Clare Valley Prescribed Water Resources Area
2019–20 water resources assessment

Department for Environment and Water
October, 2021

DEW Technical Note 2021/08

Government of South Australia
Department for Environment and Water

Department for Environment and Water

Government of South Australia

October 2021

81-95 Waymouth St, ADELAIDE SA 5000

Telephone +61 (8) 8463 6946

Facsimile +61 (8) 8463 6999

ABN 36702093234

www.environment.sa.gov.au

ISBN 978-1-922027-05-4

Preferred way to cite this publication

DEW (2021). *Clare Valley Prescribed Water Resources Area 2019–20 water resources assessment*, DEW Technical Note 2021/08, Government of South Australia, Department for Environment and Water, Adelaide.

Download this document at https://www.waterconnect.sa.gov.au

Contents

1 Summary

Clare Valley PWRA	Fractured rock aquifers	
	Surface water	

LEGEND

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

Rainfall

- Rainfall typically ranges from 500 to 620 mm with the higher rainfall in the central and elevated areas of the PWRA.
- Rainfall at Calcannia was below-average in 2019–20 and this pattern was consistently observed across the PWRA. The long-term data trends indicate a decline in rainfall and the last 3 years have been below-average.
- Conditions in late-winter and spring 2019 and the summer of 2019–20 were below-average. Of particular note are February, April and August 2020 monthly rainfall totals that were above-average, experiencing 2–3 times the long-term monthly average.

Surface water

- Three representative streamflow gauging stations were analysed, two of which (Wakefield River and Hill River) recorded the 'lowest on record' streamflow, with Hutt River recording 'very much below average' streamflow during 2019–20.
- There is an overall declining trend in streamflow recorded at the Wakefield River streamflow gauging station, with 13 of the past 15 years recording below-average annual streamflow. The annual streamflow recorded for the Wakefield River in 2019–20 was 334 ML, considerably lower than the long-term average of 7515 ML.
- The highest salinity in the Wakefield River in 2019–20 was 6772 mg/L and 2415 mg/L in the Skillogalee Creek. These values remain within the respective historical ranges for each site.

Groundwater

- In 2020, groundwater levels observed in 53% of fractured rock aquifer monitoring wells were at their lowest levels on record.
- Five-year water level trends showed declining levels in 97% of the wells at a median rate of decline of 0.98 m/y.
- Ten-year salinity trends in the fractured rock aquifers are increasing in most wells (93%). The median change of salinity trends over the period is an increase of 0.42%/y.

Water use

- Water used for the purposes of irrigation, commercial, and stock and domestic supply are derived from a variety of sources. These include pumping and diversions from watercourses and aquifers, interception and storage by farm dams and imported River Murray water via the Clare Valley Water Supply Scheme (WSS) and SA Water's reticulated distribution network.
- Water use for consumptive purposes was 5177 ML in 2019–20, which includes 3211 ML imported from the River Murray. Water sourced from within the Clare Valley included 147 ML from licensed surface water take and 1144 ML from licensed groundwater take. There was greater reliance on imported water sources and groundwater in 2019–20 due to below-average rainfall.

1.1 Purpose

The Department for Environment and Water (DEW) has a key responsibility to monitor and report annually on the status of prescribed and other groundwater and surface water resources. To fulfil this, data on water resources are collected regularly, analysed and reported in a series of annual reports. Three reports are provided to suit a range of audiences and their needs for differing levels of information:

- **Technical Notes**: (this document) provide a detailed information and assessment for each resource area, helping to identify the resource condition in further detail;
- **Fact sheets**: provide summary information for each resource area with an Annual Resource Status Overview;
- **State-wide summary**: this summarises information for the main water resources across most regions in a quick-reference format.

This document is the Technical Note for the Clare Valley Prescribed Water Resources Area (PWRA) for 2019–20 and collates rainfall, surface water and water use (i.e. surface water and groundwater) data collected between July 2019 and September 2020, and groundwater level and salinity data collected between July 2019 and December 2020.

1.2 Regional context

The Clare Valley PWRA is located approximately 100 km north of Adelaide (Figure 1.1) and lies within the Northern and Yorke Landscape Region. It includes both groundwater and surface water resources. These resources are prescribed under the *Landscape South Australia Act 2019* and a water allocation plan, adopted in 2009, provides rules for their management.

Surface water resources in the PWRA are the Broughton River, Hill River and Hutt River catchments in the north, and the Wakefield River catchment draining to the south. The main watercourses are ephemeral, with permanent pools occurring in many places, which are primarily sustained by groundwater.

There are two groundwater systems within the Clare Valley region: a Quaternary alluvial aquifer which occurs at shallow depths of less than 15 m in valley floors, and extensive fractured rock aquifers which occur throughout the area. The fractured rock aquifers are the main groundwater system in the Clare Valley and their status is described in this report. The Quaternary alluvial aquifer provides only a small portion of the groundwater resource, mainly in the vicinity of Stanley Flat.

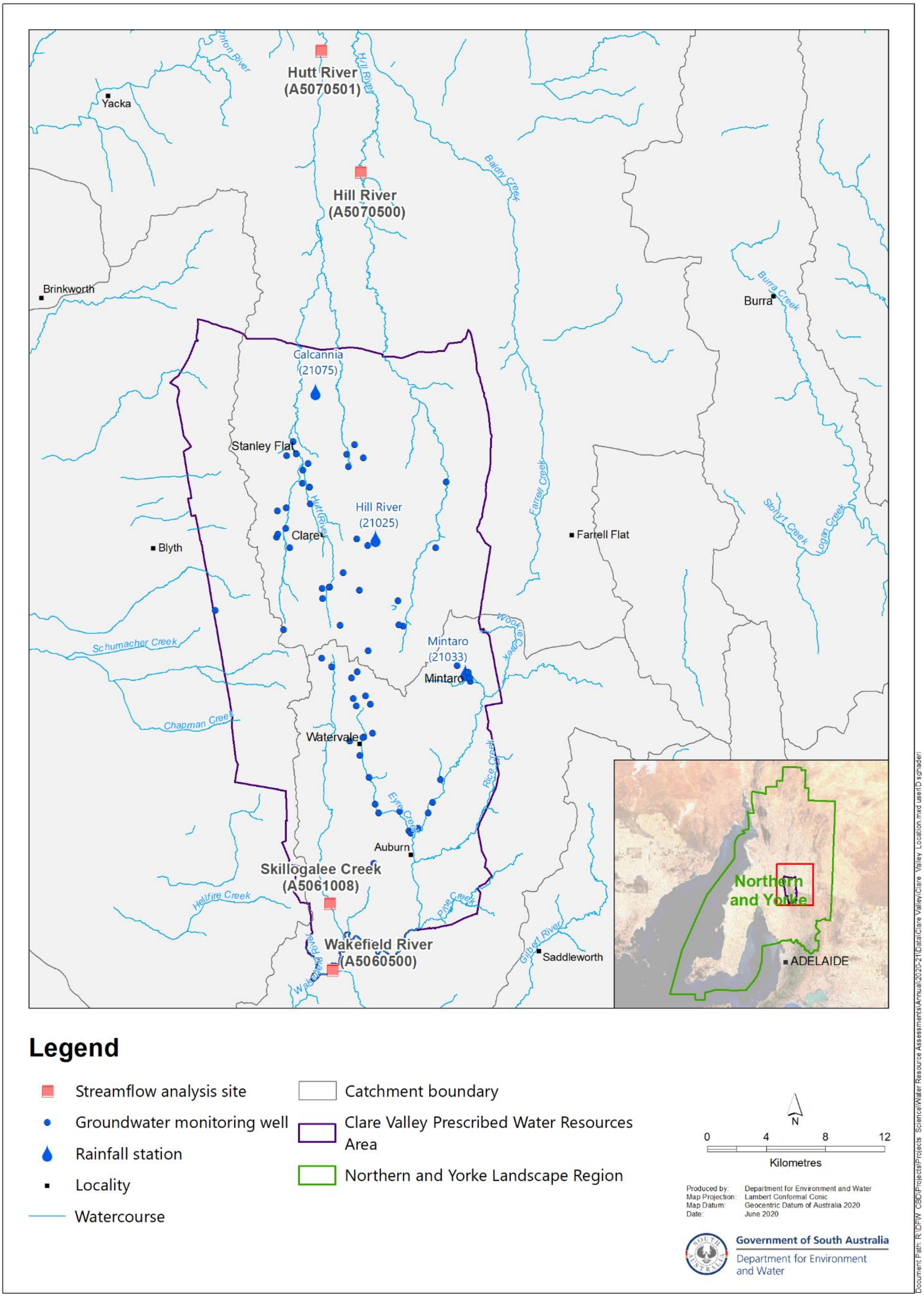


Figure 1.1. Location of Clare PWRA

2 Methods and data

This section describes the source of rainfall, surface water, groundwater and water use data presented in this assessment and the methods used to analyse and present these data.

2.1 Rainfall

Daily rainfall observations were used from selected Bureau of Meteorology (BoM) stations in order to calculate monthly and annual totals. The data were obtained from the SILO Patched Point Dataset[1] service provided by the Queensland Government, which provides interpolated values to fill gaps in observations (Figure 3.1 and Figure 3.2).

Rainfall maps were compiled using gridded datasets obtained from the BoM (Figure 3.3). The long-term average annual rainfall map (1986-2015) was obtained from Climate Data Online[2]. The map of total rainfall in 2019–20 was compiled from monthly rainfall grids obtained for the months between July 2019 and June 2020 from the Australian Landscape Water Balance[3] website.

2.2 Surface water

2.2.1 Annual streamflow

The status of each of the streamflow gauging stations is determined by expressing the annual streamflow for the applicable year as a percentile[4] of the total period of data availability. The period of data availability for the Wakefield River streamflow gauging station is 1970–20. Streamflow data were then given a description based on their percentile and decile[4] (Table 2.1 and Figure 4.1).

