
BAROSSA PWRA

Surface Water Status Report

2010-11



Department of Environment, Water and Natural Resources
25 Grenfell Street, Adelaide
GPO Box 1047, Adelaide SA 5001
Telephone National (08) 8463 6946
International +61 8 8463 6946
Fax National (08) 8463 6999
International +61 8 8463 6999
Website www.environment.sa.gov.au

Disclaimer

The Department of Environment, Water and Natural Resources and its employees do not warrant or make any representation regarding the use, or results of the use, of the information contained herein as regards to its correctness, accuracy, reliability, currency or otherwise. The Department of Environment, Water and Natural Resources and its employees expressly disclaims all liability or responsibility to any person using the information or advice. Information contained in this document is correct at the time of writing.



This work is licensed under the Creative Commons Attribution 4.0 International License.

To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© Crown in right of the State of South Australia, through the Department of Environment, Water and Natural Resources 2014

ISBN 978-1-921923-77-7

Preferred way to cite this publication

DEWNR, 2014, *Barossa PWRA Surface Water Status Report 2010-11*, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide

This surface water status report is available online at <http://www.waterconnect.sa.gov.au/Systems/GSR/Pages/default.aspx>

PURPOSE AND CONTEXT

This status report provides a snapshot of the surface water resources in the Barossa Prescribed Water Resources Area (PWRA) for the financial year 2010-11. Surface water status reports are limited to reporting on the 'hydrological status' of the PWRA. 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.

A similar separate report has been released previously for the groundwater resources of this PWRA. This surface water report is in a format consistent with that already adopted for the groundwater report. These status reports seek to support informed management decisions by resource managers and those responsible for, or reliant on, the water resources.

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 management 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. Department of Environment, Water and Natural Resources (DEWNR) in consultation with key stakeholders is working towards 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 of status of water resources, visit the NR Connect site's NRM Reporting page <http://www.nrconnect.sa.gov.au/NRM-Reporting/SitePages/Home.aspx>.

BAROSSA PRESCRIBED WATER RESOURCES AREA

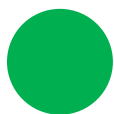
The Barossa PWRA encompasses both the highland areas of the Mount Lofty Ranges and the Barossa Valley and is located approximately 60 km north-east of Adelaide (Figure 1). Surface water (including within watercourses) and groundwater resources in the PWRA have been prescribed under South Australia's *Natural Resources Management Act 2004*. A Water Allocation Plan (WAP) was developed by the Adelaide and Mount Lofty Ranges NRM Board in 2009, which seeks to provide for sustainable management of water resources.

The Barossa PWRA covers an area of 527 km² with the major towns being Nuriootpa, Lyndoch, Tanunda, Greenock and Angaston. The topography, characterised by rolling hills and a central ridge line, essentially divides the area into two separate valleys. The eastern side of the ridge is referred to as Eden Valley and the western side is known as Barossa Valley. The majority of the PWRA is part of the Gawler River catchment with a small area in the north of the PWRA being a part of the Light River catchment. The climate of the Barossa PWRA is characterised by hot, dry summers and cool to cold, wet winters, with rainfall in the PWRA varying from over 750 mm in the south to as low as 300 mm in the north. The main watercourses draining the PWRA include Tanunda Creek, Greenock Creek, Jacob Creek and Duck Ponds Creek, all of which flow into the major watercourse of the PWRA, the North Para River. Greenock Creek flows into the North Para River outside the boundary of the PWRA (Figure 10). The North Para River flows into Gawler River, which eventually drains to Gulf St Vincent.

Surface water use for irrigation, commercial, stock and domestic purposes comes from a variety of sources, including pumping from streams and rivers, interception and storage by farm dams, imported water from the SA Water mains network and water supply from Barossa Infrastructure Ltd (BIL) via SA Water infrastructure. BIL provides up to 7,000 ML per annum of supplementary irrigation water from the River Murray to viticulture in the Barossa Valley (has capacity to supply 10,000 ML per annum). A small portion of water demand is satisfied through reclaimed wastewater from the Nuriootpa Wastewater Reuse Scheme to reduce demand on the Warren Reservoir and River Murray. Imported water is used in the PWRA, but does not form part of the surface water budget summarised in this report.

SUMMARY 2010-11

STATUS 2010-11




“no adverse hydrological trends, indicating a stable or improving situation”


This hydrological status for 2010-11 is supported by:

- Above average rainfall
- Above average streamflow
- Average or freshening salinity levels
- Low water use - 14% of total streamflow extracted for use


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 as part of assigning the hydrological status for 2010-11. 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.

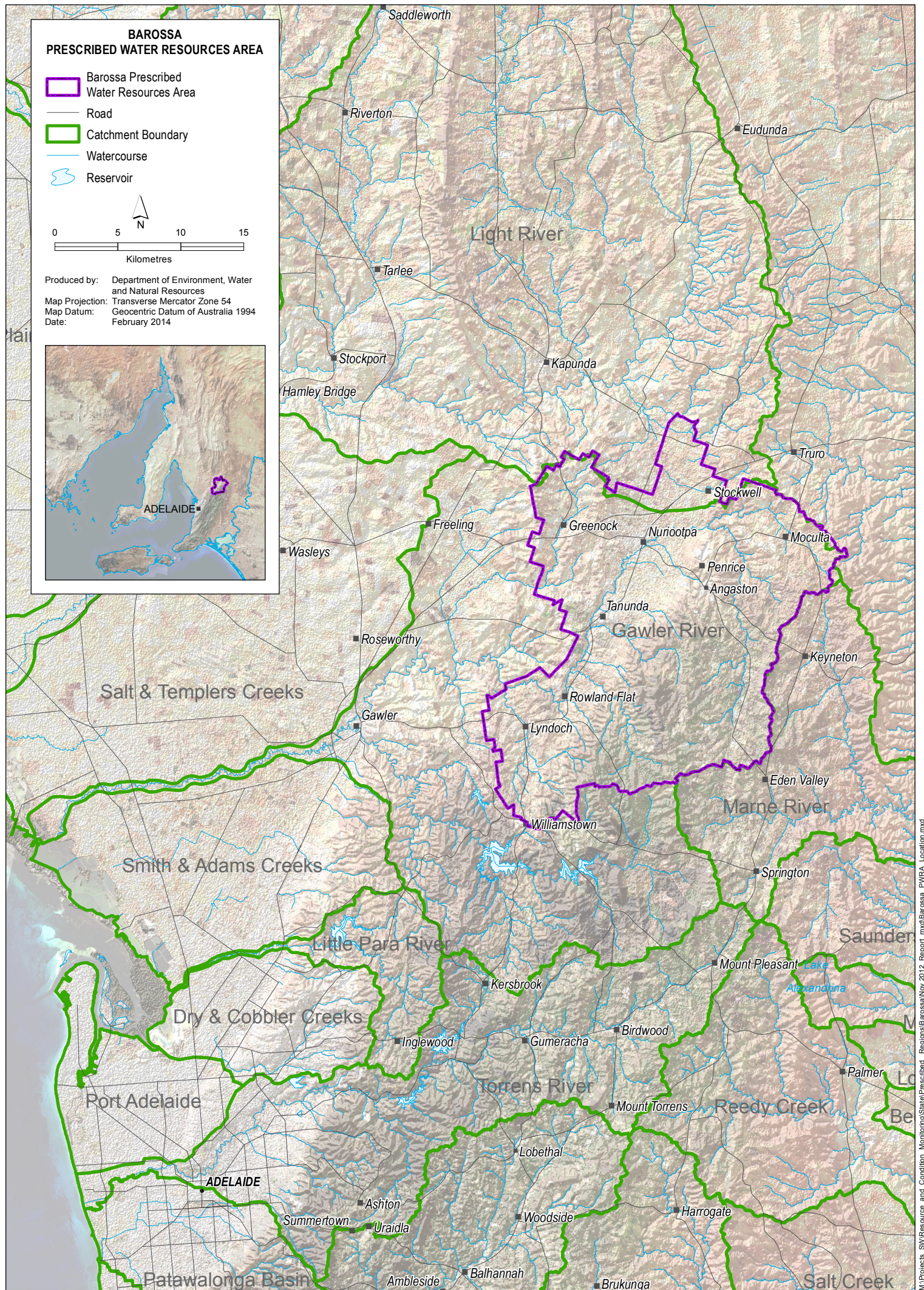


Figure 1. Barossa PWRA and surface water catchments of the region

RAINFALL

Status	Degree of Confidence	Comments on recent historical context
Above average rainfall across most of the region	High: good coverage of rainfall stations representing the rainfall variation across the region	Third year of above average rainfall at Tanunda and Williamstown. Above average rainfall at Angaston after 5 years of below average rainfall.

Rainfall in the Barossa PWRA varies from 300mm in the north to over 750mm in the south. There are 17 rainfall stations within the PWRA and 1 just outside, Williamstown (M023752) (Figure 5). Data from 3 of these stations, Angaston (M023300), Tanunda (M023318) and Williamstown were chosen for analysis of rainfall trends. Rainfall data has 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>

Angaston BoM rainfall station is located in the township of Angaston. The long term annual average rainfall (from 1889 to 2010) is 536mm at Angaston. Tanunda BoM rainfall station, located in the township of Tanunda, has a long term annual average rainfall (from 1889 to 2010) of 552mm. Williamstown BoM rainfall station is situated just outside the Barossa PWRA boundary. Williamstown has a long term rainfall data set compared to surrounding stations in higher rainfall areas that contain shorter data sets. The long term annual average rainfall (from 1889 to 2010) is 648mm at Williamstown.

RECENT RAINFALL

During 2010-11, large rainfall events were experienced during the warmer months of December, February and March at all stations (Figures 2 to 4). The rainfall recorded in these months pushed the rainfall totals to well above long term averages (1889-2010). Angaston BoM rainfall station received 710mm in 2010-11. Six months of the year received above average rainfall with August, September, December, February and March receiving well above average rainfall (Figure 2).

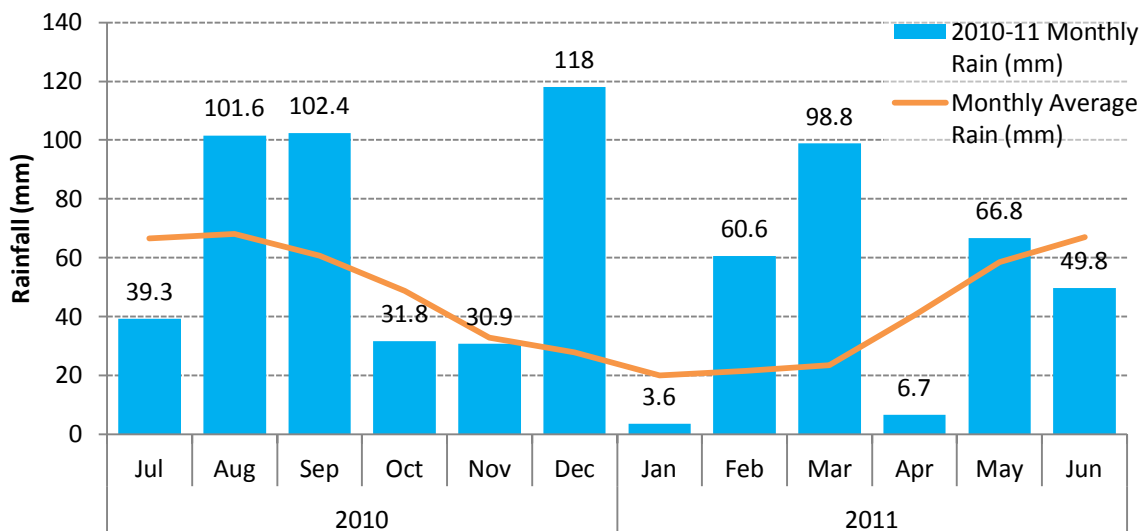


Figure 2. Monthly rainfalls at Angaston (M023300)

Tanunda BoM rainfall station received 862mm in 2010-11. Six months of the year received above average rainfall with August, September, December, February and March receiving well above average rainfall (Figure 3).

