



Bendigo Creek

Citizen Science Project

River Health Snapshot Report 2021



North Central Waterwatch and the City of Greater Bendigo support a team of citizen scientists to monitor the health of Bendigo Creek.

Reimagining Bendigo Creek is a flagship project of the City of Greater Bendigo (CoGB), which aims to restore the health of the Bendigo Creek, its catchment and tributaries.

The mission statement of the Reimagining Bendigo Creek Plan is to “Change people’s hearts and minds to take a journey of united action so that in a generation’s time Bendigo Creek will be a healthy, connected and nurturing place”.

The Plan consists of three main themes -

1. Catchment

Goal: A healthy Bendigo Creek by improving the catchment and creating flood resilient communities

2. Connections

Goal: Bendigo Creek forms a continuous and integrated public space network for our community to enjoy and move freely through

3. Culture

Goal: Bendigo Creek embodies our diverse cultures and is actively cared for by the Community

Together, the CoGB and the North Central CMA are committed to supporting communities to become better connected to their waterways, and to contribute to monitoring the health of the catchment. Our Citizen Science program is one way we can provide this opportunity. By empowering Citizen Scientists to become custodians of the environment, they play an important role in helping natural resource managers make better decisions about the management of our region’s waterways.

The Bendigo Creek Citizen Science program produces valuable data used by the City of Greater Bendigo and other stakeholders to track and communicate the long-term ecological condition of the creek and report on the progress the Reimagining Bendigo Creek Plan.

Read on to learn about the 2021 results and see how they compare to those from 2019.



Summary of Results

Bendigo Creek has a long, rich and varied history and the results indicate a waterway in recovery from previous and current influences. Contributing factors include pressures from population growth such as urban development, industry practices, mining activities and storm water infiltration.

It's well known during the gold rush of the 1800s Bendigo Creek was fundamentally used as a drain to direct the vast amounts of sludge away from the town. The values and function of the creek have changed over time and with careful planning and management, the environmental condition of the creek will continue to improve.

The COVID-19 pandemic restrictions made it difficult for citizen science volunteers to undertake their monthly water quality monitoring during 2021. Sufficient data to inform this report was collected from six sites only.

Due to restrictions on gatherings, staff undertook the waterbug monitoring, unaided by the citizen science group as would usually occur.

Water quality and waterbug results in this report contribute to a baseline of the creek's waterway health and will be replicated annually to help build a picture over-time.



Bendigo Creek, Scott Street

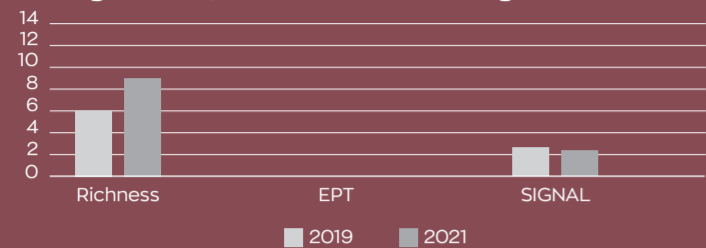
Site Code: BGO034 Monitor: Sallyanne Bartlett

COVID-19 restrictions during the reporting period led to insufficient water quality monitoring data being collected. Waterbug monitoring was undertaken with scores being very poor, likely due to lack of shade and variety of habitats at the site. Being downstream of the CBD, it can be assumed that the site may have recorded poor results for water quality indicators also. There was a slight increase in waterbug richness compared to 2019 results, however, a score of 9 is still well below 21 which is the expected score for a site of good ecological condition.

Waterbug Indicators

Richness	EPT	Signal
9	0	2.6

Bendigo Creek, Scott Street waterbug time series



Bendigo Creek, Millwood Road

Site Code: BGO060 Monitor: Nicole Howie

Water quality results in 2021 are much the same as 2019. As the creek exits the town center there is a gradual improvement in water quality. Aquatic plants and reed beds found through Epsom and Huntly help to filter nutrients and contaminants and no doubt contribute to the improved water quality at this site.

Phosphorous levels and electrical conductivity results have improved from poor to moderate since 2019. Turbidity has also improved due to suspended solids (sediments) being filtered out by the continuing instream vegetation.

The site is also approximately five kilometers downstream from a water treatment facility where high quality recycled water is released back into Bendigo Creek via a licensed discharge point.