Table 2.1. Percentile/decile descriptions*

Decile	Percentile	Description	Colour
N/A	100	Highest on record	
10	90 to 100	Very much above average	
8 and 9	70 to 90	Above average	
4, 5, 6, and 7	30 to 70	Average	
2 and 3	10 to 30	Below average	
1	0 to 10	Very much below average	
N/A	0	Lowest on record	

* Deciles and descriptions as defined by the BoM[5]

[1]https://www.data.qld.gov.au/dataset/silo-patched-point-data

[2]http://www.bom.gov.au/jsp/ncc/climate_averages/rainfall/index.jsp

[3]http://www.bom.gov.au/water/landscape/#/rr/Actual/year/-28.4/130.4/3/Point////2020/12/31/

[4] The nth percentile of a set of data is the value at which n% of the data is below it. For example, if the 75th percentile annual flow is 100 ML, 75% of the years on record had annual flow of less than 100 ML. Median streamflow: 50% of the records were above this value and 50% below. Decile: a division of a ranked set of data into ten groups with an equal number of values. In this case e.g. the first decile contains those values below the 10^{th} percentile.

[5] Bureau of Meteorology Annual climate statement at http://www.bom.gov.au/climate/current/annual/aus/

Annual streamflow data (Figure 4.2) is presented as the deviation of each year's streamflow from the long-term average with the bars shaded using the BoM classification shown in Table 2.1.

2.2.2 Monthly streamflow

Monthly streamflow for the applicable year is assessed alongside the long-term average monthly streamflow (Figure 4.3A), for the period 1970–20 and long-term monthly statistics including (a) high flows (25th percentile), (b) median flows (50th percentile) and low flows (75th percentile).

2.2.3 Daily streamflow

Daily streamflow is presented to show the detailed variability throughout the applicable year (Figure 4.3B).

2.2.4 Salinity

Box plots on a monthly basis are used to assess surface water salinity (Figure 2.1 and Figure 4.4). This enables the salinity (TDS; total dissolved solids in mg/L) for the applicable year to be presented against long-term salinity statistics (maximum, 75th percentile, median or 50th percentile, 25th percentile and minimum).

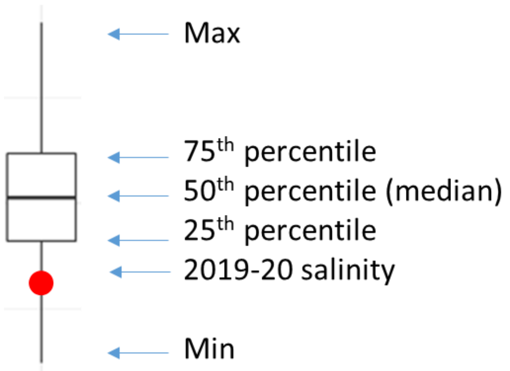


Figure 2.1 Box and whisker plot

2.3 Groundwater

2.3.1 Water level

Water level data[6] were obtained from wells in the monitoring network by both manual and continuous logger measurements. All available water level data are verified and reduced to an annual maximum water level for each well for further analysis. The annual maximum level is used as this represents the unstressed or recovered water level following pumping each year for irrigation and other uses. The amount of pumping can vary from year to year, and the proximity of pumping wells to observation wells may affect the reliability of trends and historical comparisons. Therefore the recovered level is used as it is a more reliable indicator of the status of the groundwater resource. The period of recovery each year was reviewed for each well; in general wells in the Clare Valley PWRA return to a recovered maximum level between September and December.

[6] "Water level" in this report refers to both the watertable elevation, as measured in wells completed in unconfined aquifers, and the potentiometric water level elevation, as measured in wells completed in confined aquifers where the water level or pressure in the monitoring well rises above the top of the aquifer. These are collectively referred to as the "reduced standing water level" (RSWL).

For those wells that meet the selection criteria (see below), the annual recovered water levels are ranked from lowest to highest according to their decile range (Table 2.1) and give a description in a similar way as annual streamflow. The thresholds for criteria by which wells are selected varies depending on the history of monitoring activity in different areas; for the Clare Valley PWRA, any well with 8 years or more of recovered water level data is included. The number of wells in each description class for the most recent year is then summarised for each aquifer (e.g. Figure 5.1). Hydrographs are shown for a selection of wells to illustrate common or important trends (e.g. Figure 5.3).

Five-year trends are calculated using annual recovered water levels for those wells which have at least five measurements (i.e. at least one measurement a year). The trend line was calculated by linear regression and the well is given a status of 'declining', 'rising', or 'stable', depending on whether the slope of this trend line is below, above, or within a given tolerance threshold. This threshold allows for the demarcation of wells where water levels are changing at very low rates and the water level can therefore be considered stable. The threshold also accommodates for very small measurement errors. The number of rising, declining and stable wells are then summarised for each aquifer (Figure 5.2). Fractured rock aquifers such as those in the Clare Valley have lower storages than sedimentary aquifers and are given a tolerance threshold of 1 cm/y.

Twenty-year changes in water level were calculated as the difference between the average water level in a three-year period twenty years ago (i.e. 1998–2000) and the average water level in 2020.

2.3.2 Salinity

Water samples are collected annually from pumping irrigation wells in the Clare Valley PWRA. These samples are tested for electrical conductivity (EC) and the salinity (total dissolved solids measured in mg/L, abbreviated as TDS) is calculated. Where more than one water sample has been collected in the course of a year, the annual mean salinity is used for analysis. The results are shown in Figure 5.4.

Ten-year salinity trends are calculated where there are at least seven years of salinity data (i.e. at least one measurement per year). The trend line is calculated by linear regression and the percentage change in salinity is calculated through the following formula:

$$\text{Percentage change in salinity (\%)} = \frac{\text{Slope of linear trend line (mg/L/y)} * 10}{\text{Value of trend line at start of period (mg/L)}} * 100$$

The percentage of change over the trend period is then summarised in categories depending on the range of change for each resource. The salinity measurements are based on the measurement of the electrical conductivity of a water sample and are often subject to small instrument errors (e.g. Figure 5.5).

Salinity graphs are shown for a selection of wells to illustrate common or important trends (e.g. Figure 5.6).

2.4 Water use

Meter readings are used to estimate licensed extraction volumes for both surface water and groundwater sources. Where meter readings are not available, licensed or allocated volumes are used for surface water sources (Figure 6.1).

Non-licensed water use (stock and domestic) from farm dams is not metered and is estimated at 30% of dam capacity (AMLR NRM Board, 2019). Futher information on the number, type and distribution of farm dams in the PWRA is provided in Section 6.3. Dam capacity estimates are undertaken using different methods with data derived from aerial surveys one of the primary sources.

2.5 Further information

Both surface water and groundwater data can be viewed and downloaded using the *Surface Water Data* and *Groundwater Data* pages under the Data Systems tab on WaterConnect[7]. For additional information related to groundwater monitoring well nomenclature, please refer to the Well Details page on WaterConnect[8].

Other important sources of information on water resources in the Clare Valley PWRA are:

- Summary reports on the surface water (DEWNR, 2011) and groundwater resources (DFW, 2010) of the Clare Valley PWRA.
- Annual surface water status reports such as (DEW, 2019a) and groundwater level and salinity status reports such as (DEW, 2019b).
- Favier et al. (2000, 2004) provide detailed river management plans for the Wakefield and Broughton River catchments.
- The Water Allocation Plan for the Clare Valley Prescribed Water Resources Area (NY NRM Board, 2009).

[7] https://www.waterconnect.sa.gov.au/Systems/GD/Pages/default.aspx

[8] https://www.waterconnect.sa.gov.au/Systems/GD/Pages/Well-Details.aspx

3 Rainfall

The Clare Valley PWRA has mild, wet winters and hot, dry summers which are typical of a Mediterranean climate. Rainfall in the Clare Valley is generally higher in more elevated areas (annual total of 600 to 620 mm/y) decreasing to annual totals of between 500 and 600 mm/y in other parts of the PWRA.

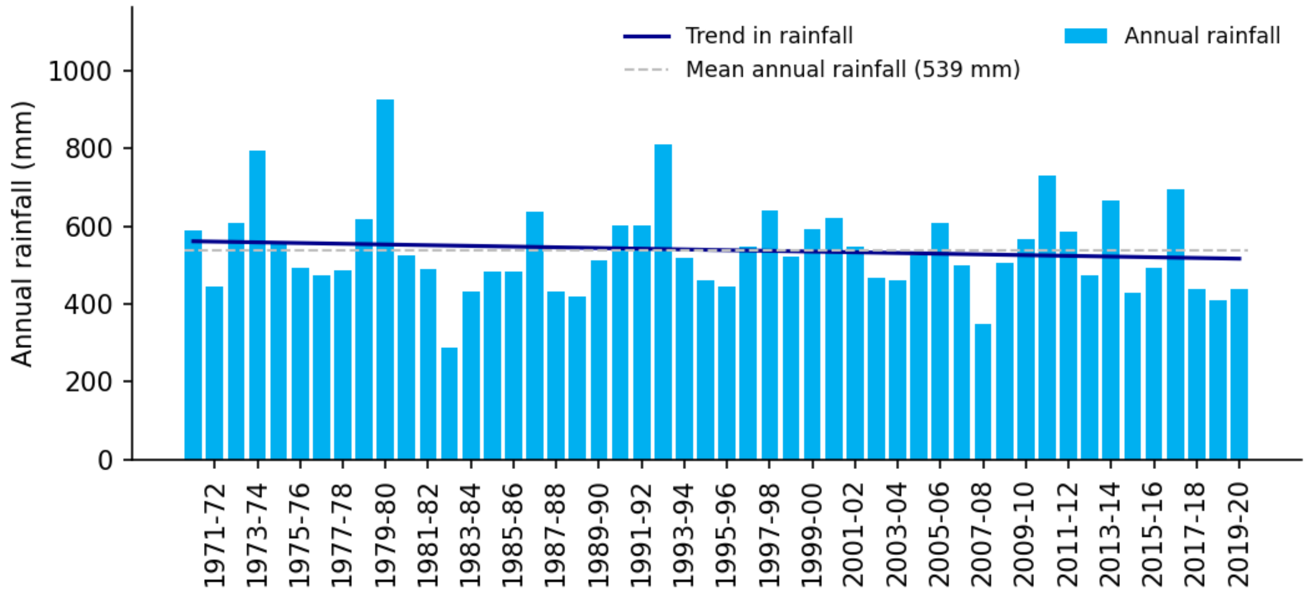


Figure 3.1 Annual rainfall for 1970–71 to 2019–20 at the Calcannia rainfall station (21075)

