WESTERN MOUNT LOFTY RANGES PWRA

Surface Water Status Report

2012–13

Government of South Australia
Department of Environment, Water and Natural Resources

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PURPOSE AND CONTEXT

This annual status report provides a snapshot of the surface water resources in the Western Mount Lofty Ranges Prescribed Water Resources Area (PWRA) for the financial year 2012–13. Surface water status reports are limited to reporting on the 'hydrological status' of the PWRA on an annual basis and at a whole prescribed area scale. Available data on climate, streamflow, salinity and water use is summarised and compared with recent and long-term data to provide an indication of the hydrological status of its water resources. Each element is discussed with reference to recent or more long-term trends where, if at all, they are present in the data. These status reports seek to support informed management decisions by resource managers and those responsible for, or reliant on, the water resources.

This status report does not seek to evaluate the sustainable limits of the resource, nor does it make any recommendations on management or monitoring of the resource. These actions are important, but occur through separate processes such as prescription and water allocation planning.

Development of the Natural Resource Management (NRM) State and Condition Reporting Framework (Government of South Australia 2012) was identified as a priority in the State NRM Plan (Government of South Australia 2012a) to strengthen the NRM system. Implementation of the NRM State and Condition Reporting Framework seeks to include an assessment of state and condition through the development of Report Cards. The Department of Environment, Water and Natural Resources (DEWNR), in consultation with key stakeholders, is developing the Report Card *"Trends in condition of rivers, streams, wetlands and drains"*, which assess resource condition and the Report Card "*Proportion of SA's water resources managed within sustainable limits*" which reports on management outcomes. For further information on the condition compared to status of water resources, visit the Enviro Data SA page: https://data.environment.sa.gov.au/Pages/Home.aspx

WESTERN MOUNT LOFTY RANGES PWRA

The Western Mount Lofty Ranges (WMLR) PWRA is located approximately 10 km east of Adelaide (Figure 1). Surface water (including within watercourses) and groundwater resources in the PWRA have been prescribed under South Australia's *Natural Resources Management Act 2004*. A Water Allocation Plan (WAP) was developed by the Adelaide and Mount Lofty Ranges Natural Resources Management Board in 2013, which seeks to provide for sustainable management of water resources.

The PWRA covers an area of approximately 2750 km^2 and includes the towns of Gawler, Mount Pleasant, Lobethal, Uraidla, Echunga, McLaren Vale, Willunga, Victor Harbor and Cape Jervis. The PWRA extends from Gawler in the north, to Middleton and across to Cape Jervis on the south coast. The topography includes the western slopes of the Mount Lofty Ranges on the eastern side of the PWRA and the central plateau of the Fleurieu Coastal catchment. Topography in the northern half of the PWRA drains major watercourses in a west or south-west direction towards Gulf St Vincent. Watercourses flow outward from the central plateau of the Fleurieu Coastal catchment towards the surrounding coast. The climate of the PWRA is characterised by hot, dry summers and cool to cold, wet winters, with highly variable rainfall ranging from over 1000 mm around the township of Uraidla to less than 500 mm in the north of the South Para catchment and parts of the Fleurieu Coastal catchment. The PWRA is divided into eight surface water catchments, those being South Para River, Little Para River, River Torrens, Onkaparinga River, Willunga Basin, Myponga River, Hindmarsh and Inman Rivers, and Fleurieu Coastal catchments. Fleurieu Coastal catchments is comparable to Willunga Basin catchment in so far as it has no major rivers or reservoirs (AMLRNRMB 2013). The PWRA also includes three prescribed watercourses which cross the Adelaide Plains to Gulf St Vincent; Gawler River downstream of the junction of North Para River and South Para River, River Torrens/Karrawirra Parri downstream of Gorge Weir, and Onkaparinga River downstream of Clarendon Weir. The section of river from a point upstream of Little Para Reservoir to Port Wakefield Road is the Little Para Proclaimed Watercourse. The four watercourses mentioned above all receive water from reservoir overflow and releases, in addition to localised surface water runoff.

Surface water use for environmental, irrigation, industrial, commercial, recreational, stock and domestic purposes comes from a variety of sources including pumping from streams and rivers, reservoirs, rainwater capture and interception and storage by farm dams. Reservoir catchments of the PWRA are used to supply approximately 60% of metropolitan Adelaide's mains water in an average year (AMLRNRMB 2013). In years of abundant rainfall, this can be as much as 90%, and as little as 10% in times of drought, where the balance has historically been supplemented by water diverted from the River Murray to the reservoirs. Licensed water use in the PWRA is administered under the WAP by DEWNR.

SUMMARY 2012-13

STATUS 2012-13

"Adverse trends indicating low risk to the resource in the short-term"

This hydrological status for 2012–13, which is based at a whole prescribed area scale, is supported by:

- below average rainfall recorded at all 7 rainfall analysis sites
- below average streamflow recorded at 6 of the 9 streamflow analysis sites
- steady salinity recorded at 3 of the 4 salinity analysis sites
- very high water use compared to resource capacity.

Point observations from current monitoring stations were used to assign the whole prescribed area status and thus may not represent the spatial variability of the reporting variables across the PWRA.

Below average rainfall and streamflow, and very high water use were contributing factors to the PWRA being assigned a yellow status for 2012–13.

Rainfall, streamflow, salinity and water usage can be highly variable from year to year. It is therefore important to acknowledge that hydrological trend, and therefore the hydrological status, can also vary greatly from year to year. However this does not necessarily translate to the variability in the condition of water dependent ecosystems. On this matter, environmental water requirements and condition of water dependent ecosystems have not been considered when assigning the hydrological status for 2012-13. The section titled 'water dependent ecosystems' provides a brief overview of the water dependent ecosystems in the PWRA.

(green) No adverse trends, indicating a stable or improving situation

Trends are either stable (no significant change), or have improved over the reporting period, indicating that there is insignificant risk of impact to the beneficial use of the resource.

(yellow) Adverse trends indicating low risk to the resource in the short-term (1 to 3 years)

Observed adverse trends are gradual and if continued, are unlikely to lead to a change in the current beneficial uses of the surface water resource in the short-term.

(amber) Adverse trends indicating medium risk to the resource eventuating in the short-term

Observed adverse trends are significant and if continued, moderately likely to lead to a change in the current beneficial uses of the surface water resource in the short-term.

(red) Adverse trends indicating high risk to the resource within the short-term

Trends indicate degradation of the resource is occurring. Degradation will very likely result in a change in the beneficial use (e.g. reduced ability to access surface water entitlements and/or decline in the condition of environmental assets).

(grey) Unclear

Trends are unable to be determined due to a lack of adequate information on which to base a sound judgement of status.

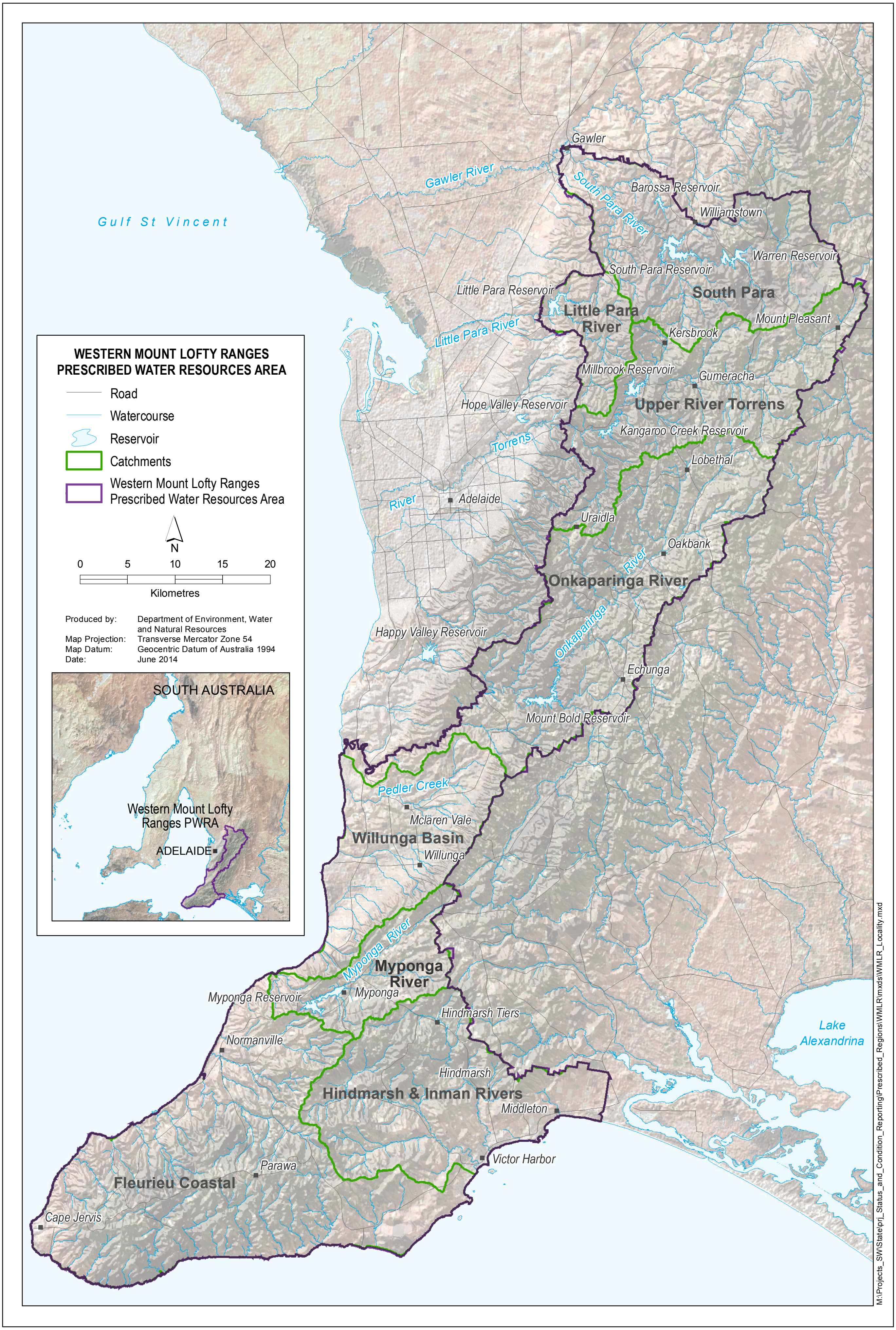


Figure 1 Western Mount Lofty Ranges PWRA and surface water catchments in the region

RAINFALL

Status	Degree of confidence	Comments on recent historical context
Below average rainfall recorded at all stations analysed	High: good coverage of rainfall stations representing the rainfall variation across the region	Below average rainfall at Mount Bold and Port Elliot in 2012–13 after three years of above average rainfall. Second year of below average rainfall at Uraidla, Parawa, Cudlee Creek, Mount Pleasant and Yankalilla

Rainfall in the Western Mount Lofty Ranges PWRA is highly variable, ranging from over 1000 mm around the township of Uraidla to less than 500 mm in the north of the South Para catchment and parts of the Fleurieu Coastal catchments. Rainfall stations in the PWRA are shown in Figure 9. As rainfall is highly variable across the PWRA, data from seven stations that represent the spatial variability if rainfall across the PWRA, Uraidla (M023750), Parawa (M023761), Cudlee Creek (M023731), Mount Bold (M023734), Mount Pleasant (M023737), Yankalilla (M023754) and Port Elliot (M023742) were chosen for analysis of rainfall trends (Table 1). While some of the stations have longer data sets, all data are summarised from 1889 to ensure a consistent reporting period. Rainfall data have been sourced from SILO and is Patched Point Data. Further information on SILO climate data is available at: http://www.longpaddock.qld.gov.au/silo/index.html.

Table 1. Summary of rainfall stations used in the Western Mount Lofty Ranges PWRA status report

Station name (number)	Location	Period of operation	Period of record for assessment	Mean annual rainfall (mm)
Uraidla (M023750)	Onkaparinga River catchment	1890–current	1889–2012	1066
Parawa (M023761)	Fleurieu Coastal catchment	1942–current	1889–2012	945
Cudlee Creek (M023731)	Upper Torrens River catchment	1914–current	1889–2012	810
Mount Bold (M023734)	Onkaparinga River catchment	1938–current	1889–2012	711
Mount Pleasant (M023737)	Upper Torrens River catchment	1875–current	1889–2012	667
Yankalilla (M023754)	Fleurieu Coastal catchment	1892–current	1889–2012	582
Port Elliot (M023742)	Hindmarsh and Inman Rivers catchment	1867–current	1889–2012	499

RECENT RAINFALL

During 2012–13, below average rainfall was observed at all of the rainfall stations analysed. However, total rainfall recorded in the winter months (July, August and June) was above average at all these stations except Uraidla, with much higher than average rainfall recorded during the month of June (Figures 2–8). The remaining months of the year from September to May recorded predominantly below average rainfall at all stations analysed. Uraidla BoM rainfall station received a below average rainfall of 758 mm in 2012–13 in comparison to its long-term average of 1066 mm. Below average rainfall was experienced in all months across 2012–13 with October to December and also February receiving less than half their monthly average rainfall (Figure 2).

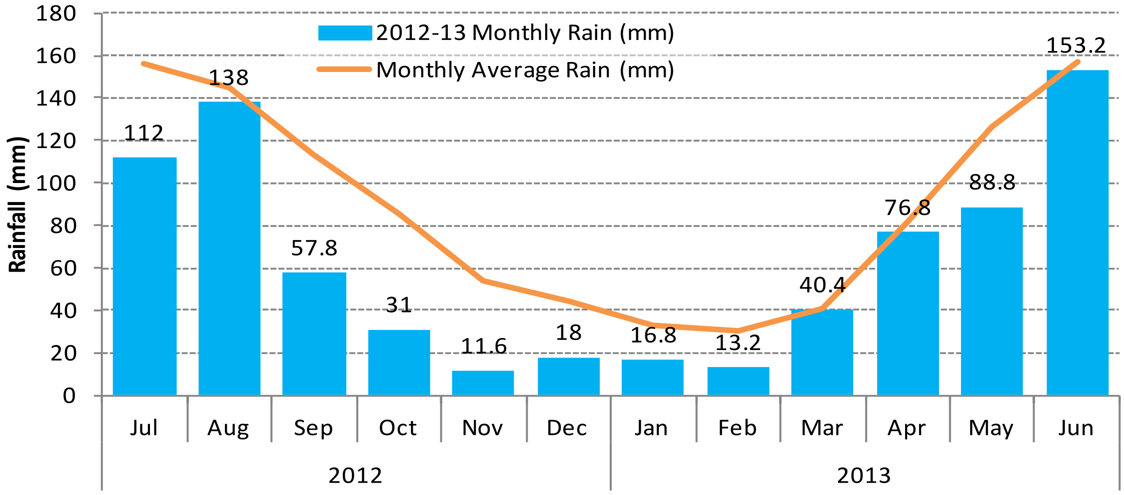


Figure 2. Monthly rainfalls at Uraidla (M023750)

Parawa BoM rainfall station received a below average rainfall of 880 mm in 2012–13 in comparison to its long-term average of 945 mm. August and June were the only months of the year to receive above average rainfall with June receiving almost double the monthly average. The months of December and February received less than half their monthly average rainfall (Figure 3).

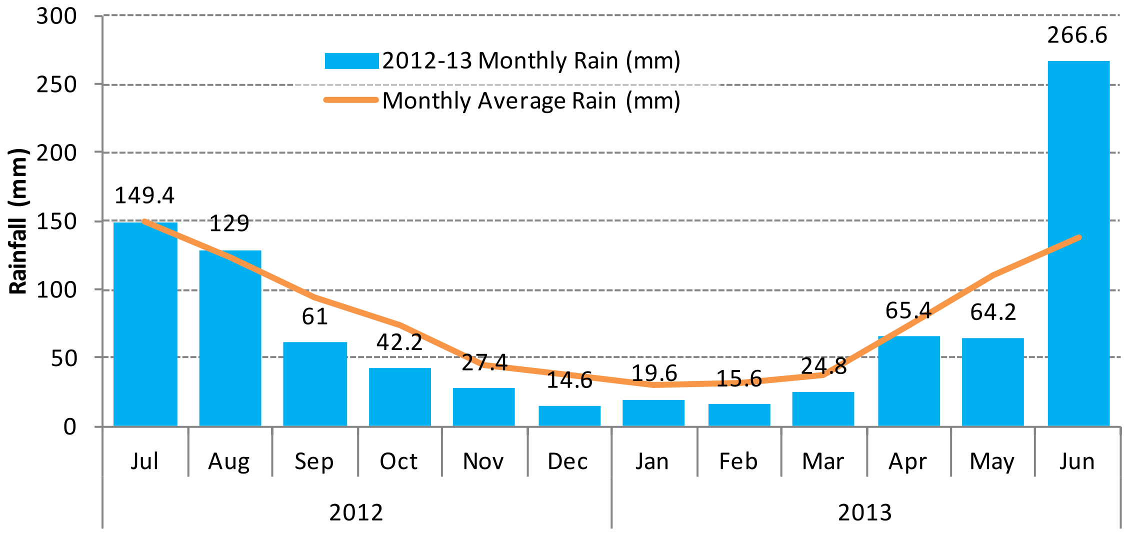


Figure 3. Monthly rainfalls at Parawa (M023761)

Cudlee Creek BoM rainfall station received a below average rainfall of 687 mm in 2012–13 in comparison to its long-term average of 810 mm. August, February, March and June received above average rainfall with the months of October and November receiving less than half their monthly average rainfall (Figure 4).

