Rainfall and streamflow summary – June 2012
Water Resource Assessment Branch

The following rainfall and streamflow summary for June 2012 is based on information from the Department of Water, Bureau of Meteorology, Department of Agriculture and Food and the Water Corporation. This summary is produced monthly from May to October. Some of the information here is presented in the context of Seasonal Response on the Department of Water website; go to www.water.wa.gov.au and follow the links under News & Events.

Summary of key rainfall and streamflow conditions:

- Rainfall in June was average to above average across the majority of South West WA.
- Kalgan River recorded the highest rainfall on record in June.
- Narembeen was the only station analysed that recorded below average rainfall in June.
- June rainfall has improved the year to date rainfall to average at most sites compared to the end of May however the Autumn (March to May) period had the 5th lowest rainfall for the 1975 to 2011 period for the south west so a number of sites remained well below average.
- Streamflow in June ranged from well below average to above average across south-west WA.
- Year to date streamflow has ranged from well below average to above average across south-west WA.
- Only one analysed streamflow site, Chapman Brook, has recorded above average streamflow for the year to date.

Figure 1 - Year to date rainfall for Western Australia and year to date streamflow for South West Western Australia (January to June 2012)
(Rainfall map courtesy of Bureau of Meteorology website (1 January to 1 July 2012), copyright Commonwealth of Australia reproduced by permission.)
Rainfall – June

The June rainfall deciles for Western Australia are shown in Figure 2. Rainfall for the state has generally been average (compared with the period 1900 to present). Areas in the mid-west Gascoyne, Pilbara and South Coast regions recorded higher than average rainfall. A small area near Albany along the South Coast received the highest rainfall on record. The Kimberley and Goldfields regions received average to below average rainfall.

Figure 2 - Monthly rainfall deciles (June 2012) for WA
(Courtesy of Bureau of Meteorology, copyright Commonwealth of Australia reproduced by permission.)
Rainfall – year to date

Figure 3 shows the year to date rainfall (January to June 2012) as a percentage of average annual rainfall. Year to date rainfall in the south-west WA is currently between 20-60% of the 1961-1990 mean annual rainfall. Year to date rainfall in northern WA is currently from 60-200% of the 1961-1990 mean annual rainfall. A small region in central WA has currently received between 200-300% of the mean annual rainfall.

Figure 3 - Year to date rainfall (January to June 2012) for WA as a percentage of the 1961-1990 mean annual rainfall
(Courtesy of Bureau of Meteorology, copyright Commonwealth of Australia reproduced by permission.)
South West WA rainfall – June

Data from 30 rainfall stations across South West WA are summarised to show the current rainfall condition across the region in comparison to historical rainfall since 1975. The period post 1975 is used because there has been an observed reduction in rainfall and runoff in the south-west from 1975 in comparison to long-term averages.

Rainfall in June (Figure 4) has been average to above average across the majority of south-west WA. The Kalgan River gauge received the highest June rainfall on record corresponding with above average rainfalls occurring in June over this region. Two consecutive days of high rainfall on the 1st and 2nd of June contributed to above rainfall at the Kalgan River gauge and surrounding region. The Narembeen gauge received below average rainfall.

Figure 4 - Monthly rainfall deciles (June 2012) for South West WA
South West WA rainfall – year to date

Year to date rainfall (Figure 5) has varied from average to well below average across south-west WA. Although average to above average rainfall throughout June has increased the yearly total at most sites, the Autumn (March to May) period had the 5th lowest rainfall for the 1975 to 2011 period for the south west. Seventeen sites moved to a higher rainfall category compared to the year to date totals reported in May, eleven sites stayed in the same category and one site, Narembeen moved into a lower category.

Of particular note are the Margaret, Deep, Denmark, Albany and the Kalgan River sites as the June streamflow increased the year to date totals for these sites from well below average to average.

Figure 5 - Year to date rainfall deciles (January to June 2012) for South West WA
Perth rainfall

The year to date rainfall for Perth (Mount Lawley 009225), with reference to the 1975 to 2011 minimum, maximum and percentile rainfall is shown in Figure 6. Perth recorded 141 mm of rainfall during June, which is close to the median rainfall for Perth compared to the monthly average from 1975 to 2011. This rainfall brought the cumulative rainfall total (January to June) to 302 mm, which is between the 30\textsuperscript{th} and 40\textsuperscript{th} percentiles of the cumulative monthly rainfall.

Figure 6 - Year to date rainfall (January to June 2012) for Perth (Mt Lawley, 009225) with reference to the 1975-2011 period minimum, maximum and percentile rainfalls
Rainfall outlook

Two sources of rainfall outlooks are used; the Bureau of Meteorology three month outlook across Australia, and the Department of Agriculture and Food WA statistical seasonal forecasts specific for south-west Western Australia. Percent consistent figures are shown for both outlooks to indicate the skill in the forecasts.

The Bureau of Meteorology produces three monthly outlook of the probability of exceeding the median rainfall. The percentiles are calculated over the 1900 to 2005 period. The outlook for total rainfall over the September quarter (July to September) for Western Australia is shown in Figure 7. The chance of exceeding the median rainfall is low, between 30 and 40 per cent. The rest of WA has a 40 to 50 per cent chance of exceeding the median rainfall. This is similar to the forecast given last month for the August quarter.

The percent consistent figure shows there is poor predictive skill in the seasonal forecast for this period for the majority of the state. The predictive skill is highest the central south west region of WA which has a per cent consistent figure of between 55 to 75 per cent.