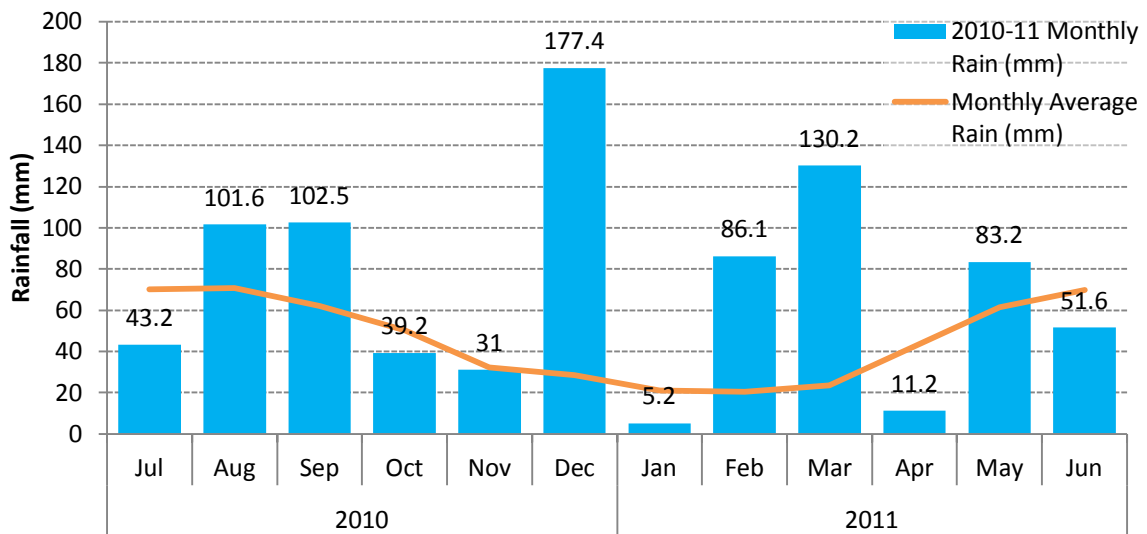


Figure 3. Monthly rainfalls at Tanunda (M023318)

Williamstown BoM rainfall station received 957mm in 2010-11. Six months of the year received above average rainfall with August, September, December, February and March receiving well above average rainfall (Figure 4).

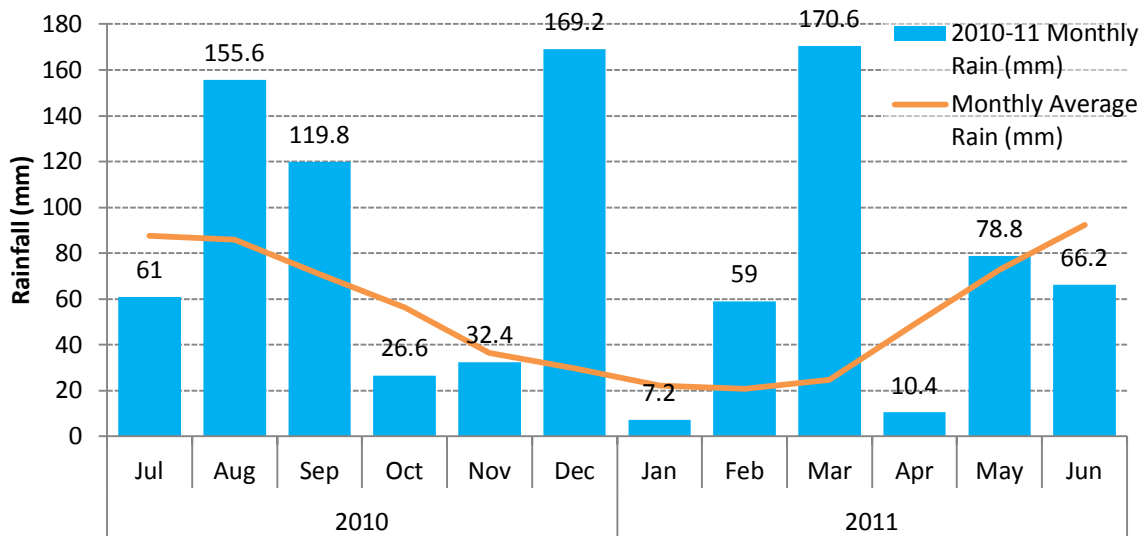


Figure 4. Monthly rainfalls at Williamstown (M023752)

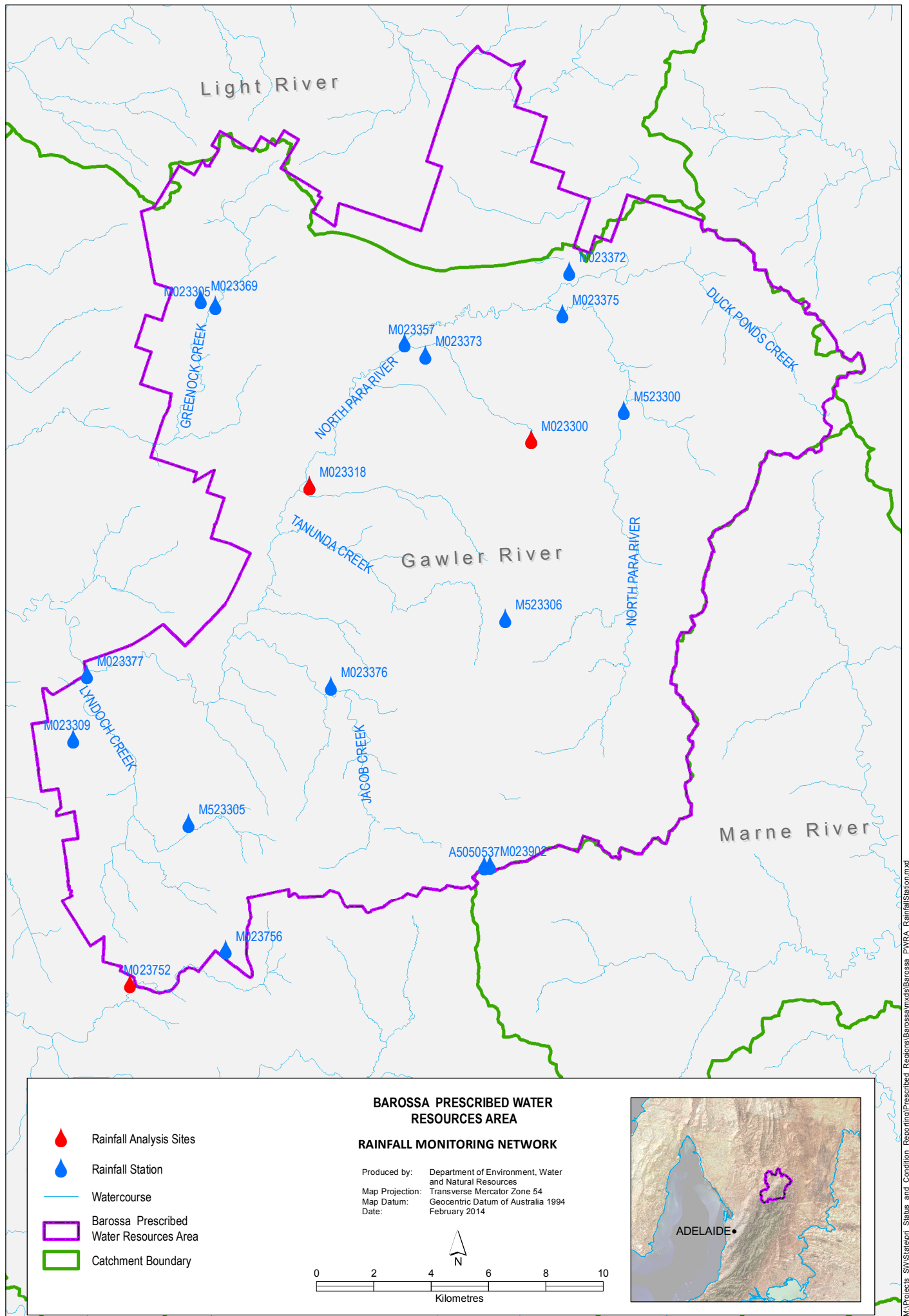


Figure 5. Location of rainfall monitoring sites in the Barossa PWRA

LONG AND SHORT TERM TRENDS

Figure 6 shows the spatial distribution of rainfall over the Barossa PWRA for the:

1. Long term average annual rainfall from 1900-2010
2. Short term average of the previous 10 years (2001-2010)
3. Annual rainfall for 2010

The three panels of Figure 6 indicate that over much of the PWRA, rainfall for the year 2010 (panel 3) was equal to or above the long and short term averages (panel 1 and panel 2). The north east portion of the PWRA in 2010 however shows slightly less rainfall than the long term average. Panel 2 shows the average rainfall for the years 2001-2010 and this shows a largely similar rainfall pattern to the long term average but with a slightly lower rainfall across the northern part of the PWRA.

