



SPECIAL CLIMATE STATEMENT 9

An exceptionally dry decade in parts of southern and eastern Australia: October 1996 – September 2006

Issued 10th October 2006
National Climate Centre

Summary

The decade from October 1996 to September 2006 has been a notably dry one in large parts of southern and eastern Australia. Whilst much of tropical and central Australia has seen wet conditions through most of the last ten years, for many parts of the south 1996 was the last year with significantly above-average rainfall.

The most extreme rainfall anomalies have been in the area around Melbourne, where falls during the last 10 years have widely been about 20% below the long-term average, and 10% below those of any other 10-year period in recorded history. Other areas where rainfall over the last 10 years has been the lowest on record are parts of western Victoria and adjoining south-eastern South Australia, parts of eastern Tasmania, the area around Perth in Western Australia, and a few locations in the Darling Downs and Burnett regions of south-eastern Queensland.

October 1996 is taken as the starting point for this statement, as September 1996 was the last in a sequence of months with above-average rainfall in most of Victoria, as well as the end of the main 1996 rainfall season in south-west Western Australia, which preceded a run of eight successive drier-than-average years in Perth. In New South Wales and Queensland, the downturn in rainfall has generally been a more recent phenomenon, generally starting in 2000 near the east coast and 2001 further inland. It is noteworthy that in some of these parts the last 5-7 years have been dry enough as to register on the 10-year deficiency analysis.

Rainfall anomalies over Australia, October 1996 – September 2006

Figure 1 shows rainfall for the 10 years ending in September 2006, in comparison with the historical record from 1900 to the present.

When averaged over Australia as a whole, the period was somewhat wetter than the long-term average, particularly between 1997 and 2001, which was the second-wettest five-year period on record for Australia (after 1973-77). This has largely been the result of exceptionally wet conditions through central and north-western Australia, particularly in the Northern Territory and the northern two-thirds of Western Australia.

The area of drier-than-average conditions covers most of southern and eastern Australia, including all major Australian cities except Darwin, and the vast majority of the nation's cropping areas. Over the 10-year period rainfall deficits have been most acute in the south-east and the south-west. In the south-west these are an extension of a downward trend which has been present since around 1970.

In the south-east, however, they came at the end of a period with generally rather high rainfall which had been in place since about 1950.

Exceptional rainfall deficits concentrated in southern Victoria

The most extreme rainfall deficits have occurred in southern Victoria, centred on the area around and to the east of Melbourne (including Melbourne's water supply catchments). At several key sites in this region, including Melbourne itself, O'Shannassy Reservoir (representative of the Melbourne catchment region) and Drouin (West Gippsland), rainfall since 1996 has been about 20% below the long-term average (Table 1). It has also been about 10% below the lowest 10-year total recorded prior to 1996. At Melbourne itself (as well as at O'Shannassy), there have been nine successive years of below-average rainfall from 1997 to 2005, with 2006 also running well below average at the time of writing. Such a run is unprecedented, with the longest previous run of successive below-average years at Melbourne being six from 1979 to 1984.

There is also a substantial area of lowest-on-record decadal rainfall in western Victoria and south-eastern South Australia. Whilst rainfall in this region is not as far below previous records as it has been around Melbourne, it has still resulted in acute water shortages in parts of the region, particularly in those areas reliant on the Wimmera-Mallee catchments.

Elsewhere in northern Victoria and southern inland New South Wales, the 1996-2006 period generally ranks amongst the three driest decades on record, alongside periods centred on 1938-45 and 1895-1902 (the so-called 'Federation Drought'). In most of this region one or both of those two periods was drier than 1996-2006 has been, but 1996-2006 has been the driest ten-year period since the 1940s almost throughout the region, and in a few locations (particularly west of Canberra), 1996-2006 has been the driest ten-year period on record.

Averaged over Victoria as a whole, the 10-year period ending in September 2006 has been the second-driest on record (564 mm, 14% below the 1961-90 average), just behind 1935-45 (555 mm). 2000 (2% above average), which was a relatively wet year in northern Victoria but dry in much of the south, has been the only year since 1997 with above-average rainfall in Victoria (Figure 2).

Dry conditions have also affected large parts of eastern and northern Tasmania, including most of the major population centres. A few areas along the east coast have had their driest ten-year period on record, and many others (including Hobart) are approaching record levels.