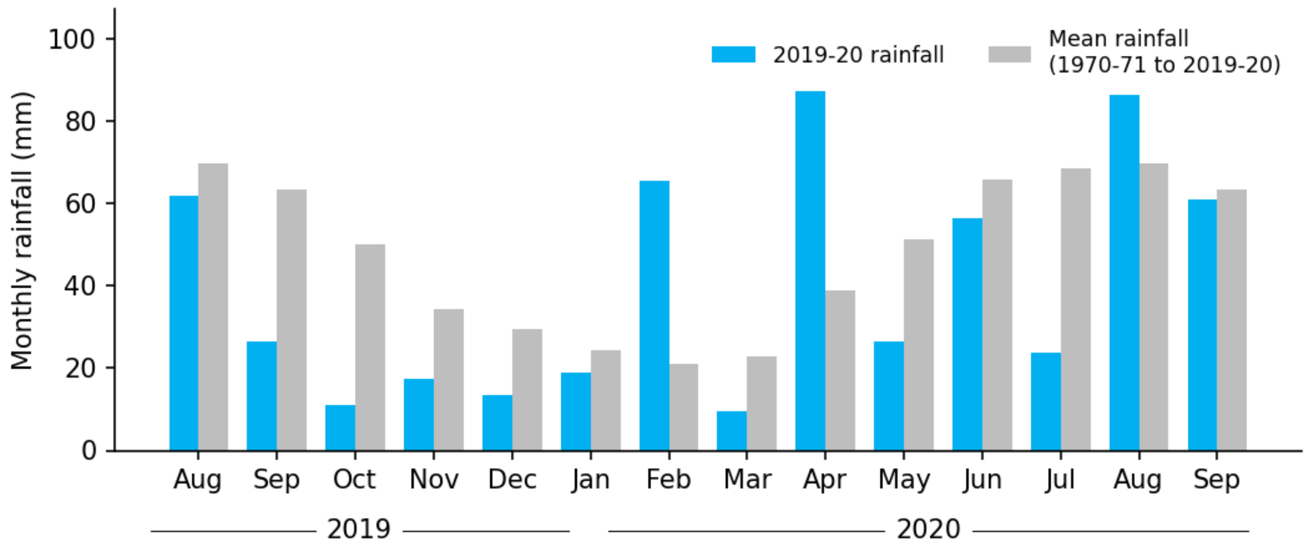


Figure 3.2 Monthly rainfall between July 2019 and September 2020 at the Calcannia rainfall station (21075)

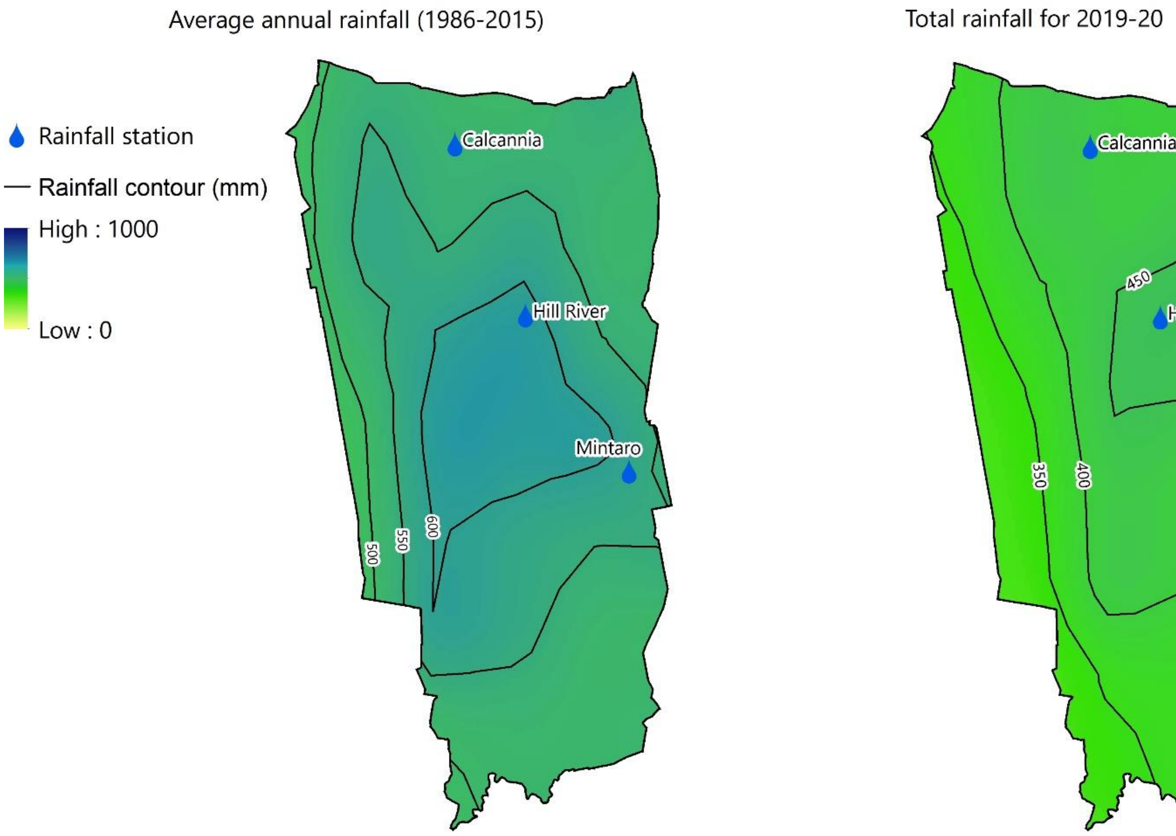


Figure 3.3 Rainfall in the Clare Valley PWRA for 2019–20 compared to the 30-year average (1986–2015)

- The Calcannia rainfall station (BoM station 21075) is located at the northern edge of the PWRA. The annual total recorded for 2019–20 was 439 mm. This was 100 mm lower than the annual average rainfall of 539 mm/y (1970–20). Annual rainfall has been below average for the last 5 out of 6 years, including the last three years consecutively.
- Rainfall at other stations in the PWRA was also below average in 2019–20:
  - Hill River (BoM station 21025) in the central part of the PWRA recorded 490 mm in 2019–20, 140 mm lower than the average of 630 mm.
  - Mintaro (BoM station 21033) on the eastern edge of the PWRA recorded 451 mm in 2019–20, 139 mm lower than the average of 590 mm.
- Conditions in late-winter and spring 2019 and the summer of 2019–20 were below-average. Of particular note are February, April and August 2020 monthly rainfall totals that were above-average, experiencing 2-3 times the long-term monthly average (Figure 3.2).
- Rainfall in 2019–20 was lower than the long-term average consistently across the PWRA, although rainfall was slightly higher in the central and elevated parts relative to the boundaries of the PWRA (Figure 3.3[9]).

[9] Some differences may be noticeable between the spatial rainfall maps and the annual rainfall from individual stations. This is due to the use of different data sources and time periods and further detail is provided in Section 2.1.

4 Surface water

4.1 Streamflow

The topography in the Clare Valley PWRA essentially represents a divide in the area between the north and the south. The northern area comprises part of the Broughton River catchment that drains to Spencer Gulf near Port Pirie, as well as the ephemeral Hill and Hutt Rivers. The southern area comprises part of the ephemeral Wakefield River catchment that drains to Saint Vincent Gulf near Port Wakefield. Trends in streamflow and salinity are primarily rainfall driven i.e. below-average winter rainfall will result in reduced annual streamflow volumes. Conversely, higher rainfall will result in increased surface water availability.

Three streamflow gauging stations (Figure 1.1) are used as representative sites when assessing streamflow in the Clare Valley PWRA (Figure 4.1):

- Wakefield River (A5060500) gauging station, located at the downstream outlet of the PWRA.
- Hill River (A5070500) and the Hutt River (A5070501) gauging stations are located outside the PWRA and so some of their catchment areas are not within the PWRA, but regardless provide representative streamflow analysis data for the region.

In 2019–20, lower-than-average streamflow was recorded in all three of the representative gauging stations (Figure 4.1). The Hill River and Wakefield Rivers stations recorded the 'Lowest on record' streamflow, and the Hutt River recorded 'Very much below average' streamflow. Further detail on methodologies used for analysis can be found in Section 2.