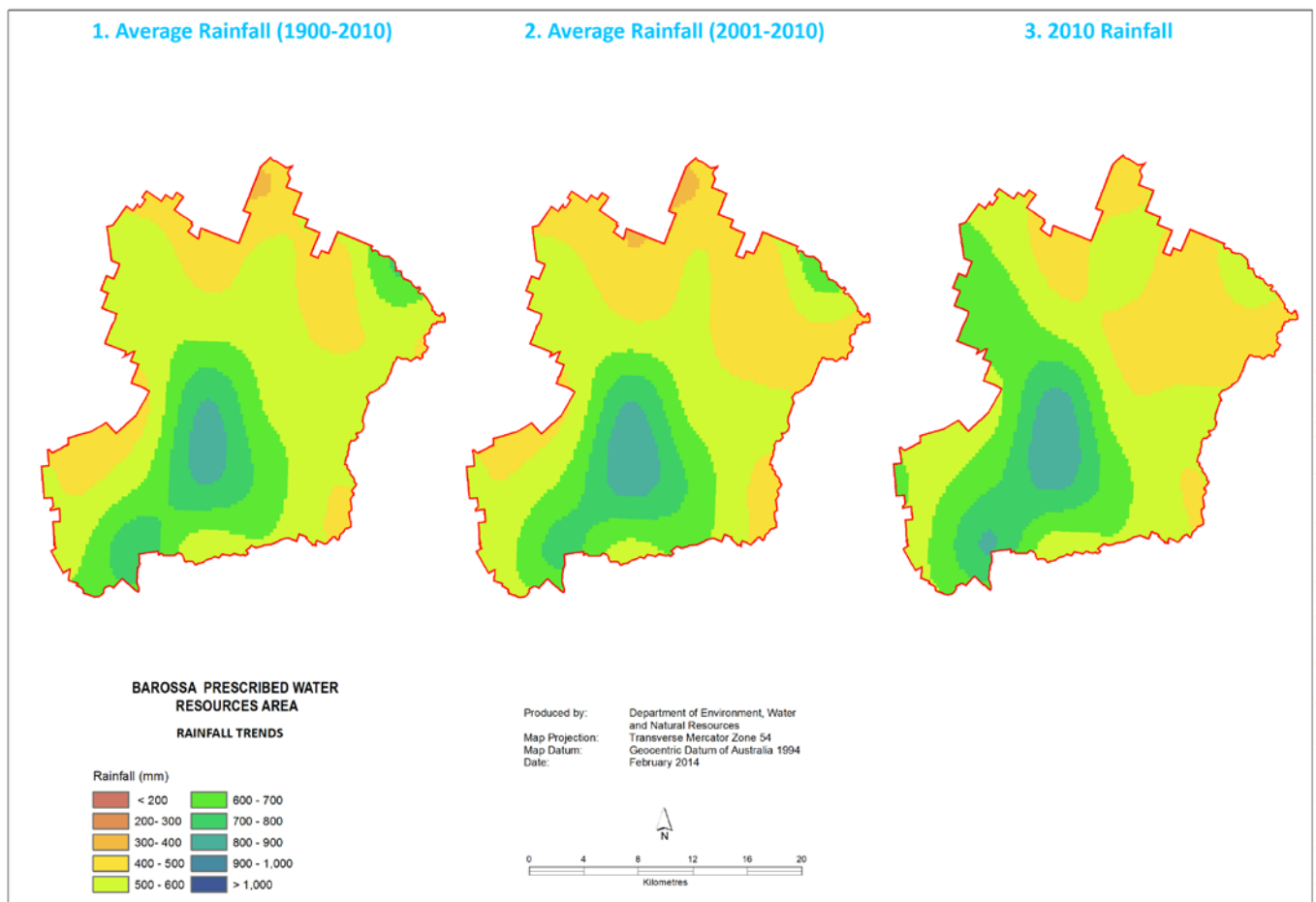


Figure 6. Annual rainfall distributions for the Barossa PWRA

The cumulative deviation from average annual rainfall (residual mass curve) is plotted in orange in Figures 7 to 9 to identify periods of above or below average trends. An upward slope indicates a period of above average rainfall, while a downward slope indicates a period of below average rainfall.

Angaston shows variable above and below average rainfall trends across the data period (Figure 7). From 1900 to 1925, the rainfall trend is in a sharp incline with predominantly above average rainfall throughout this period before a slight decrease between 1925 and the late 1940's. The rainfall trend is predominantly declining from the late 1950's before levelling out to around average rainfall from the early 1990's.

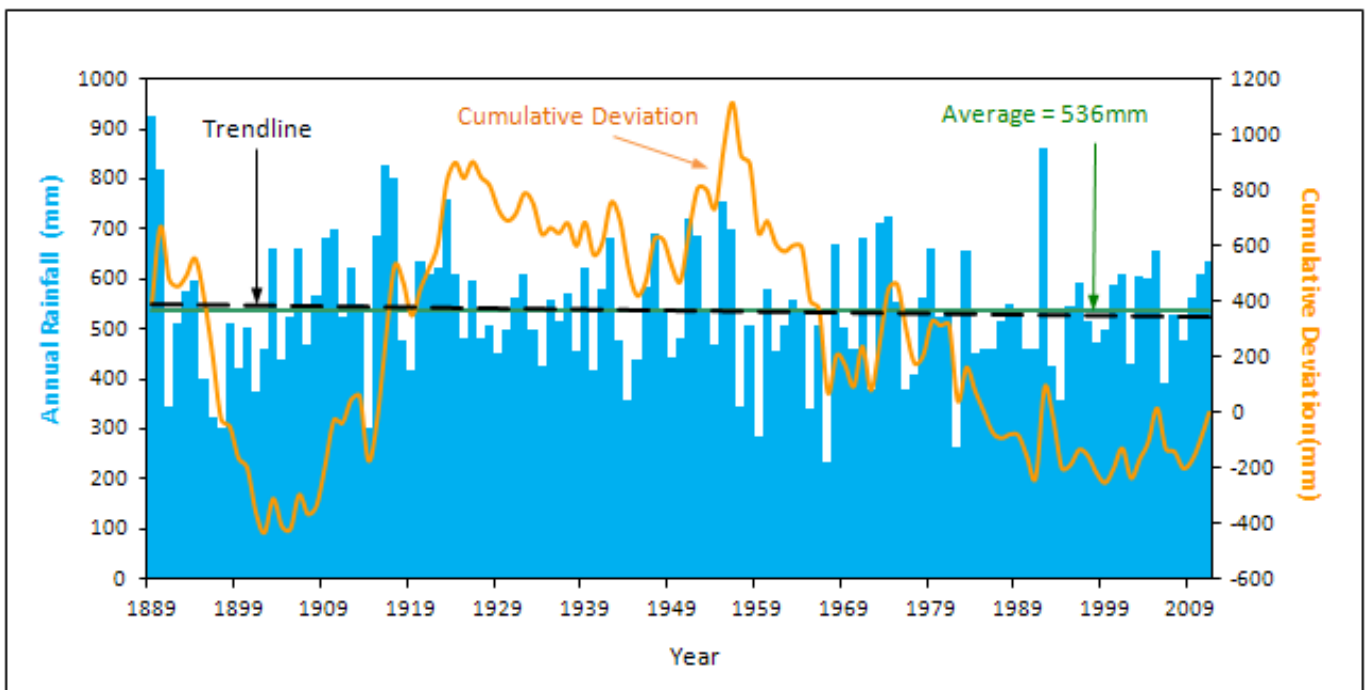


Figure 7. Angaston annual rainfall showing long term trend and cumulative deviation

The period of record at Tanunda shows some similarities to that of Angaston with an upward trend from around 1900 before a period of decline after 1925 (Figure 8). From around the late 1950's however, Tanunda rainfall shows a steep declining trend before a levelling out to around average rainfall from the 1980's onwards.

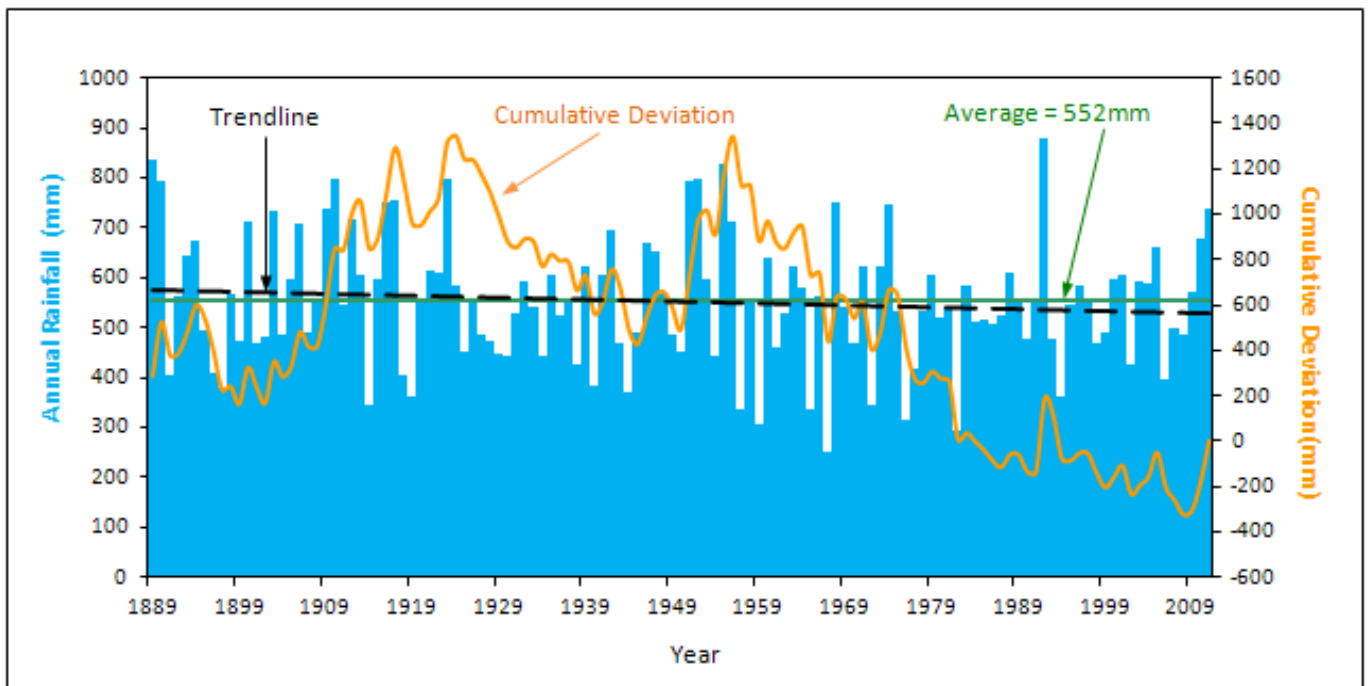


Figure 8. Tanunda annual rainfall showing long term trend and cumulative deviation

Williamstown shows a series of above and below average rainfall periods throughout the record (Figure 9). A sharp incline from the late 1880's to mid 1890's is followed by fluctuating rainfall for the next 40 years. A steady decline in rainfall can be seen from the mid 1930's before another period of fluctuating rainfall from the mid 1960's. The last few years of the record, for all three stations, begins to show an upward trending rainfall.

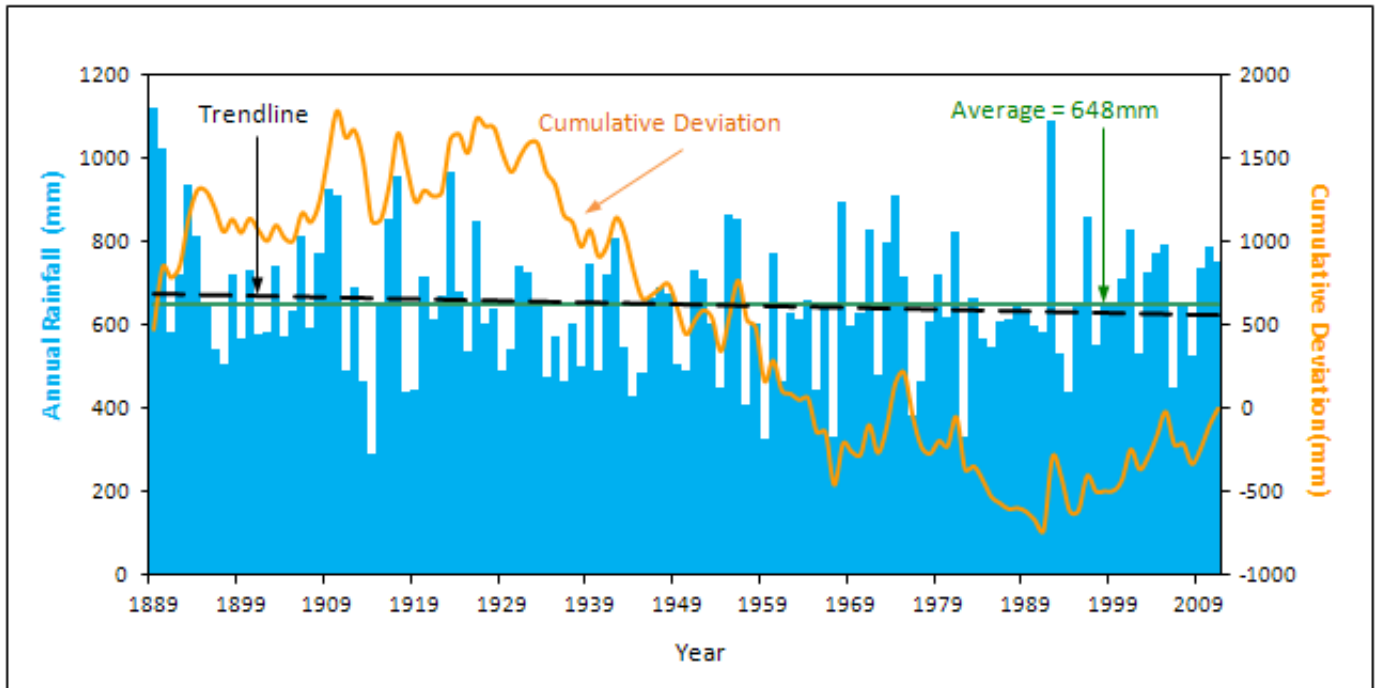


Figure 9. Williamstown annual rainfall showing long term trend and cumulative deviation