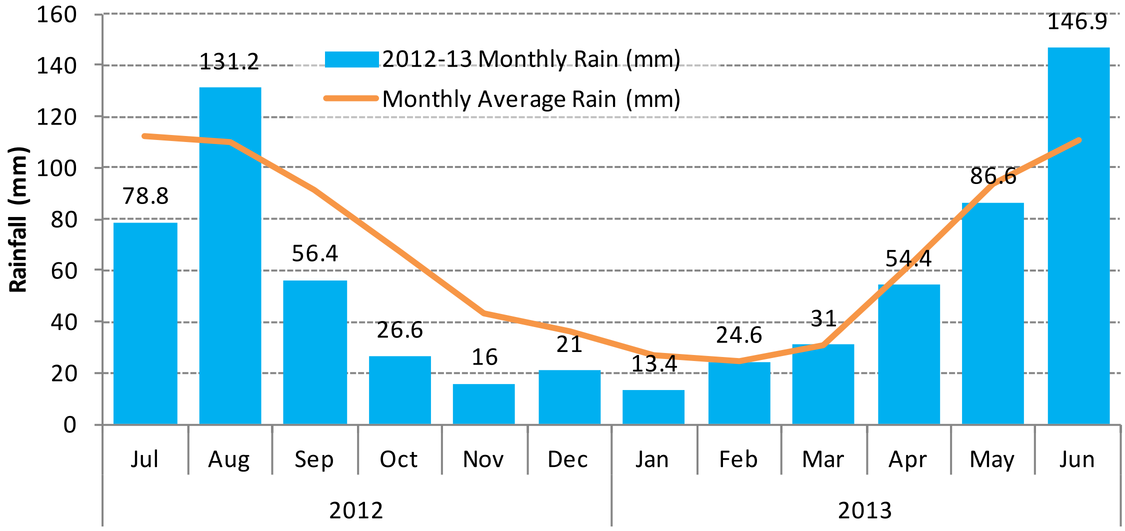


Figure 4. Monthly rainfalls at Cudlee Creek (M023731)

Mount Bold BoM rainfall station received a below average rainfall of 640 mm in 2012–13 in comparison to its long-term average of 711 mm. July, August and June received above average rainfall with the months of November and December receiving less than half their monthly average rainfall (Figure 5).

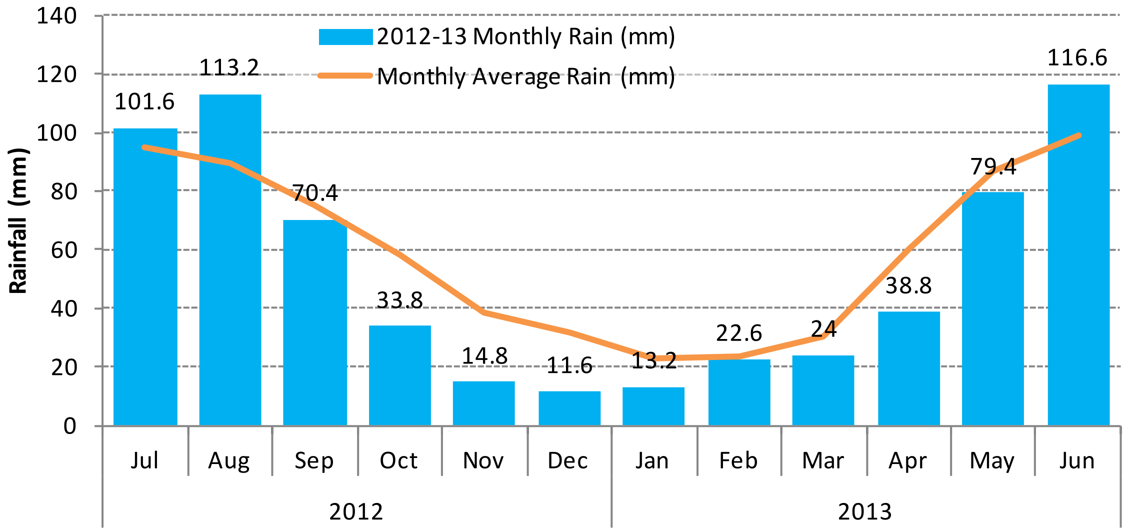


Figure 5. Monthly rainfalls at Mount Bold (M023734)

Mount Pleasant BoM rainfall station received a below average rainfall of 530 mm in 2012–13 in comparison to its long-term average of 667 mm. April and June received above average rainfall with the months of October, November and January receiving less than half their monthly average rainfall (Figure 6).

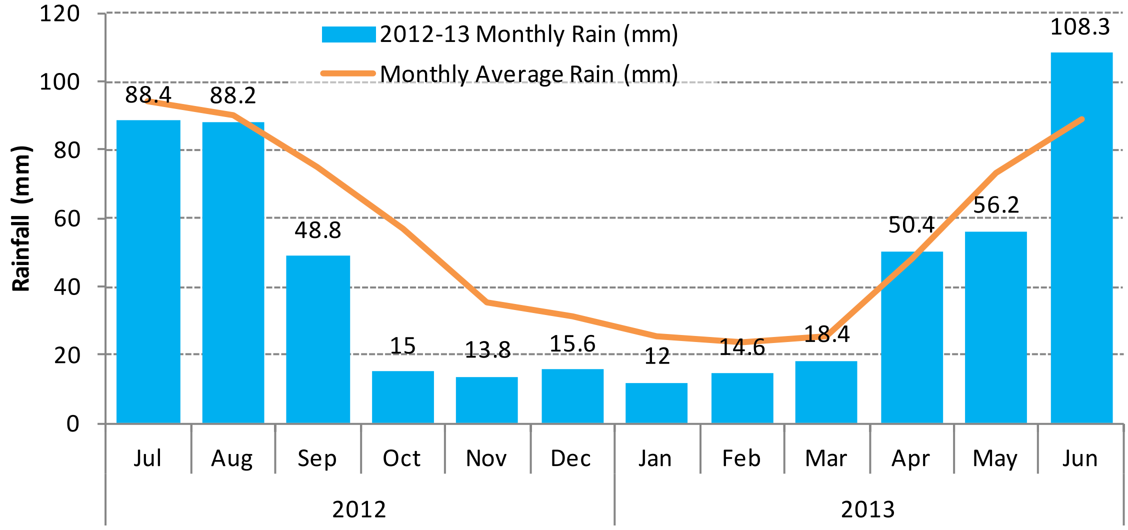


Figure 6. Monthly rainfalls at Mount Pleasant (M023737)

Yankalilla BoM rainfall station received a below average rainfall of 491 mm in 2012–13 in comparison to its long-term average of 582 mm. June was the only month to receive above average rainfall recording almost double the monthly average. The months of December and January received less than half their monthly average rainfall (Figure 7).

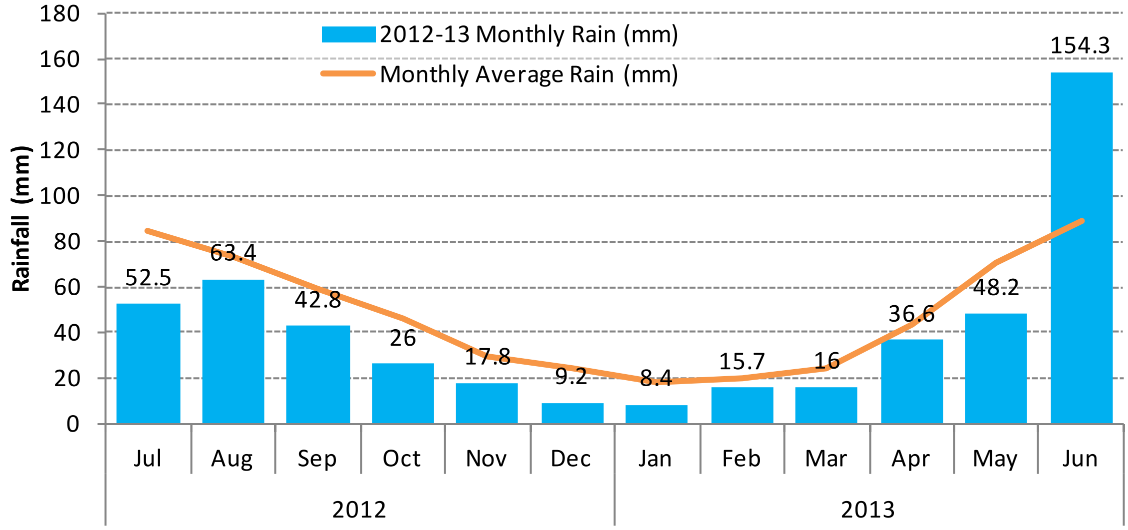


Figure 7. Monthly rainfalls at Yankalilla (M023754)

Port Elliot BoM rainfall station received a below average rainfall of 490 mm in 2012–13 in comparison to its long-term average of 499 mm. July, August and June received above average rainfall, with June receiving more than double the monthly average. The months of October and also December to March received less than half their monthly average rainfall (Figure 8).

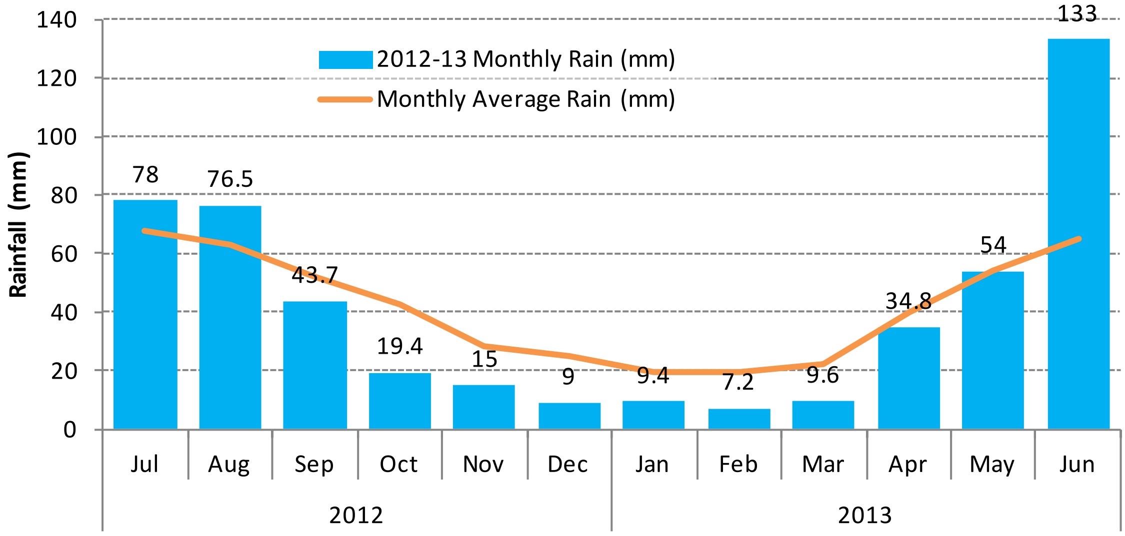


Figure 8. Monthly rainfalls at Port Elliot (M023742)

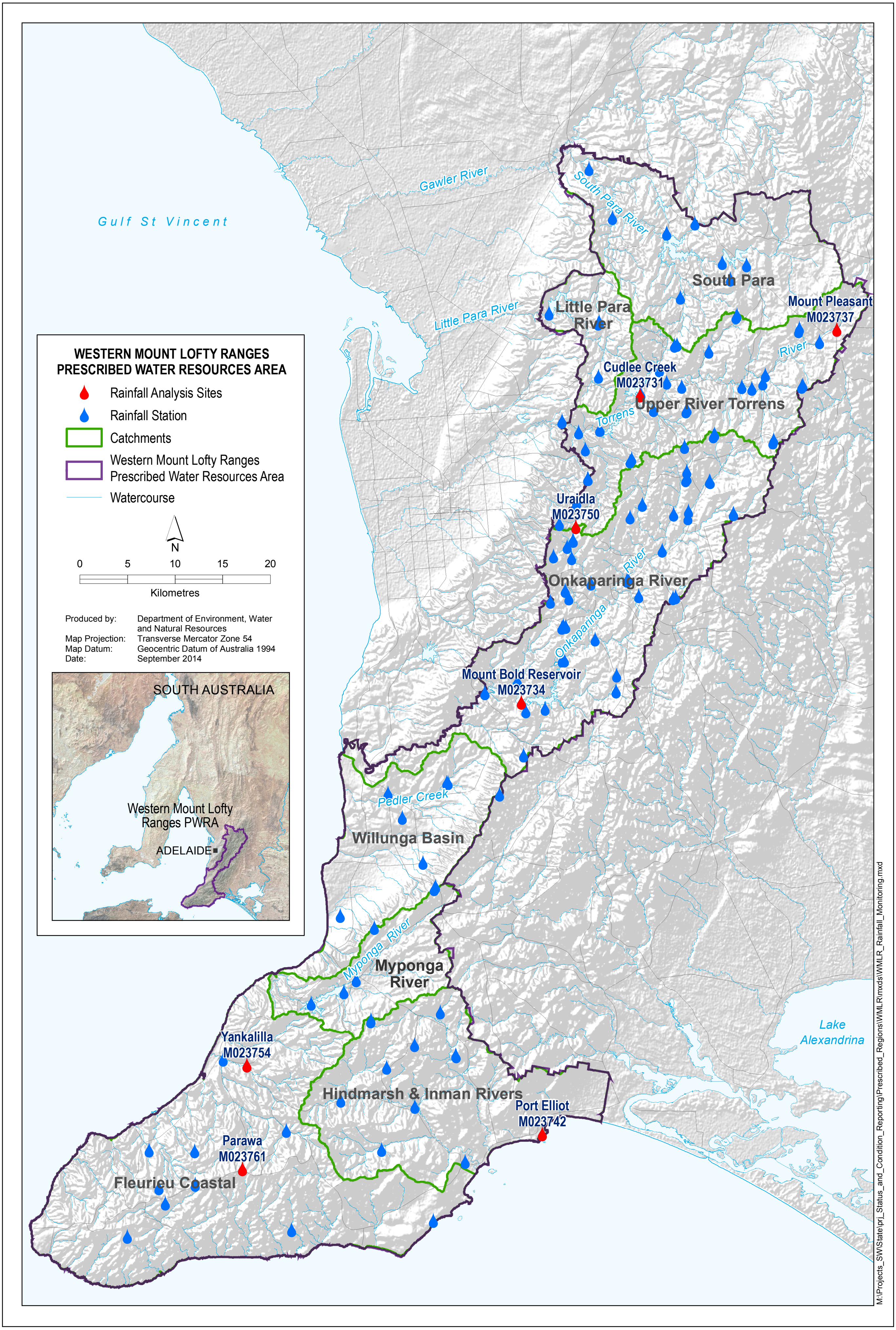


Figure 9 Location of rainfall monitoring sites in the Western Mount Lofty Ranges PWRA

LONG AND SHORT-TERM TRENDS

Figure 10 shows the spatial distribution of rainfall over the Western Mount Lofty Ranges PWRA for the:

1. long-term average annual rainfall from 1900-2012
2. short-term average of the previous 10 years (2003-12)
3. annual rainfall for 2012–13.

The three panels of Figure 10 indicate that over much of the PWRA, rainfall for the year 2012–13 (panel 3) was below the long and short-term averages (panel 1 and panel 2). Panel 2 shows the average rainfall for the years 2003-12 and this shows a slightly lower rainfall pattern in the central part of the PWRA and the Fleurieu Peninsula when compared to the long-term average.