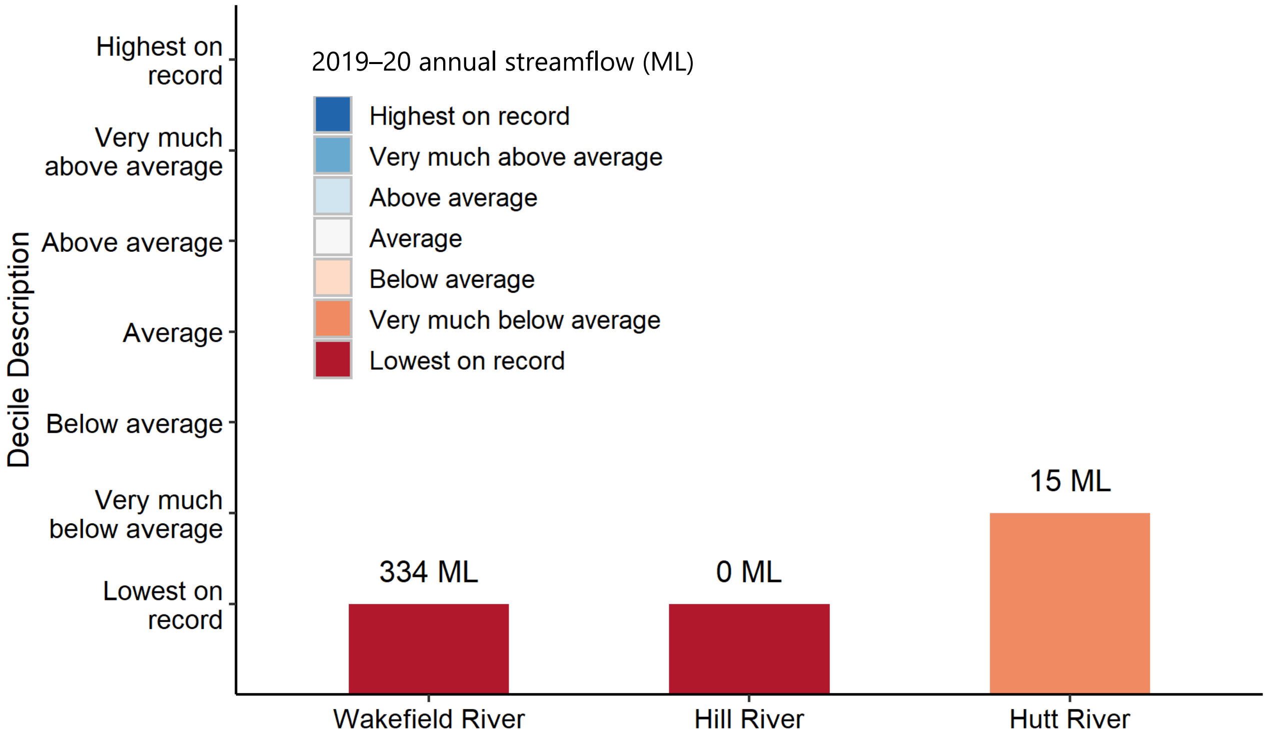


Figure 4.1 Clare Valley PWRA annual streamflow summary 2019–20

4.1.1 Wakefield River (A5060500)

The principal long-term streamflow gauging station for the PWRA is located on the Wakefield River at the outlet of the catchment and covers a catchment area of 416 km^2.

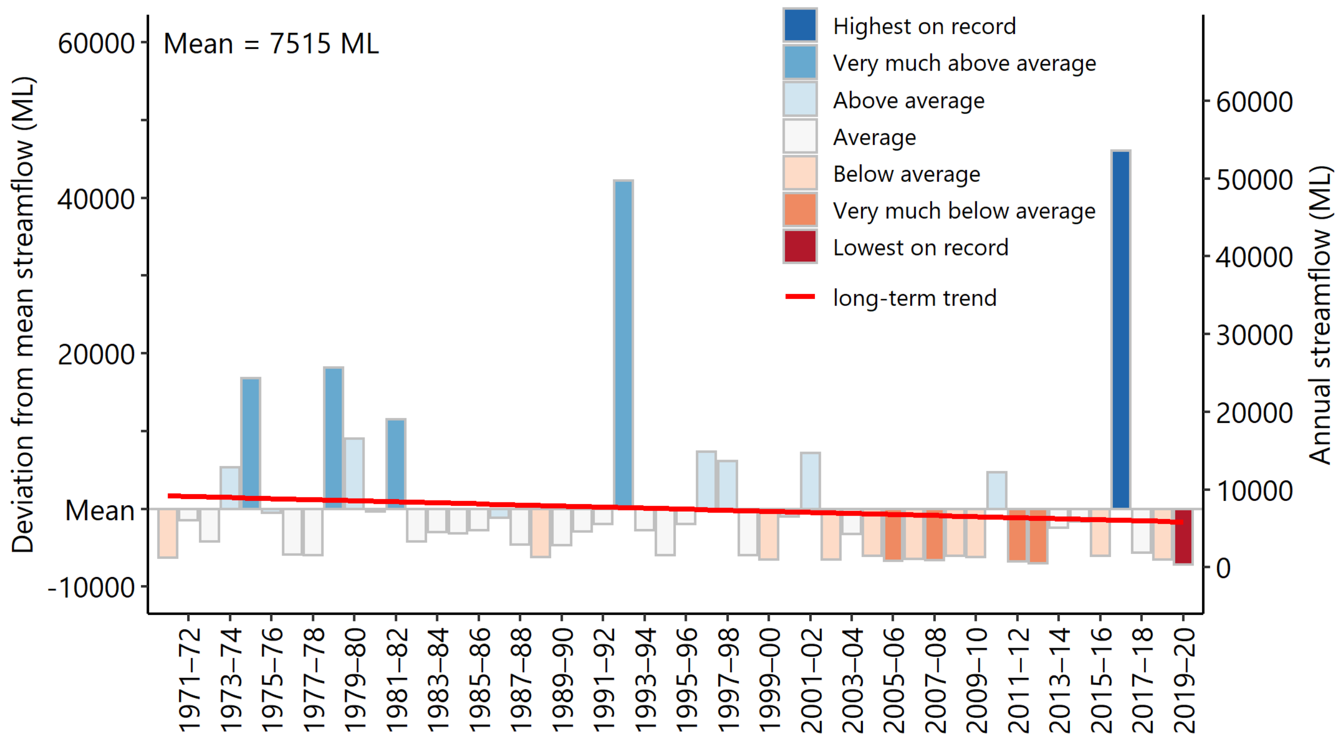


Figure 4.2 Annual deviation from mean streamflow at the Wakefield River (1970–71 to 2019–20)

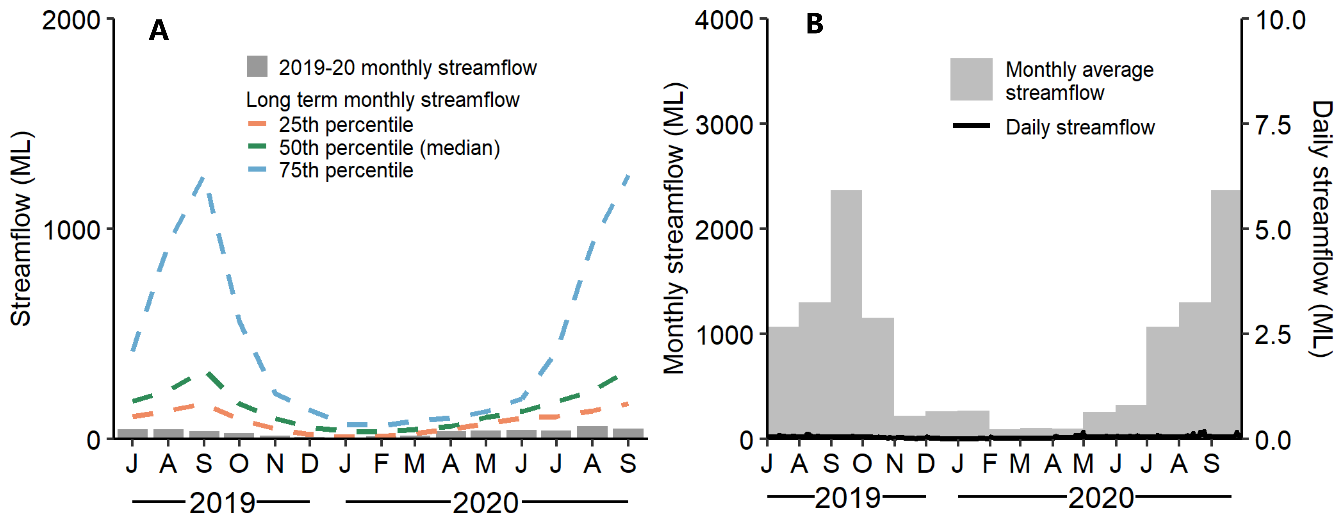


Figure 4.3 (A) Long-term monthly statistics and 2019–20 monthly streamflow on the Wakefield River; (B) Long-term average monthly streamflow and 2019–20 daily streamflow on the Wakefield River

The deviation of each individual year's streamflow from the long-term average streamflow is shown in Figure 4.2. The annual streamflow recorded at the Wakefield River gauging station was 334 ML in 2019–20.

The annual total is ranked as 'lowest on record' assessed for the period 1970–20. Annual streamflow at the Wakefield River gauging station indicates a long-term declining trend, with 13 out of the last 15 years experiencing flows below the average annual streamflow (Figure 4.2).

Figure 4.3A shows the monthly streamflow for 2019–20 (grey bars) relative to the long-term monthly streamflow (1970–20) for (a) low flows (25th percentile), (b) median flows (50th percentile) and high flows (75th percentile). Historically, the majority of streamflow in the Clare Valley PWRA occurs between July and October and typically accounts for approximately 90% of the total annual flow in any given year. However, all months were drier-than-average (and below the 25th percentile streamflow) in 2019–20. In the period from July to September 2020, flows remained below the 25th percentile streamflow.

Figure 4.3B presents the long-term average monthly streamflow (1970–20) and the daily flows for 2019–20. Maximum daily flows of 4.7 ML/d were recorded in August 2020 and average daily flows for 2019–20 were 1.1 ML/d. There were no periods of zero flow days at the Wakefield River gauging station.