Even though water quality scores for this site are good, the waterbug richness and EPT scores remain poor. The SIGNAL score, indicating the presence of more sensitive bugs at the site, has fallen since the 2019 survey.

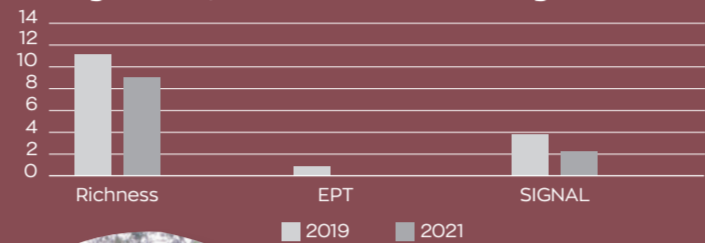
Water Quality Indicators

pH	EC	Phos	Turbidity
7.7	823	0.05	15

Waterbug Indicators

Richness	EPT	Signal
9	1	2.3

Bendigo Creek, Millwood Road waterbug time series



Bendigo Creek, Knight Street

Site Code: BGO029

This site is approximately 650 meters downstream from where the creek converts from concrete to an earthen bed, with instream and riverbank vegetation improving conditions. Vegetation plays a vital role in improving water quality and providing habitat which are compromised with a concrete base to the creek.

Unfortunately, this monitoring site was vacated during the reporting period and insufficient water quality data means results cannot be provided, however it can reasonably be assumed results in 2021 would be similar to those of 2019.

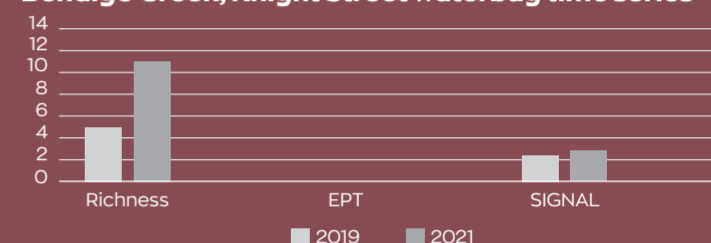
Waterbug taxa richness, EPT and SIGNAL scores all rated poor at the site in 2019. This is not surprising as the water in the creek has travelled through the city with various industrial and urban influences.

Adjacent to this site is Wanyarram Dum, the Knight Street frog ponds, developed by Djandak (the commercial arm of Dja Dja Wurrung Clans Aboriginal Corporation). Tributaries here flow through a series of vegetated ponds and swales before entering the Bendigo Creek, a great example of effective water treatment in an urban environment.

Waterbug Indicators

Richness	EPT	Signal
11	0	2.8

Bendigo Creek, Knight Street waterbug time series



Bendigo Creek, Bay Street

Site Code: BGO022 Monitor: Peter O'Toole

Electrical conductivity at this site has increased since the 2019 report. This site has a high groundwater table, is a known salinity discharge point and has the potential for groundwater intrusion into the creek. Electrical conductivity results could be influenced by saline groundwater along this reach.

Reactive phosphorous has also declined from a good to a moderate rating, while turbidity remains fairly stable at moderate.

Waterbug taxa richness, EPT and SIGNAL scores are all rated poor at the site. Only 12 types of waterbugs were present and no stonefly, mayfly or caddisfly larvae being present. With their high sensitivity, this is likely attributed to the relatively poor water quality and the limited variety of habitats offered by this site.

Approximately 70 meters downstream from this site, the creek enters a concrete channel that continues for more than five kilometers through the central business district of Bendigo to just downstream of Lake Weeroona where it returns to an earth creek bed.

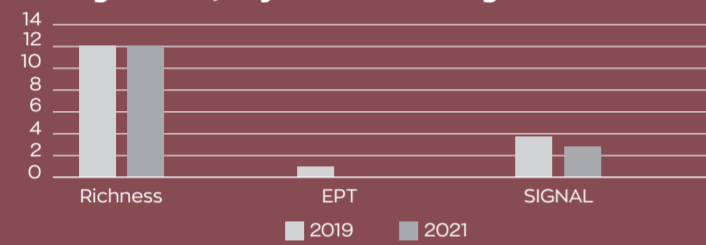
Water Quality Indicators

pH	EC	Phos	Turbidity
7.6	2650	0.10	27

Waterbug Indicators

Richness	EPT	Signal
12	0	2.7

Bendigo Creek, Bay Street waterbug time series



Frog Ponds, Number 7 Reservoir

Site Code: FRO001 Monitor: Steph Carter

Although not on the Bendigo Creek itself, the Frog Ponds site at Number 7 Reservoir is a good representation of what the Bendigo Creek may have once looked like.