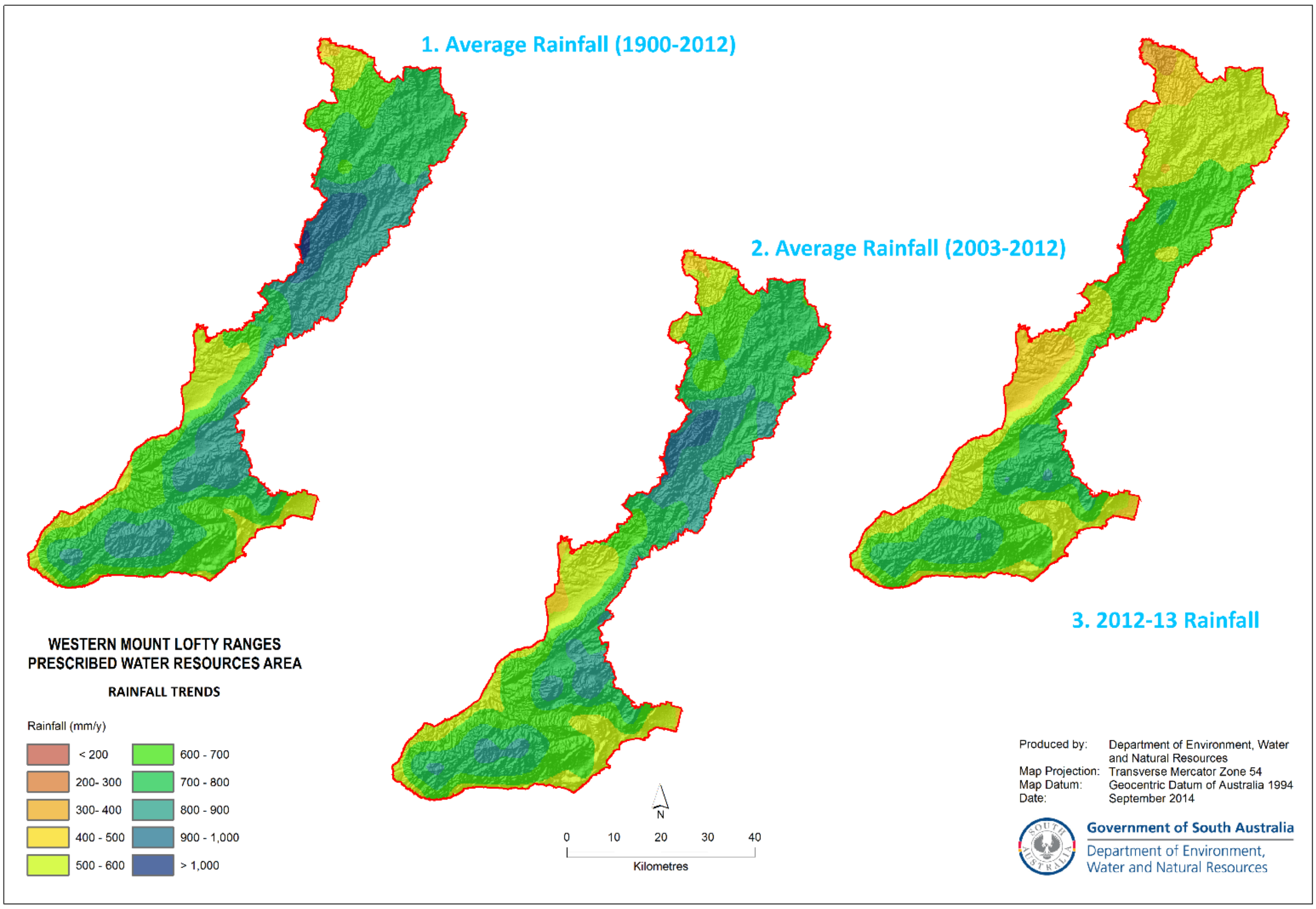


Figure 10. Annual rainfall distributions for the Western Mount Lofty Ranges PWRA

To identify periods of above or below average trends, the cumulative deviation from average annual rainfall (residual mass curve) is plotted in orange on Figures 11 to 17. An upward slope indicates a period of above average rainfall, while a downward slope indicates a period of below average rainfall.

Uraidla shows highly variable rainfall from 1889 to the late 1950s (Figure 11). From the late 1950s to the early 1990s there is a predominantly declining trend in rainfall apart from a small period of upward trending rainfall from the late 1960s to early 1970s. From the early 1990s there was a steadier trend in rainfall.

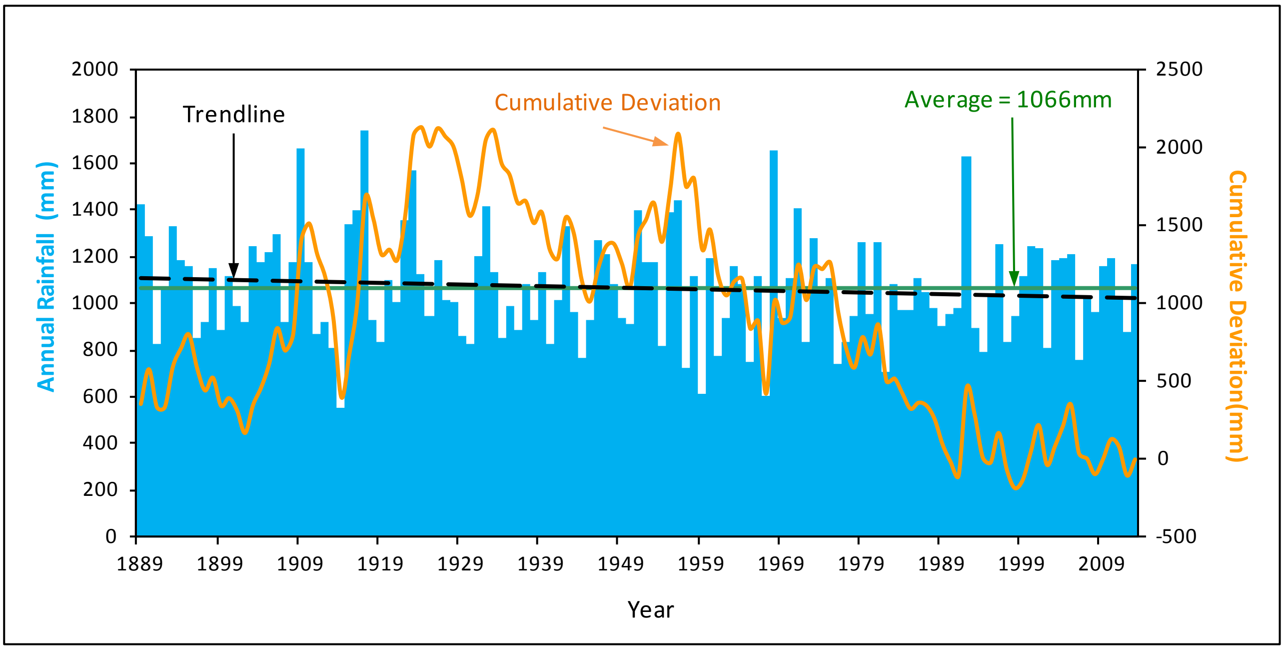


Figure 11. Uraidla annual rainfall showing long-term trend and cumulative deviation

Parawa shows a variable rainfall trend from 1889 to the mid 1920s before a declining trend to the early 1940s (Figure 12). The rainfall trend is upward from the early 1940s to the late 1950s before a period of predominantly declining rainfall trend to the late 1960s. The upward rainfall trend between the late 1960s and mid 1990s is followed by another declining trend in rainfall.

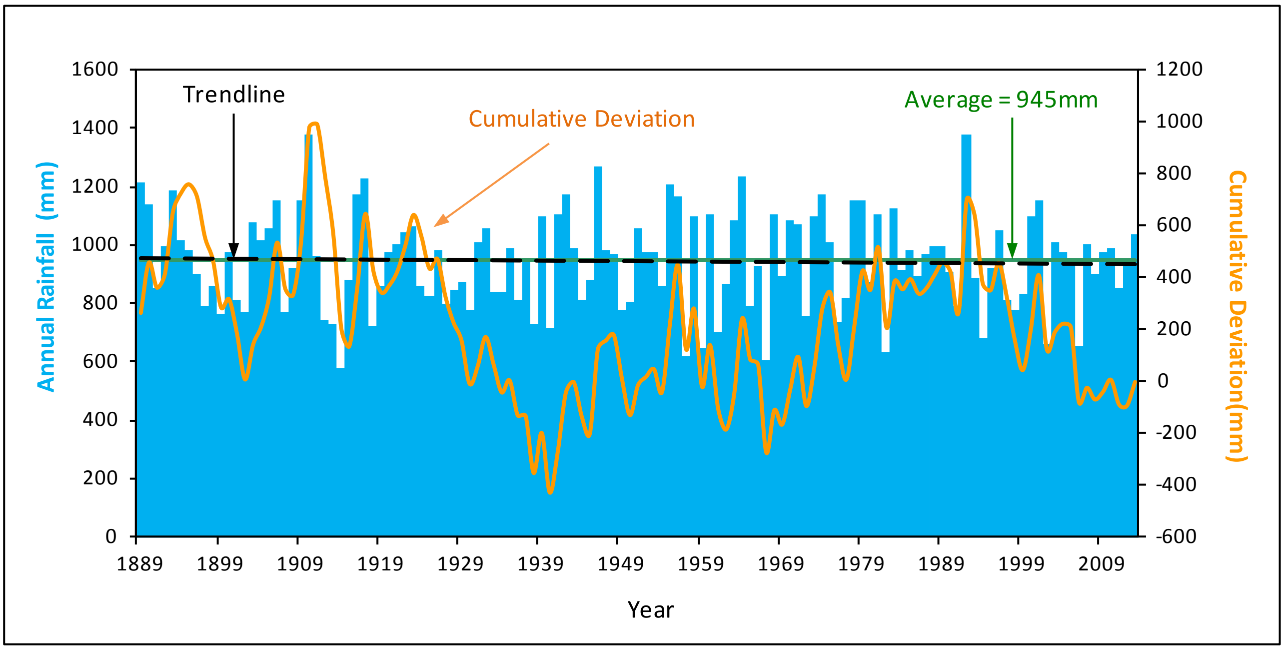


Figure 12. Parawa annual rainfall showing long-term trend and cumulative deviation

The rainfall trend for Cudlee Creek is declining from 1889 to the mid 1910s (Figure 13). From the mid 1910s the rainfall trend at Cudlee Creek is predominantly upward.

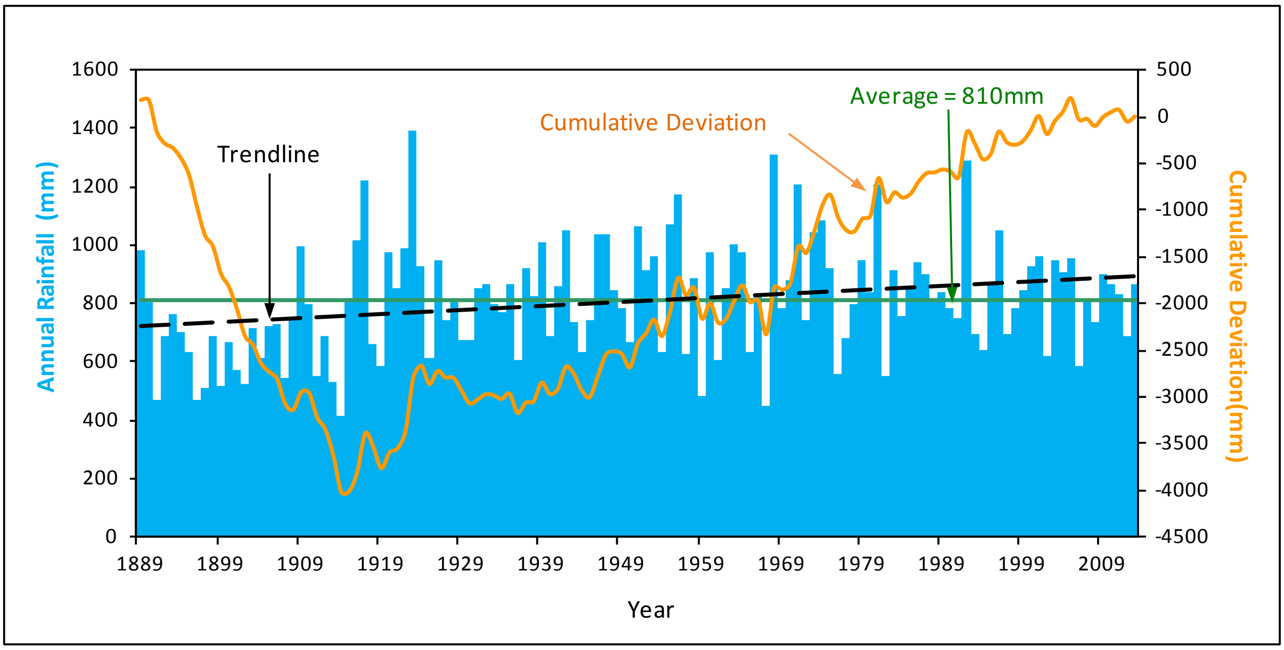


Figure 13. Cudlee Creek annual rainfall showing long-term trend and cumulative deviation

There are two distinct long-term rainfall trends shown for Mount Bold (Figure 14). A declining trend is shown between 1889 and the early 1950s and an upward trend from the late 1960s to present.

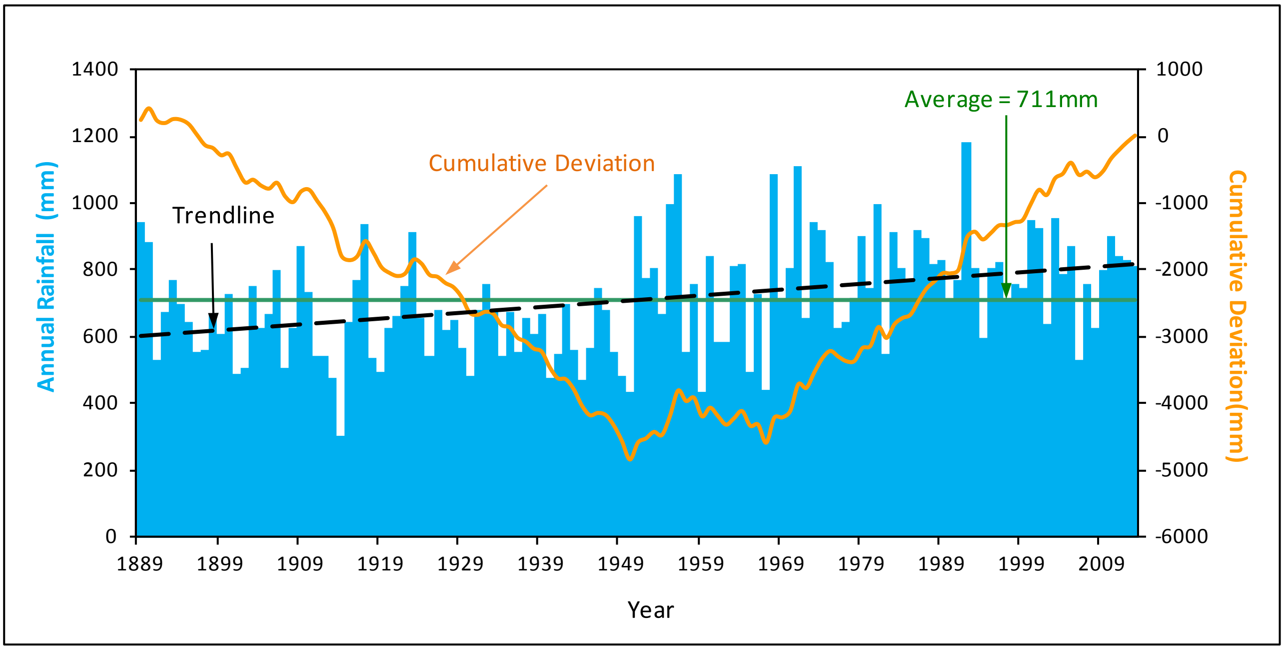


Figure 14. Mount Bold annual rainfall showing long-term trend and cumulative deviation

The annual rainfall trend for Mount Pleasant is steady from 1889 to the early 1910s before an inclining trend in rainfall to the mid 1920s (Figure 15). The rainfall trend declines from the mid 1920s to late 1940s before an upward trend to the late 1970s. The rainfall trend is predominantly declining from the late 1970s.