A continuation of the drying trend in south-western Australia

The last 10 years have seen a continuation of the dry conditions which have persisted since around 1970 in the south-west of Western Australia. The period 1996-2006 has been the driest on record for the south-western Australia region (southwest of a line running approximately from Jurien to Bremer Bay), although totals have not been substantially lower than those recorded at some other times in the post-1970 period. The 1996-2006 regional mean of 605 mm compares with 610 mm for 1977-87, and 613 mm for 1968-78.

The most substantial rainfall anomalies have been in the area around and immediately south of Perth (Figure 1), including many of Perth's water supply catchments. Perth itself has had its driest 10-year period on record (Table 1), 15% below the long-term average.

Shorter-term droughts in eastern Australia

North of about latitude 35°S, the early part of the 1996-2006 period was relatively wet in much of eastern Australia. 2000 was an especially wet year in much of the inland east, whilst 1998 was also much wetter than average in many locations.

A marked downturn in rainfall has occurred since then in many locations. Whilst 2000 was a very wet year inland, it was a rather dry year along the NSW and southern Queensland coast (as well as adjacent inland parts of south-eastern Queensland), and more widespread dry conditions occurred from 2001 onwards. Whilst the relatively wet early part of the period has prevented many 10-year record lows from being set, the later part of the period has been very dry. The 7-year period since October 1999 has been the driest on record in parts of south-eastern Queensland, whilst the 5-year period since October 2001 has been generally dry through most of eastern Australia (Figures 3(a) and 3(b)).

At a few locations in Queensland, rainfall since 1999 has been so far below average that, even with the relatively wet period up until 1999 included, the 10-year rainfall is still the lowest on record. These locations include Toowoomba, Gayndah and Rockhampton (Table 1). Rockhampton's rainfall deficits have been particularly notable, as they also missed out in the generally wet years of the mid-1990's, and have had below-average rainfall in 14 of the last 15 years.

Wet conditions in north-western and central Australia

Whilst it was a dry period through much of southern and eastern Australia, the decade from 1996-2006 was very wet in large parts of north-western and central Australia. The 1997-2001 period was especially wet, with rainfall closer to long-term average levels in 2002-05 (although 2006 has been a wet year in much of this region). Much of this increased rainfall has fallen during monsoonal events. The town of Katherine has seen its highest and third-highest flood events during this time.

Rainfall in the 1996-2006 period has been the highest on record over substantial, although mostly sparsely populated, areas of northern Australia (Figure 1). These include Wyndham, in the far north of Western Australia, and Giles, near the border of Western Australia, South Australia and the Northern Territory (Table 1). Over an even wider area, covering most of north-western Australia, 1996-2006 has been slightly drier than some other 10-year period(s) which overlap (for example, at Darwin, the 10-year mean rainfall of 1920 mm compares with 2000 mm for the period 1990-2000), but wetter than any pre-1996 10-year period.

Southern Australian dry conditions concentrated in the first half of winter rainfall season

The decline in rainfall in both south-western and south-eastern Australia has been particularly acute in the first half of the winter rainfall season (April-July), with much smaller changes in the late winter and spring (August-November). This is a continuation of long-term trends from the 1950s onwards in both regions.

In Victoria, April-July rainfall in the last 10 years has been 21% below the 1961-90 average, whilst August-November rainfall has been only 9% below. The contrast is even more marked in south-western Australia, where April-July rainfall over the last 10 years has been 16% below the 1961-90 average, but August-November rainfall has been 6% above.

Lack of sustained wet periods

A notable feature of the last 10 years in many of the notably dry areas has been a lack of any sustained wet periods. Whilst there have only been a few individual years with severe short-term drought (most notably 2002, but also 1997 in Victoria and 2001 in the southwest), the lack of wet periods has had a particularly severe impact on some large water storages, which are dependent on a small number of major flood events for a large proportion of their inflows. (As an example, 32% of the total inflows into Warragamba Dam in the last 20 years have come from the wettest 2% of months).

This is illustrated by the situation at Moss Vale (NSW) and Toowoomba (Queensland). At Moss Vale, there has only been one month (August 1998) since 1992 with more than 200 mm of rainfall, compared with a pre-1992 average of about one month in 15 above 200 mm. At Toowoomba, with a long-term average of one month in 18 above 200 mm, there have been no 200 mm months since February 2001 (68 months). This has been a contributing factor to the acute water shortages currently affecting the Sydney and Brisbane regions, even though the 10-year rainfall in Sydney itself has only been 7% below average, and well above levels seen in the 1937-47 period.