The site is at the top of the Bendigo Creek catchment and has a good riparian zone of fringing and aquatic vegetation.

The ponds are kept full by regular top-ups from the adjacent Number 7 Reservoir, so water quality is largely based on that of the Reservoir, combined with natural runoff following rain. Water quality results are similar to that in the 2019 report - generally good, with pH and electrical conductivity rating well, and reactive phosphorous at moderate levels. Turbidity at this site is often high, most likely due to inflows from the reservoir disturbing sediments in the ponds.

Despite the relatively good water quality, waterbug richness, EPT and SIGNAL scores rated low at the site, likely a result of poor turbidity.

The site also acts as a surrogate habitat and natural hatchery for a population of Southern pygmy perch, a species which has been locally extinct from the Bendigo Creek catchment since the 1860s. A number of captive-bred fish were released to the site in 2020 and are now actively breeding and thriving in the habitat. Over time, some of these fish will be relocated to other sites in the north central region, including the Gunbower wetlands.

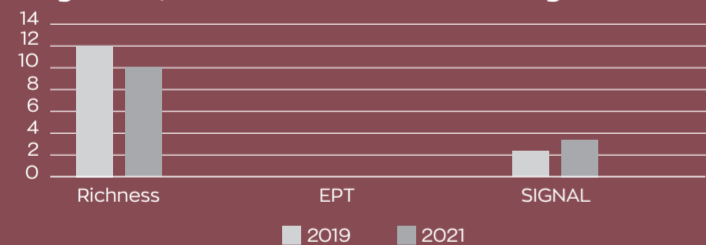
Water Quality Indicators

pH	EC	Phos	Turbidity
7.1	611	0.05	33

Waterbug Indicators

Richness	EPT	Signal
10	0	3.4

Frog Ponds, Number 7 Reservoir waterbug time series



Bendigo Creek, Lockwood Road

Site Code: BGO011 Monitor: Steph Carter

Compared to 2019 water quality results, this site has seen an increase in electrical conductivity. This may be due to reduced inflows leading to a concentration of salts, an increase in industrial waste or saline water entering the creek, or creek bed disturbance leading to saline groundwater entering the waterway. Reactive phosphorous and pH have remained much the same. There has been an improvement in turbidity, perhaps due to a large urban housing development upstream now being largely complete resulting in less sediment being washed into the creek.

Results are as expected for an urban creek with a very narrow vegetated buffer. The adjacent walking track is popular for dog walking; faeces entering the waterway could be a contributor to the moderate nutrient (reactive phosphorous) level score, along with usual pollution pressures often seen in similar urban streams.

No waterbug data was collected for the site during the reporting period.

Water Quality Indicators

pH	EC	Phos	Turbidity
7.4	1970	671	9



Bendigo Creek, Bayne Street

Site Code: BGO027 Monitor: Derek Webb

This site is immediately downstream of the Bendigo CBD and is the most impacted by stormwater inputs from the city and surrounding industries. Compared with 2019 results, electrical conductivity, reactive phosphorous and turbidity have slightly improved, but remain poor at this site.

As with the previous site, this reach of the creek is also characterised by a concrete bank and substrate with no instream or fringing vegetation.

No waterbug data was collected for this site during the reporting period.

Water Quality Indicators

pH	EC	Phos	Turbidity
8.2	2170	0.15	23



Bendigo Creek, Violet Street

Site Code: BGO025 Monitor: Derek Webb

This site is close to the central business district (CBD) of Bendigo and its health is likely being impacted by a variety of contaminants often seen in urban stormwater. Litter, organic pollutants (leaves, grass clippings, animal dropping etc.) and chemical agents, such as petrochemicals, oils, fertilizers and industrial waste, all have a significant impact on the health of our urban waterways. Contaminants are an issue along the length of Bendigo Creek but more compounded through the CBD where there is a concrete substrate and no instream vegetation to help filter out contaminants.

The Golden Gully tributary enters Bendigo Creek about 750 meters upstream of this site and may be a significant contributor to poor quality water as it travels through an industrial zone before entering Bendigo Creek.

As this reach of the creek is characterised by a concrete bank and substrate there is no instream or fringing vegetation to assist with water decontamination. Turbidity and electrical conductivity are poor, while reactive phosphorous is moderate.