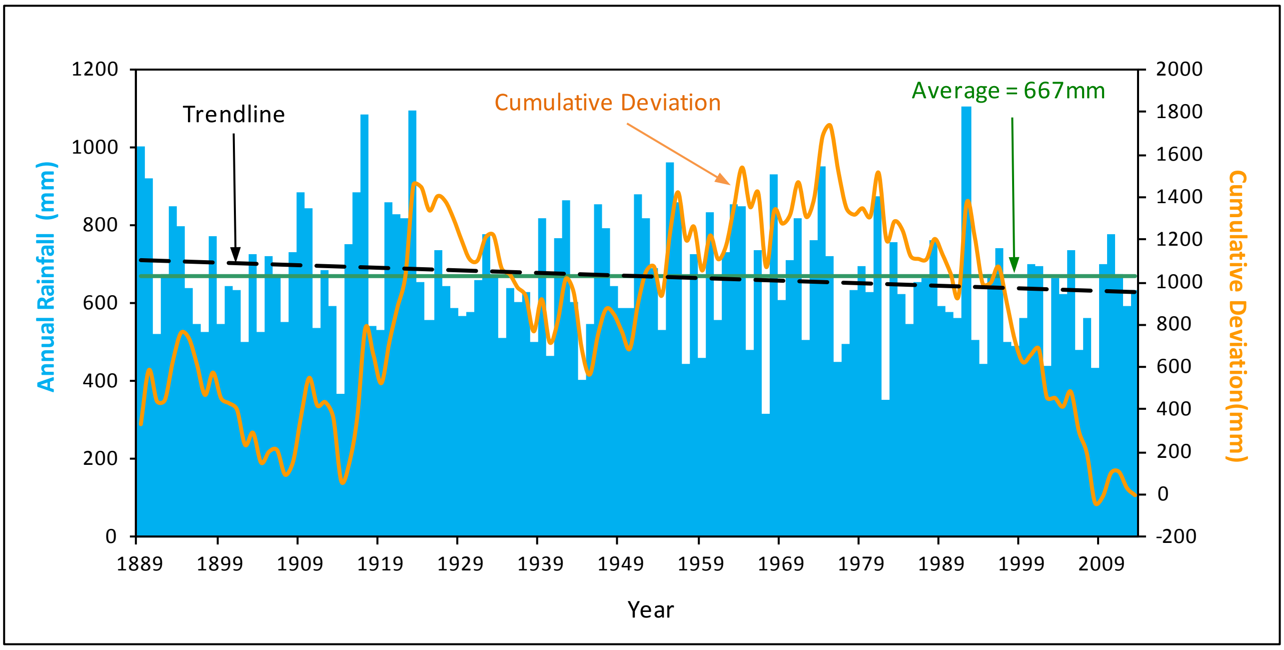


Figure 15. Mount Pleasant annual rainfall showing long-term trend and cumulative deviation

The annual rainfall trend at Yankalilla is declining to the early 1900s before a predominantly upward trend to the mid 1920s (Figure 16). A declining trend in rainfall occurred between the mid 1920s and early 1940s before a slightly upward trend to the mid 1990s inclusive of steady rainfall trends. There is a predominantly declining rainfall trend from the mid 1990s.

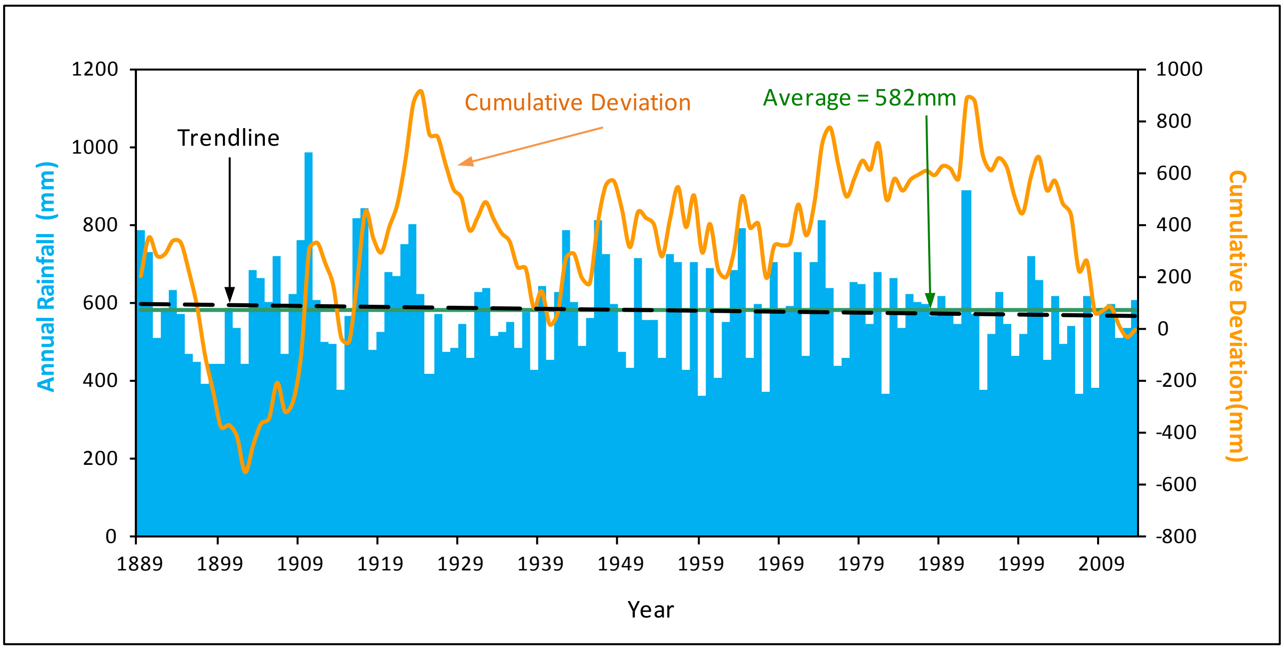


Figure 16. Yankalilla annual rainfall showing long-term trend and cumulative deviation

The annual rainfall trend at Port Elliot was variable between 1889 and the early 1910s before a sharp declining trend to the mid 1910s (Figure 17). A short period of upward trending rainfall to the mid 1920s is followed by another declining trend then a steady trend in rainfall to the late 1940s. A sharp upward trend to around 1950 is followed by a predominantly declining trend to the late 1960s. The rainfall trend is again upward from the late 1960s to late 1970s before predominantly declining to the early 1990s. A sharp upward trend to the mid 1990s is followed by a declining trend.

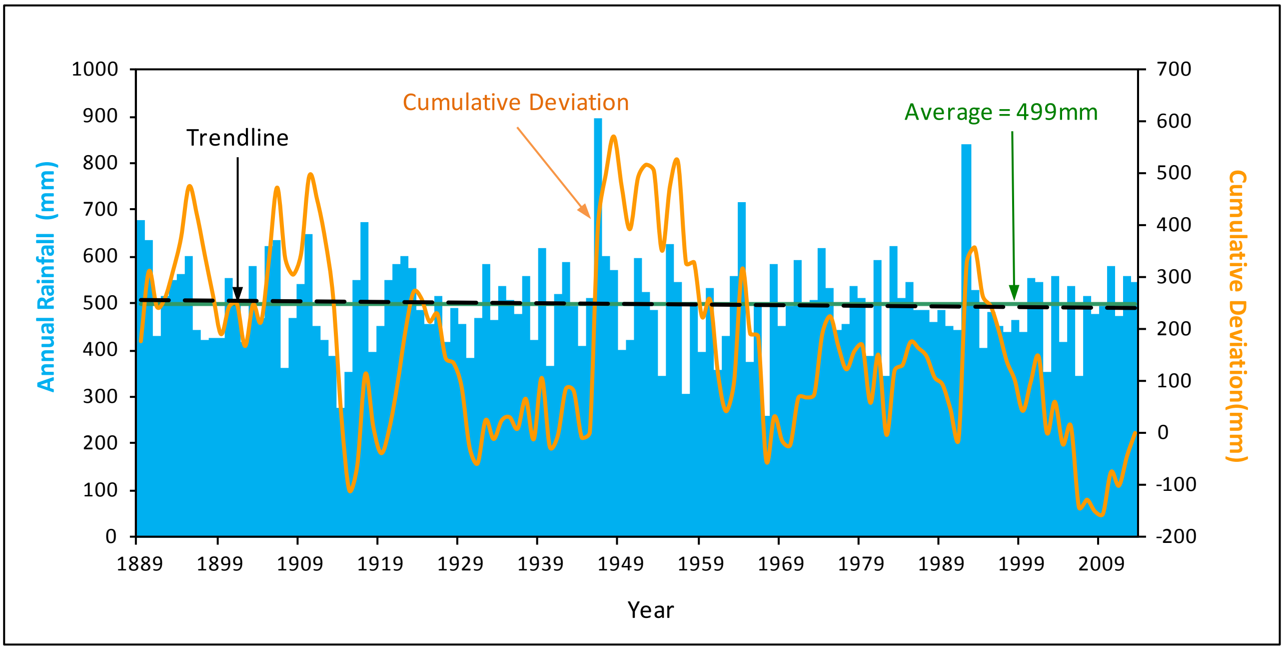


Figure 17. Port Elliot annual rainfall showing long-term trend and cumulative deviation

STREAMFLOW

Status	Degree of confidence	Comments on recent historical context
Below average streamflow at six of nine streamflow analysis sites	High: data derived from long-term gauging stations	Below average streamflow at South Para in 2012–13 after above average streamflow in 2011–12. 2012–13 was the 2nd successive year of below average streamflow at Mount Pleasant, Sixth Creek, Kersbrook Creek, Scott Creek and Myponga River. Above average streamflow at Inman River and Yankalilla River in 2012–13 after below average streamflow in 2011–12. 2012–13 was the third successive year of above average streamflow at Baker Gully following 4 consecutive years of below average streamflow from 2006–10.

The streamflow monitoring network for the Western Mount Lofty Ranges PWRA is summarised in Table 2 and shown in Figure 18. Some stations also include salinity in the list of variables monitored. For the purpose of reporting on the status of streamflow, nine long-term gauging stations have been selected for analysis of streamflow trends: Torrens River at Mount Pleasant (A5040512), Sixth Creek at Castambul (A5040523), Kersbrook Creek upstream (u/s) Millbrook Reservoir (A5040525), South Para River 2.6km SE Gawler Post Office (PO) (A5050503), Scott Creek at Scott Bottom (A5030502), Baker Gully 4.5km WNW Kangarilla (A5030503), Myponga River u/s dam and road bridge (A5020502), Inman River u/s sewage treatment works (A5010503) and Yankalilla River downstream (d/s) Blackfellows Creek (A5011006). Streamflow data are available via WaterConnect: http://www.waterconnect.sa.gov.au.

The PWRA has a total of eight catchments based on surface water catchment boundaries. Catchments include the South Para River, the Little Para River, the River Torrens, the Onkaparinga River, the Willunga Basin, the Myponga River, the Hindmarsh and Inman Rivers and the Fleurieu coastal catchments (Figure 18). South Para River, Little Para River, Torrens River, Onkaparinga River and Myponga River catchments contain large on-stream reservoirs with a combined storage capacity of more than 182 gigalitres (AMLRNRMB 2013). Willunga Basin catchment is an elevated coastal plain and, unlike the other catchments, has no major rivers (AMLRNRMB 2013). Streams gain water from catchment runoff largely in the hills on the eastern side of the PWRA and the majority discharge to Gulf St Vincent. Streamflow in the Fleurieu Coastal catchments radiates outward from a central plateau towards the coast.

Table 2. Summary of gauging stations used in the Western Mount Lofty Ranges PWRA status report

Gauging station	**Station no.**	**Period of record**	**Average annual streamflow**	
			ML	**mm**
Torrens River at Mount Pleasant	A5040512	1973–2012	2011	77
Sixth Creek at Castambul	A5040523	1994–2012	6617	150
Kersbrook Creek (u/s) Millbrook Reservoir	A5040525	1992–2012	2715	120
South Para River 2.6km SE Gawler PO*	A5050503	1982–2012	6815	21
Scott Creek at Scott Bottom	A5030502	1969–2012	3619	136
Baker Gully 4.5km WNW Kangarilla	A5030503	2003–12	4038	83
Myponga River u/s dam and road bridge	A5020502	1998–2012	6522	86
Inman River u/s sewage treatment works	A5010503	1995–2012	7251	44
Yankalilla River d/s Blackfellows Creek	A5011006	2006–12	4365	57

*Streamflow is influenced by the presence of three on-stream reservoirs upstream of the gauging station.

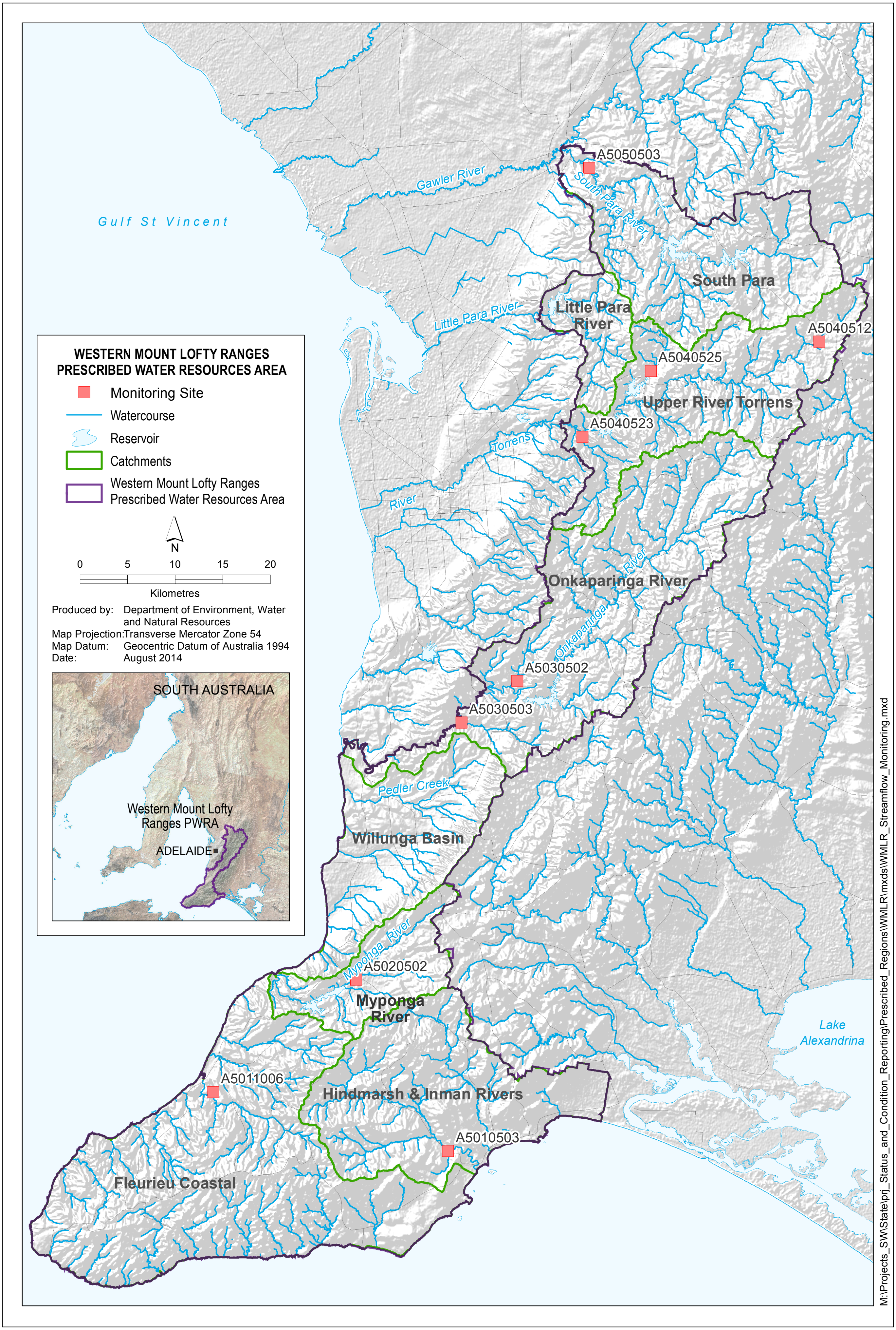
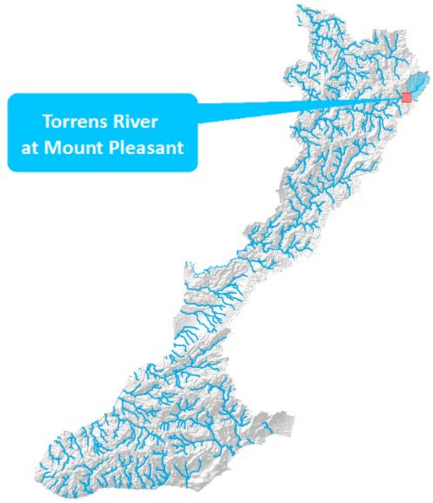


Figure 18. Location of streamflow and salinity monitoring stations in the Western Mount Lofty Ranges PWRA

STREAMFLOW DATA – TORRENS RIVER

Torrens River at Mount Pleasant gauging station (A5040512) experienced a below average annual streamflow of 1823 ML for 2012–13 (9% lower than the long-term average), as highlighted in green in Figure 19. Aside from above average flows in 2010–11, Torrens River has experienced below average streamflow since 2006–07. During the forty year period since 1973–74, only fourteen experienced streamflows that were above the long-term average. Since 1992–93, a twenty year period, above average streamflows were observed during six years.

The monthly breakdown of streamflow for 2012–13 (Figure 20) highlights that August received well above average streamflow. August alone received 52% of the annual total, while July received 23%. All other months aside from May received below average streamflow. No streamflow was recorded between December and April.



