daily totals in each region between 20 and 25 March 2021.

Region	State	Site number	Location	Value (mm)	Date
Mid North Coast	NSW	60017	Hannam Vale	370.0	20 Mar
Central Tablelands	NSW	63285	Mt Irvine (Booralee)	205.3	22 Mar
Sydney	NSW	67100	Castle Hill	165.9	21 Mar
Southeast Coast	QLD	40209	Point Lookout	229.2	23 Mar
Southeast Coast	QLD	40197	Mt Tamborine	225.0	23 Mar
North West Slopes	NSW	53115	Moree	150.0	23 Mar
Upper Western	NSW	46126	Tibooburra	103.0	23 Mar
South Coast	NSW	69152	Cathcart (Mount Darragh)	162.4	24 Mar
South Gippsland	VIC	85053	Madalya	170.0	24 Mar
East Coast	TAS	92159	Gray (Haven of Hope)	295.4	25 Mar

Table 2: Locations, including selected composites, with 50 years or more of data across south-east Australia which had their wettest March day on record between 17 and 25 March 2021.

Site Number	Location	State	Value (mm)	Date	Previous record (mm)	Date of previous record
40343	Wamuran	QLD	163.7	22 Mar	160.5	6 Mar 2004
41013	Canning Downs	QLD	92.0	23 Mar	91.9	8 Mar 1939
41100	Texas	QLD	95.6	23 Mar	88.9	31 Mar 1947
41175	Applethorpe	QLD	86.0	23 Mar	70.6	30 Mar 1975
41285	Fairleigh	QLD	86.6	24 Mar	73.2	28 Mar 2014
41338	Ballandean	QLD	78.8	23 Mar	78.6	2 Mar 2007
41376	Warroo Station	QLD	94.0	23 Mar	79.0	2 Mar 2013
41391	Woodspring	QLD	97.0	23 Mar	82.6	10 Mar 1958
41445	Leslie Dam	QLD	95.2	23 Mar	82.2	4 Mar 1999
43060	Havelock	QLD	102.0	17 Mar	83.8	16 Mar 1989
44054	Mulga Downs	QLD	100.2	22 Mar	74.9	15 Mar 1937
46002	Borrona Downs	NSW	91.0	23 Mar	57.4	15 Mar 1977
46126	Tibooburra(*)	NSW	103.0	23 Mar	85.9	5 Mar 1949
50020	Warroo	NSW	97.6	23 Mar	90.8	24 Mar 1982
51034	Mumblebone	NSW	109.6	23 Mar	90.2	5 Mar 1893
51038	Nevertire	NSW	99.6	18 Mar	97.5	12 Mar 1949
51042	Quambone Station	NSW	83.6	18 Mar	71.9	24 Mar 1926
52067	Rowena	NSW	114.0	23 Mar	108.0	10 Mar 2000
53003	Bellata	NSW	98.0	23 Mar	76.2	10 Mar 1939
53033	Pallamallawa	NSW	119.0	23 Mar	102.6	10 Mar 1982
53035	Aberfeldie	NSW	138.2	23 Mar	129.0	15 Mar 1908
53085	Garah	NSW	133.6	23 Mar	122.8	1 Mar 2013
53115	Moree(*)	NSW	150.0	23 Mar	142.0	20 Mar 1894
54029	Warialda(+)	NSW	111.0	23 Mar	111.0	31 Mar 1904
54043	Ashford	NSW	100.2	23 Mar	69.2	19 Mar 2017
54049	Graman	NSW	120.0	23 Mar	83.8	7 Mar 1939
54073	Nullamanna	NSW	88.4	23 Mar	74.6	25 Mar 2001
54074	Oakwood	NSW	116.4	23 Mar	107.0	1 Mar 1994
54078	Wandera	NSW	95.2	23 Mar	76.0	1 Mar 1994
54104	Pindari Dam	NSW	83.0	23 Mar	71.2	3 Mar 1999
54124	Crooble Station	NSW	105.2	23 Mar	63.0	1 Mar 1999
54125	Caroda	NSW	151.0	23 Mar	107.2	1 Mar 1967
55190	Gowrie South	NSW	75.0	24 Mar	67.8	5 Mar 1982
55195	Garoo	NSW	76.4	24 Mar	66.3	9 Mar 1967
56052	Mole Station	NSW	86.8	24 Mar	79.0	30 Mar 1975
60017	Hannam Vale(^)	NSW	370.0	20 Mar	241.3	12 Mar 1931
60085	Yarras (Mount Seaview)	NSW	272.0	20 Mar	241.2	23 Mar 2018
63028	Faulconbridge	NSW	144.8	21 Mar	131.3	29 Mar 1942
67084	Orchard Hills	NSW	134.0	21 Mar	117.0	20 Mar 1978
73110	Grenfell	NSW	90.2	23 Mar	87.6	19 Mar 1969
85163	Yanakie(^)	VIC	69.2	24 Mar	60.0	22 Mar 1983
92001	Apslawn	TAS	137.2	25 Mar	128.0	3 Mar 1931
92010	Darlington	TAS	100.0	25 Mar	81.0	6 Mar 1919
92027	Orford	TAS	120.2	25 Mar	91.1	23 Mar 1983
92053	Coles Bay	TAS	113.4	25 Mar	69.0	21 Mar 2003
92067	Rushy Lagoon	TAS	53.0	25 Mar	46.4	15 Mar 1979

(*) Composite location, comprising data from two or more sites at the location. Site number refers to the currently open site.

(+) Equal-wettest March day on record.

(^) Also an annual record.