Temperatures in eastern Australia since 1996

In addition to being very dry, the last 10 years have been a very warm period for most of eastern Australia. Daytime maximum temperatures have been particularly high, and have been the highest on record in almost all of eastern Australia south of the tropics (Figure 4). In most of this region maximum temperatures have been 0.5 to 1.0°C above the 1961-90 average, with a few areas exceeding 1.0°C. The situation has been more patchy for overnight minimum temperatures, and in Victoria (where the exceptionally dry conditions have led to unusually large diurnal ranges of temperature) minimum temperatures since 1996 have been below average, but large areas further north have also had their warmest overnight minimum temperatures on record.

In contrast, temperatures since 1996 have generally been near the 1961-90 average in those areas of north-western Australia which have seen very wet conditions since 1996.

2006 to date – a very dry year in southern Australia

Many of the rainfall patterns seen in the last 10 years have continued in 2006, with generally well-below average rainfall for the January-September period in both southeastern Australia (including Tasmania) and the southwest (Figure 5). A number of major locations, including Hobart, Perth and Ballarat, may be at risk of having their driest year on record in 2006 if below-average rainfall continues for the remainder of the year. The snowpack on the Australian Alps has also been at near-record low levels, mainly due to low precipitation in the alpine regions (although warm conditions in August and September also contributed to rapid melting).

Further Information:

The following climate meteorologists in the National Climate Centre – Dr David Jones (03 9669 4085), Dr Blair Trewin (03 9669 4623) – can be contacted about this statement.

Figures

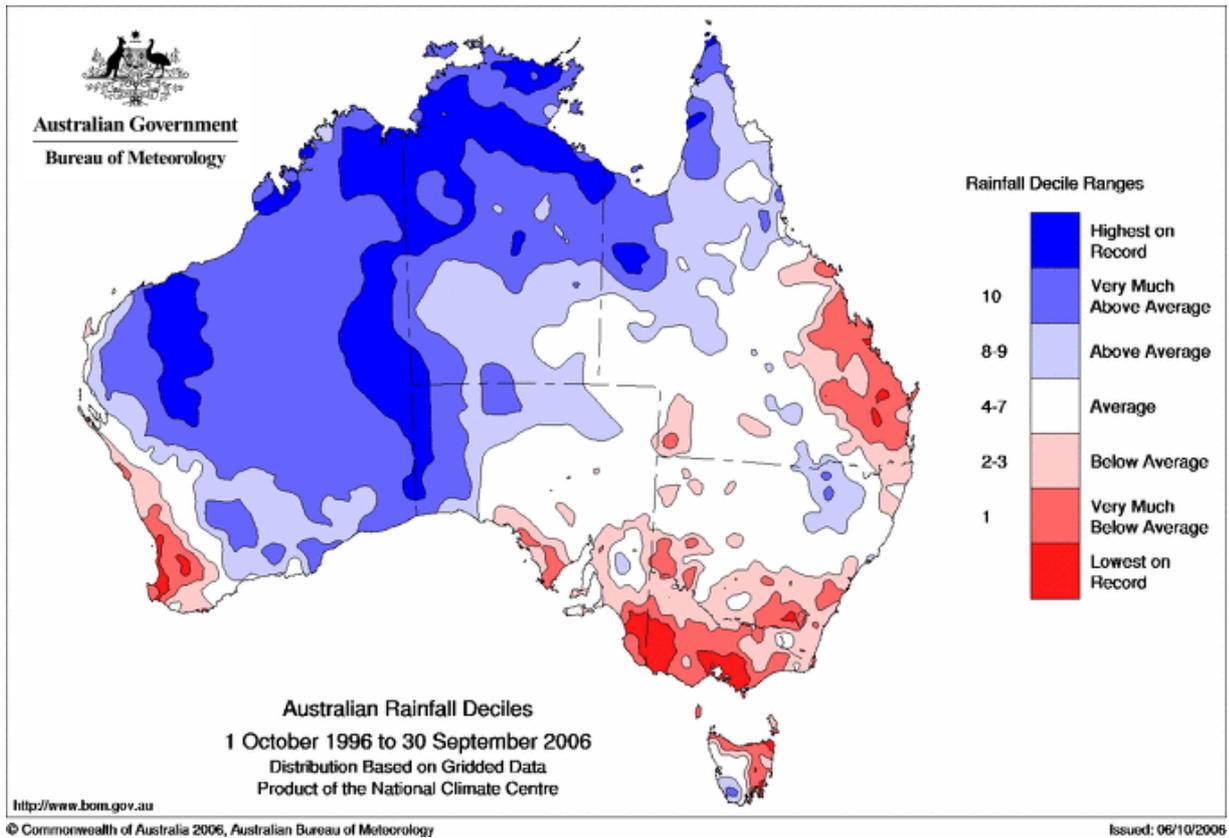


Figure 1. Australian rainfall deciles for the 10-year period October 1996 to September 2006.