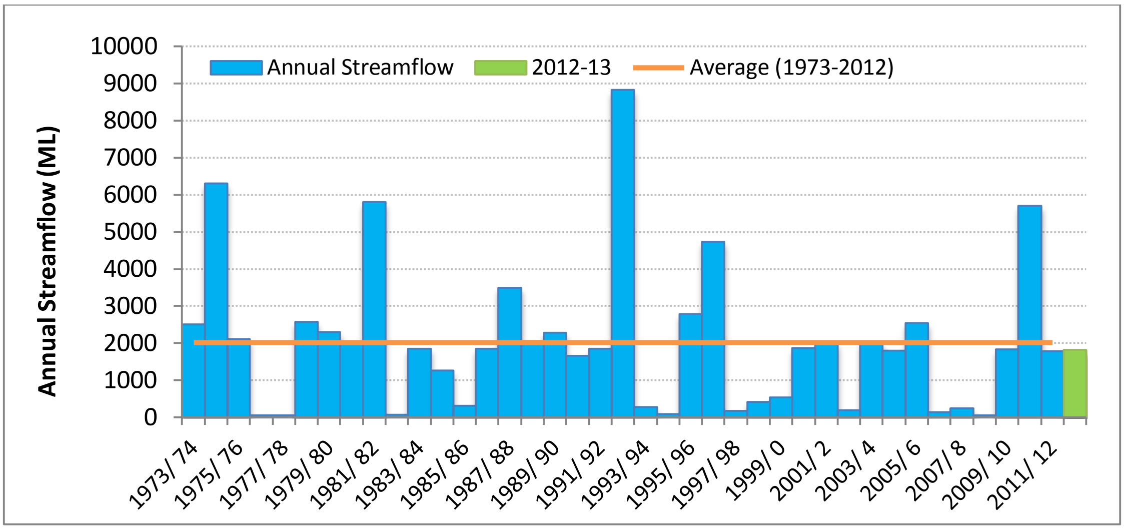


Figure 19. Torrens River annual streamflow (ML)

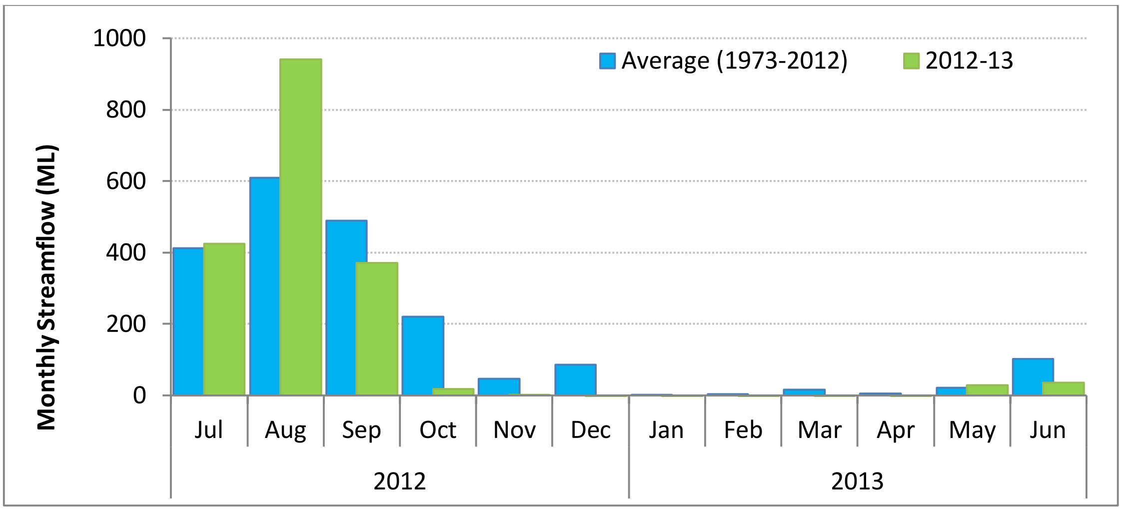


Figure 20. Torrens River monthly streamflow (ML)

STREAMFLOW DATA – SIXTH CREEK

Sixth Creek at Castambul gauging station (A5040523) experienced a below average annual streamflow of 2888 ML for 2012–13 (55% lower than the long-term average), as highlighted in green in Figure 21. Aside from above average flows during 2009–10 and 2010–11, Sixth Creek has experienced below average streamflow since 2006–07. During the nineteen year period since 1994–95, only nine experienced streamflows that were above the long-term average.

The monthly breakdown of streamflow for 2012–13 (Figure 22) highlights that all months received below average streamflows. August received 41% of the annual total, while July and September received 20% and 12% respectively.

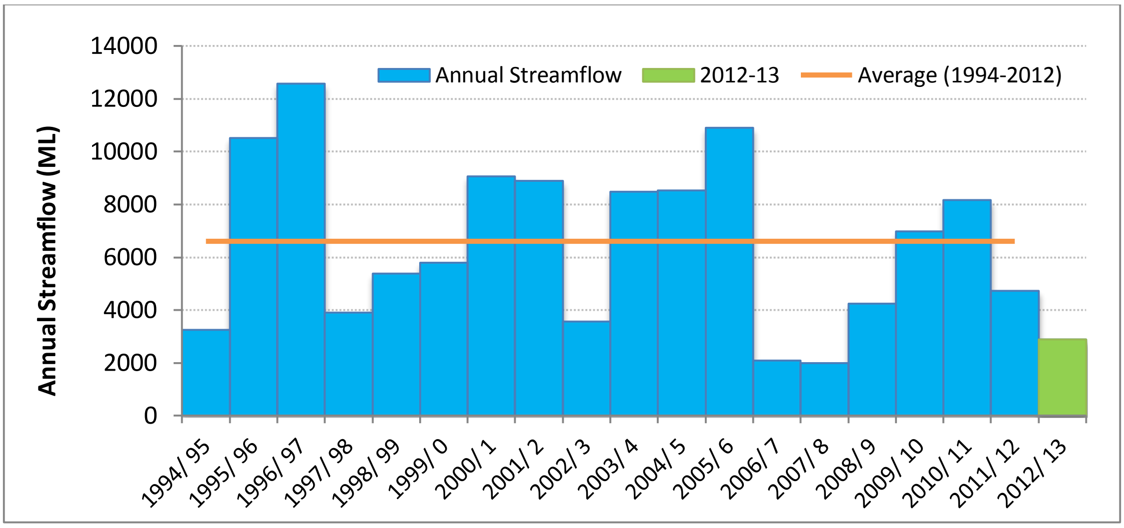


Figure 21. Sixth Creek annual streamflow (ML)

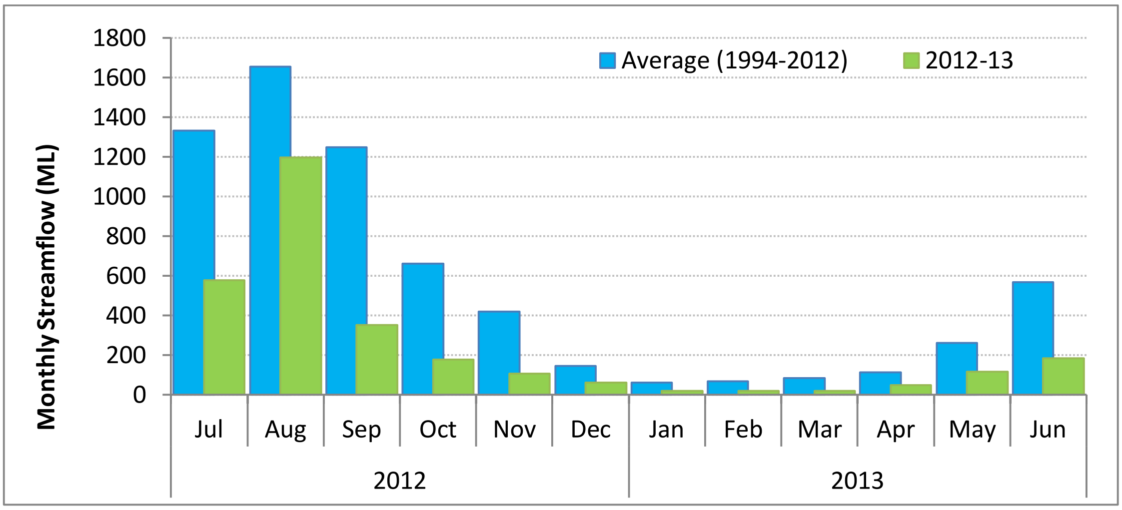


Figure 22. Sixth Creek monthly streamflow (ML)

STREAMFLOW DATA – KERSBROOK CREEK

Kersbrook Creek u/s Millbrook Reservoir gauging station (A5040525) experienced a below average annual streamflow of 991 ML for 2012–13 (64% lower than the long-term average), as highlighted in green in Figure 23. Aside from above average flows during 2009–10 and 2010–11, Kersbrook Creek has experienced below average streamflow since 2006–07. During the twenty-year period since 1992–93, only nine experienced streamflows that were above the long-term average.

The monthly breakdown of streamflow for 2012–13 (Figure 24) highlights that May was the only month to receive above average streamflow. August alone received 62% of the annual total, while July and September received 16% and 13% respectively. No streamflow was recorded between December and April.

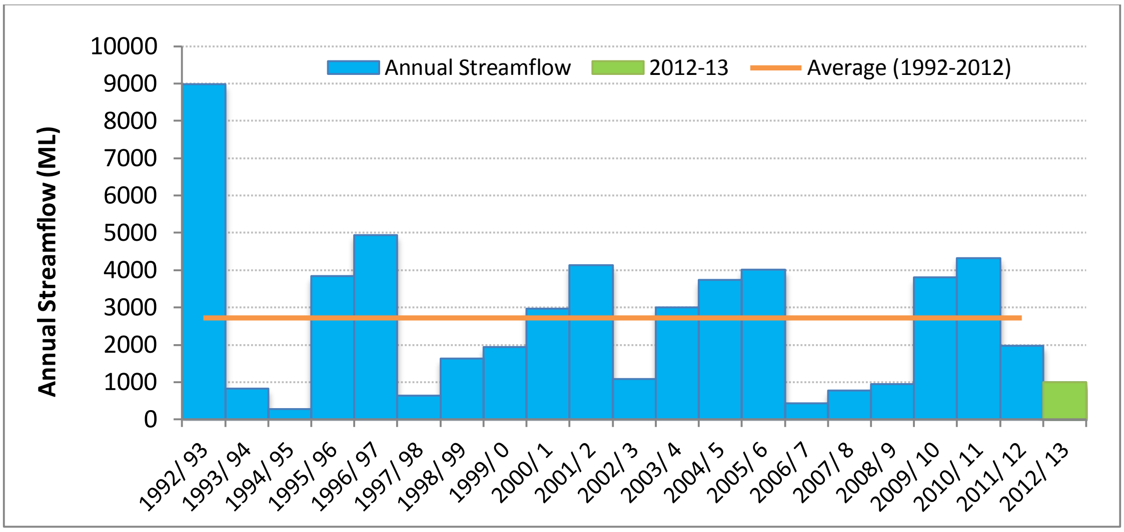


Figure 23. Kersbrook Creek annual streamflow (ML)

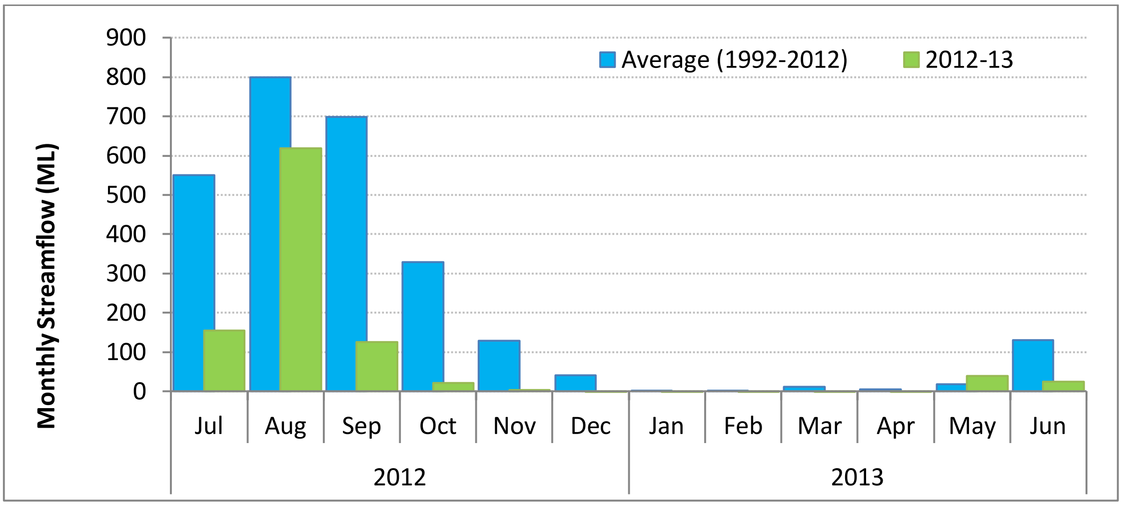


Figure 24. Kersbrook Creek monthly streamflow (ML)

STREAMFLOW DATA – SOUTH PARA

South Para River 2.6km SE Gawler PO gauging station (A5050503) experienced a below average annual streamflow of 1431 ML for 2012–13 (79% lower than the long-term average), as highlighted in green in Figure 25. Aside from above average flows during 2009–10 and 2011–12, South Para River has experienced below average streamflow since 2006–07. During the thirty one year period since 1982–83, only six experienced streamflows that were above the long-term average. Since 1992–93, a twenty-year period, above average streamflows were observed during five years.

The monthly breakdown of streamflow for 2012–13 (Figure 26) highlights that all months received below average streamflow. September received 32% of the annual total. No streamflow was recorded between January and May.

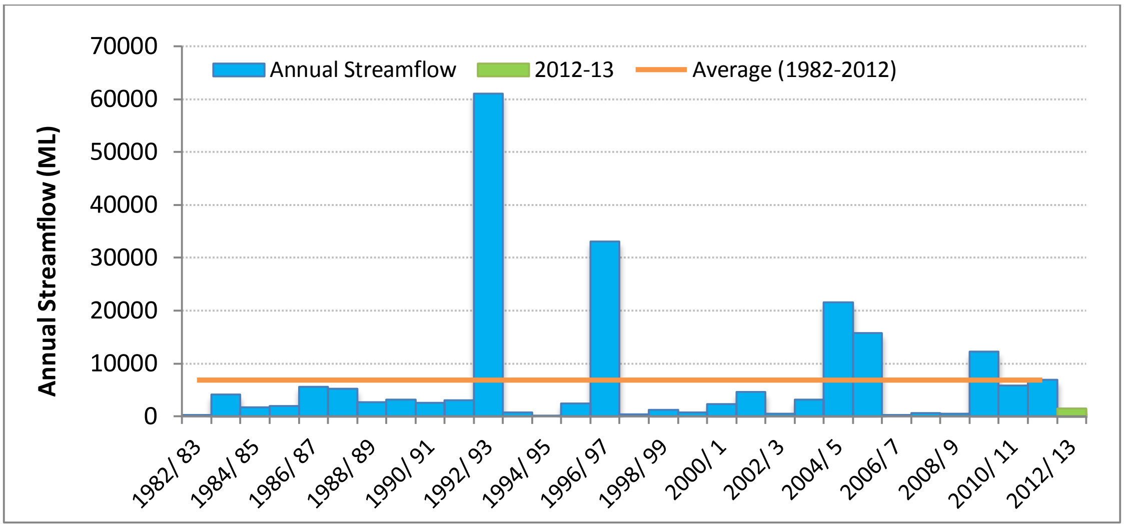


Figure 25. South Para River annual streamflow (ML)

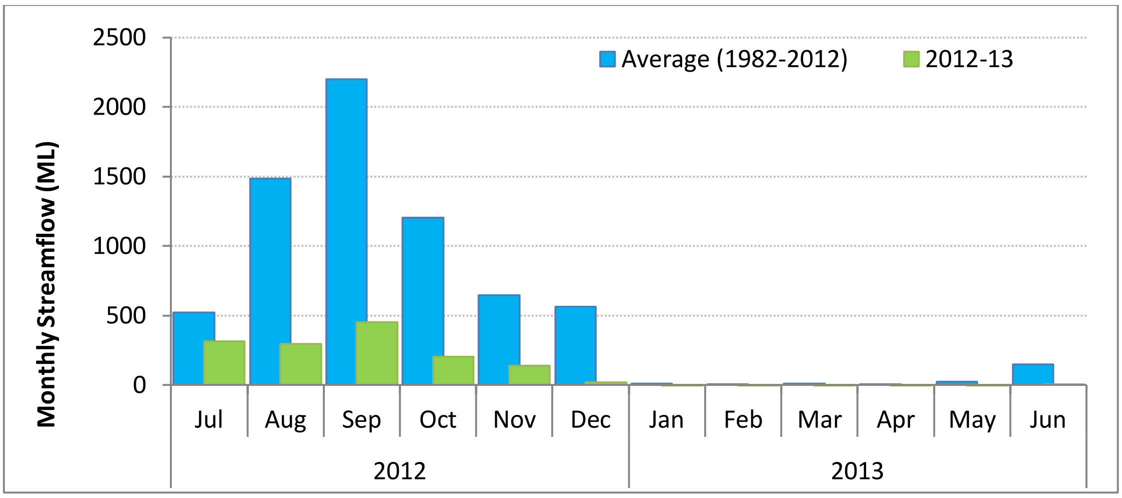


Figure 26. South Para River monthly streamflow (ML)

STREAMFLOW DATA – SCOTT CREEK

Scott Creek at Scott Bottom gauging station (A5030502) experienced a below average annual streamflow of 2568 ML for 2012–13 (29% lower than the long-term average), as highlighted in green in Figure 27. Aside from above average flows during 2010–11, Scott Creek has experienced below average streamflow since 2006–07. During the forty four year period since 1969–70, only twenty experienced streamflows that were above the long-term average. Since 1992–93, a twenty-year period, above average streamflows were observed during eight years.