STREAMFLOW

Status	Degree of Confidence	Comments on recent historical context
Above average streamflow	High: data derived from long term streamflow stations	Streamflow at Yaldara and Penrice have returned to above average streamflow while it is the second year of above average streamflow at Mt McKenzie and Tanunda

The streamflow monitoring network for the Barossa PWRA is summarised in Table 1 and shown in Figure 10. Parameters recorded at the monitoring sites include both streamflow and salinity. North Para River at Mt McKenzie is however a streamflow station only. Streamflow data is available via WaterConnect <http://www.waterconnect.sa.gov.au/Pages/Home.aspx>

Four active gauging stations are within the Barossa PWRA, three of which are on the main watercourse, the North Para River. The period of record available at each site varies from the early 1940's, late 1970's to more recently established stations in the 1990's. Nine subcatchments are within the PWRA, the two largest being Barossa Valley and Flaxman Valley (Figure 10). Subcatchments in the southern half of the PWRA include Lyndoch Creek, Jacob Creek and Tanunda Creek. Subcatchments in the northern half include Angaston Creek, Duck Ponds Creek, Mid Light River and Greenock Creek. The area of Greenock Creek subcatchment extends beyond the PWRA boundary and only a very small portion of Mid Light River subcatchment lies within the PWRA.

Streamflow gauging stations of the North Para River are located at Yaldara, Penrice and Mt McKenzie, with gauging station catchment area decreasing in that order. North Para River at Yaldara has a gauging station catchment area of 376km² and an average annual streamflow of 13,410ML for the period 1977-2010. Streamflow data at this station dates back to 1943 but contains large amounts of missing data. For quality purposes, a later period with limited missing data was used for analysis. The gauging station at Penrice is approximately 30km upstream of Yaldara, with a catchment area of 117km² and an average annual streamflow of 5,000ML for the period 1977-2010. The gauging station at Mt McKenzie is approximately 15km upstream of Penrice, with a catchment area of 44km² and an average annual streamflow of 2,260ML for the period 1992-2010. Tanunda Creek is the fourth gauging station in the PWRA, with a catchment area of 21km² and an average annual streamflow of 1,870ML for the period 1992-2010.

Streamflow, when expressed in terms of volumetric units, megalitres (ML) in this case, represents the total volume of surface water draining from a catchment (or sub-catchment) at its outlet. Depth units, millimetres (mm) in this case, represent the average depth of runoff generated across the catchment (or sub-catchment). The runoff depth is obtained by dividing the stream volume (ML) by the catchment area (km²). Representation in depth units is useful when comparing runoff with rainfall (mm) across the catchment, which provides an indication of a catchment's runoff generation efficiency.

Table 1. Summary of gauging stations in the Barossa PWRA

Gauging station	Station No.	Period of Streamflow	Average annual streamflow	
			ML	mm
North Para River at Yaldara	A5050502	1977-2010	13,410	36
North Para River at Penrice	A5050517	1977-2010	5,000	43
North Para River at Mt McKenzie	A5050533	1992-2010	2,260	53
Tanunda Creek at Bethany	A5050535	1992-2010	1,870	91

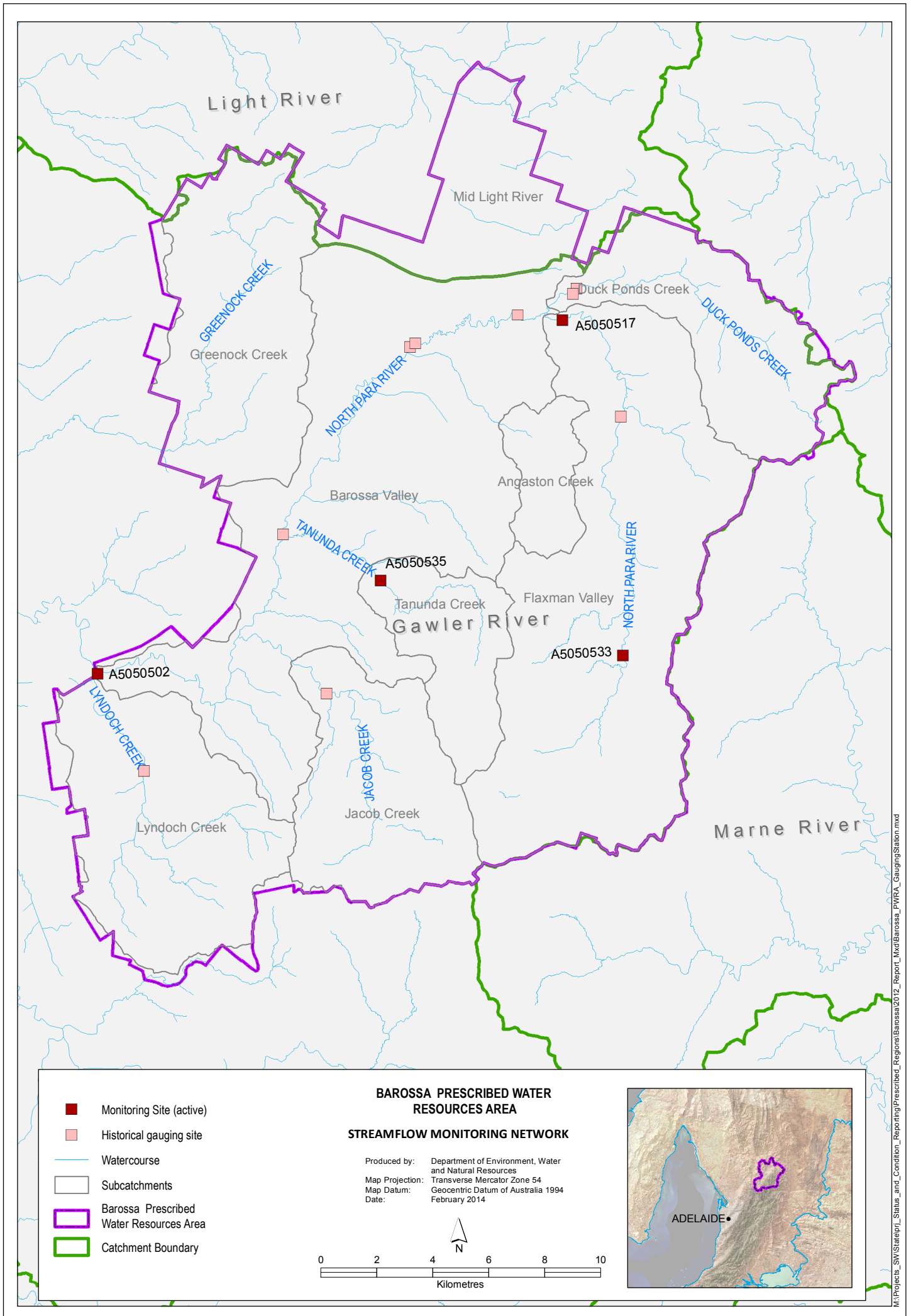


Figure 10. Location of streamflow and salinity monitoring sites in the Barossa PWRA

STREAMFLOW DATA – NORTH PARA RIVER AT YALDARA

North Para River at Yaldara experienced an above average annual streamflow for 2010–11, as highlighted in green in Figure 11. The 15,170 ML total was 13% higher than the 13,410 ML long term average. Prior to above average flows in 2010-11, Yaldara experienced below average streamflow since 2006-07. During the 18 year period since 1993-94, only five had streamflows that were above the long term average.

The monthly breakdown of streamflow for 2010–11 (Figure 12) highlights that September and December were both well above average. September alone contributed 47% of the annual total, December contributing 29% of the annual total but more than 11 times the average for that month. January through to May also recorded above average streamflow.

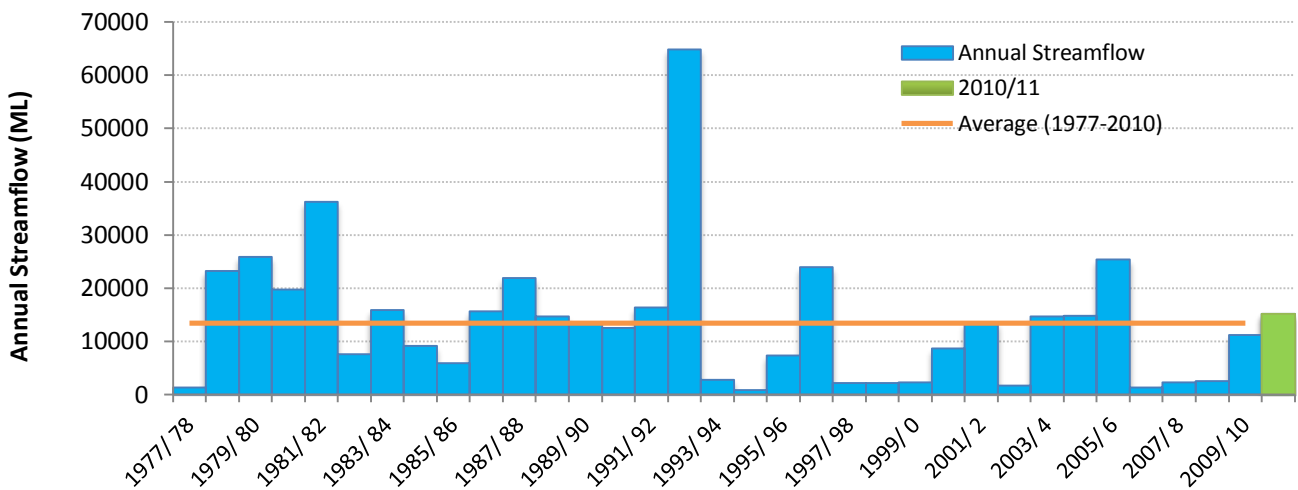
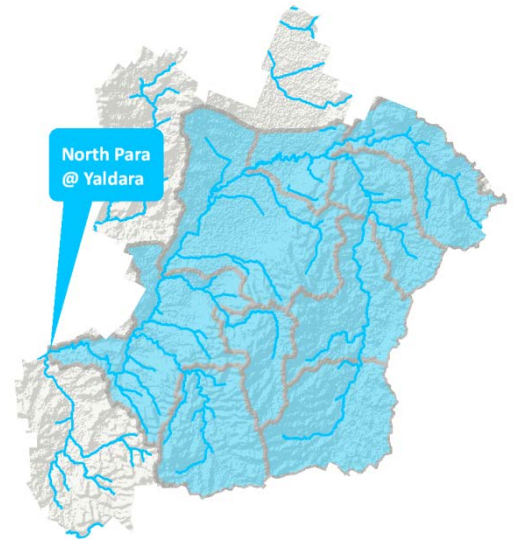


Figure 11. North Para River at Yaldara annual streamflow (ML)