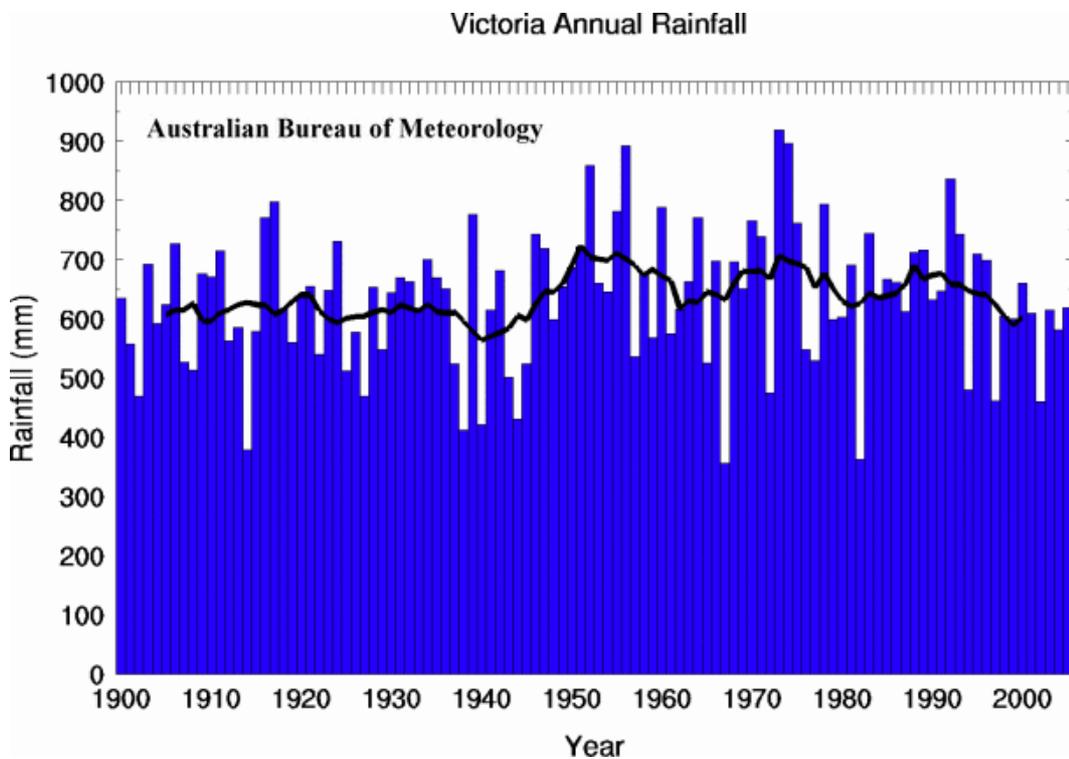


Figure 2. Victorian area-averaged annual rainfall, 1900 to 2005. The black line is an 11-year moving average.