Table 3: Locations, including selected composites, with 50 years or more of data in New South Wales which had their wettest week on record during March 2021.

Site number	Location	Value (mm)	Date	Previous record (mm)	Date of previous record
59002	Bowraville	708.0	17–23 Mar	562.0	12–18 Feb 2009
59055	Moparrabah	520.2	18–24 Mar	470.4	7–13 Mar 2001
60017	Hannam Vale	933.0	18–24 Mar	658.9	5–11 Feb 1929
60030	Taree	620.8	18–24 Mar	592.9	6–12 Feb 1929
60036	Wingham	609.2	18–24 Mar	574.8	7–13 Feb 1929
60042	Craven	392.0	18–24 Mar	374.6	30 Jan – 5 Feb 1990
60046	Bobin	566.7	18–24 Mar	470.4	12–18 Jan 1968
60085	Yarras (Mount Seaview)	889.4	18–24 Mar	609.2	27 Feb – 5 Mar 2013
60103	Tipperary	519.0	17–23 Mar	463.2	19–25 Mar 1978
60161	Comboyne(*)	943.0	18–24 Mar	875.3	6−12 Feb 1929
61054	Nelson Bay	595.8	18–24 Mar	415.5	15–21 Apr 1946
61309	Milbrodale	237.2	17–23 Mar	235.0	2–8 Feb 1990

(*) Composite location, comprising data from two or more sites at the location. Site number refers to the currently open site.

Table 4: Significant catchment multi-day rainfall totals. Values ranking in the three highest on record are listed. Rankings are based on Australian rainfall analyses since 1900 and excludes overlapping periods.

Catchment	Length of period (days)	Value (mm)	Date	Rank	Record (mm)	Date of record
Hastings	2	291.9	19−20 Mar	3	341.7	8−9 Feb 1929
	3	363.4	19−21 Mar	3	511.9	7−9 Feb 1929
	4	456.6	19−22 Mar	2	584.4	7−10 Feb 1929
	5	494.5	19−23 Mar	2	612.3	6−10 Feb 1929
	6	524.1	18−23 Mar	2	626.2	6−11 Feb 1929
	7	541.4	18−24 Mar	2	638.1	5−11 Feb 1929
Manning	4	291.2	19−22 Mar	3	345.0	7−10 Feb 1929
	5	323.1	19−23 Mar	2	384.1	7−11 Feb 1929
	6	341.2	19−24 Mar	2	402.7	6−11 Feb 1929
	7	355.8	18−24 Mar	2	419.8	5−11 Feb 1929
Karuah	3	278.8	19−21 Mar	2	320.7	14−16 Apr 1927
	4	349.3	19−22 Mar	1	331.1	14−17 Apr 1927(*)
	5	403.1	18−22 Mar	1	359.4	7−11 Feb 1929(*)
	6	422.1	18−23 Mar	1	403.4	6−11 Feb 1929(*)
	7	438.3	18−24 Mar	1	428.1	5−11 Feb 1929(*)
Hawkesbury-Nepean	6	256.7	19−24 Mar	3	270.3	7−12 Feb 2020
	7	269.3	18−24 Mar	3	289.2	7−13 Feb 2020

(*) Date of previous record

Table 5: Weeks in which rainfall averaged over coastal New South Wales has exceeded 190 mm. If two or more overlapping 7-day periods exceeded 190 mm, only the highest value is shown.

Dates	Total (mm)
18−24 March 2021	255.1
7−13 February 2020	240.4
16−22 March 1978	231.9
2−8 February 1990	200.3
27 January−2 February 2013	195.2
6−12 February 1929	194.1
1−7 May 1996	190.5

Table 6: Significant flood peaks during the event.

River	Location	Height (m)	Date	Status
Manning	Wingham	14.3	20 Mar	Highest since 1978
Manning	Taree	5.7	20 Mar	Highest since 1929
Manning	Gloucester	6.4	20 Mar	Highest on record
Hastings	Kindee Bridge	12.1	19 Mar	Highest since 1968
Hastings	Wauchope Railway Bridge	8.6	19 Mar	Highest since 1968
Hastings	Settlement Point	2.5	22 Mar	Highest since 1968
Camden Haven	Logans Crossing	8.8	20 Mar	Highest on record
Clarence	Grafton	6.5	24 Mar	Highest since 2013
Coxs	Kelpie Point	7.6	21 Mar	Highest since 1986
Coxs	Island Hill	3.1	23 Mar	Highest since 1998
Coxs	Glenroy Bridge	2.8	23 Mar	Highest since 1998
Hawkesbury	North Richmond WPS	14.0	21 Mar	Highest since 1998
Hawkesbury	Windsor PWD	12.7	24 Mar	Highest since 1990
Hawkesbury	Sackville	9.7	24 Mar	Highest since 1990
Gwydir	Pallamallawa	10.5	24 Mar	0.2 m below 1955 record
Gwydir	Yarraman Bridge	10.0	23−26 Mar	0.2 m below 1955 record
Mehi	Moree	14.2	25 Mar	0.4 m below 1955 record
Macintyre	Yetman Bridge	10.0	24 Mar	Highest since 2000

References and further information

National gridded rainfall analyses are for the period since 1900 and national gridded temperature analyses are for the period since 1910.

This Statement covers information available as of 26 May 2021.

Links to further information

Australia's changing climate:

State of the Climate 2020

Climate information:

http://www.bom.gov.au/climate/

Australian Rainfall Analyses:

http://www.bom.gov.au/climate/maps/rainfall/

Australian Landscape Water Balance:

http://www.bom.gov.au/water/landscape