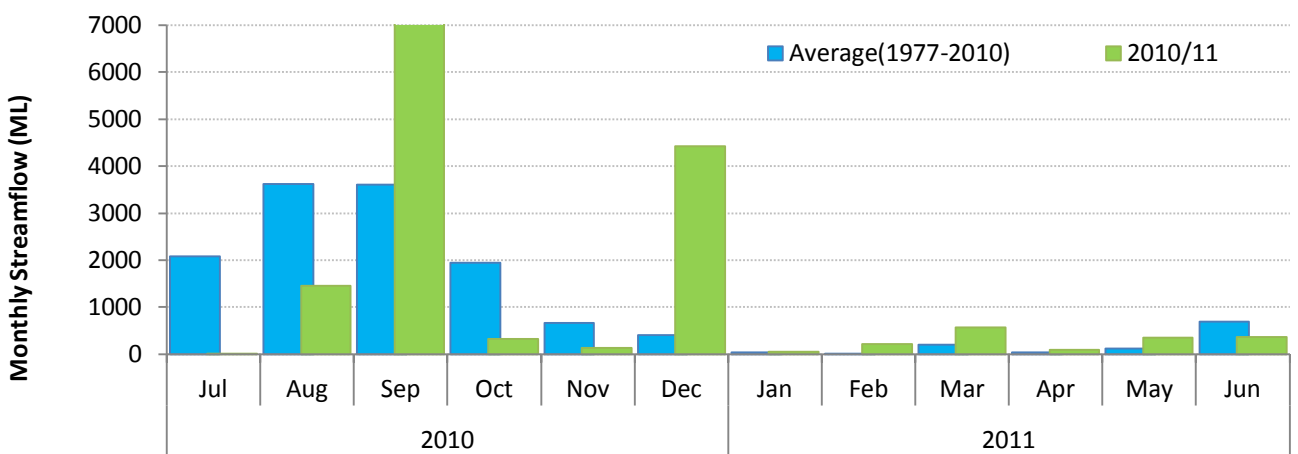


Figure 12. North Para River at Yaldara monthly streamflow (ML)

STREAMFLOW DATA – NORTH PARA RIVER AT PENRICE

North Para River at Penrice experienced an above average annual streamflow for 2010–11, as highlighted in green in Figure 13. The 5,370 ML total was 7% higher than the 5,000 ML long term average. Penrice has experienced below average streamflow since 2006–07, consistent with North Para River at Yaldara. During the 18 year period since 1993–94, only five had streamflows that were above the long term average.

The monthly breakdown of streamflow for 2010–11 (Figure 14) highlights that September and December were both well above average. September alone contributed 64% of the annual total streamflow. January, February and April also recorded above average streamflow.

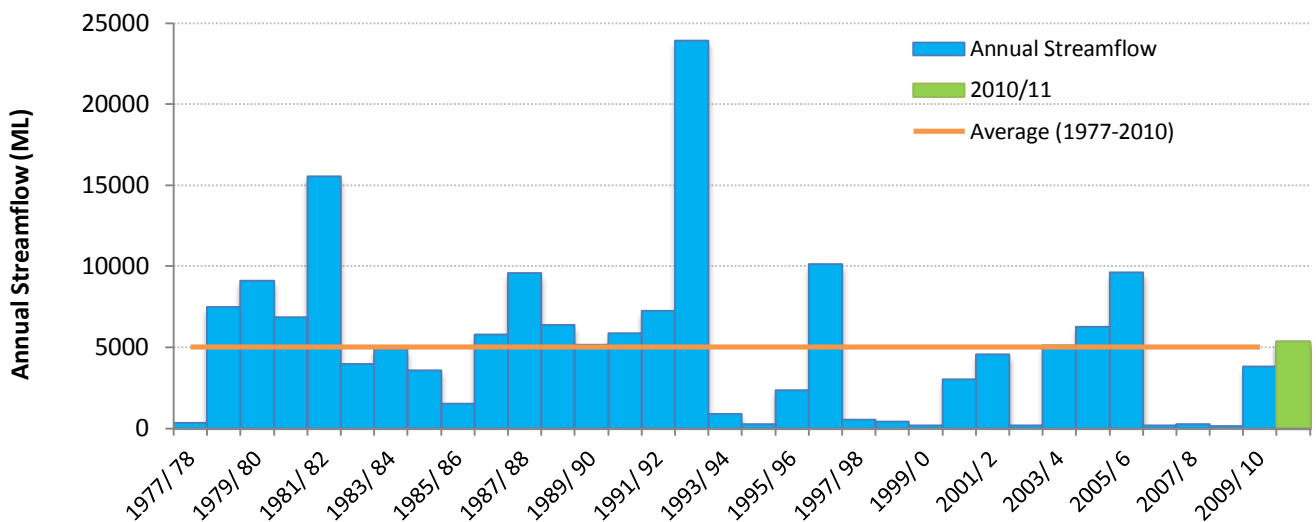
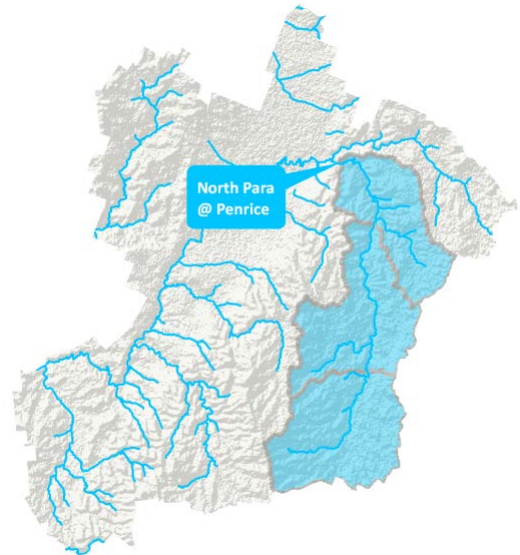


Figure 13. North Para River at Penrice annual streamflow (ML)

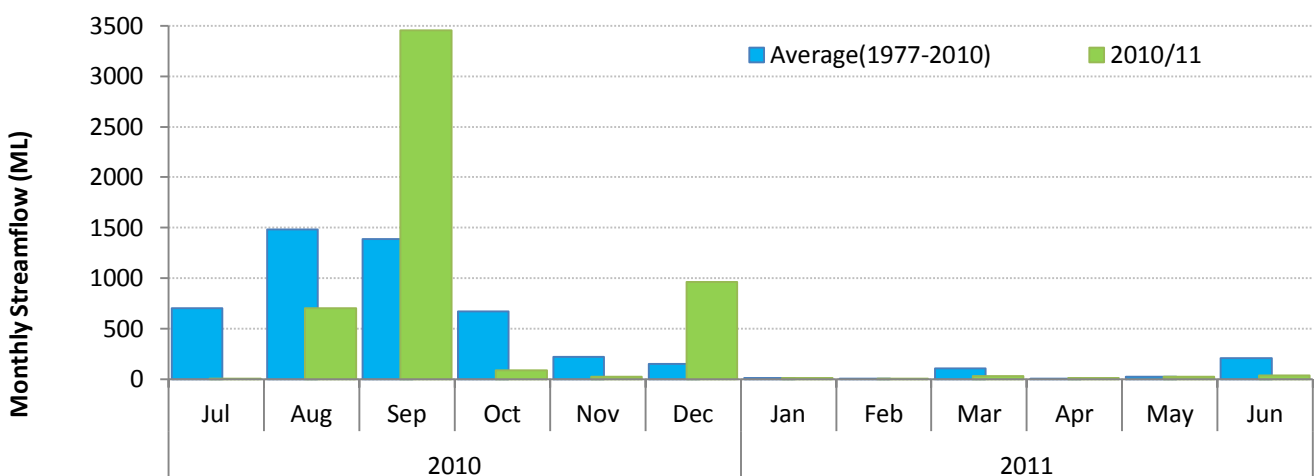
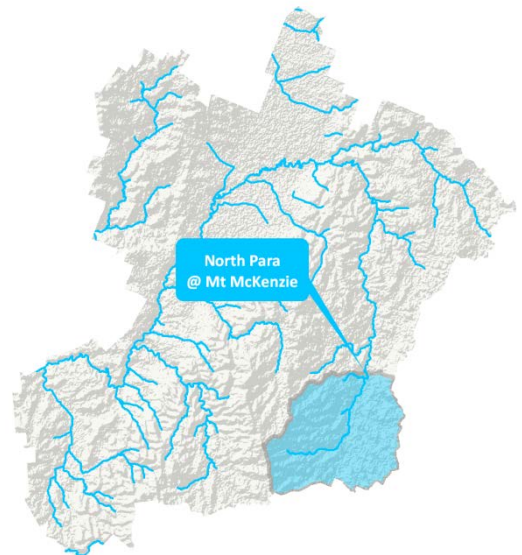


Figure 14. North Para River at Penrice monthly streamflow (ML)

STREAMFLOW DATA – NORTH PARA RIVER AT MT MCKENZIE

North Para River at Mt McKenzie experienced an above average annual streamflow for 2010–11, as highlighted in green in Figure 15. The 3,420 ML total was 51% higher than the 2,260 ML long term average. Above average streamflow was recorded the previous year also, after extremely dry years since 2006-07. During the 19 year period since 1992-93, only eight had streamflows that were above the long term average.



The monthly breakdown of streamflow for 2010–11 (Figure 16) highlights a consistent trend with the previous two stations, where September and December were both well above average. September alone contributed 69% of the annual total streamflow and more than three times the average for that month. March and April were the only other months to record above average streamflow.

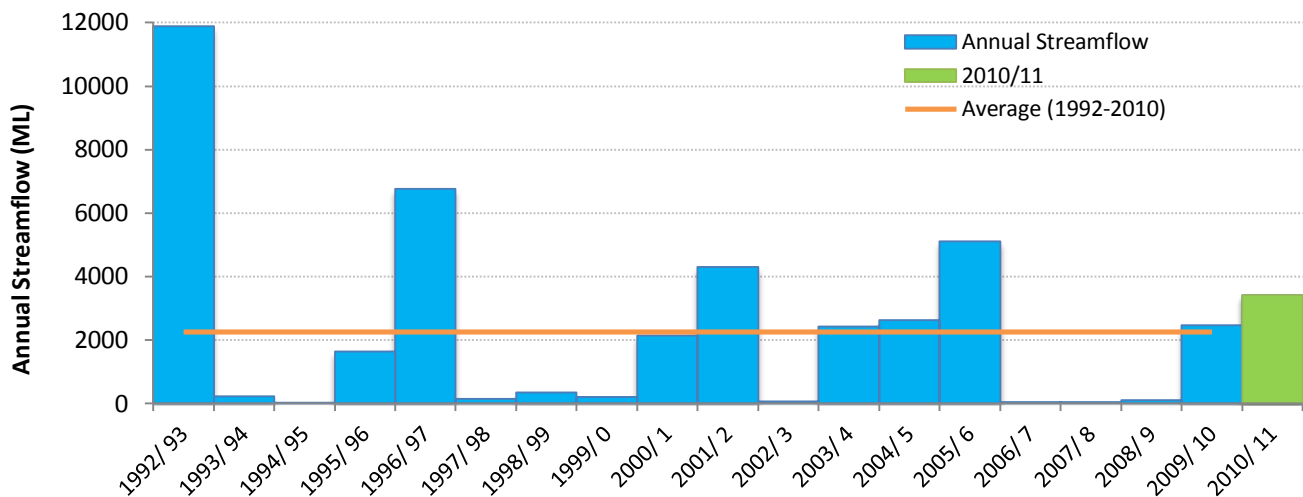


Figure 15. North Para River at Mt McKenzie annual streamflow (ML)