The Department of Agriculture and Food WA also produce statistical seasonal forecasts (SSF) of the probability of exceeding the median rainfall. DoW uses the reference base climatology period of 1975 to 2011 (other periods available as the base periods within the SSF are 1970 to 2011 and 1990 to 2011). The forecasts in the model can be made monthly or for combination of months between May to October (the wet season). The forecast for July to September for south west WA is shown in Figure 8. The forecast shows that the majority of south west WA has a 40-60 per cent chance of exceeding the median rainfall for July to September. The northern area of south west WA, surrounding Geraldton, has a lower probability (0-40 per cent) of exceeding the median rainfall for the next three months. The region along the south coast has a higher probability (60-80 per cent) of exceeding the median rainfall for the next three months.

The percent consistent figure shows there is poor predictive skill in the seasonal forecast for this period. The predictive skill is higher in the northern and south coast regions of WA, where the per cent consistent figure is greater than 50 per cent.
Figure 7 - Probability of exceeding median rainfall (1900-2005) for July to September 2012 across Western Australia
(Courtesy of Bureau of Meteorology, copyright Commonwealth of Australia reproduced by permission)
Figure 8 - Probability of exceeding median rainfall (1975-2011) for the next 3 months across South West Western Australia
(Courtesy of Department of Agriculture and Food WA, copyright and reproduced by permission.)
**Streamflow – June**

Eighteen telemetered streamflow gauges across the south-west WA were analysed for the month of June (Figure 9).

June streamflow has ranged from well below average to above average across south-west WA and has improved since May. Six sites recorded well below average streamflow, four sites recorded below average streamflow, five sites recorded average streamflow and three sites recorded above average streamflow in June.

Kalgan river has recorded above average streamflow in June, although recorded the lowest flow on record in May. This is a reflection of the highest rainfall on record for June at this site.

![South West Western Australia Streamflow Deciles - June 2012](image-url)
Streamflow – year to date

Year to date streamflow in south-west WA (Figure 10) ranges from well below average to above average. The majority of sites, eight out of 18, have recorded average streamflow. Two sites recorded below average streamflow and seven sites recorded well below average streamflow.

Only one site, Chapman Brook, recorded above average streamflow for the year to date. Of particular note are the Wilyabrup, Kalgan, and Frankland sites as the January to June streamflow improved by two deciles from the January to May period.

Although average to above average rainfall has occurred over a majority of the South Coast in June, recorded streamflow remains average to well below average at the majority of sites.

Figure 10 - Year to date streamflow deciles (January to June 2012) for South West WA
Surface water storage – Perth IWSS

As of 4 July 2012, the total volume of water stored in the dams supplying water to the Integrated Water Supply System (IWSS) was 180 GL, which is approximately 30 per cent of the total capacity (Figure 11). As a comparison, storages at this time last year were at 147 GL.

Based on historical observations of inflow and IWSS water supply since 1999, there is an 80 per cent probability of the total storage increasing to 217 GL and a 50 per cent probability of the total storage being 266 GL by the 31 October 2012.

From 1 May, an estimated 360 mm (±26%) of rainfall at Jarrahdale was needed to start streamflow into the northern IWSS reservoirs (10 of the 12 IWSS reservoirs). Rainfall from the 1 May to the 30 June at Jarrahdale is 325 mm (Figure 11). Minor inflow to some of the individual dams that supply the IWSS has started. However the overall rate of increase in the inflow to the dams is not sufficient for the start of inflow to have occurred.

Figure 11 - Total volume of water stored in the Integrated Water Supply System reservoirs (courtesy Water Corporation 2012)
Groundwater

The Gnangara Mound is an important source of water for public water supply, irrigated agriculture, parks and gardens, industry and groundwater dependant ecosystems in Perth and IWSS supplied areas. Groundwater levels across the Gnangara Mound have been in decline for the last thirty years.

Figure 12 shows a selection of historical monthly average Gnangara groundwater levels since 1997. Groundwater levels shown on the graph are based on data from over 50 bores located across the mound’s superficial aquifer. These measurements were averaged to produce a single average groundwater level for each month. The water levels are taken at the beginning of the month. However, the average groundwater level is shown on the graphic as the middle of the month.

The level for June this year is approximately -3.8m which is approximately 0.1m higher than this time last year. The June groundwater level for 2011 was the lowest on record.

From 1 January, an estimated 730 mm (±10%) of rainfall at Perth Airport is needed to recharge Gnangara groundwater levels to those recorded at the end of last winter. Rainfall from 1 January to 30 June at Perth Airport was 272 mm.

Figure 12 - Average groundwater level across the Gnangara Mound (Department of Water). Groundwater levels shown on the graph are based on data recorded from over 50 bores located across the mound’s superficial aquifer. These measurements were averaged to produce a single average figure for each month.
Appendix – legend definitions

Serious deficiency – rainfall in the lowest 10% of historical totals, but not in the lowest 5%

Severe deficiency – rainfalls in the lowest 5% of historical totals

Lowest on record – lowest since at least 1900 when the rainfall data analysis began (for streamflow lowest since 1975)

Well below average – rainfalls in the lowest 10% of historical totals

Below average – rainfalls in the lowest 30% of historical totals, but not in the lowest 10%

Average – rainfalls in the middle 40% of historical totals

Above average – rainfalls in the highest 30% of historical totals, but not in the highest 10%

Well above average – rainfalls in the highest 10% of historical totals

References


