Marne Saunders status update

#4 Resource & ecosystem condition

Monitoring for stream flow and its salinity, and underground water level and its salinity, occurs at several sites throughout the Marne Saunders Prescribed Water Resources Area (PWRA). This includes flow gauging stations operated by the Department of Environment and Water (DEW) and the Murraylands and Riverland Landscape Board, regular bore monitoring by DEW, and provision of underground water samples by licensees for salinity testing.

The health of water-dependent ecosystems is monitored through annual citizen science Bioblitz water bug surveys; annual surveys of fish populations by the Murraylands and Riverland Landscape Board; and monitoring by the EPA to inform aquatic ecosystem condition reports.

An information pack has been developed as an outcome of the Cambrai Water Forum in February 2022. There are 6 papers in the series as supporting information developed for the upcoming meetings in November 2022:

#1: History, Licences, and Allocations

#2: Hydrological cycle in the PWRA

#3: Water development and use

#4: Resource and ecosystem condition

#5: Frequently asked questions

#6: How to address concerns

What is happening with surface water and groundwater?

DEW assesses the status of surface water and underground water resources in the Marne Saunders PWRA each year. The latest observations of groundwater level and stream flow from 2019-20 were either very much below average, or the lowest on record.

A summary of the 2019-20 status report for surface water and groundwater is reproduced overleaf. The full report, and reports from previous years, can be found on the WaterConnect website:

https://www.waterconnect.sa.gov.au/Content/Publications/DEW/Marne_Saunders_2020_Technical_Note.pdf

Marne Saunders Prescribed Water Resources Area

2019–20 surface water and groundwater status overview

Marne Saunders PWRA	Fractured rock aquifers
	Murray Group Limestone
	Surface water

LEGEND

- Highest on record
- Very much above average
- Above average
- Average
- Below average
- Very much below average
- Lowest on record
- Long-term trend

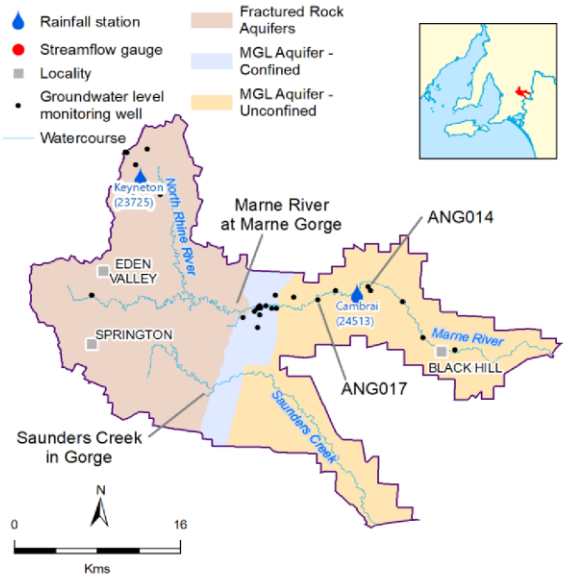
Regional context

The Marne Saunders PWRA relies on both surface water and groundwater resources which are managed under a Water Allocation Plan (WAP) adopted in 2010.

The PWRA is located in the Murray-Darling Basin. It is characterised by high rainfall in the hills and valleys of the ranges to the west, while the east is largely defined by gently undulating plains with rocky outcrops and very low rainfall.

The main watercourses within the PWRA are the ephemeral Marne River and Saunders Creek, which have their headwaters in the Mount Lofty Ranges.

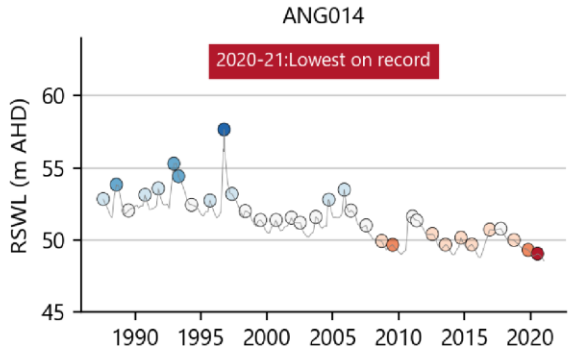
Groundwater is located in two types of aquifer: fractured rock aquifers found in the ranges to the west and the sedimentary Murray Group Limestone aquifers occurring beneath the Murray plains.



Groundwater level

56% of monitoring wells show 'Lowest on record' groundwater levels

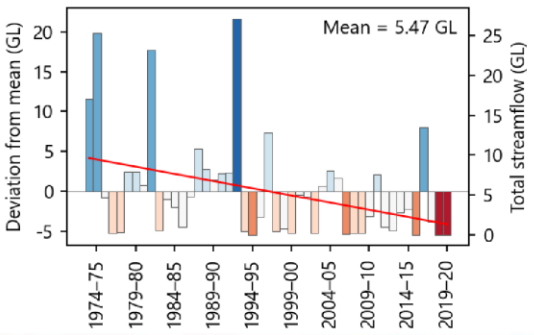
- Water levels in the fractured rock and Murray Group Limestone aquifers are classified from 'Below average' to 'Lowest on record' compared to their historical record.
- 56% of the monitoring wells (9 of 16) show lowest water levels on record in 2019–20, when compared to their respective historical record.
- Five-year trends in water level indicate that the majority of monitoring wells (92%) are declining.
- The figure below shows long-term groundwater levels at a monitoring well located near the Marne River (see map).