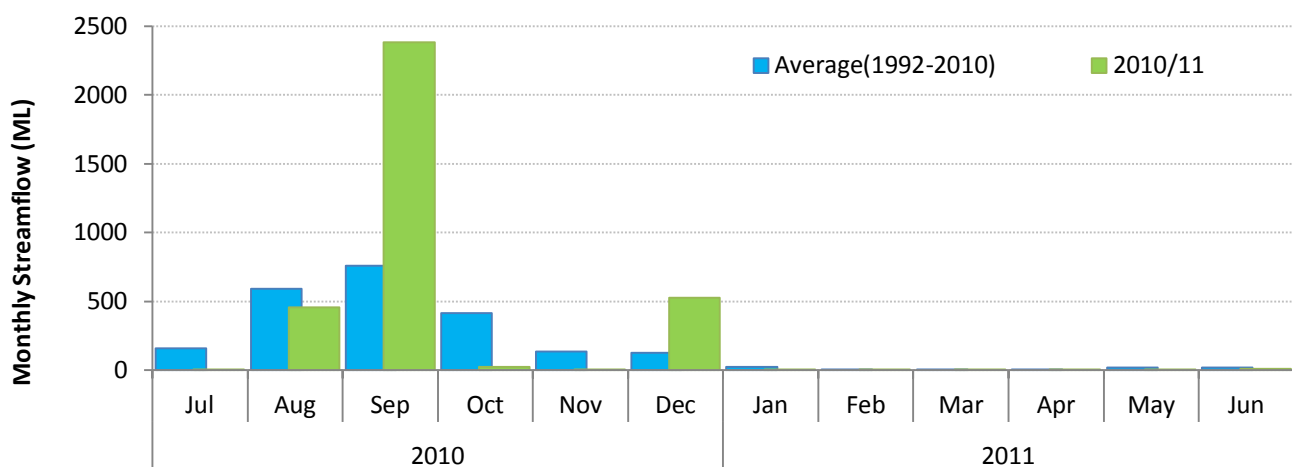
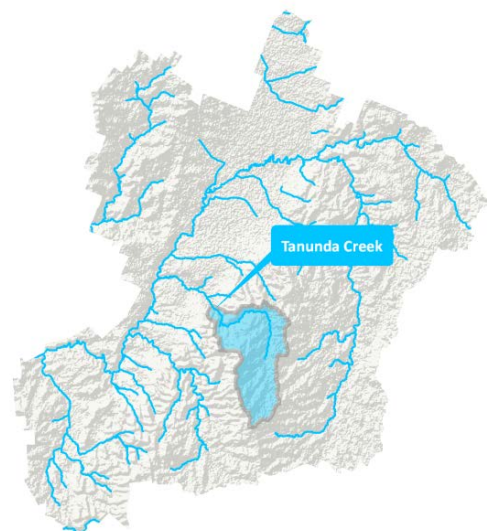


Figure 16. North Para River at Mt McKenzie monthly streamflow (ML)

STREAMFLOW DATA – TANUNDA CREEK

Tanunda Creek experienced an above average annual streamflow for 2010–11, as highlighted in green in Figure 17. The 2,750 ML total was 47% higher than the 1,870 ML long term average. Above average streamflow was recorded the previous year also, after extremely dry years since 2006-07. During the 19 year period since 1992-93, only eight had streamflows that were above the long term average.



The monthly breakdown of streamflow for 2010–11 (Figure 18) highlights the majority of flow occurring during the months of August, September and December. September contributed 54% of the annual total streamflow and almost three times the average for that month.

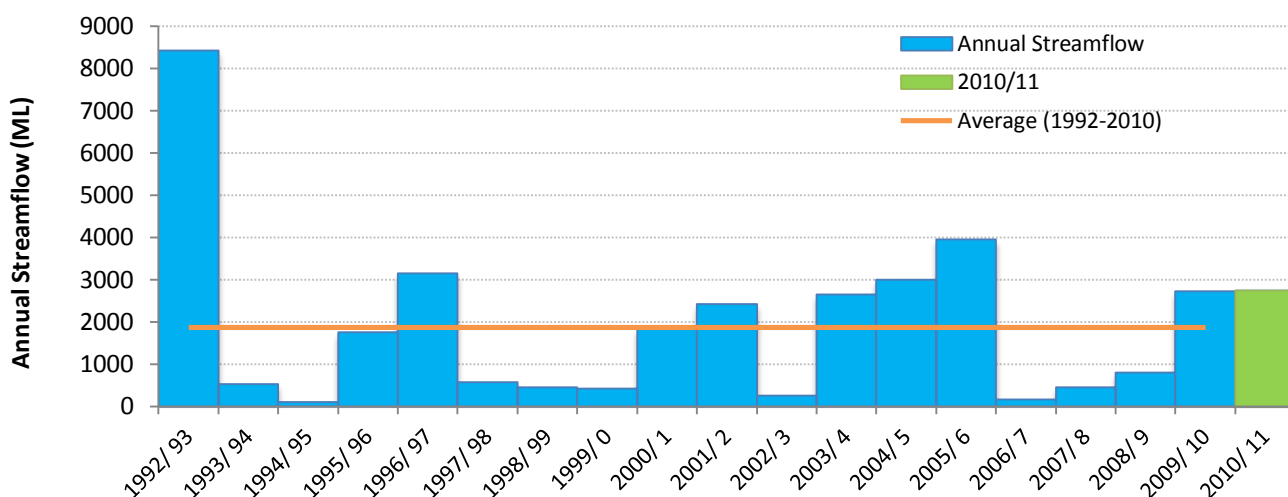


Figure 17. Tanunda Creek annual streamflow (ML)

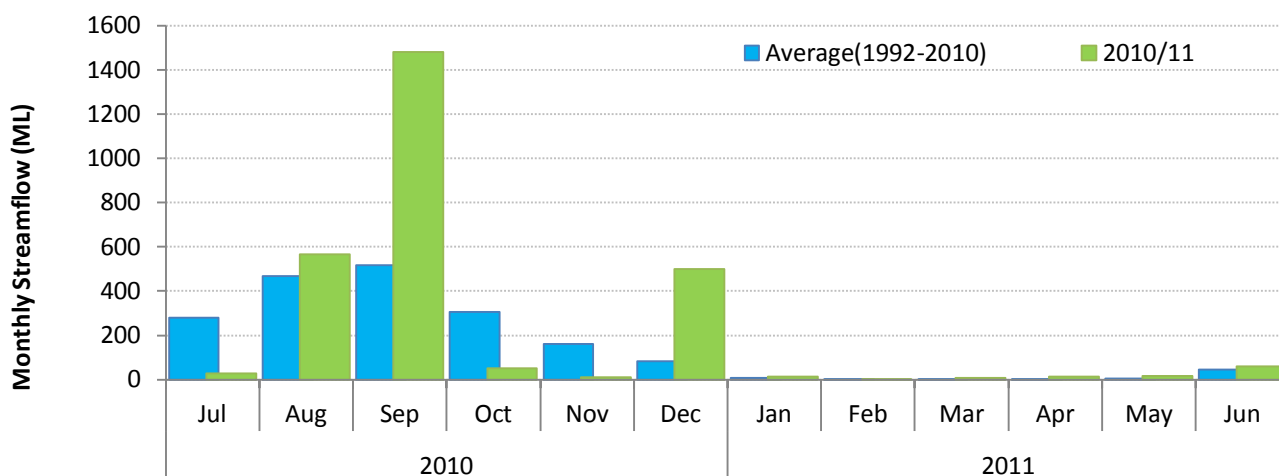


Figure 18. Tanunda Creek monthly streamflow (ML)

SALINITY

Status	Degree of Confidence	Comments on recent historical context
Around average or freshening	High: data derived from long term salinity monitoring	Salinity ranges at Yaldara seem to be freshening due to increased flows this year. Salinity ranges at Penrice and Tanunda are around average.

NORTH PARA RIVER AT YALDARA

Salinity data has been recorded at North Para River at Yaldara since 1994. Despite data gaps with no recorded information, the station provides a good indication of salinity variation in the river over the past 17 years (Figure 19).

The station drains 376km² of the Barossa PWRA. Prior to archiving in Hydstra, DEWNR's surface water archive, data is coded according to the relative quality of the time series data. In the case of North Para River at Yaldara, 69% of the recorded data is rated as good or fair quality, 3% at poor or unknown quality and 28% as either missing or outside the recordable range.

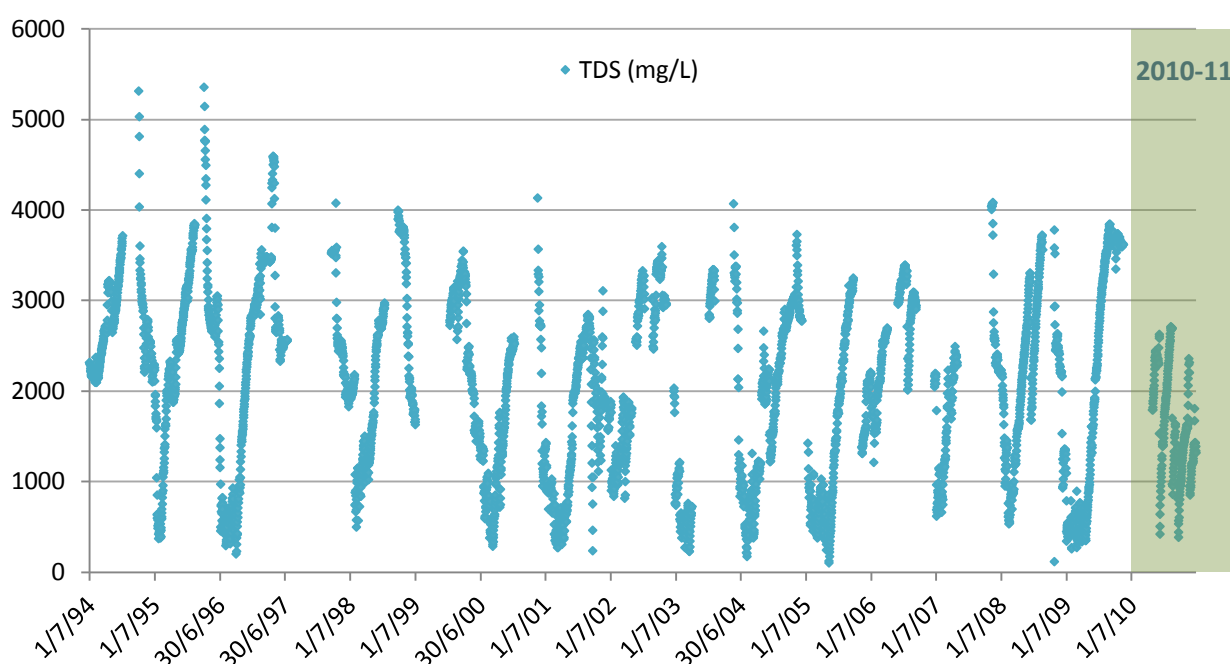
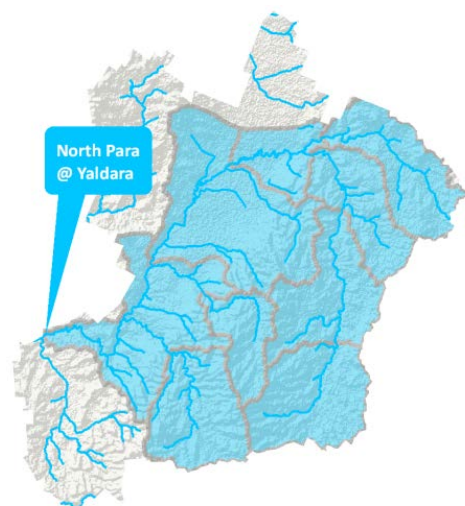


Figure 19. Salinity data at North Para River at Yaldara from 1994-2011

The range of salinity data is broad. Of the total record, 64% was recorded as <2500mg/L, 21% being <1000mg/L. 35% of the record was between 2500-4000mg/L and 1% >4000mg/L. The salinity range seems to be narrower in 2010-11 compared to previous years, with higher values around 2700mg/L during the summer months. Salinity data is available via WaterConnect <http://www.waterconnect.sa.gov.au/Pages/Home.aspx>

NORTH PARA RIVER AT PENRICE

Salinity data has been recorded at North Para River at Penrice since 1994. Even though some data gaps are present, the record is long enough to provide a good indication of salinity in the river over the past 17 years (Figure 20).