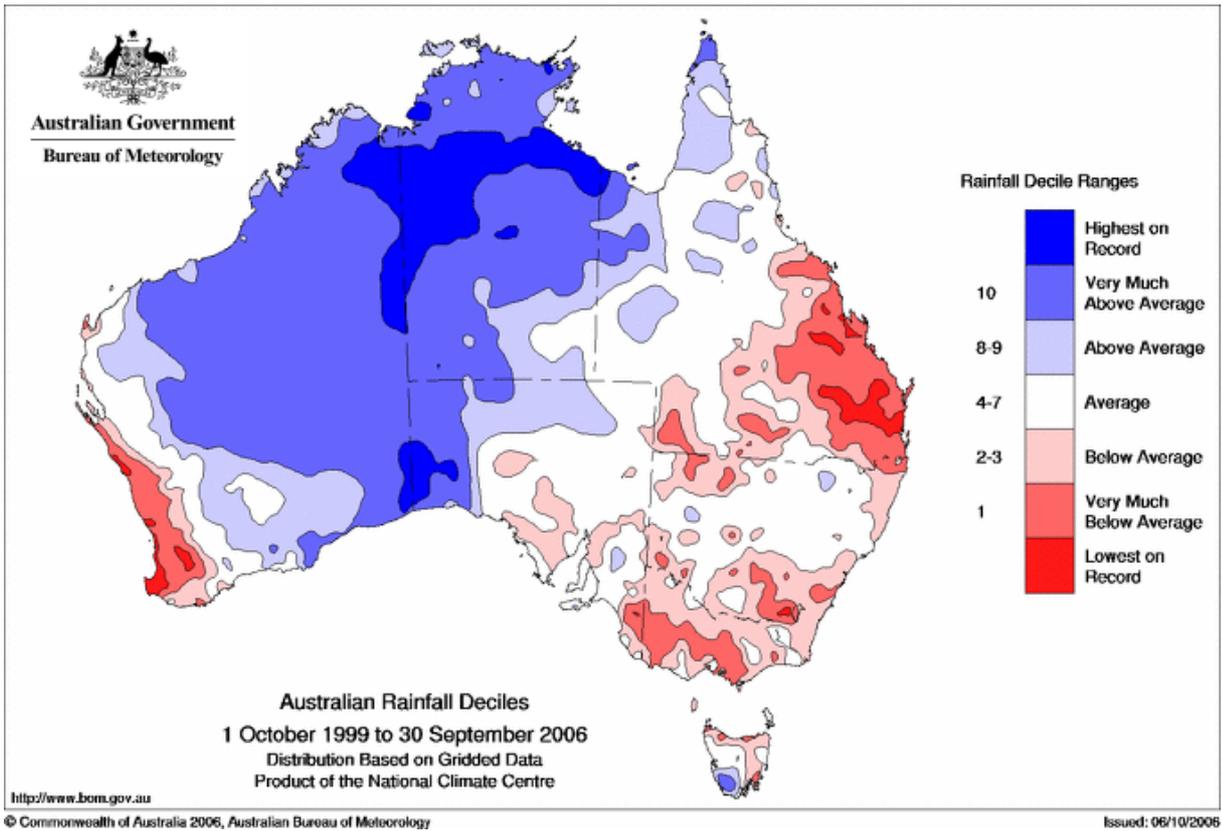


Figure 3(a). Australian rainfall deciles for the 7-year period October 1999 to September 2006.