The monthly breakdown of streamflow for 2012–13 (Figure 28) highlights that August was the only month to receive above average streamflow. August received 39% of the annual total, while July and September received 31% and 15% respectively.

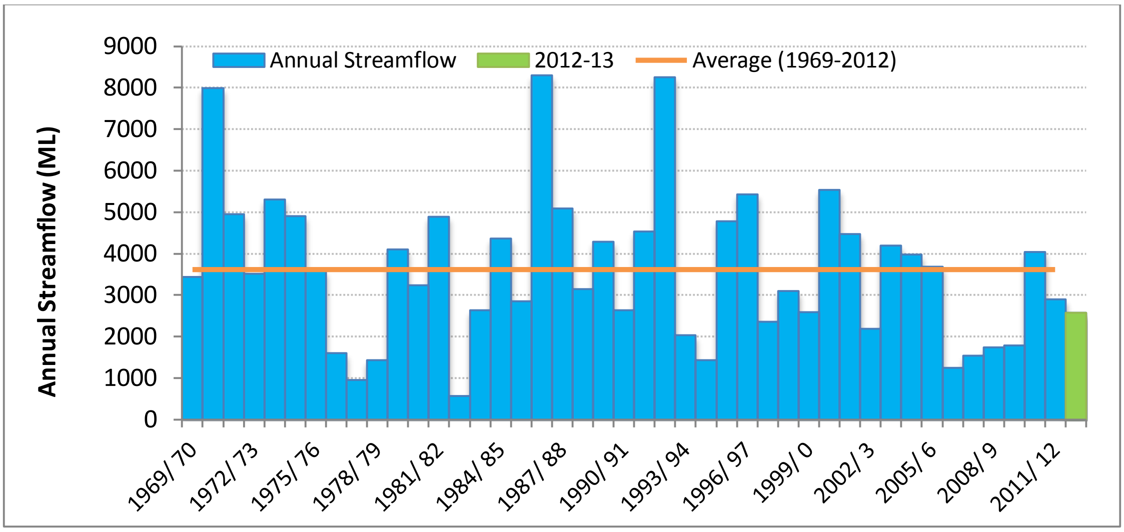


Figure 27. Scott Creek annual streamflow (ML)

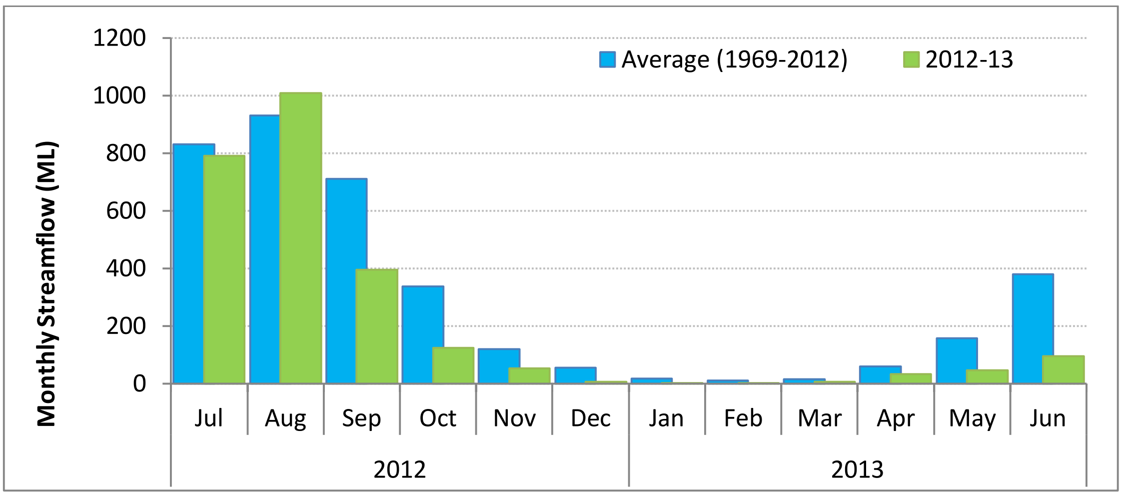


Figure 28. Scott Creek monthly streamflow (ML)

STREAMFLOW DATA – BAKER GULLY

Baker Gully 4.5km WNW Kangarilla gauging station (A5030503) experienced an above average annual streamflow of 6897 ML for 2012–13 (71% higher than the long-term average), as highlighted in green in Figure 29. 2012–13 was the third successive year of above average annual streamflow at Baker Gully. Prior to 2010–11, Baker Gully experienced four successive years of below average streamflow since 2006–07.

The monthly breakdown of streamflow for 2012–13 (Figure 30) highlights that July, August and September received well above average streamflows. August received 32% of the annual total, while July and September received 30% and 20% respectively. No streamflow was recorded between January and March.

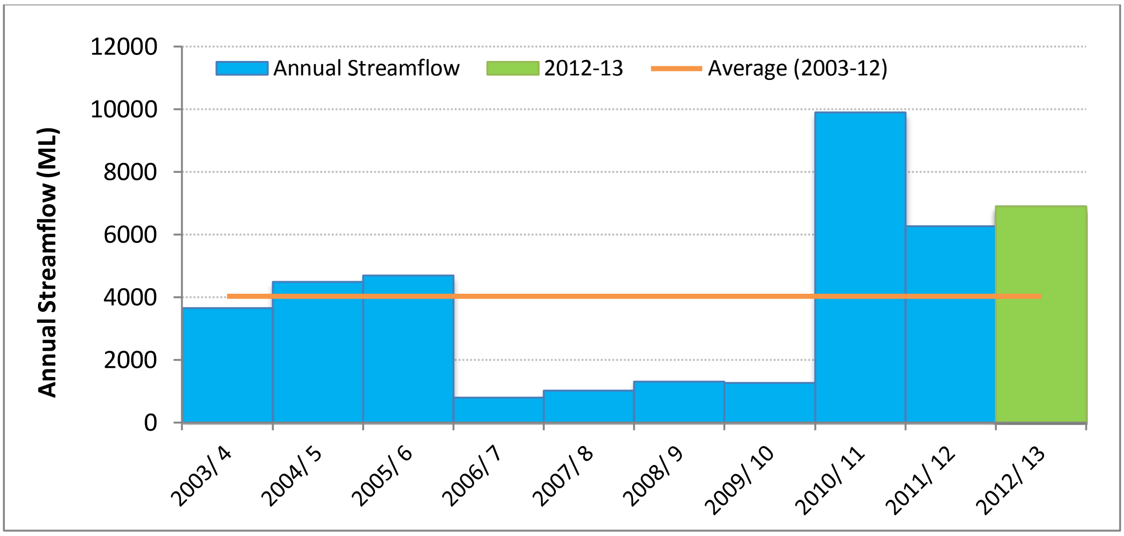


Figure 29. Baker Gully annual streamflow (ML)

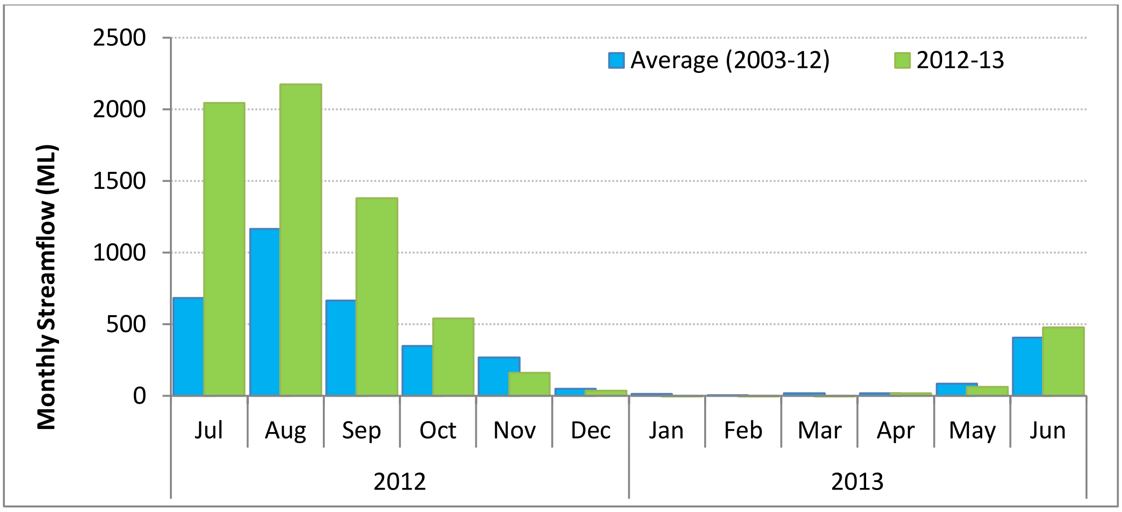


Figure 30. Baker Gully monthly streamflow (ML)

STREAMFLOW DATA – MYPONGA RIVER

Myponga River u/s dam and road bridge gauging station (A5020502) experienced a below average annual streamflow of 5610 ML for 2012–13 (14% lower than the long-term average), as highlighted in green in Figure 31. Aside from above average flows during 2009–10 and 2010–11, Myponga River has experienced below average streamflow since 2006–07. During the fifteen-year period since 1998–99, only six experienced streamflows that were above the long-term average.

The monthly breakdown of streamflow for 2012–13 (Figure 32) highlights that July and August both received above average streamflows. July alone received 33% of the annual total, while August received 29%. No streamflow was recorded between February and March.

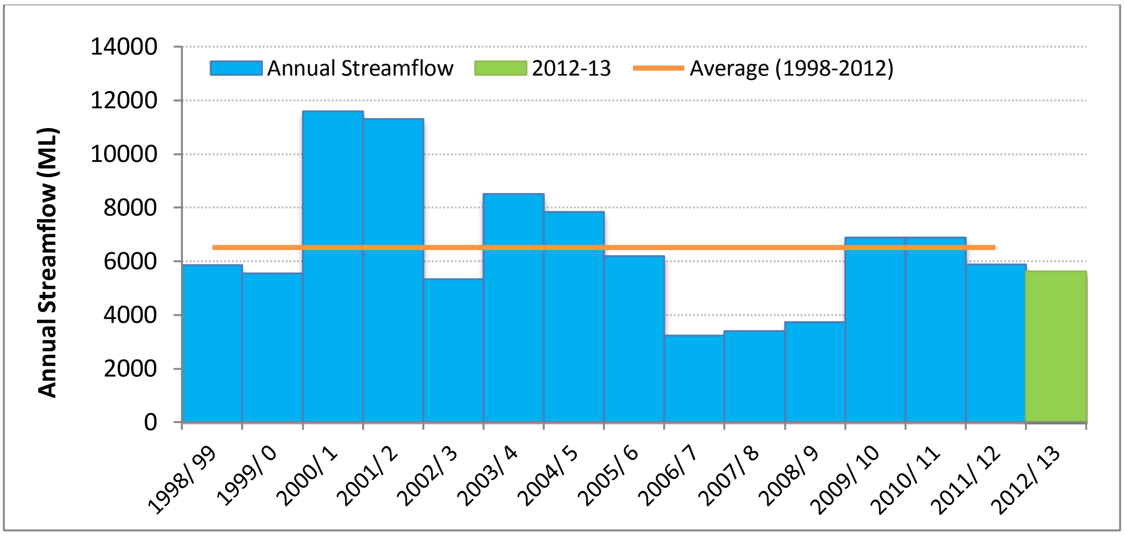


Figure 31. Myponga River annual streamflow (ML)

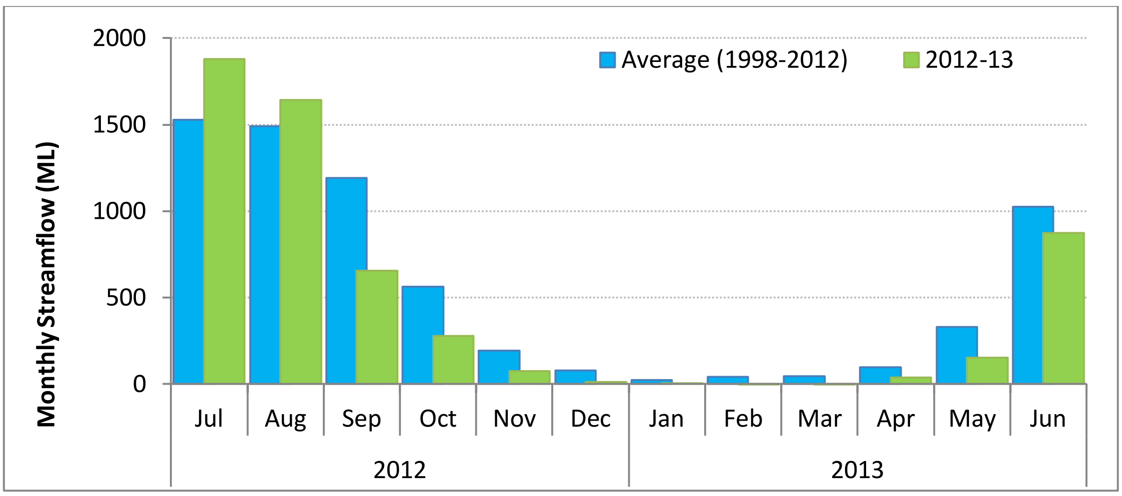


Figure 32. Myponga River monthly streamflow (ML)

STREAMFLOW DATA – INMAN RIVER

Inman River u/s sewage treatment works gauging station (A5010503) experienced an above average annual streamflow of 10 348 ML for 2012–13 (43% higher than the long-term average), as highlighted in green in Figure 33. Prior to above average flows in 2012–13 and 2010–11, Inman River experienced below average streamflow since 2004–05. During the eighteen-year period since 1995–96, only seven experienced streamflows that were above the long-term average.

The monthly breakdown of streamflow for 2012–13 (Figure 34) highlights that July and August both received well above average streamflows. August alone received 42% of the annual total, July receiving 35% of the annual total and both months were double the averages for those months. All other months recorded below average annual streamflows.

