Rainfall and streamflow summary – June 2011
Water Resource Assessment Branch

Introduction

The following rainfall and streamflow summary for June 2011 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.

For most of Western Australia rainfall for June was average (compared to the 1900 to present period), below average rainfall occurred across the south west region and above average rainfall for the Goldfields (Figure 2). The Bureau of Meteorology outlook for the next three months indicates a below average chance of exceeding the median rainfall (1900 to 2005) for most of the state.

Three of the thirteen streamflow gauging stations analysed in South West WA recorded the lowest flow on record for June and six recorded well below average streamflow. The Collie and Pallinup River gauges recorded average streamflow for the month. The year to date streamflow showed four of the thirteen sites have experienced the lowest flow volumes on record (Figure 1). Only the Collie River recorded average streamflow from January to June.

Figure 1 Year to date rainfall for Western Australia and year to date streamflow for South West Western Australia (January to June 2011)
(Rainfall map courtesy of Bureau of Meteorology website, copyright Commonwealth of Australia reproduced by permission.)
Rainfall – June

The rainfall deciles for Western Australia are shown in Figure 2 with most of the state experiencing average rainfall (compared with the period 1900 to present) for June. Across South West WA average to below average rainfall occurred and the areas in the Goldfields region recorded above to very much above average rainfall for June.

Figure 2 Monthly rainfall deciles (June 2011) 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 2011) as a percentage of average annual rainfall. Year to date rainfall in the South West of Western Australia is 20 to 60 per cent of the average rainfall for the entire year. The Goldfields, Kimberley, Pilbara and Gascoyne regions have experienced rainfalls greater than the annual average.

Figure 3 Year to date rainfall (January to June 2011) 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 22 rainfall stations located 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.

Figure 4 indicates that the June rainfall is average to below average over most of the south west. Well below average rainfall for June was recorded for Northcliffe and Salmon Gums.

![Figure 4 - Monthly rainfall deciles (June 2011) for South West WA](image-url)
South West WA rainfall – year to date

Rainfall for most areas south of Perth recorded average totals for the first half of the year (Figure 5). Perth recorded average to below average rainfall for the January to June period. Geraldton and Collie are the only two stations to record above average rainfall for the year to date. Newdegate and Salmon Gums recorded well below average rainfall for the January to June period. Kirup also falls within the well below average category although the recorded YTD total is only 5 mm short from being below average. The May rainfall for Kirup was well below average and the rainfall that occurred over June was not sufficient enough to increase the year to date total to above the well below average.

Figure 5 - Year to date rainfall deciles (January to June 2011) for South West WA
Perth rainfall

The year to date rainfall for Perth, with reference to the 1975 to 2010 period minimum, maximum and percentile rainfall is shown in Figure 6. Perth (Mount Lawley, 009225) recorded 171 mm of rainfall during June, which is 24 mm above the average for June from 1975 to 2010. This rainfall brought the cumulative rainfall total (January to June) to 296 mm, which is just above the 30\textsuperscript{th} percentile rainfall for the year to date.

Figure 6 Year to date rainfall (January to June 2011) for Perth (Mt Lawley, 009225) with reference to the 1975-2010 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 three monthly forecasts.

The Bureau of Meteorology produces seasonal forecasts 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 for July to September over the South West and Pilbara is approximately 40 per cent. This is an improvement in the probability of median rainfalls to the previous period (June to August) of less than 30 per cent for the South West. For the rest of Western Australia there is a 45 per cent chance that rainfall over the September quarter will be above the historical long-term median. The percent consistent figure shows there is poor skill in the seasonal forecast for this period for WA.

The Department of Agriculture and Food WA also produce statistical seasonal forecasts of the probability of exceeding the median rainfall. These are in reference to the base climatology period of 1975 to 2010 (other periods available as the base period are 1970 to 2009 and 1990 to 2009). The forecast for July to September for South West WA are shown in Figure 8. This shows some areas have a high chance of exceeding the median 1975 to 2010 rainfall in the next three months. The Capes area and Perth and the surrounding hills areas indicate a preference for July to September rainfall to be less than the median. Overall, the predictions show an improved rainfall situation to the June- August predictions. The percent consistent figure shows there is a mix of poor to reasonable predictive skill in the seasonal forecast for this period.

The Department of Agriculture and Food’s Growing Season Outlook indicates that strong high pressures and warm sea surface temperatures west of WA and cool waters north of Australia have set-up a pattern which would be indicative of low chances of winter rainfall exceeding the median (Bowran et al., 2011).
Figure 7 Probability of exceeding median rainfall (1900-2005) for July to September 2011 across Western Australia
(Courtesy of Bureau of Meteorology, copyright Commonwealth of Australia reproduced by permission)
Figure 8 Probability of exceeding median rainfall (1975-2010) for July to September 2011 across South West Western Australia
(Courtesy of Department of Agriculture and Food WA, copyright and reproduced by permission.)
Streamflow – June

Thirteen telemetered streamflow gauges across the South West of WA were analysed for the month of June (Figure 9) and the year to date (Figure 10).

The Swan River, Harvey River and Lefroy Brook streamflow stations recorded the lowest flow on record. Below to well below average flow was recorded at seven stations across the South West region. Average flow was recorded at the Pallinup and Collie Rivers. No data is available at Young River for this month.

Figure 9 Monthly streamflow deciles (June 2011) for South West WA
Streamflow – year to date

Four streamflow gauges, Gingin Brook, Swan River, Harvey River, and Lefroy Brook recorded the lowest year to date streamflow total on record (1975 to 2010). Below to well below average flows occurred at seven of the gauges across the south west (Figure 10). The Collie River gauging station recorded an average flow total from January to June. This is because there was a rain event in January in the Collie River catchment which generated well above average streamflow.

Figure 10 Year to date streamflow deciles (January to June 2011) for South West WA
Surface water storage – Perth IWSS

At the 1 July 2011, the total volume of water stored in the dams supplying water to the Integrated Water Supply System (IWSS) was 146 GL, which is approximately 24 per cent of the total capacity (Figure 11). As a comparison, at this time last year storages were at 216 GL, which is a 70 GL difference.

Based on historical observations of inflow and IWSS water supply since 1999, there is an 80 per cent probability of the total storage being 176 GL and a 50 per cent probability of the total storage being 237 GL by the 31 October 2011.

From 1 May, an estimated 500 mm ± 10% of rainfall at Jarrahdale is needed to start streamflow into the northern IWSS reservoirs (10 of the 12 IWSS reservoirs). Rainfall from 1 May to 30 June at Jarrahdale is 288 mm. Despite this being below the estimated 500 mm we have already seen minor inflows to the IWSS storage (Figure 11). This is from four high rainfall days in June occurring in close succession rather than the rainfall being equally spread throughout the period.

![Figure 11 Total volume of water stored in the Integrated Water Supply System reservoirs (Water Corporation 2011)](image-url)
Groundwater

The Gnangara Mound is an important source of water for public water supply, irrigated agriculture, parks and gardens, industry and groundwater dependent 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 historical monthly average Gnangara groundwater levels. 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 groundwater level for each month. Note that 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 2011 is the lowest June average groundwater level on record (since 1997). Currently the average groundwater level is approximately 0.3 m lower than the previous June minimum that occurred last year.

From 1 January, an estimated 800 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 is 258 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.
Appendices

Appendix A – 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


Bureau of Meteorology, 2011, Current year to date rainfall percentages for Western Australia, Climate maps, viewed 1 July 2011, http://www.bom.gov.au/cgi-bin/silo/rain_maps.cgi