Streamflow

Streamflow was 'Lowest on record' for the 2 principal gauging stations in the PWRA

- Two principal streamflow gauging stations operational in the Marne Saunders PWRA recorded the below-average streamflow during 2019–20 (Marne River data presented below).
- The Marne River streamflow gauging station has not recorded any streamflow since November 2017. 10 ML of flow was recorded in the Saunders Creek in 2019–20.
- The data show a long-term declining trend in streamflow.



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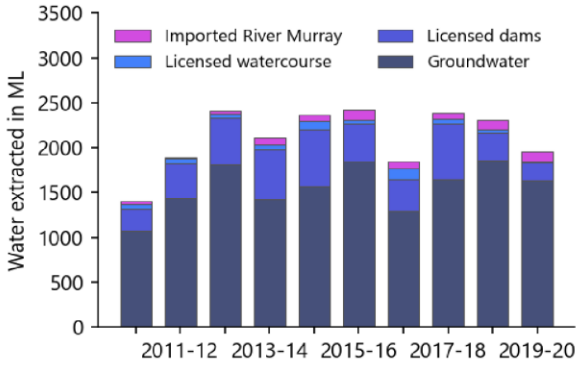
LANDSCAPE SOUTH AUSTRALIA MURRAYLANDS AND RIVERLAND

Water use

Water use in 2019–20 was 2454 ML with 1632 ML of this total extracted from groundwater, 822 ML from surface water sources (209 ML from licensed take and 496 ML of estimated demand from non-licensed sources) and 117 ML imported from the River Murray

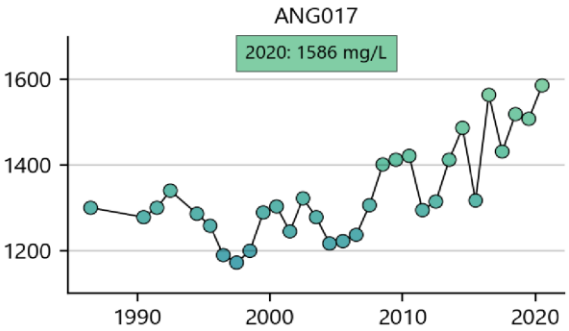
- Water sources include watercourses, farm dams, groundwater and imported water from the River Murray for municipal water supply and irrigation.



Salinity

In 2020, groundwater salinity from 76 wells ranged from 465 to 7387 mg/L with a median of 1810 mg/L

- Eight-year salinity trends in the fractured rock aquifers are decreasing in most wells (66%). The change in salinity over the eight-year period varies from a decrease of 6.34% per year to an increase of 1.04% per year, with a median rate of 0.27% decrease per year.
- Eight-year salinity trends in the Murray Group Limestone aquifer vary from a decrease of 5.99% per year to an increase of 7.93% per year, with a median rate of 0.02% increase per year.
- The figure below shows increases in salinity over the past 30 years at a monitoring well located east of Cambrai.



- No salinity values were recorded in the Marne River or Saunders Creek due to insufficient flow in 2019–20.

Climate-driven trends in water resources

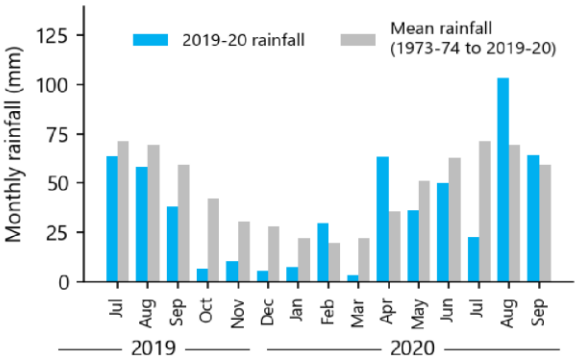
Climate is one of the main drivers of trends in the local water resources. Surface water and groundwater resources in the Marne Saunders PWRA are highly dependent on rainfall.

Below-average winter rainfall results in a reduction in annual streamflow volumes. Below-average summer rainfall can increase the need for irrigation and therefore lead to higher water extraction. This can in turn lead to an increase in salinity. Conversely, increased rainfall results in increased surface water availability, decreased irrigation extractions, with potential decline or stabilisation of salinity.

Below-average rainfall also results in reduced recharge to shallow aquifers. Together with increased water extractions can cause groundwater levels to decline even in deeper confined aquifers. Conversely, above-average rainfall can cause increased recharge and lower irrigation extraction, which can cause groundwater levels to increase.