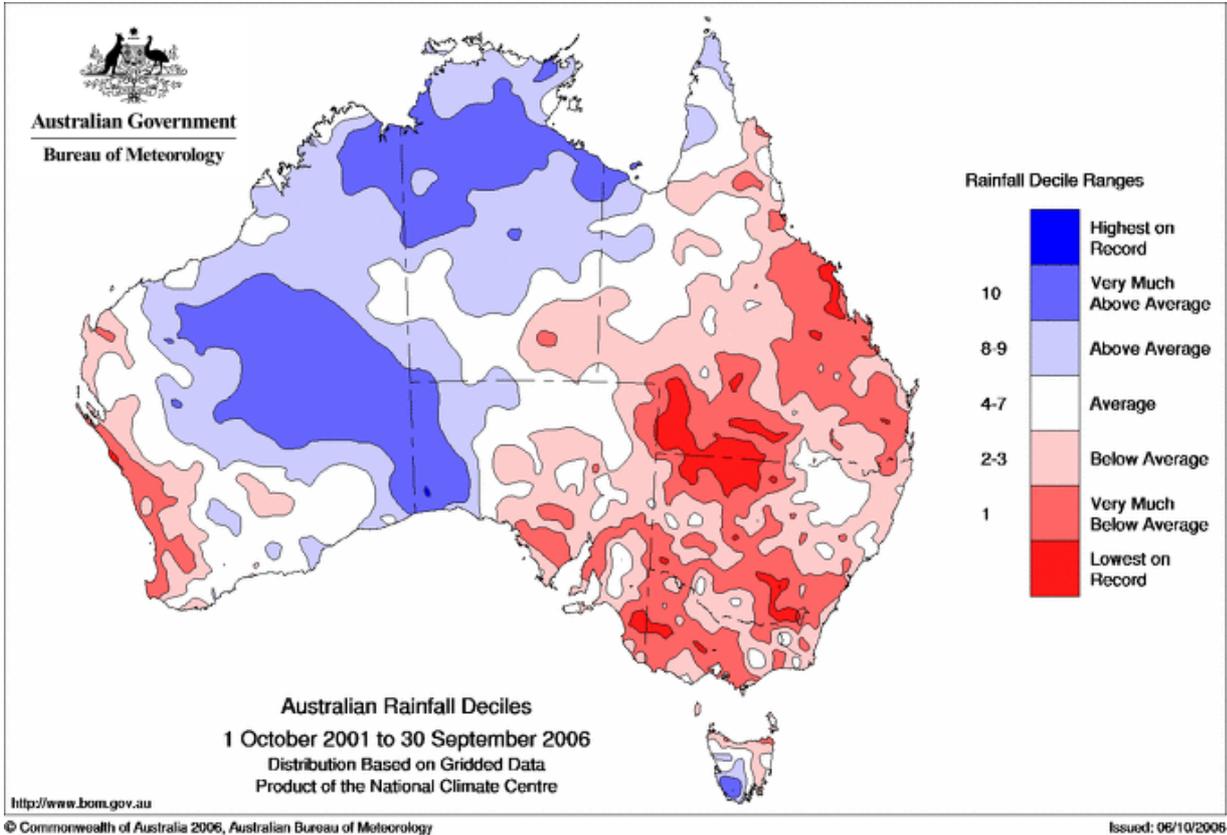


Figure 3(b). Australian rainfall deciles for the 5-year period October 2001 to September 2006.

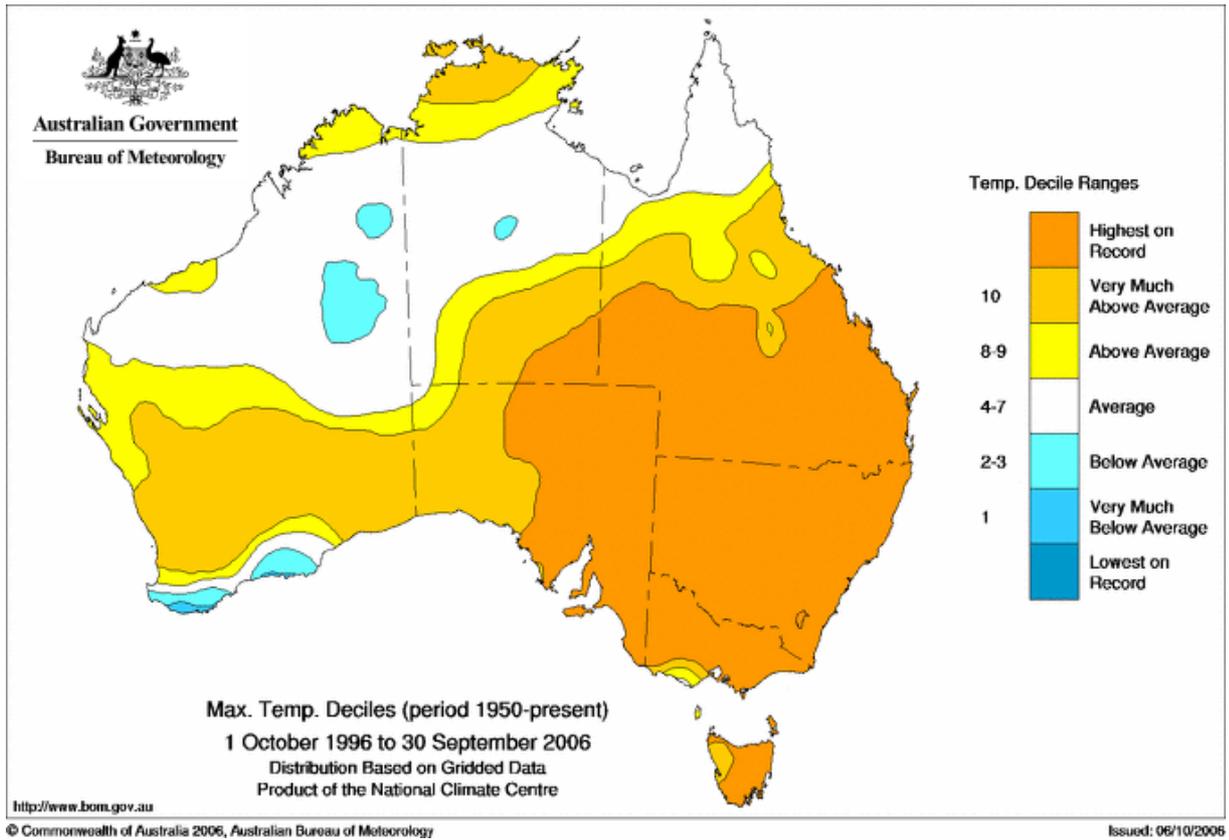


Figure 4(a). Maximum temperature deciles for the decade 1996 to 2006.