4.2 Salinity

Below-average summer rainfall can result in increased irrigation extractions. These two elements can cause salinities to increase by reducing the amount of streamflow available to dilute mobilised salts. Conversely, higher rainfall will result in increased surface water availability and decreased irrigation extractions, resulting in a reduction or stabilisation of salinity. Salinity is recorded at the Wakefield River (A5060500) and Skillogalee Creek (A5061008) streamflow gauging stations in the PWRA and they provide a good indication of salinity in the PWRA.

Figure 4.4 shows the long-term monthly salinity statistics for the period 1992–19 recorded at the Wakefield River streamflow gauging station. Median monthly salinity values for 2019–20 (red dots) are also shown in Figure 4.4.

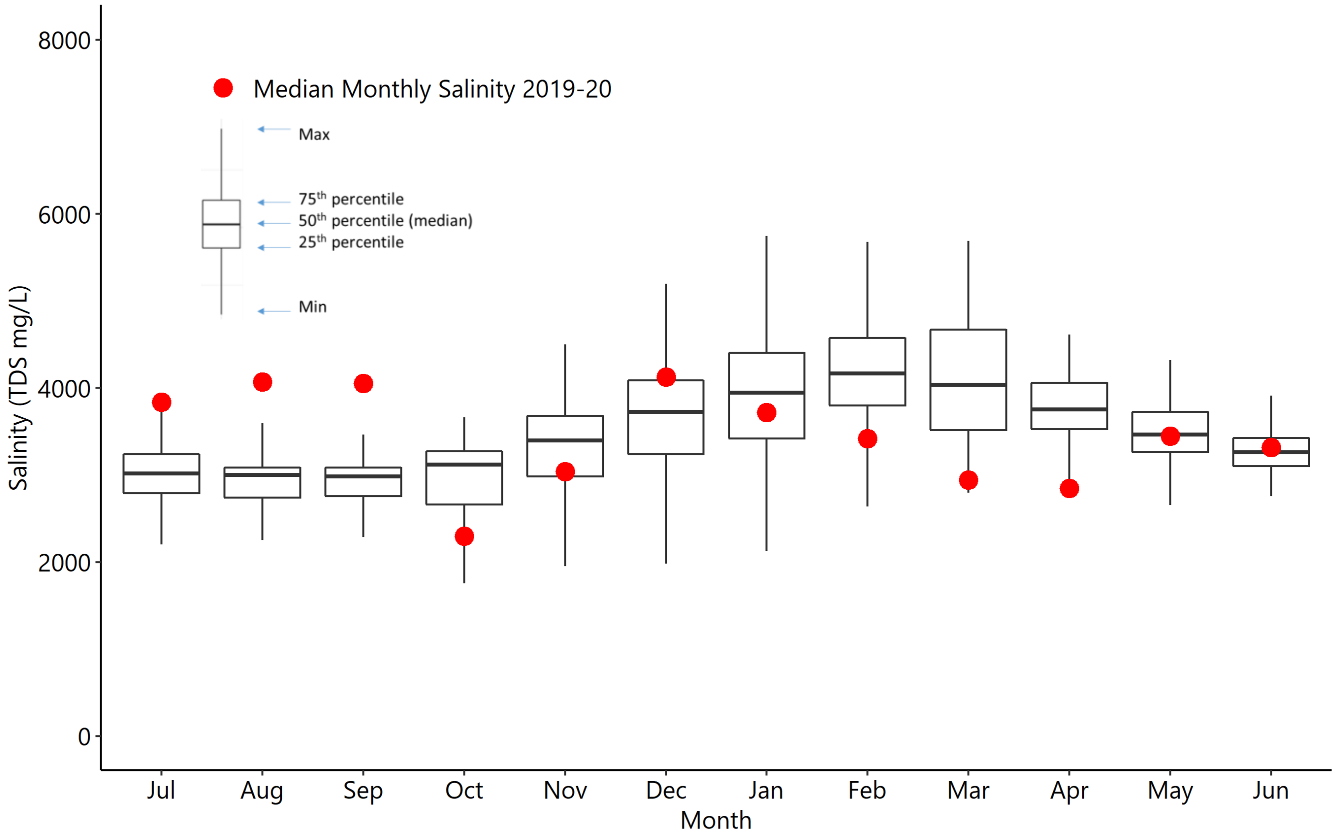


Figure 4.4 Long-term and 2019–20 monthly salinity at Wakefield River streamflow gauging station (A5060500)

Over 70% of the salinity values recorded at the Wakefield River streamflow gauging station are between 2500-4000 mg/L. The long-term monthly data at this site indicates a lower variability in monthly salinity than the Yaldara streamflow gauging station in the Barossa, which is indicated by the smaller range between the minimum and maximum values. The 2019–20 median salinity values remained within the monthly historical range of salinities for the majority of the year except for winter 2019, where they were higher than the maximum previously recorded, due to the very low streamflow over this period normally only experienced over the summer months. The highest salinity recorded at the Wakefield River streamflow gauging station in 2019–20 was 6772 mg/L. Salinity is also measured on the Skillogalee Creek and this site is comparably less saline than the Wakefield River with 92% of salinity data less than 2500 mg/L. The highest salinity recorded on the Skillogalee Creek in 2019–20 was 2415 mg/L.

5 Groundwater

There are two groundwater systems within the Clare Valley region: a Quaternary alluvial aquifer which occurs at shallow depths of less than 15 m in valley floors and extensive fractured rock aquifers that underlie the Quaternary aquifer and occur throughout the area. The fractured rock aquifer is the main groundwater system in the Clare Valley and is the focus of this report. The Quaternary aquifer provides only a small portion of the available groundwater resource.

Groundwater levels are affected by the amount of rainfall recharge to both the Quaternary and fractured rock aquifers. Periods of above-average rainfall are likely to result in rising groundwater levels and decreasing groundwater salinity, while years of below-average rainfall are likely to result in declining groundwater levels and increasing groundwater salinity.

5.1 Hydrogeology

5.1.1 Fractured rock aquifer

The fractured rock aquifer occurs in Proterozoic rocks of the Burra and Umberatana Groups, consisting of siltstones, shales, dolomites and quartzites. Four major fractured rock units provide groundwater for irrigation in the Clare region: Mintaro Shale, Saddleworth Formation, Undalya Quartzite and the Skillogalee Dolomite. Within these formations, the fractures act as conduits for groundwater flow. The yield of groundwater from a particular well is dependent on the size and spacing between fractures, the orientation of fractures intercepted and the interconnectedness of fractures. Variations in supply from individual bores are likely to be the result of fracturing or other geological structural constraints rather than the rock type.

The fractured rock aquifer can be divided into two regional zones; a relatively permeable zone in the upper 20-40 m within which fractures are closely spaced (generally <0.5 m apart) and a deeper, low-permeability zone where the size and spacing of fractures tends to decrease with depth.

5.2 Fractured rock aquifer - water level

During 2019–20, below-average to lowest-on-record recovered water levels were observed in the majority (94%) of fractured rock aquifer monitoring wells with long-term records. These wells are spread across the area with the majority located from Stanley Flat in the north (where most groundwater extraction occurs) to Watervale, (Figure 5.1). In 18 wells, the observed water level was lowest on record. The change in water level over the past 20 years are declines ranging from 1.16 m to 19.25 m. The median change is a decline of 3.32 m.

Five-year trends in water levels are declining in 97% of wells with rates ranging from a decline of 2.21 m/y to a rise of 0.17 m/y (the median change over this period is a decline of 0.98 m/y; Figure 5.2).

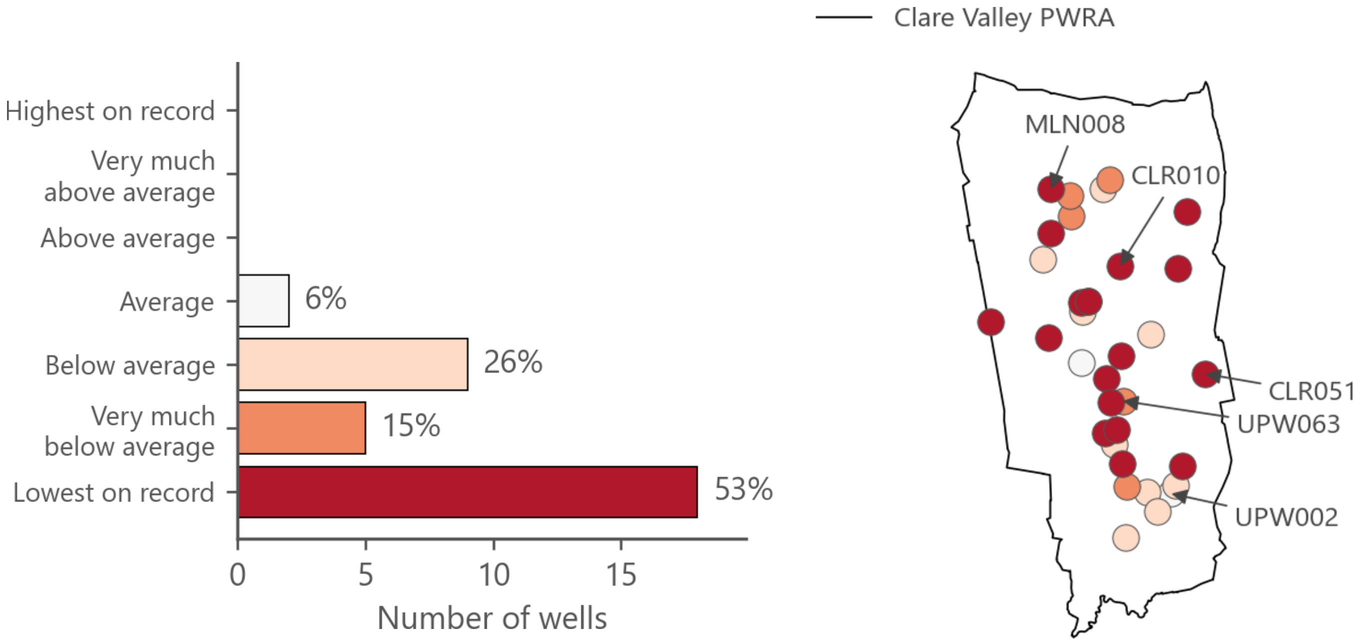


Figure 5.1 2020 recovered water levels for wells in Clare Valley fractured rock aquifers