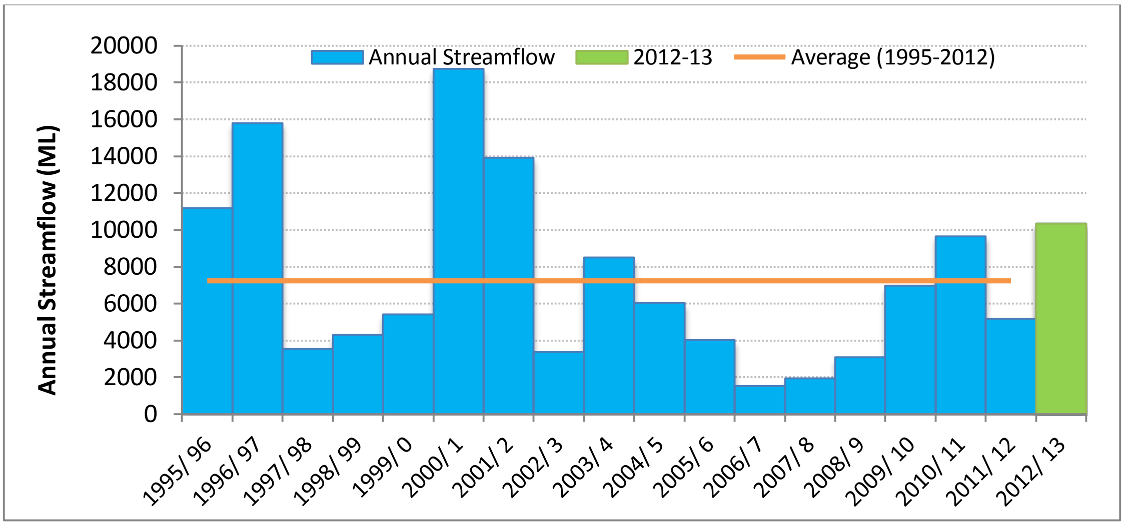


Figure 33. Inman River annual streamflow (ML)

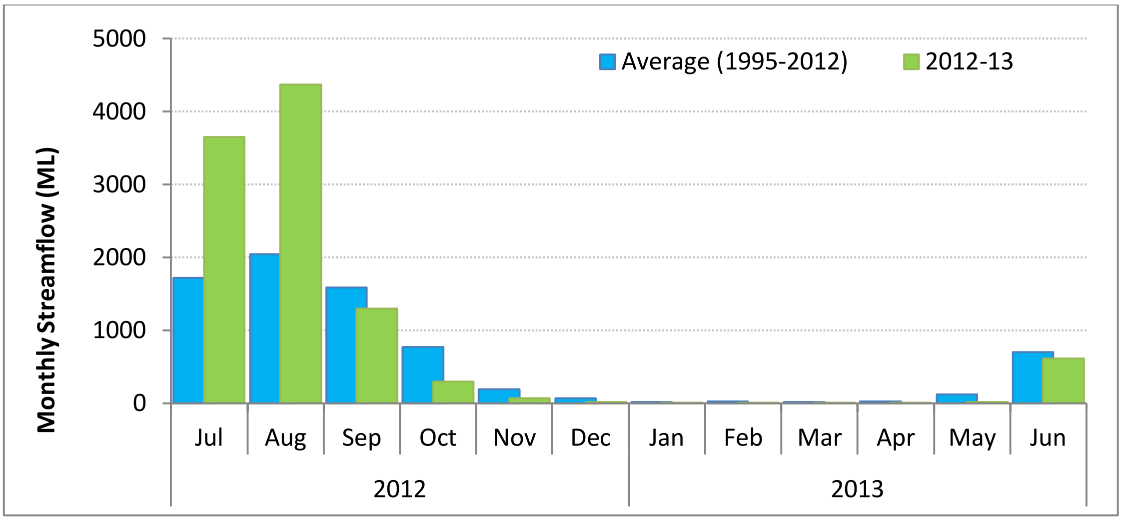
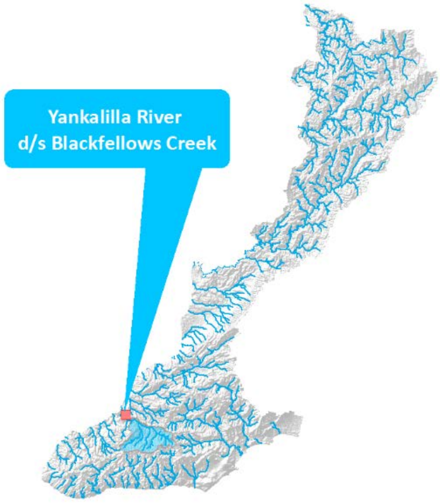


Figure 34. Inman River monthly streamflow (ML)

STREAMFLOW DATA – YANKALILLA RIVER

Yankalilla River d/s Blackfellows Creek gauging station (A5011006) experienced an above average annual streamflow of 6072 ML for 2012–13 (39% higher than the long-term average), as highlighted in green in Figure 35. Prior to above average flows in 2012–13, Yankalilla River also received above average flows in 2009–10 and 2010–11. During the seven-year period since 2006–07, four of these had streamflows that were below the long-term average.

The monthly breakdown of streamflow for 2012–13 (Figure 36) highlights that June, July and August received well above average streamflows. August alone received 31% of the annual total, while July received 30% and more than double the average for that month. No streamflow was recorded between February and March.



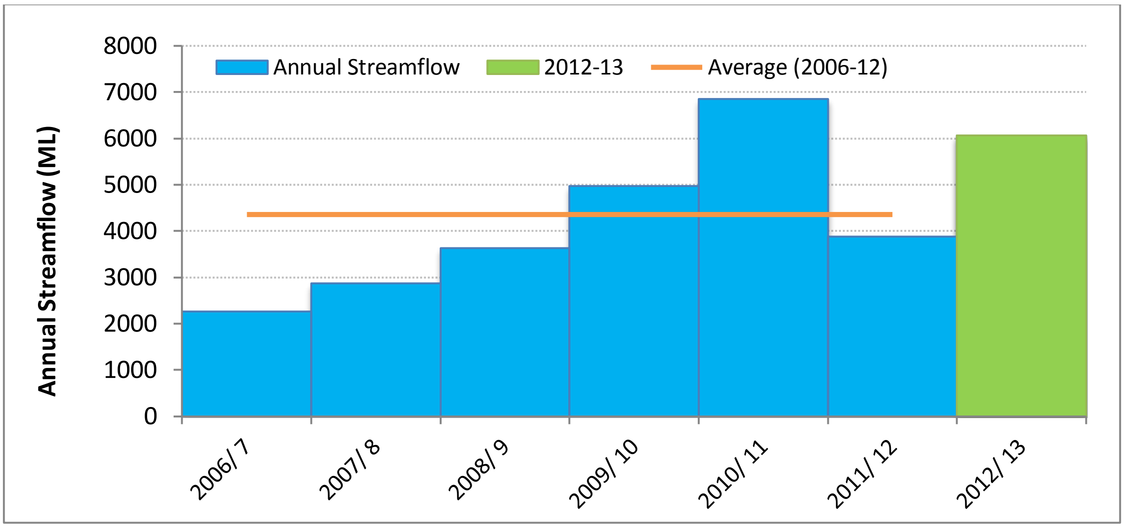


Figure 35. Yankalilla River annual streamflow (ML)

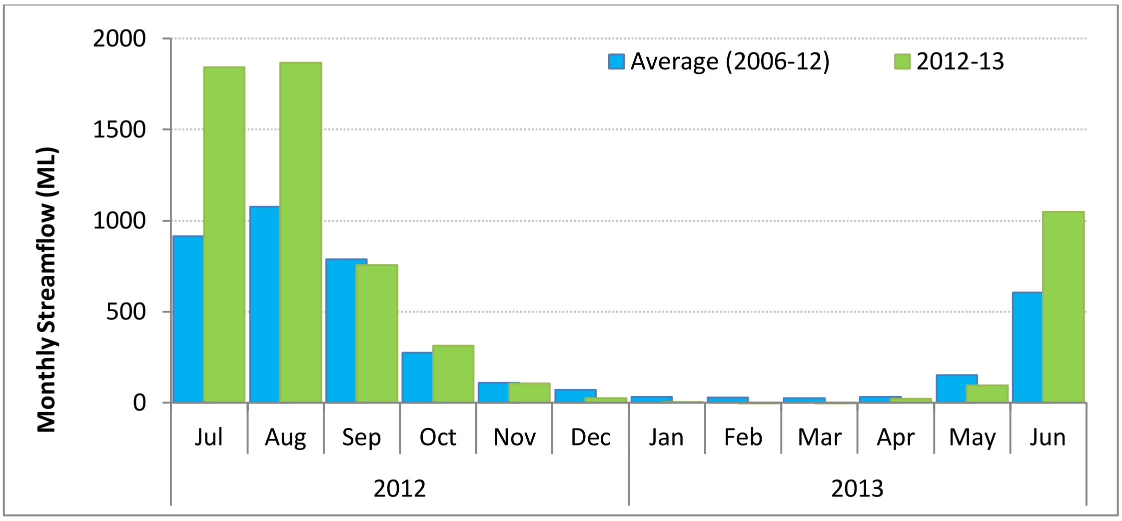


Figure 36. Yankalilla River monthly streamflow (ML)

RESERVOIR STORAGE

This status report for the Western Mount Lofty Ranges PWRA does not include an assessment of reservoir trends, however it is important to recognise the presence of reservoirs in the area.

SA Water has an obligation to ensure public water supply but is also required to participate in an environmental water provisions trial to reaches downstream of reservoirs as part of their licence requirements. Environmental water provisions aim to improve ecosystem health by providing a flow regime that reduces the risk to downstream natural biota and processes through the release of water from reservoirs. SA Water will supply up to 16.5 GL annually to be released from its reservoirs for environmental flow purposes, subject to the outcomes of trial investigations of the required flow regime (AMLRNRMB 2013).

Water storage data (Table 3) has been sourced from BoM for accessible capacity only i.e. excludes dead storage capacity. Further information on water storage data is available at: http://water.bom.gov.au

Table 3. Water storage summary for Western Mount Lofty Ranges PWRA reservoirs

Reservoir name	**Date of construction**	**Storage capacity (ML)**	**Volume as of 30th June 2012 (ML) (% Full)**	**Volume as of 30th June 2013 (ML) (% Full)**	**Change in volume**
Warren Reservoir A5050500	1916	4780	2787 (58.3%)	3895 (81.5%)	↑
South Para Reservoir A5050516	1958	44 537	25 847 (58%)	15 152 (34%)	↓
Barossa Reservoir A5050534	1902	4491	3973 (88.5%)	4097 (91.2%)	↑
Little Para Reservoir A5040528	1977	20 612	4412 (21.4%)	6801 (33%)	↑
Kangaroo Creek Reservoir A5040531	1969	18 700	5244 (28%)	5091 (27.2%)	↓
Millbrook Reservoir A5040520	1918	16 312	9788 (60%)	8694 (53.3%)	↓
Mount Bold Reservoir A5030501	1938	45 873	11 469 (25%)	8951 (19.5%)	↓
Myponga Reservoir A5020501	1962	26 830	21 200 (79%)	21 864 (81.5%)	↑

SALINITY

Status	Degree of confidence	Comments on recent historical context
Steady	Fair - data is derived from short-term monitoring stations	The salinity trend at most stations shows the high range of salinity in 2012–13 being comparable to 2011–12.

TORRENS RIVER D/S HOLLANDS CREEK

Salinity data has been recorded at Torrens River d/s Hollands Creek (A5041003) since 2003. Data from the station provides a fair indication of salinity in the river over the past 10 years (Figure 37).

Prior to archiving in Hydstra, DEWNR's surface water archive, data is coded according to the relative quality of the time series data. For this station, 71% of the recorded data is rated as good or fair quality, 1% as poor or unknown and 28% as either missing or outside the recordable range. Data rated as missing or outside the recordable range includes reduced or cease-to-flow periods where the salinity probe is above the height of water and unable to register a measurement. As salinity is expected to be higher during reduced streamflow events, the ability to monitor potentially higher salinities is reduced.

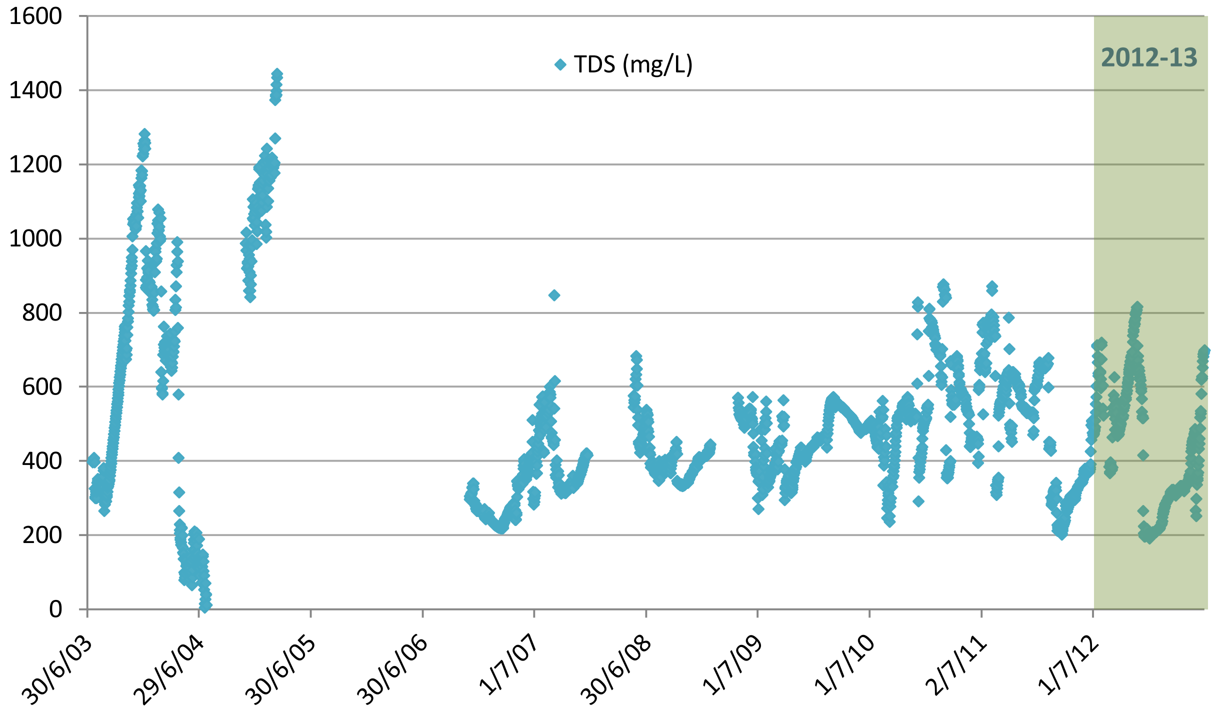


Figure 37. Salinity data at Torrens River d/s Hollands Creek from 2003–13

Of the total record, 95% was recorded as <1000 mg/L, 5% of the record was between 1000–1500 mg/L. The salinity range in 2012–13 is comparable to the previous few years, with higher values between 800–900 mg/L but less than the high salinity levels recorded in the early part of the data period. Salinity data are available via WaterConnect: http://www.waterconnect.sa.gov.au.

ONKAPARINGA RIVER U/S HAHNDORF DISSIPATER

Salinity data have been recorded at Onkaparinga River u/s Hahndorf Dissipater (A5031001) since 2002. Even though some data gaps are present, the record is long enough to provide a fair indication of salinity in the river over the past eleven years (Figure 38).

For this station, 76% of the recorded data is rated as good or fair quality, 5% at poor or unknown quality and 19% as either missing or outside the recordable range.

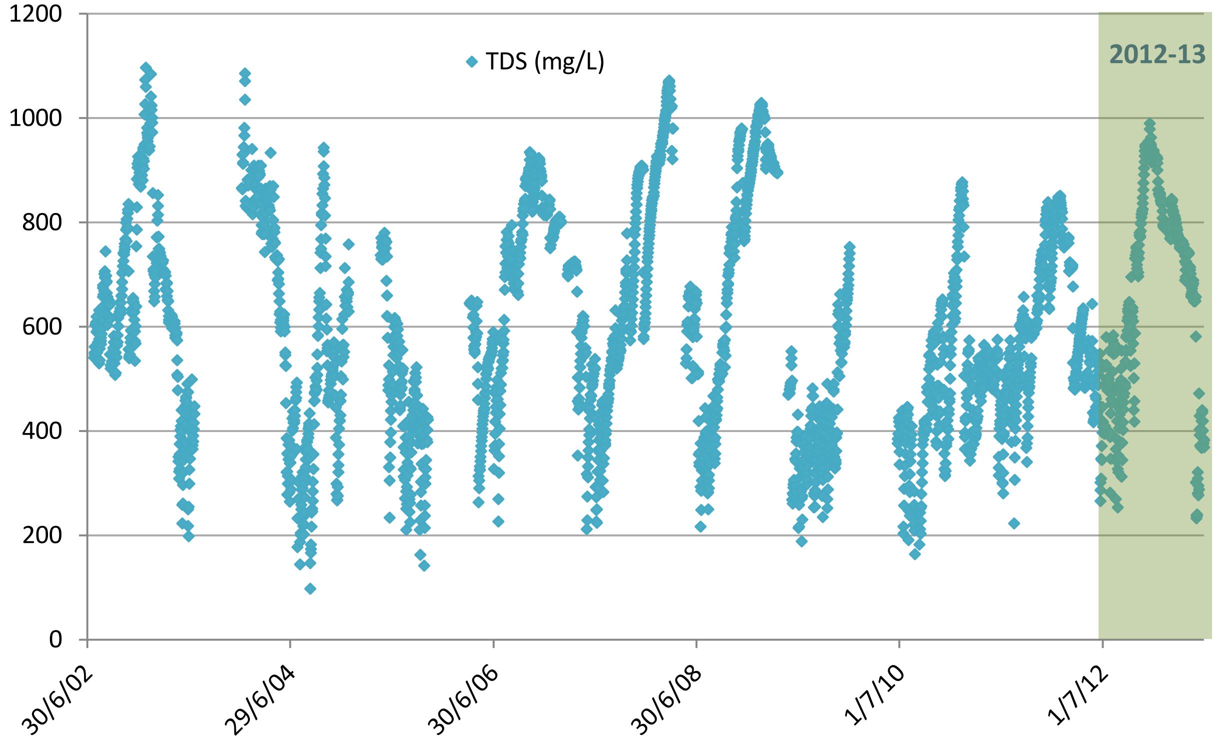


Figure 38. Salinity data at Onkaparinga River u/s Hahndorf Dissipater from 2002–13

Of the total record, 98% was recorded as <1000 mg/L, 2% of the record was between 1000–1100 mg/L. The salinity range in 2012–13 is slightly higher when compared to the previous few years, with higher values of 1000 mg/L but less than the high salinity levels recorded in the early and mid-part of the data period.

INMAN RIVER U/S SEWAGE TREATMENT WORKS

Salinity data has been recorded at Inman River u/s sewage treatment works (A5010503) since 2009. Despite the short period of data, the station shows a clear pattern of salinity in the river over the past four years (Figure 39). This pattern of salinity clearly illustrates the lower concentration of salinity being associated with the generally higher winter streamflows. Reduced volume of streamflow during summer months generally results in a higher concentration of salinity.