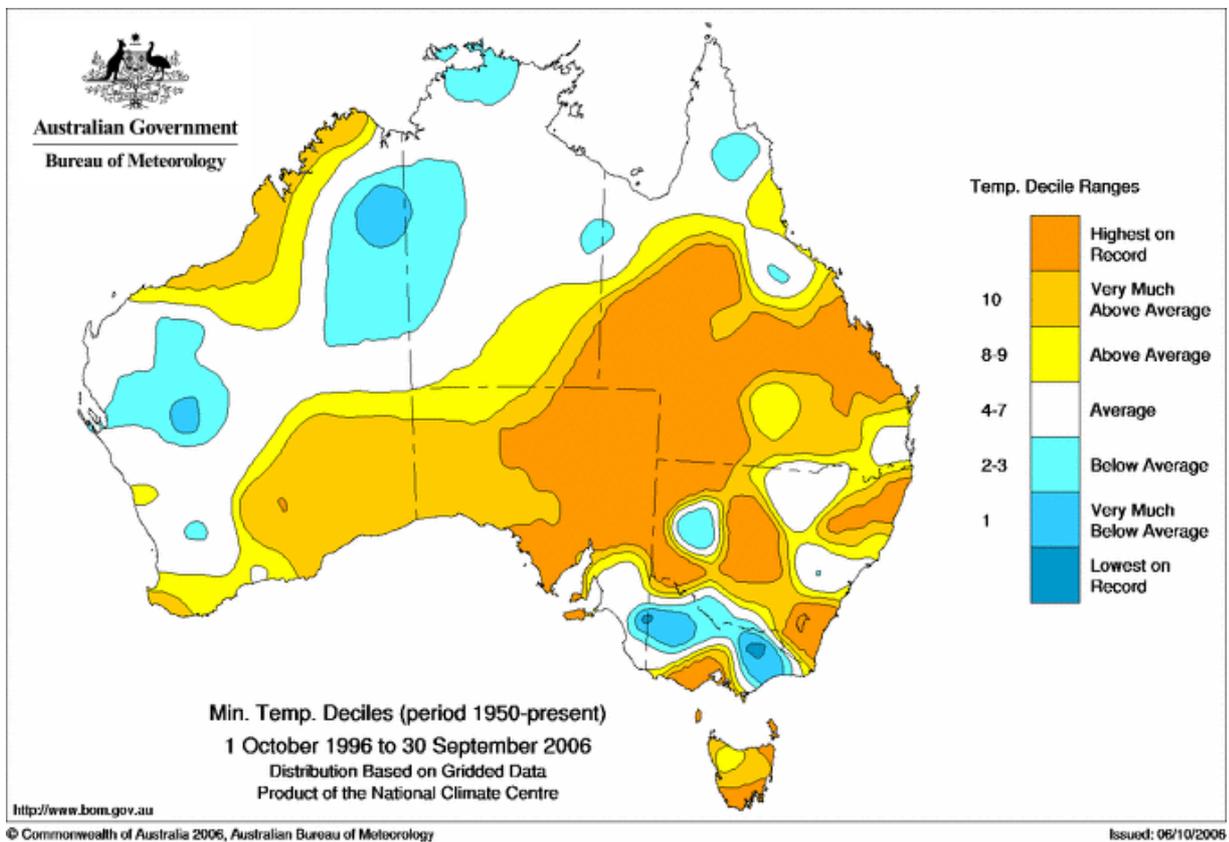


Figure 4(b). Minimum temperature deciles for the decade 1996 to 2006.