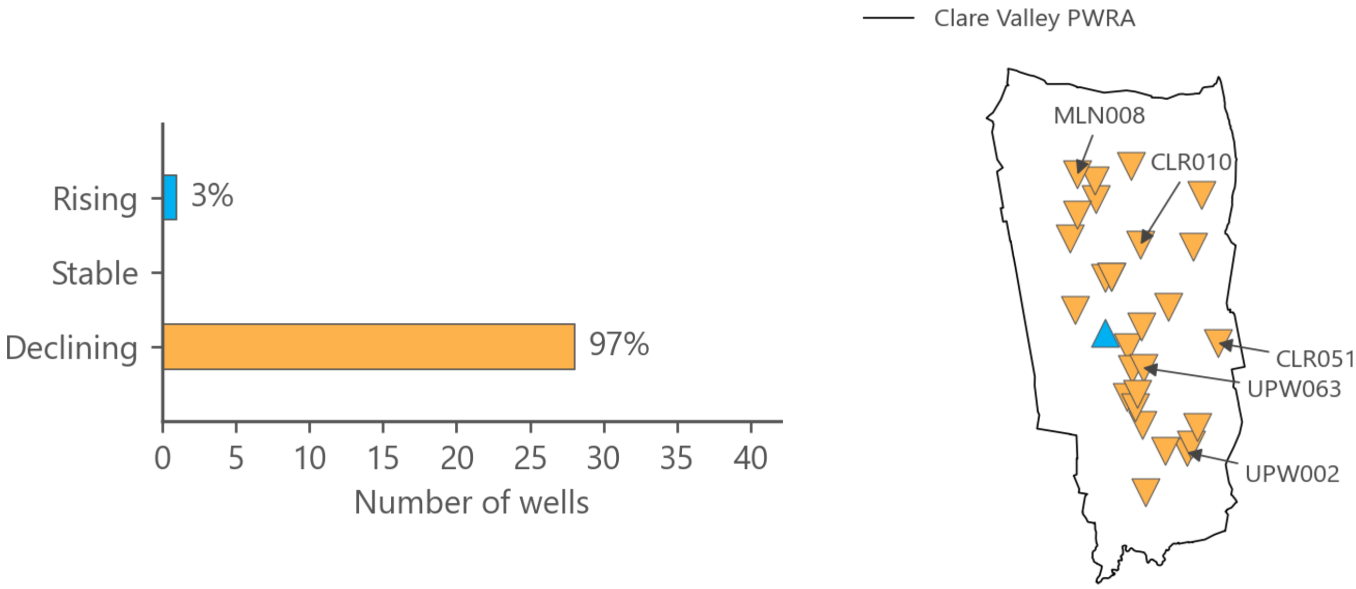


Figure 5.2 2016–20 trend in recovered water levels for wells in Clare Valley fractured rock aquifers

Groundwater is extracted from fractured rock aquifers across the entire area. Extraction volumes are slightly higher in the north, around Stanley Flat (MLN008) and Clare (CLR010), and in the southeast (UPW002). Extraction volumes are lower in the south around Watervale (UPW063).

Most monitoring wells show similar long-term trends, i.e. a general decline of water levels from the beginning of monitoring in the 1990s until the end of the Millennium drought around 2009 (Figure 5.3). Following the drought, monitoring wells show varying degrees of recovery up until 2017 and then steady decline to the present. In 2020, some monitoring wells show levels lower than towards the end of the Millennium drought, which is likely due to below-average rainfall in the northern areas from 2012–2013 (Figure 3.1). In the south-east, between Auburn and Mintaro, groundwater levels have been generally more stable (UPW002) and in the winter of 2020 water levels recovered to typical historical levels (Figure 5.3).

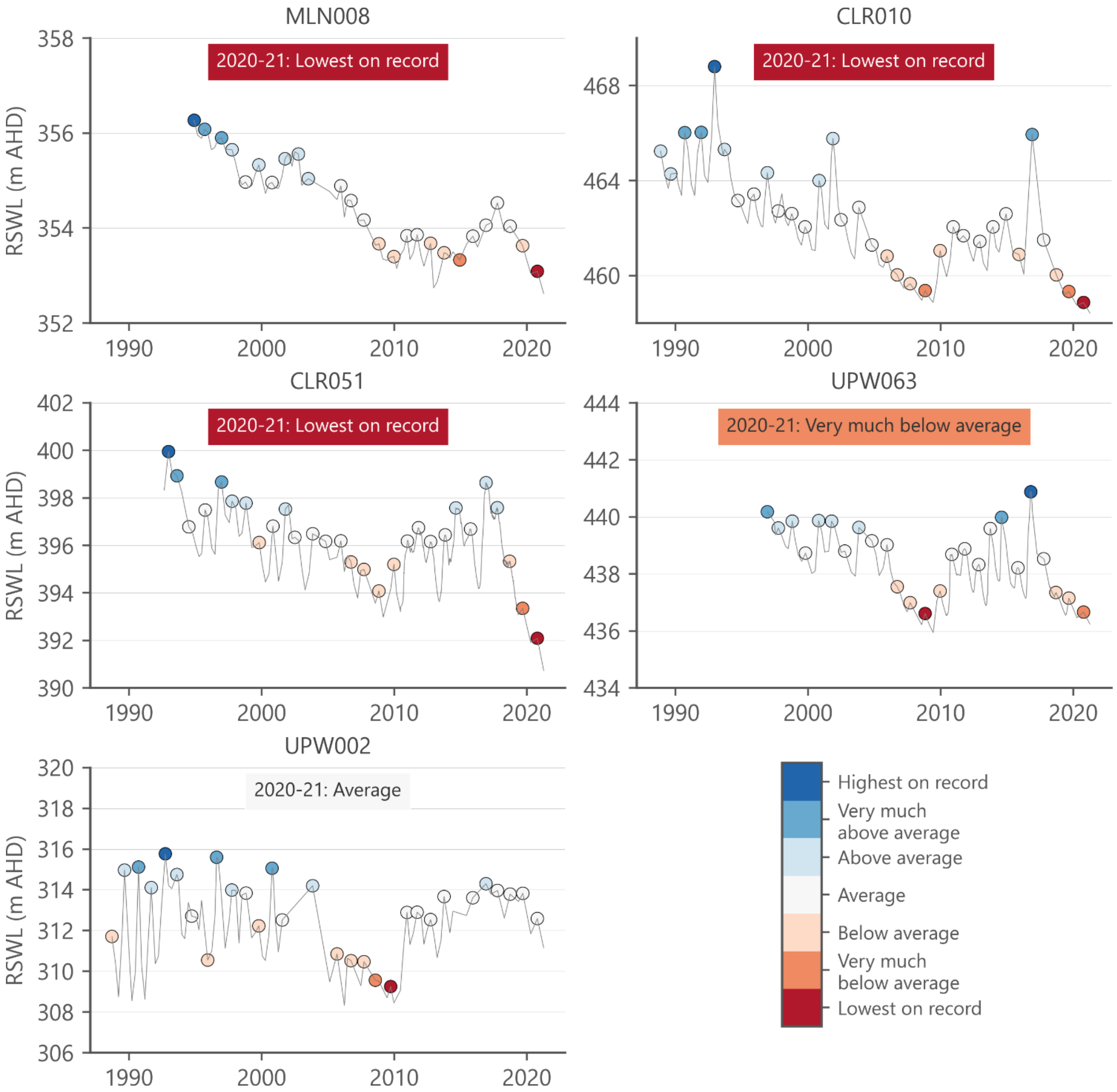


Figure 5.3 Selected hydrographs for Clare Valley fractured rock aquifers

5.3 Fractured rock aquifers - salinity

Across the Clare Valley, the freshest groundwater generally occurs in locations with higher topography and higher rainfall. In 2020, groundwater salinity from 15 wells ranged between 638 and 3120 mg/L. Most wells have salinities of less than 1500 mg/L (Figure 5.4).

In the 10 years to 2020, the majority of wells (93%) recorded an increase in salinity levels. The salinity trends over the 10-year period varies from a decrease of 0.10% per year to an increase of 4.25% per year, with a median of 0.42% increase per year (Figure 5.5).