The station drains 117km² of the Barossa PWRA. 60% of the recorded data is rated as good or fair quality, 1% at poor or unknown quality and 39% as either missing or outside the recordable range.

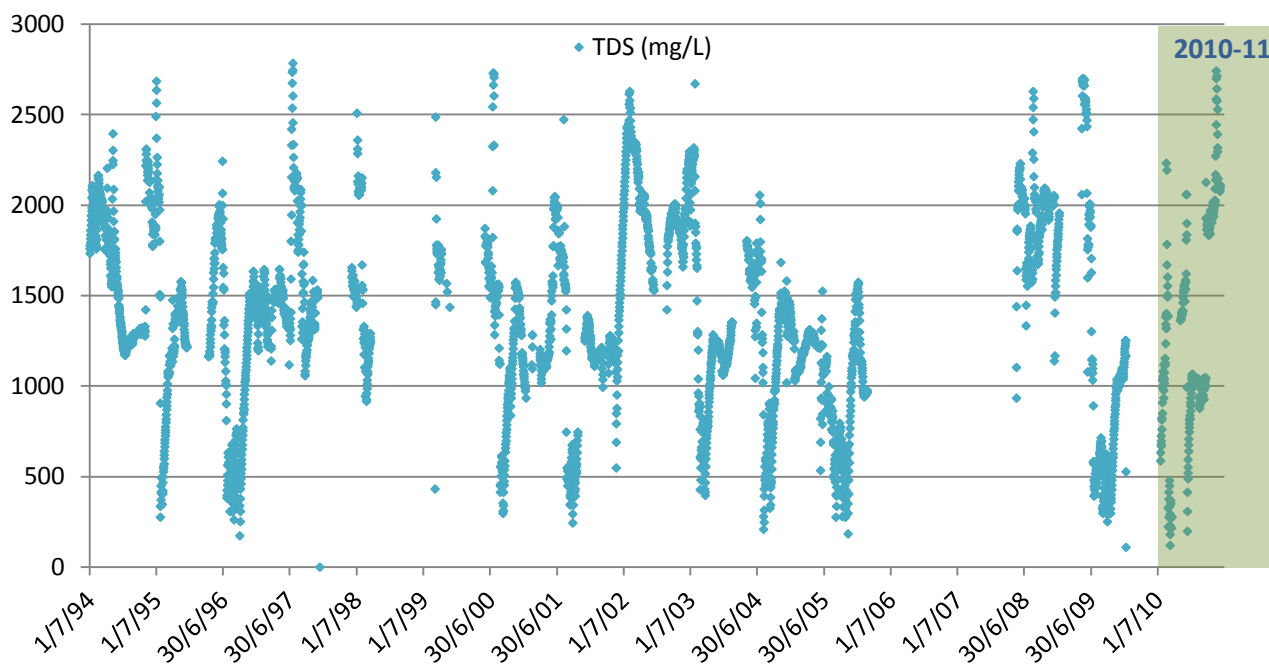
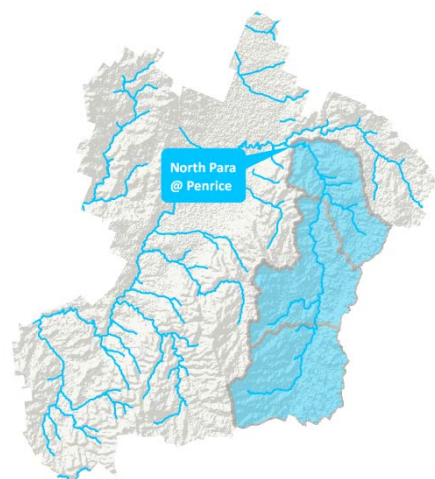


Figure 20. Salinity data at North Para River at Penrice from 1994-2011

Of the total record, 98% was recorded as <2500mg/L, 20% being <1000mg/L. Only 2% of the record was >2500mg/L. The salinity range in 2010-11 seems to be consistent with salinity ranges in previous years.

TANUNDA CREEK

Salinity data has been recorded at Tanunda Creek since 1994. The station has recorded salinity in the creek over the past 17 years, but does contain some data gaps.

The station drains 21km² of the Barossa PWRA. 55% of the recorded data is rated as good or fair quality, 0% at poor or unknown quality and 45% as either missing or outside the recordable range. This data is shown in Figure 21 below.

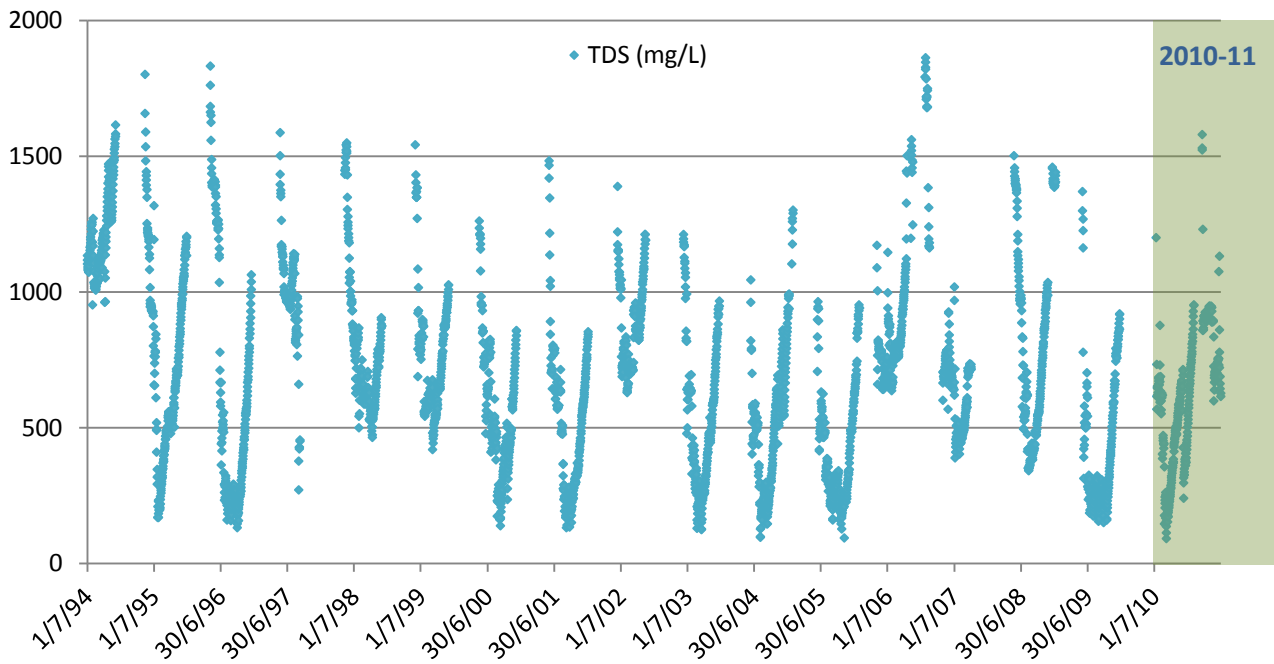
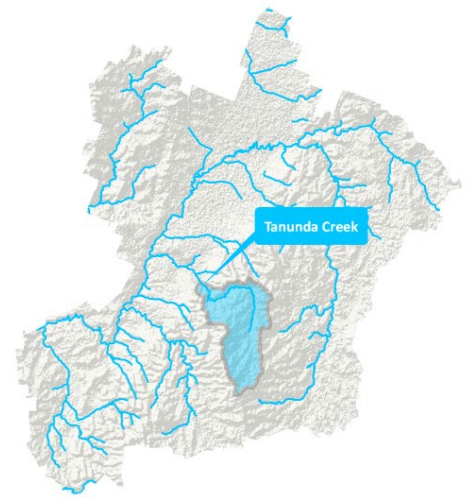


Figure 21. Salinity data at Tanunda Creek from 1994-2011

The range of salinity in Tanunda Creek is much smaller than the North Para River. The range is confined to 0-2000mg/L. Of the total record, 83% was recorded as <1000mg/L. The low levels in the salinity range for 2010-11 seem to be consistent with previous years, whereas the high levels didn't reach the highs of previous years.

SURFACE WATER USE

Status	Degree of Confidence	Comments on recent historical context
Low use 14% use/volume ratio	High - Medium: high confidence in metered data, medium confidence in data that is estimated	Imported water use has fallen whilst extractions from farm dams and streams has also reduced below average levels

This section includes description and estimates of the type and distribution of farm dams and use in the Barossa PWRA. Groundwater use is described in the Groundwater Status Report available for this region on the WaterConnect website: <http://www.waterconnect.sa.gov.au/Systems/GSR/Pages/default.aspx>

Water use for irrigation, commercial, stock and domestic purposes comes from a variety of sources including pumping from streams and rivers, interception and storage by farm dams, imported water from the SA Water mains network and water supply from Barossa Infrastructure Ltd (BIL) via SA Water infrastructure. Water use is controlled by the WAP for the Barossa PWRA, which is administered by the Adelaide and Mount Lofty Ranges NRM Board.

FARM DAMS

The Barossa WAP (AMLRNRMB 2009) states that total capacity of farm dams in the PWRA is estimated to be 8,725 ML. A breakdown of farm dam statistics from the WAP is given in Table 2 below for licensed irrigation and non-licensed stock and domestic dams. Data is based on farm dam development as at March 2005.

Table 2. Summary of farm dams in the Barossa PWRA

Major sub-catchment	Volume (ML)		
	Licensed Irrigation	Non-Licensed Stock and Domestic	Total Volume
Greenock	945	105	1050
Tanunda	552	98	650
Jacob	675	169	844
Duck ponds Creek	0	295	295
Lyndoch	310	378	688
Angaston	32	74	106
Barossa Valley	924	1175	2099
Flaxman (Upper and Lower)	1544	1449	2993
Total	4982	3743	8725

As irrigated water use from farm dams and watercourse extractions are metered, those numbers are reported in the following section on water use.

Estimated non-licensed water demand

Existing stock and domestic dams are not controlled through the Barossa WAP therefore an estimate is used to report on non-licensed water demand. The estimated non-licensed water demand is 1100 ML for 2010-11, based on 30% of the existing stock and domestic dam capacity. This estimate is based on previous indicative work undertaken for the Mount Lofty Ranges NRM region (AMLRNRMB 2010). It should be considered an estimate only, as stock and domestic water use is not metered.

WATER USE 2010-11

Water use includes imported water, irrigated water use from dams and watercourses and estimated stock and domestic demand from farm dams (Table 3). The major contributor of imported water is BIL, which is sourced from the River Murray. It is understood that in some areas underground water demand has been reduced in favour of BIL water, as a result of increases in underground water salinity, poor flow and better quality BIL water (AMLRNRMB 2009). The total water volume given for BIL water below does include supply to some areas outside of the Barossa PWRA. Some irrigators have purchased their own River Murray entitlements and made arrangements with SA Water for the transport of this water (off-peak). Other irrigators have purchased water from SA Water but do not own River Murray entitlements; they rely on SA Water's entitlement (peak). Only off-peak water use data is summarised below.

