

Brownhill Creek (Willawilla) water quality survey - a citizen science project

Peter Dillon, Hon Research Fellow CSIRO Land and Water & Friends of BHC

The Brownhill Creek aquatic ecosystem was assessed by EPA (2016) to be in Good Condition.

The creek is ephemeral over most of its length and has yabbies in its upper reaches that has flow over most of the year in most years. This upper section receives baseflow from its alluvial aquifer above the Eden Burnside Fault (in the vicinity of Fullarton Road). Downstream on the plain the stream is perched above the water table and contributes to recharge (Bresciani et al 2015).

Study Objectives

The current study was conceived as a way to better understand;

- (1) the connection between groundwater and presence of yabbies in Willawilla – and the extent to which yabbies could be a bio-indicator of hydraulic connection with groundwater
- (2) the relative contribution of groundwater to surface water flow in Willawilla to the extent that this can be inferred from easily measured water quality parameters eg electrical conductivity, pH, Temperature, Turbidity and Dissolved Oxygen.
- (3) the change in oxygen status in the stream particularly when flow ceases and in autumn when deciduous (non-native) riparian trees shed their leaves and flow starts to increase due to reduced evapotranspiration

Flow is monitored near Scotch College at gauging station A5040913 and further downstream near Adelaide Airport at A5040583. There have been times when water quality parameters have also been monitored at these sites, and information on this will be sought. Only flow rate and temperature could be found in a quick search on the SA DEW Water Data web site.

Study Method

A Hanna HI9829 multiparameter meter was purchased. This is capable of measuring :

- pH and ORP (oxidation/reduction potential)
- Dissolved Oxygen
- Electrical Conductivity
- Turbidity

This the probe is being used to monitor water quality at up to 9 stations between the ford near the historical manure pits and the park at the orphanage in Millswood, including at the gauging station just upstream of Scotch College.

The first four runs were made on 13 August, 19 August, 31 August and 10 Sept.

The probe was calibrated each time and 5 readings taken at each site. An analysis of variability between samples at each site and between sites was performed for the first four sampling events.

This lead to an understanding of the reliability of the comparisons between readings at the different sites on the same day and between readings on different days at the same sites, and is giving confidence in the sensitivity of the data.

Next steps

Further sample runs will be conducted based on an interpretation of the changes observed to date. It is expected that these will occur at least once a month over twelve months, at a frequency that will become apparent from the data.

It is intended to obtain flow and water quality information from the Scotch College gauging station site to hopefully link up water quality data from both sources and understand temporal variability at Scotch College.

It is also intended to learn how to undertake a basic aquatic ecosystem survey of selected sampling points to relate to the water quality data, and recorded information on flow/pooled/dry condition of each station.

It is intended to obtain information on accessible wells adjacent the stream to quantify groundwater contributions to stream flow.

Undertaking a geophysical cross-section surveys across Willawilla in the vicinity of the fault would help to determine net groundwater flux in the stream alluvium, and may help with building a model of Willawilla annual water balance.

Further evaluation of other data are warranted, such as obtaining reports on radon and isotope measurements from previous studies in Willawilla, to draw all existing evidence to bear on the objectives.

Ultimately it could be desirable to also have chemical and biological analysis of major and minor ions, organics, chemical signatures of biota, and microbiological analysis. However this would require an understanding of whether such analyses would help in resolving any key questions.

Depending on findings it may be possible to design a simpler study that could be pursued by school students to answer questions more accurately and get a better understanding of responses of the creek system and ecosystem indices to wet and dry years.

The work is intended to be published in a journal if possible, or otherwise as an open access report. The earliest would be end 2022, but this will depend on findings, and the need for supporting information to be produced.

References

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