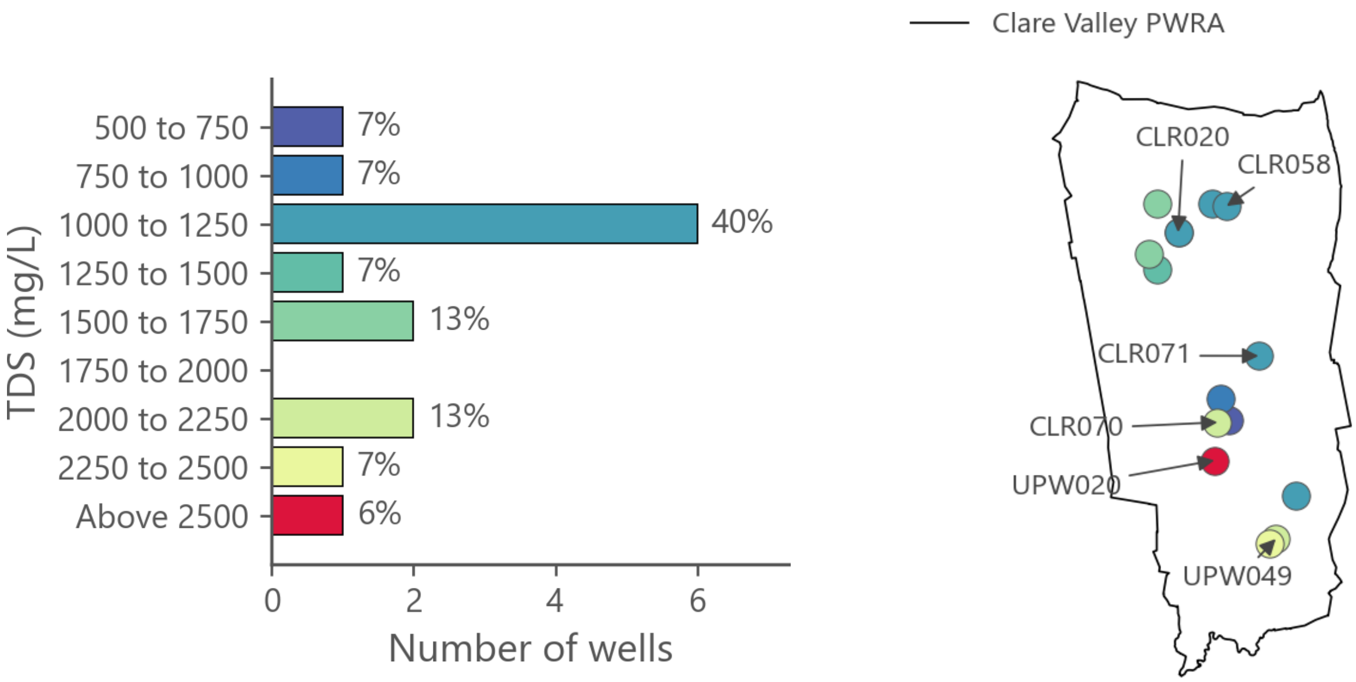


Figure 5.4 2020 salinity observations from wells in the fractured rock aquifer

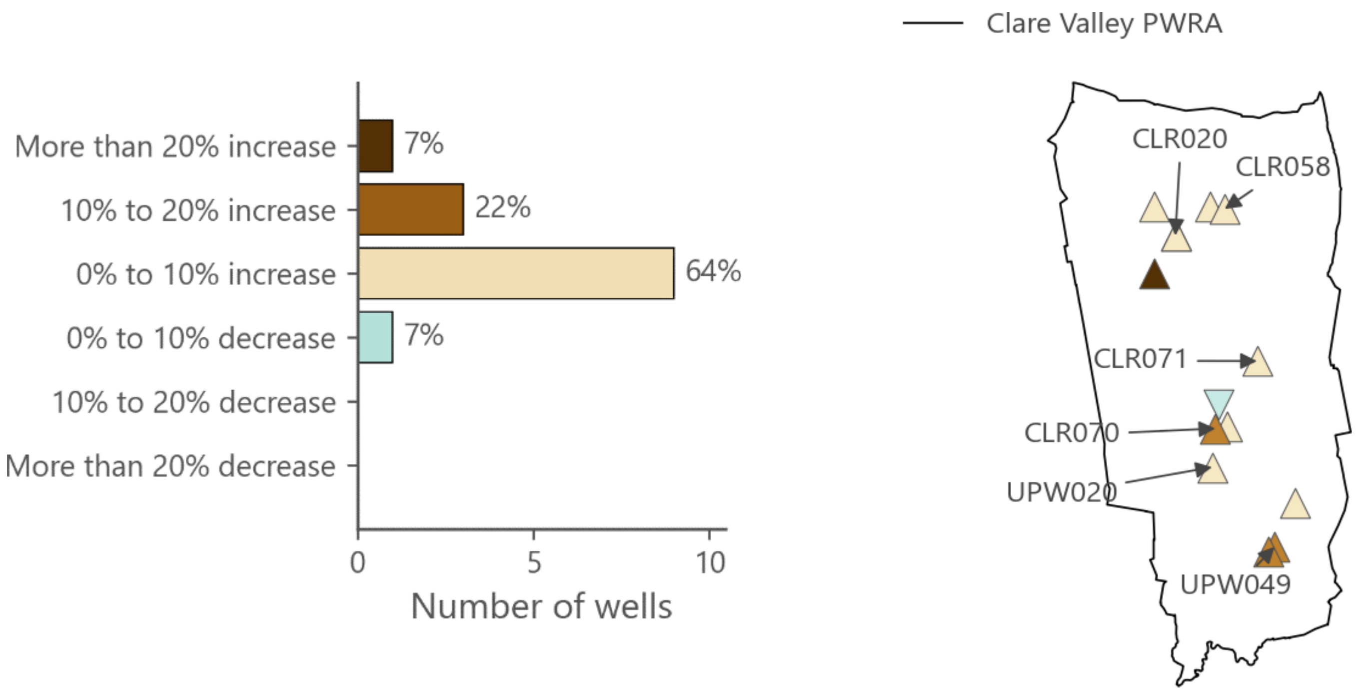


Figure 5.5 Salinity trend in the 10 years to 2020 for wells in the fractured rock aquifer

Groundwater salinity in fractured rock aquifers can be highly variable due to the complex system of preferential flow paths affecting recharge and transport through the aquifer. Figure 5.6 shows salinity graphs from a selection of fractured rock aquifer monitoring wells. CLR020 and CLR058 are located at Clare and both show a gradual increasing trend from the commencement of monitoring until 2016, followed by a period of aquifer freshening.

CLR071 to the west of Sevenhill and UPW020 at Watervale show large seasonal variation in groundwater salinity, but remained relatively stable over the monitoring period. To the south of Sevenhill CLR070 recorded stable salinity from 1995 to 2006, followed by a gradual increasing trend.

UPW049 at Auburn, to the south of the PWRA where rainfall is generally lower, displays a sustained increase of salinity since monitoring began in 1996.

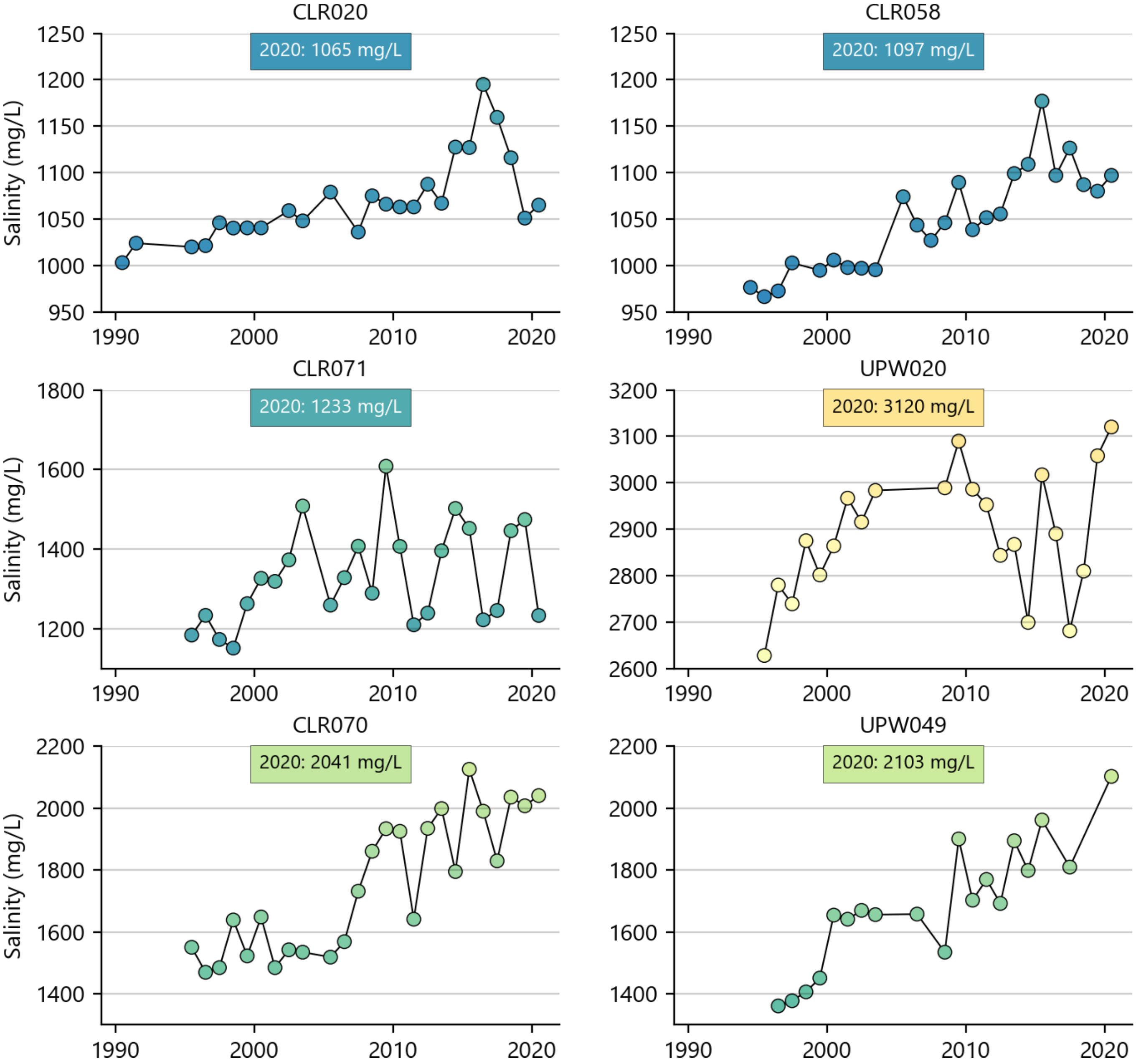


Figure 5.6 Selected fractured rock aquifer salinity graphs

6 Water use

Water sources in the Clare Valley PWRA include watercourses, farm dams, groundwater and imported water from SA Water's Clare Valley WSS. This scheme brings treated water from the River Murray for the purposes of municipal water supply and irrigation of high value crops. The largest source of water used is now imported River Murray water.

