Introduction

The following rainfall and streamflow summary for September 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.

Rainfall for September was average for most of Western Australia (compared to the 1900 to present period). The Mid-West region recorded above average rainfall, but along the south coast, around Esperance, below to very much below average rainfall was recorded (Figure 2). The Bureau of Meteorology outlook for the next three months indicates a greater than 55 per cent chance of exceeding the median rainfall (1900 to 2005) for the South West region and the rest of the state (Figure 7).

In South West WA eight of the fifteen streamflow gauging stations analysed recorded below average flow for September and three gauges recorded well below average flow. Only three stations observed average flow (Figure 9). The year to date streamflow is generally less than average across South West WA (Figure 1). Only two stations recorded an average flow and five other sites are well below average.

Figure 1 - Year to date rainfall for Western Australia and year to date streamflow for South West Western Australia (January to September 2011)

(Rainfall map courtesy of Bureau of Meteorology website (1 January to 3 October 2011), copyright Commonwealth of Australia reproduced by permission.)
Rainfall – September

The September rainfall deciles for Western Australia are shown in Figure 2. Most of the state experienced average rainfall (compared with the period 1900 to present). Isolated areas across the Mid-West, Kimberley and wheat belt regions recorded above average rainfall. Below average and well below average rainfall occurred along the South Coast, Western Plateau and the Eastern border of the state.

Figure 2 - Monthly rainfall deciles (September 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 September 2011) as a percentage of average annual rainfall. Year to date rainfall in the South West of Western Australia is at 60 to 100 per cent of the average rainfall for the year. The Goldfields, Kimberley, Pilbara and Gascoyne regions have experienced rainfalls greater than the annual average.

Figure 3 - Year to date rainfall (January to September 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 – September

Data from 23 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.

Figure 4 indicates that the September rainfall over most of the south west ranges from above average to well below average at specific sites. Four sites recorded above average rainfall, 15 recorded average rainfall, three recorded below average rainfall. There was no data recorded in September at the Busselton rainfall station due to the equipment failure.

Figure 4 - Monthly rainfall deciles (September 2011) for South West WA
South West WA rainfall – year to date

Rainfall for most areas of South West WA, 13 out of 23 analysed stations, recorded average total rainfall from January to September (Figure 5). Seven stations recorded below average rainfall for the January to September period. Two stations, Wokalup and Donnybrook recorded above average rainfall for the year to date.

![Figure 5 - Year to date rainfall deciles (January to September 2011) for South West WA](image-url)
Perth rainfall

The year to date rainfall for Perth (Mount Lawley 009225), with reference to the 1975 to 2010 minimum, maximum and percentile rainfall is shown in Figure 6. Perth recorded 109 mm of rainfall during September, which is 30 mm higher than the monthly average from 1975 to 2010. This rainfall brought the cumulative rainfall total (January to September) to 681 mm, which is just below the median rainfall total for the year to date.

Figure 6 - Year to date rainfall (January to September 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 forecasts.

The Bureau of Meteorology produces three monthly 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 December quarter (October to December) for Western Australia is shown in Figure 7. The chance of exceeding the median rainfall for the December quarter over the South West region is around 55 to 60 per cent. This is a decline in the probability of exceeding median rainfall compared to the previous period (September to November) which was approximately 65 per cent for the South West. For the rest of Western Australia there is also 60 per cent chance that rainfall over the December quarter will be above the historical long-term median. The percent consistent figure shows there is very poor predictive skill in the seasonal forecast for this period for the South West region. For the rest of the state the percent consistent figure shows more reasonable predictive skill for this period.

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 periods are 1970 to 2009 and 1990 to 2009). The forecasts are made to the end of October (the wet season). The forecast for October for South West WA is shown in Figure 8. This shows a high probability that rainfall is going to exceed the median October rainfall (1975 to 2010). The percent consistent figure shows there is strong predictive skill in the seasonal forecast for this period.
Figure 7 - Probability of exceeding median rainfall (1900-2005) for October to December 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 October 2011 across South West Western Australia
(Courtesy of Department of Agriculture and Food WA, copyright and reproduced by permission.)
Streamflow – September

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

Three stations, Gingin Brook, Murray River and Lefroy Brook recorded well below average flow for September. The majority of stations, eight out of 15 recorded below average flow and only three stations, two on the Collie River and one on the Young River, recorded average flow. Previous assessments have included the streamflow status at Deep River however problems with telemetry communications have occurred and physical access to the site is restricted due to dieback quarantine issues.

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

Five out of 15 gauges recorded well below average year to date streamflow, while seven stations recorded a below average year to date total (Figure 10).

Collie River and Young River are the only gauges to record average year to date streamflow totals. Average flows were recorded on the Collie River because of a significant rain event in January which generated well above average streamflow.

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

As of 3 October 2011, the total volume of water stored in the dams supplying water to the Integrated Water Supply System (IWSS) was 216 GL, which is approximately 35 per cent of the total capacity (Figure 11). As a comparison, at this time last year storages were at 218 GL.

Based on historical observations of inflow and IWSS water supply since 1999, there is an 80 per cent probability of the total storage reducing to 213 GL and a 50 per cent probability of the total storage being 217 GL by the 31 October 2011.

From 1 May, an estimated 500 mm ± 10% of rainfall at Jarrahdale was needed to start streamflow into the northern IWSS reservoirs (10 of the 12 IWSS reservoirs). Rainfall from 1 May to 30 September at Jarrahdale was 842 mm resulting in streamflow generating consistent inflows to the IWSS storage (Figure 11).

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

The Gnangara groundwater system 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 groundwater system 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 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 September this year is the lowest September average groundwater level on record (since 1997). Currently the average groundwater level is approximately 0.09 m lower than the previous September 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 September at Perth Airport is 668 mm.

Figure 12 - Average groundwater level across the Gnangara groundwater system (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

Bowran, D., Evans, F., Foster, I., Goulding, P., and Stephens, D., 2011, Growing Season Outlook, Department of Agriculture and Food, viewed 6 October 2011,