Table 3. Summary of water use in the Barossa PWRA

Barossa PWRA water resources (ML)	Watercourse extractions	994
	Dam extractions	285
	Total licensed extractions*	1279
	Estimated stock and domestic demand	1100
Imported water (ML)	Barossa Infrastructure Ltd	2540
	SA Water mains (off-peak supply only)	1410
Total water extractions (ML)		6329

*This value refers to metered extraction only.

Water usage from licensed surface water sources in 2010–11 totalled approximately 1,279 ML (Table 3). This is down from the previous year's total of 1,970 ML. Water use from BIL is down to 2,540 ML from the previous year's total of 5,070 ML. It is suspected that water use is down due to above average summer rainfall received in December, February and March, which may have reduced irrigation requirements for crops during the normal irrigation season.

The distribution of water use across the area is shown in Figure 22. Comparing the source of water use, the highest percentage of water was sourced from imported water. The relative contribution of surface water and watercourse water for extraction is expected to be elevated in higher rainfall years.

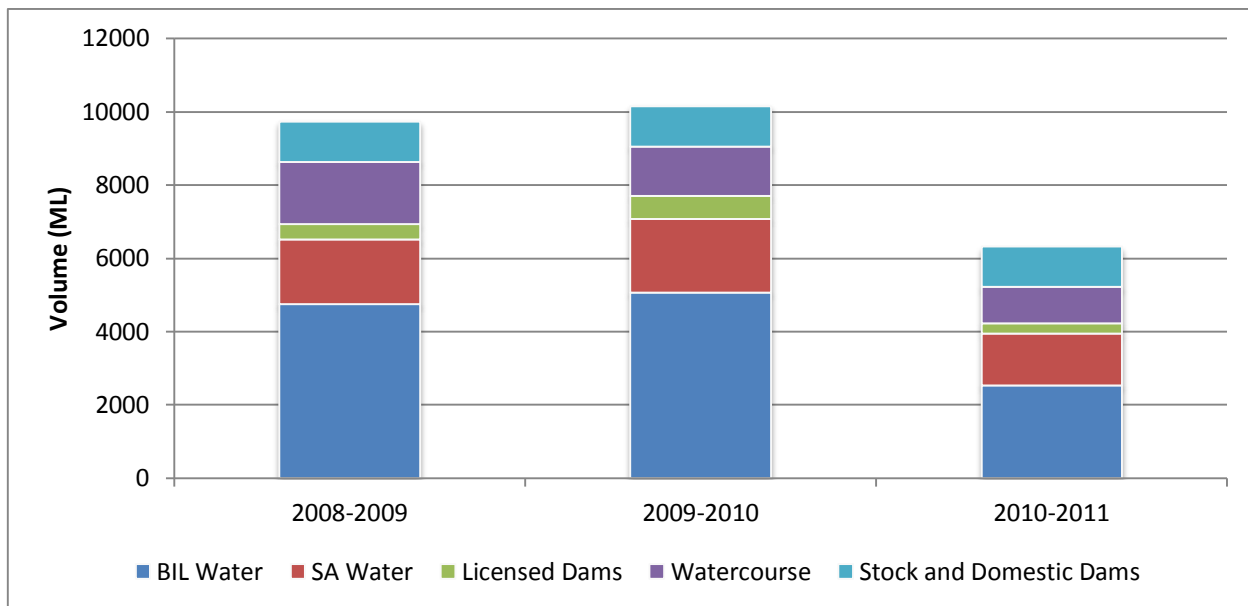


Figure 22. Surface water use in the Barossa PWRA from 2008-2011 (this figure does not seek to include groundwater, rainwater harvested from roofs, recycled wastewater or harvested urban stormwater)

USE RATING

An assessment of use was carried out using a rating from 1 to 6 to indicate the estimated percentage of the year's surface water resources used for irrigation, commercial, or stock or domestic purposes.

Water resources in the Barossa PWRA provide high value irrigation to the wine and other industries. The year 2010–11 was an above average rainfall year, which produced above average runoff to the rivers and creeks of the PWRA. In order to determine the impact of water extractions from farm dams and watercourse, a comparison of recorded streamflow and recorded and estimated water use is provided below.

Recorded streamflow for the Barossa PWRA in 2010–11 (recorded at North Para River at Yaldara) was approximately 15,170 ML, with approximately 2379 ML recorded or estimated as being extracted. As such, of the 2010–11 total estimated Barossa PWRA streamflow volume (not including evaporation from farm dams) (15,170 + 2379 = 17,549 ML), it is estimated that 14% was extracted for use (56% in 2008-09 and 21% in 2009-10) (Figure 23). In terms of the rating system described by Table 4, the Barossa PWRA has been assigned a use rating of 2 (Low use) for 2010–11.

Table 4. Use Rating System

Rating	% of streamflow 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

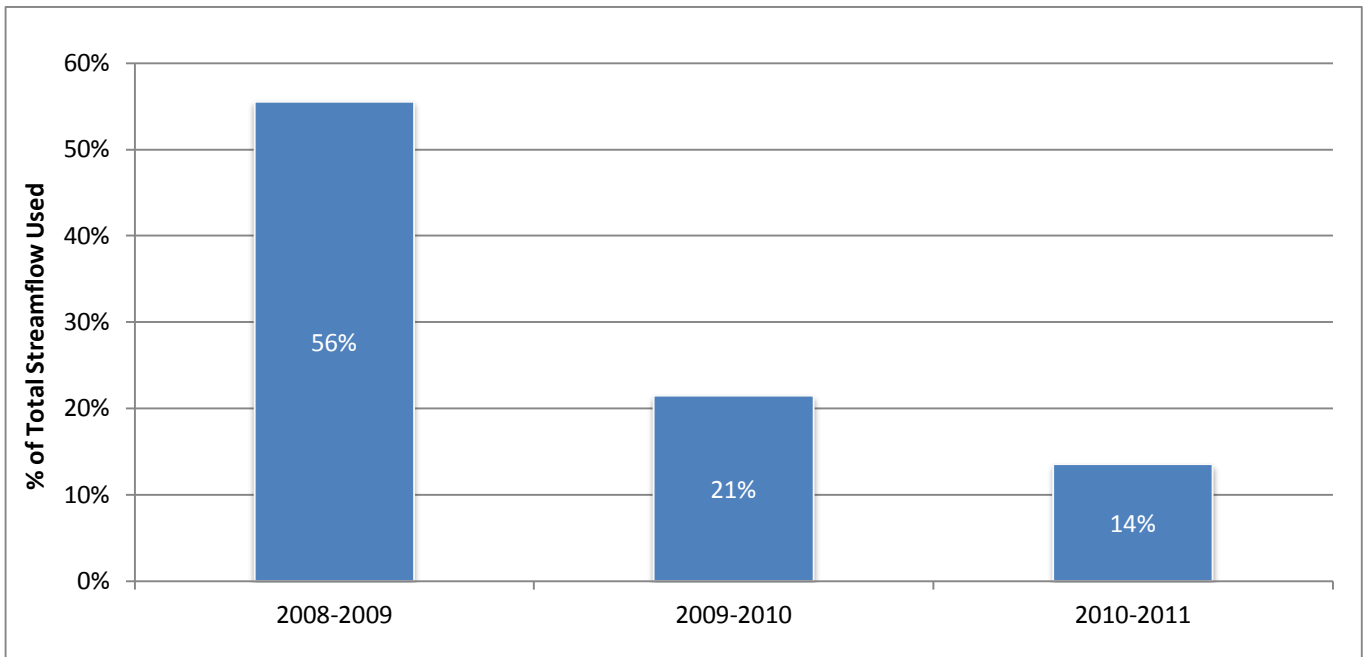


Figure 23. Percentage of total Barossa PWRA streamflow used from 2008-2011

WATER DEPENDENT ECOSYSTEMS

This status report for the Barossa 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 North Para River catchment within the Barossa PWRA is an ephemeral river system with permanent pools dispersed along its length, which are thought to be dependent on groundwater (AMLRNRMB 2009). These permanent pools provide a refuge for aquatic flora and fauna during periods of surface water disconnection (no flow). There is also anecdotal evidence of limited areas within the PWRA that maintain flow year round. In both cases, water quality and the viability of the habitat as an ecological refuge is dependent on the length of 'no flow' periods: the longer these periods, the greater the deterioration in water quality and the risk of the loss of the refuge (VanLaarhoven and van der Wielen 2009).

Previous surveys of the aquatic vegetation within the PWRA has identified common and resistant species dominated by bull rush and the common reed (*Typha* and *Phragmites*) and a limited over story of River Red Gum (*Eucalyptus camaldulensis*) and the exotic Ash (*Fraxinus*) (EPA 1999). Large reaches of the river have been cleared of native vegetation allowing exotic plants to establish, including several weeds of national significance; Broom, Gorse and Willow (EPA 1999).

The macroinvertebrate community was sampled in two locations during the 2010-11 period by the Environmental Protection Agency. The headwaters in the Flaxman Valley showed a macroinvertebrate community of 25 species dominated by tolerant species mostly suited to pool habitat (EPA 2011). The macroinvertebrate community in the main river channel downstream of Tanunda showed a more diverse community of 48 species, though the species present were dominated by generalists and tolerant species. There were three rare and sensitive species present; a leptophlebiid mayfly (*Atalophlebia australasica*), hydrobiosid caddisfly (*Ulmerochorema membrum*) and an unidentified stonefly (EPA 2011).

Previous surveys of the fish community, from Fish Action Plan Data 1998 in the Biological Databases of South Australia, have shown the PWRA to be dominated by tolerant natives and exotics. Of the native fish found in the PWRA the main species is the Flathead Gudgeon. Other natives include Blue Spot Goby and Mountain Galaxias, both in limited spatial distribution. Fish numbers are dominated by exotics including three noxious species under the Fisheries Management Act (Government of South Australia 2007); Redfin Perch, European Carp and Mosquito fish.

Threats to the aquatic ecosystem in the Barossa PWRA include large numbers of exotic vegetation and fish species (EPA 1999) and the increased periods of 'no flow' between the permanent pools (VanLaarhoven and van der Wielen 2009).

REFERENCES

Adelaide and Mount Lofty Ranges Natural Resources Management Board 2009. 'Water Allocation Plan, Barossa Prescribed Water Resources Area'. Government of South Australia, through the Adelaide and Mount Lofty Ranges Natural Resources Management Board, Adelaide, South Australia.

Adelaide and Mount Lofty Ranges Natural Resources Management Board 2010. 'Draft Water Allocation Plan, Western Mount Lofty Ranges'. Government of South Australia, through the Adelaide and Mount Lofty Ranges Natural Resources Management Board, Adelaide, South Australia.

AMLRNRMB – see Adelaide and Mount Lofty Ranges Natural Resources Management Board

EPA 1999, Watercourse Survey and Management Recommendations for the North Para Catchment, Environmental Protection Agency, Government of South Australia.

EPA 2011, Aquatic Ecosystem Condition Reports, Environmental Protection Agency, Government of South Australia.

Government of South Australia 2007, *Fisheries Management Act*, Government of South Australia, Adelaide.

Government of South Australia 2012, *Natural Resource Management State and Condition Reporting Framework SA 2012*, Adelaide.

Government of South Australia 2012a, *Our Place. Our Future. State Natural Resources Management Plan South Australia 2012-2017*. Government of South Australia.

VanLaarhoven J and van der Wielen M 2009, Environmental Water Requirements for the Mount Lofty Ranges Prescribed Water Resources Areas, Department of Water, Land and Biodiversity Conservation, Government of South Australia.