Total water use for consumptive purposes was 5177 ML in 2019–20 (Figure 6.1). This includes licensed surface water and groundwater extracted from the Clare Valley and also imported River Murray water. The estimate of annual stock and domestic surface water use of 675 ML is included in the consumptive use total every year (as discussed below) but is not plotted on the bar chart as it is an estimate and not based on allocation or measured data (Figure 6.1).

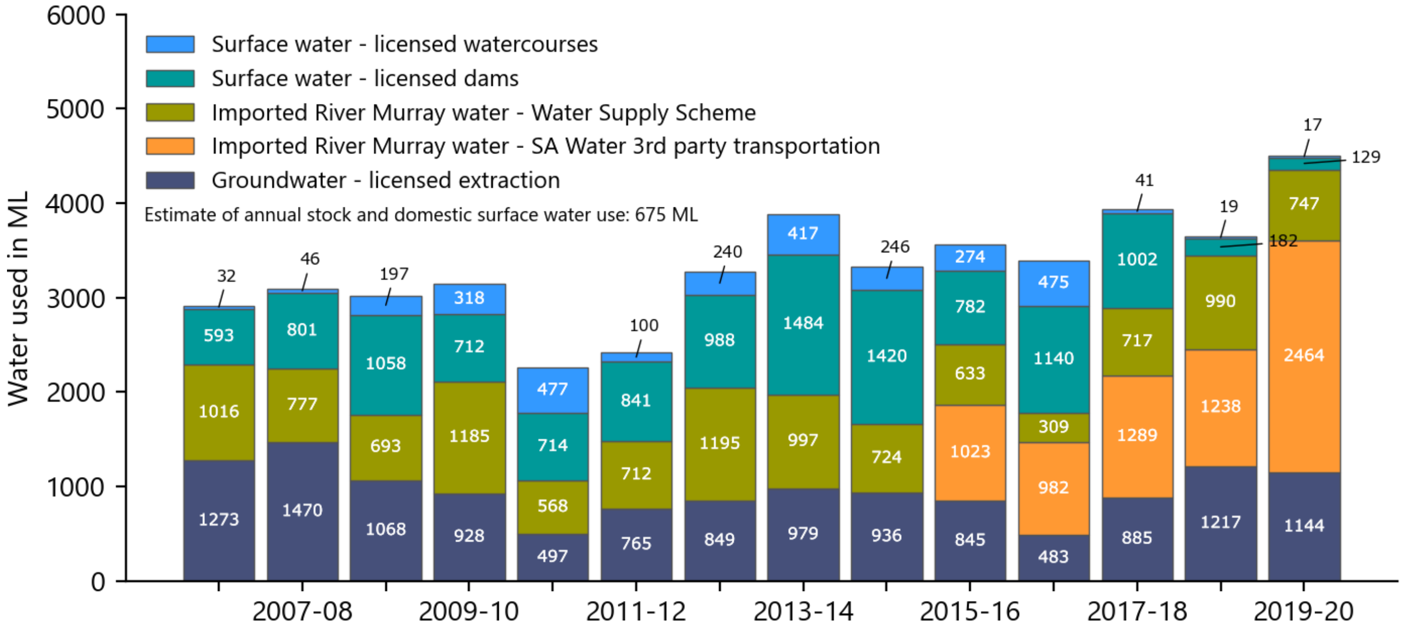


Figure 6.1 Water used from 2006–07 to 2019–20 for the Clare Valley PWRA

6.1 Groundwater use

Groundwater is extracted from fractured rock aquifers primarily for the irrigation of grapevines and stock and domestic use. Water taken for irrigation is metered and is managed through a water licensing system while water taken for stock and domestic purposes is exempt from this requirement.

In 2019–20, a total volume of 1145 ML was extracted from fractured rock aquifers which is a decrease of 6% compared to the previous year. Metered extraction data suggest a spatial distribution of groundwater extraction volumes across the PWRA that is similar to previous years.

6.2 Surface water use

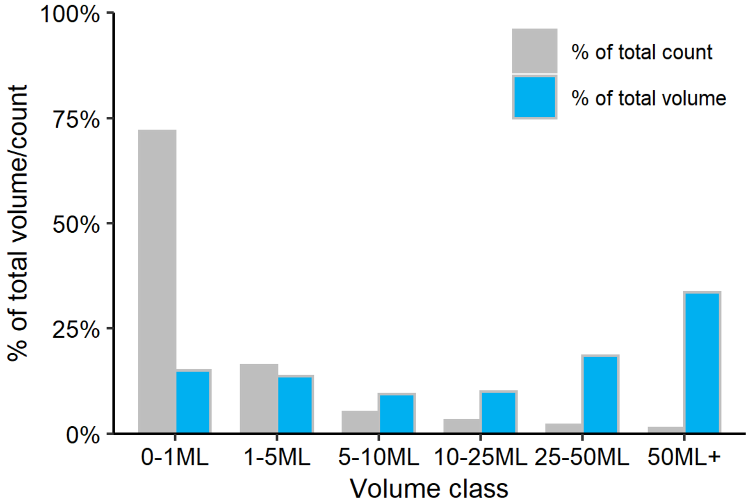
In 2019–20, licensed surface water take (from dams and watercourses) was 147 ML compared to 201 ML in 2018–19). These data are based on meter readings from licensed water use. Non-licensed water demand (stock and domestic) was estimated at 675 ML based on 30% of dam capacity; this estimate is based on analysis in the water allocation plan (NY NRM Board, 2009).

The total volume of imported River Murray water into the Clare Valley PWRA was 3211 ML in 2019–20. This is imported via the Clare Valley WSS and by a third-party transportation (water delivery) agreement with SA Water. There has been a greater reliance on water from the River Murray due to the lower rainfall experienced across the Clare Valley PWRA in 2019–20 and previous years. This is reflected in reduced licensed surface water take.

6.2.1 Farm dams

The Clare Valley WAP (NY 2009) states that there are 1435 farm dams within the Clare Valley PWRA, with an estimated capacity of 6451 ML. Of these dams, 14% are licensed representing 62% of the total estimated storage capacity.

Across the PWRA, smaller dams (capacity less than 5 ML) account for the majority of the number of dams (88%), but represent only a small proportion (29%) of the total storage capacity of dams. Larger dams (5 ML or greater capacity) make up only 12% of the total dam count but contribute to 71% of the total storage capacity (Figure 6.2). The average farm dam density of the PWRA is 10 ML/km^2, with the higher rainfall headwaters having a higher density in comparison to lower rainfall areas (Figure 6.2).



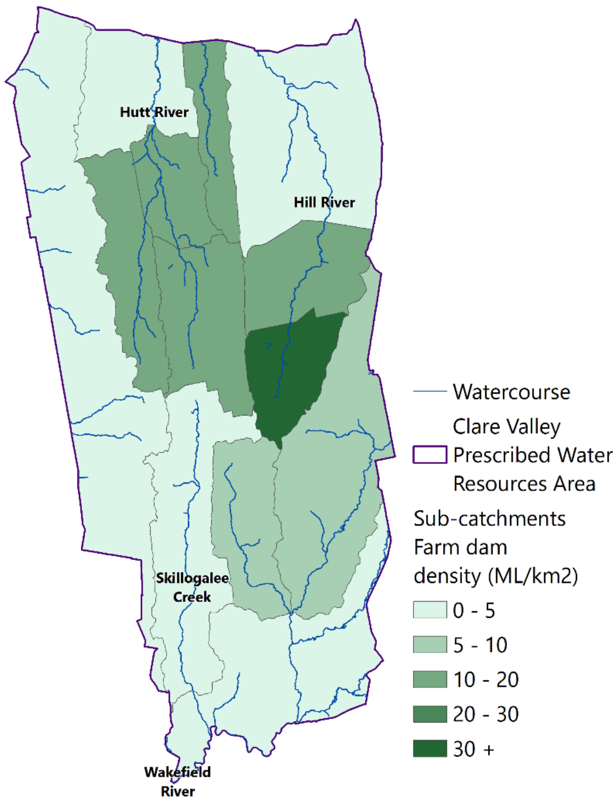


Figure 6.2 Farm dam volume, count analysis, and density in the Clare Valley PWRA

7 References

DEW (2019a), Clare Valley Prescribed Water Resources Area 2018 Surface water status report, Government of South Australia, through Department for Environment and Water, Adelaide.

DEW (2019b), Clare Valley Prescribed Water Resources Area Fractured rock aquifers 2018 Groundwater level and salinity status report, Government of South Australia, through Department for Environment and Water, Adelaide, Adelaide.

DEWNR (2011), Clare PWRA surface water status and condition report 2010–11, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide, Adelaide.

DFW (2010), Clare PWRA Groundwater Status Report 2009–10, Government of South Australia, through Department for Water, Adelaide.

Favier D, Rixon S and Scholz G (2000), A River Management Plan for the Wakefield Catchment, Government of South Australia, through Environment Protection Agency, Adelaide.

Favier D, Scholz G, Vanlaarhoven, J and Bradley J (2004), A River Management Plan for the Broughton Catchment, Report DWLBC 2004/16, Government of South Australia, through Department of Water, Land and Biodiversity Conservation, Adelaide.

NY NRM Board (2009), Water Allocation Plan for the Clare Valley Prescribed Water Resources Area, Government of South Australia, through Northern and Yorke Natural Resources Management Board, Crystal Brook, South Australia.

Government of South Australia

Department for Environment and Water