Rainfall was below-average for 2019–20

- Rainfall typically ranges from 280 mm/y on the Murray Plains at the eastern boundary of the PWRA to 800 mm/y across the higher elevations at the western boundary.
- Rainfall across the region was below-average in 2019–20.
- Rainfall at Keyneton was 373 mm in 2019–20, 27% below-average, while rainfall at Cambrai was 192 mm, 33% below average. This pattern was consistently observed across the PWRA (data for Keyneton presented below).
- Below-average rainfall was observed throughout 2019–20 with very dry conditions experienced in the spring and summer of 2019–20.
- Long-term data trends indicate declining rainfall (1973–20).



More Information

This fact sheet is a high level summary of information provided in the 2019–20 Water Resources Assessment for the Marne Saunders PWRA. Full details of the assessment can be found at: https://www.waterconnect.sa.gov.au/

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What is happening with water-dependent ecosystems?

A 20 year review has recently been done of fish monitoring data from 2001-2021 across the Marne Saunders PWRA, including links with water quality and flow data.

The review found there has been a decline in the condition of fish populations over that time at most sites. This decline includes a reduction in the number and distribution of fish in the hills, and increasing dominance of generalist and introduced fish species in the plains. Of particular concern is the threat of local extinction of the river blackfish population in the lower Marne at Black Hill Springs, which could occur in the near future.

The review analysed data on water salinity and key measures of the stream flow pattern, including modelled flow data that removes the effects of dams. This analysis suggests that an important contributor to the decline in fish populations is a reduction in flow (e.g. fewer days of stream flow, and fewer pulse flows or freshes at important times of year) and increasing salinity. The analysis showed that the reduction in flow is due to surface water capture by dams, and reduction in rainfall over the review period, particularly in the hills zone where most of the stream flow is generated.

A primary threat to fish populations in the hills zone is the increased drying out of waterways, leading to direct extermination of fish when refuge pools dry up. Waterways drying out also reduces connection between habitats across the hills, which reduces the ability of fish to recolonise areas.

The primary threat to the river blackfish population in the plains zone appears to be increasing salinity preventing successful breeding and survival of young fish (Figure 1, right). This may be due to the lack of large flow events in the last few years that flush the pools and bring fresh recharge to the local underground water.

These findings from the fish review align with local observations and previous reports on the reduction of the extent of permanent water in the lower Marne around Black Hill, and poor condition of river red gums that are also dependent on high flow events for watering and groundwater recharge.

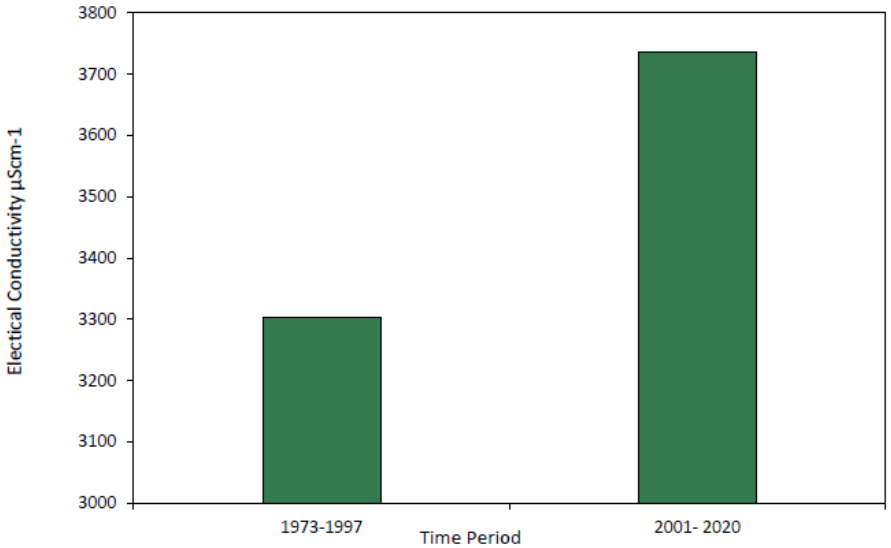

Figure 1: Mean annual salinity (as Electrical Conductivity EC) for years 1973-1997 Marne River at Cambrai and 2001–2021. Figure adapted from Whiterod et. al (2021), Nature Glenelg Trust.

Further information:

For more information on water resource and ecosystem monitoring please refer to:

- Monitoring data for surface water and underground water: www.waterconnect.sa.gov.au
- Surface water and groundwater annual status reports: https://www.waterconnect.sa.gov.au/Systems/GSR/Pages/Default.aspx
- EPA aquatic ecosystem condition reports: https://www.waterconnect.sa.gov.au/Systems/EPAWQ/SitePages/Home.aspx
- Citizen science monitoring: www.landscape.sa.gov.au/mr/get-involved/citizen-science/water-monitoring
- 20 year review of the status of water resources and fish communities within the Marne Saunders PWRA: https://cdn.environment.sa.gov.au/landscape/images/20-YEAR-REVIEW_FISH_MarneSaunders-PWRA_Whiterod-et-al_FINAL_2021.pdf

More information

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https://www.landscape.sa.gov.au/mr/water/water-allocation-plans/marne-saunders