No waterbug data was collected for the site during the reporting period.

Water Quality Indicators

pH	EC	Phos	Turbidity
8.1	1629	0.05	30



Interpreting results

The results in this report are based on the analysis of water quality data collected throughout 2021 and macroinvertebrate monitoring data collected in spring 2021. The report provides a baseline assessment of the current condition of Bendigo Creek using citizen science data.

The Victorian Government has a set of guidelines that provides limits to acceptable water quality levels and macroinvertebrate indices for healthy ecosystems. These levels are based on biological characteristics assigned to parts of the catchment which is determined by its position in the region.

In this program, the catchments lie within the Cleared Hills Bioregion.

Four water quality parameters were measured at each site during this time: pH, electrical conductivity, reactive phosphorous and turbidity. And three indices are calculated using macroinvertebrate data, assessed against Agreed Level Taxonomy (ALT) reference condition values.

Each site was assessed against these reference condition values and are calculated based on information known for the area, as if it was in the best available condition for that region.

Waterbugs Colour Coding

Sites have been colour coded and interpreted as follows:

- Meets or exceeds ALT objectives for a healthy ecosystem** (>30th percentile of index values for reference sites). Key processes and/or water quality may be slightly impacted however most habitats are intact.
- Close to meeting ALT objectives for a healthy ecosystem** (5th—30th percentile of index values for reference sites). Many key processes are not functional; water quality and/or habitat are moderately impacted.
- Does not meet ALT objectives for a healthy ecosystem** (<5th percentile of index values for reference sites). Most key processes are not functional and water quality and/or habitat is severely impacted.

Water Quality Colour Coding

Sites have been colour coded and interpreted as follows:

- Good:** Water quality is acceptable and has minimal impacts on aquatic ecosystem health.
- Moderate:** Water quality and aquatic ecosystem health are moderately impacted.
- Poor:** Water quality and aquatic ecosystem health are largely impacted.



Symbols

- Richness** is the number of different types of macroinvertebrates at a site; sites with higher taxa richness are generally in better ecological condition.
- EPT** is the number of different types of stoneflies, mayflies and caddisflies at a site; low diversity of these sensitive macroinvertebrates may indicate ecological disturbance at a site.
- SIGNAL** indicates the pollution tolerance of the macroinvertebrate community at a site. Each type of macroinvertebrate is assigned a value between one (tolerant) and 10 (sensitive) based on pollution tolerance or intolerance. The ALT Signal Index is the average of these values.

A site in good ecological condition, based on the ALT objectives, meets the following targets:

Richness	EPT	SIGNAL
21	6	4.2

Water quality indicator levels

Water quality indicator levels for the Cleared Hills bioregions:

SEPP (WoV) segment	River health category	Reactive Phosphorous (mg/L)	pH (lower)	pH (lower)	Electrical conductivity (µS/cm)	Turbidity (NTU)
Cleared Hills	Good	≤0.03	≥6.3	≤8.5	≤700	≤15
	Moderate	>0.03 ≤0.1	<6.3 ≥5.5	>8.5 ≤9.0	>700 ≤1500	>15 ≤25
	Poor	>0.1	<5	>9.0	>1500	>25

Want to get involved?

If you're passionate about your local environment, then we need your help!

We're calling on the local community to help keep a watchful eye on the health of our priority waterways.

If you would like to get involved and become a volunteer citizen scientist, please register your interest with our Citizen Science project officer at citizenscienceteam@nccma.vic.gov.au or call (03) 5448 7124

Acknowledgments

North Central Waterwatch would like to acknowledge the contribution and support from the City of Greater Bendigo in particular Liam Sibly and Mark Toohey who advocate for the program.

We also acknowledge the tireless effort from our dedicated volunteer citizen scientists. If it weren't for their contribution and the vast amount of data collected this report would not be possible.

References

1. Reimagining Bendigo Creek Plan, 2020. City of Greater Bendigo. Online: <https://www.bendigo.vic.gov.au/About/Document-Library/Reimagining-Bendigo-Creek>

Acknowledgment of Country

The North Central Catchment Management Authority (CMA) acknowledges Traditional Owners and Aboriginal and Torres Strait Islander peoples within the region, their rich culture and spiritual connection to Country. We also recognise and acknowledge the contributions and interests of Aboriginal peoples and organisations in land and natural resource management.