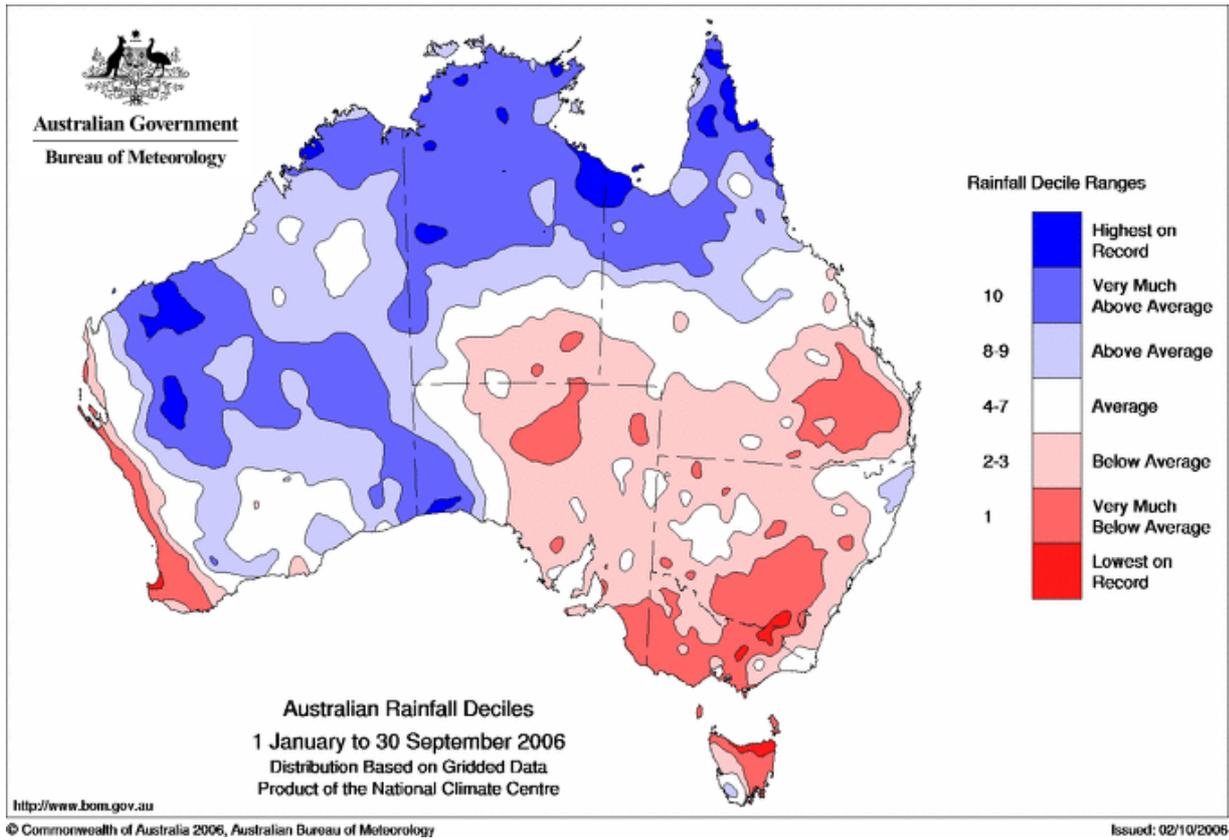


Figure 5. Australian rainfall deciles for the 9 months January to September 2006.

Tables

Station number(s)	Station name	Mean annual rainfall Oct 1996 – Sep 2006 (mm)	Long-term mean annual rainfall (mm)	Previous record mean annual rainfall over 10-year period (mm)
South-central Victoria				
85023	Drouin	848	1010	890 (1995-2005) 904 (1918-28)
86071	Melbourne	539	655	569 (1995-2005) 594 (1978-88)
86090	O'Shannassy	1129	1417	1221 (1995-2005) 1252 (1935-45)
89002	Ballarat	563	703	595 (1995-2005) 627 (1977-87)
Western Victoria/SE South Australia				
25507	Keith	409	467	421 (1935-45)
78031	Nhill	360	410	366 (1992-2002)
79023	Horsham	388	454	390 (1960-70)
90024	Coleraine	550	612	562 (1995-2005) 568 (1912-22)
Eastern Queensland				
39039	Gayndah	651	768	662 (1993-2003)
39082/39083	Rockhampton	606	818	623 (1994-2004)
40083	Gatton	629	780	643 (1992-2002)
41103	Toowoomba	738	947	771 (1913-23)
Southwestern Australia				
9225/9034	Perth	739	873	762 (1970-80)
9538	Dwellingup	1141	1246	1155 (1974-84)
10614	Narrogin	426	505	439 (1994-2004) 457 (1895-1905)
Northwestern Australia				
1013/1006	Wyndham	1025	753	965 (1994-2004) 851 (1954-64)
13017	Giles	409	281	399 (1994-2004) 337 (1972-82)

Table 1. Selected locations with record 10-year rainfall for the period October 1996-September 2006. In some cases where the previous 10-year record was set recently the pre-1996 record is also shown. All records are record lows except for those in northwestern Australia.

Note: Notable near-misses include Hobart (546 mm, record 542 mm from 1978-88) and Canberra (558 mm, record 552 mm from 1977-87).