For this station, 91% of the recorded data is rated as good or fair quality and 9% as either missing or outside the recordable range.

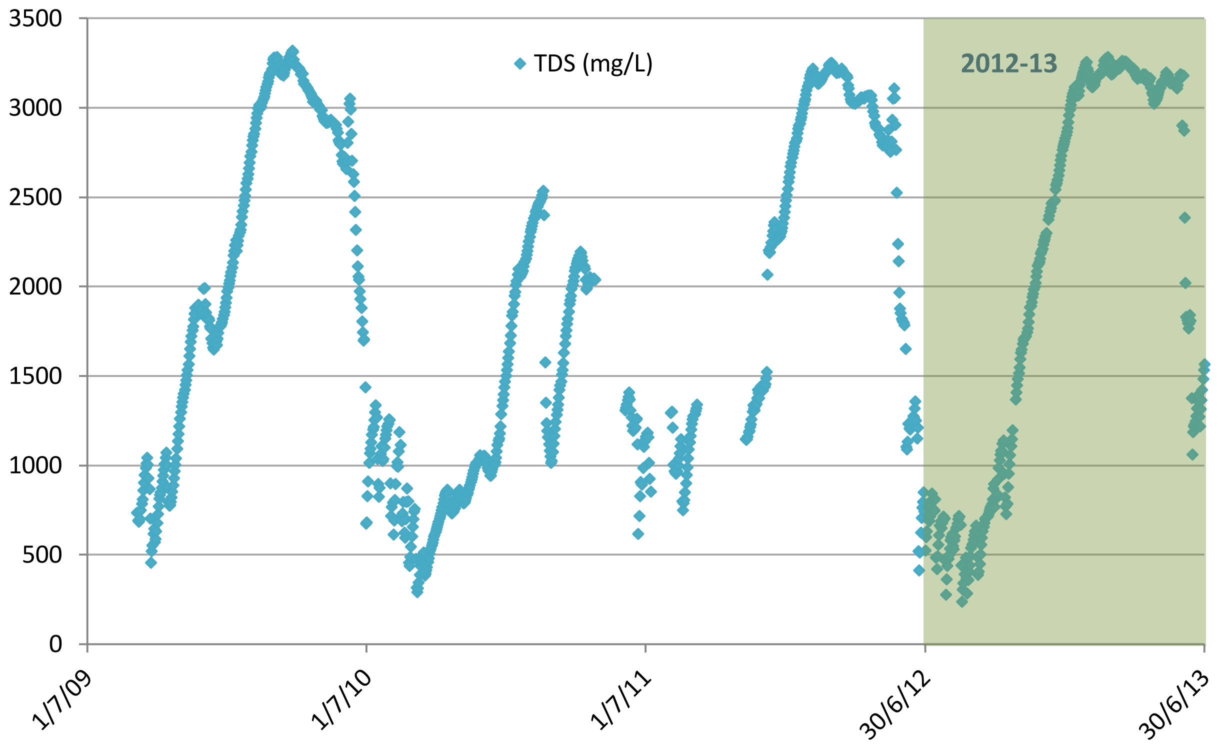


Figure 39. Salinity data at Inman River u/s sewage treatment works from 2009–13

The range of salinity data is broad. Of the total record, 65% was recorded as <2500 mg/L, 25% being <1000 mg/L. 35% of the record was between 2500–4000 mg/L. The trend clearly shows salinity starts to rise around September of each year and then begins to fall with the onset of winter streamflow. The salinity range in 2012–13 is comparable to the previous years of data, with higher values around 3300 mg/L.

YANKALILLA RIVER D/S BLACKFELLOWS CREEK

Salinity data have been recorded at Yankalilla River d/s Blackfellows Creek (A5011006) since 2003. Even though some data gaps are present, the record is long enough to provide a fair indication of salinity in the river over the past 10 years (Figure 40).

For this station, 67% of the recorded data is rated as good or fair quality, 9% at poor or unknown quality and 24% as either missing or outside the recordable range.

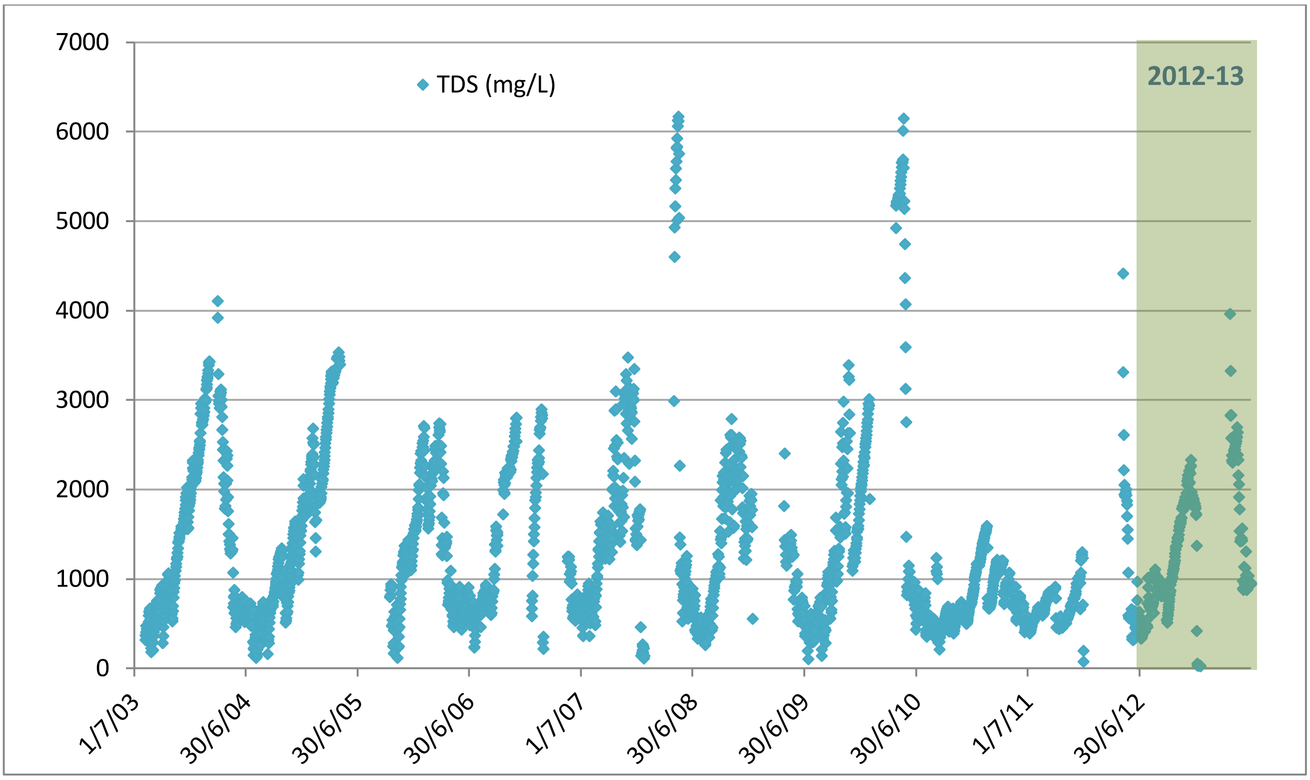


Figure 40. Salinity data at Yankalilla River d/s Blackfellows Creek from 2003–13

The range of salinity data is broad. Of the total record, 89% was recorded as <2500 mg/L, 51% being <1000 mg/L. 9% of the record was between 2500–4000 mg/L and 2% >4000 mg/L. The salinity range in 2012–13 is slightly less when compared to 2011–12, with higher values around 4000 mg/L.

SURFACE WATER USE

Status	Degree of confidence	Comments on recent historical context
Very high use	Fair – licensed water use is based on estimates as roll-out of water licenses is being finalised	N/A

This section includes description and estimates of the type and distribution of farm dams and surface water use at a whole prescribed area scale. As such, this may not represent the spatial variability of water use across the PWRA. Groundwater use is described in the Groundwater Level and Salinity Status Report available for this region on the WaterConnect website: http://www.waterconnect.sa.gov.au.

Surface water use for irrigation, industrial, commercial forestry, recreational, stock and domestic purposes comes from a variety of sources including pumping from streams and rivers, rainwater capture and interception and storage by farm dams. Licensed water use is managed by the WAP for the PWRA, which is administered by DEWNR.

FARM DAMS

The total number of farm dams in the PWRA is calculated to be approximately 13 000, with 1700 of the total used for irrigation purposes (AMLRNRMB 2013). The storage capacity of the 11 300 non-licensed farm dams is estimated to be 16 516 ML.

SURFACE WATER USE 2012–13

Water use includes estimated non-licensed surface water demand, irrigated water use from surface water and watercourses, public water supply and plantation forest water use.

Estimated non-licensed surface water demand

Existing stock and domestic dams are not metered, therefore an estimate is used to report on non-licensed water demand. The estimated non-licensed water demand is 4872 ML (Table 4). This volume is based on estimating these needs as 30% of non-licensed dam capacity, as used in water accounting calculations in the WMLR WAP (AMLRNRMB 2013). This means that as long as the estimated non-licensed dam capacity remains unchanged from one year to the next, so too will the estimated non-licensed surface water demand, irrespective of variations in annual rainfall and streamflow. As such, the limitations of this estimation method should be kept in mind when considering estimated non-licensed surface water demand.

Licensed surface water demand

Roll-out of water licenses to existing users commenced in 2013 and requires licensed water use to be metered. Meters are not required for dams used solely for stock and domestic purposes, dams less than 5 ML capacity (excluding high risk dams) and dams 5 ML capacity or greater with an allocation of 70–100% of the dam capacity (excluding high risk dams). As this process is ongoing, an estimate is used to report on licensed water demand. The estimated licensed surface water demand is 18 655 ML (Table 4). This volume is based on the sum of all allocations for crop or industrial and commercial purposes. Licensed extractions for public water supply made by SA Water during 2012–13 totalled 57 281 ML and this was across the whole prescribed area. This volume is from runoff generated within the PWRA and does not include imported water from the River Murray.

Plantation forestry water use

The impacts on surface water resources due to plantation forestry are large in some areas of the PWRA and the method used to account for that impact is provided in the WMLR WAP (AMLRNRMB 2013). Key assumption in the method is:

- Plantation forestry is responsible for an 85% reduction in available surface water resource over the planted areas; consistent with the Statewide Policy Framework (SA Government 2009)

For a total estimated area of commercial forestry of around 12 400 ha within the PWRA, an estimated 17 413 ML of surface water is estimated to be intercepted.

Table 4. Summary of surface water use in the Western Mount Lofty Ranges PWRA

WMLR PWRA surface water use (ML)	Estimated non-licensed water demand	4872
	Licensed surface water demand	18 655
	SA Water licenced extractions (public water supply)*	57 281
	Plantation forestry	17 413
Total water extractions (ML)		**98 221**

*SA Water licensed extractions data provided by SA Water

USE RATING

An assessment of use was carried out using a rating from 1 to 6 to indicate the estimated percentage of the PWRAs resource capacity used for irrigation, industrial, commercial forestry, recreational, stock and domestic purposes for the financial year 2012–13. This annual approach is slightly different to that used in the State's NRM Plan 2006, where water allocation and management guidelines stipulate that 25% of median annual adjusted runoff is considered to be an indicator of sustainable use limits, outside prescribed areas, until additional information becomes available. This is to protect the needs of downstream users, including water dependent ecosystems. In prescribed areas, use limits are defined in the various WAP's developed by NRM Boards and currently range between 15–30% and are generally based on long–term average values. The 25% rule is consistent with peer reviewed independent scientific studies in south eastern Australia (SKM 2003, RMCWMB 2003). As such, Table 5 was developed whereby 25% of resource capacity used is considered moderate (21–30%). Any percentage of resource capacity used greater than 30% is considered high, very high or extreme and therefore above use limit guidelines. This use rating has been standardised to apply to all prescribed area status reports.

In order to determine the impact of water use, a comparison of estimated water use and resource capacity is provided below.

Water use for the PWRA in 2012–13 was estimated to be 98 221 ML. The resource capacity of the PWRA as stated in the WMLR PWRA WAP is 286 000 ML and is adjusted to remove the impacts of farm dams and plantation forestry. To make the resource capacity more relevant to the 2012–13 reporting year, it has been scaled. This was achieved by taking into account the streamflow recorded in 2012–13 and the long–term resource capacity of surface water management zones upstream of the gauging stations, as outlined in the WMLR PWRA WAP. As such, of the total 199 038 ML resource capacity for the PWRA, it is estimated that 49% was used. In terms of the rating system described by Table 5, the PWRA has been assigned a use rating of 5 (Very high use) for 2012–13. The assessed 'very high use' rating is based at a whole prescribed area scale.

Table 5. Use rating system

Rating	**% of resource capacity used in current year**	**Description**
1	0 – 10 %	Negligible use
2	11 – 20 %	Low use
3	21 – 30 %	Moderate use
4	31 – 40 %	High use
5	41 – 50 %	Very high use
6	Greater than 50 %	Extremely high use

WATER DEPENDENT ECOSYSTEMS

This status report for the Western Mount Lofty Ranges PWRA does not include an assessment of aquatic ecosystem condition and trend, however it is important to recognise the ecological components of the watercourses in the area.

The PWRA covers eight major drainage areas running west of the Mount Lofty Ranges. The majority of the PWRA is comprised of the headwaters of these major drainage areas with only the channels themselves being prescribed across the Adelaide Plains. Several of the major rivers have been dammed for the supply of water to metropolitan Adelaide or for flood mitigation (e.g. Gawler River). The majority of rivers are seasonal, flowing through winter and spring but perennial reaches are also located throughout the area, providing refuge for flow loving species. Several ecological assets have been identified as being of national importance including the Fleurieu Peninsula Swamps (listed under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*) as well as several state and regionally listed species. Collectively, there are numerous significant water dependent ecological assets throughout the Western Mount Lofty Ranges PWRA.

A total of 510 water dependent vegetation species have been identified across the Mount Lofty Ranges (VanLaarhoven and van der Wielen 2009). These are broadly categorized into 10 functional groupings (Casanova 2011), which are used to characterise and classify sites. Riparian areas of the PWRA are dominated by an overstorey of River Red Gum (*Eucalyptus camaldulensis*) and an understory of Common Reed (*Phragmites australis*) and Bulrush (*Typha domingensis*). Vegetation communities of note are the Fleurieu Peninsula Swamps that contain several species of conservation concern including two EPBC listed species of plant, Osborns Eyebright (*Euphrasia collina ssp osbornii*) and Maroon Leek Orchid (*Prasophyllum frenchii*) (Department of the Environment 2014).

Monitoring of fish communities across the PWRA is undertaken as part of the Verification of Water Allocation Science Program (VWASP) and the Aquatic Ecosystem Health program. During 2013 this was supplemented with additional sampling for a large investigation into environmental water requirements currently underway through the Goyder Research Institute. Data shows there is a diverse range of fish assemblages across the PWRA. The WMLR WAP lists 30 native species of fish and nine species of alien fish present across the PWRA (AMLRNRMB 2013). The 2012–13 sampling undertaken by the South Australian Research and Development Institute (Aquatic Sciences) found the majority of these species were present in their expected ranges and the findings are reported in Schmarr et al. (2014). The report details the following three major issues currently affecting the state of fish populations across the PWRA:

1. change in water regime including a resulting reduction in water quality
2. the loss or modification of the riparian habitat coupled with issues associated with management and the presence of exotic species of fish
3. barriers to fish passage excluding diadromous species of fish for migrating between the headwater habitat and the ocean/estuary.

In-depth discussions for regions and sites are provided in Schmarr et al. (2014). The most common native species of fish captured were Mountain Galaxias (*Galaxias olidus*) and Climbing Galaxias (*Galaxias brevipinnis*). The ratio of native to alien fish captured was 56: 44, with the majority of the alien fish being Plague Minnow (*Gambusia holbrookii)*. It is important to note that while numerically the native fish are more abundant, the actual biomass of fish is heavily skewed to the alien species as they tend to be much larger bodied.

The last relevant investigation into the macroinvertebrate community for the 2012–13 reporting period in the WMLR was undertaken in 2013 by the Environment Protection Authority's aquatic ecosystem monitoring, evaluation and reporting program. They sampled 40 sites across the PWRA with the majority (74%) of sites being classed as either fair, poor or very poor condition (EPA 2014). The sites classed as better condition (better than fair) were located in the higher rainfall areas of the PWRA, which have high levels of remnant vegetation in the catchment area. These include First, Sixth, Brownhill, Scott and Jacobs Creeks, Little Para River and First, Deep, Callawonga and Boat Harbour Creeks on the Fleurieu Peninsula. Key issues identified across the PWRA is the presence of higher salinities, sedimentation, degraded riparian vegetation, significant nutrient enrichment and the presence of alien plants and fish.

Several risks to the ecology of the water dependent ecosystems of the PWRA were identified across multiple reports and programs. These are consistent across many agricultural landscapes and include alien species, nutrient enrichment, stock access and hydrological regime change (decreased flow and changes in flow patterns).

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