EstuaryWatch Victoria

WaterWatch Victoria

CORANGAMITE CMA

Annual Curdies Water Quality Report

Corangamite CMA Citizen Science Program, 2023

About this report

The purpose of this annual report is to share information about the baseline and ongoing monitoring occurring in the Curdies catchment by Corangamite CMA citizen scientists with Curdies River Coordinating Committee.

Curdies River catchment citizen science program

EstuaryWatch and WaterWatch methods are being used to monitor water quality changes in the Curdies catchment. Indicators that monitor surface water quality including clarity and nutrient levels have been examined in the Scotts Creek catchment by WaterWatch volunteers. Further downstream EstuaryWatch volunteers at the Curdies estuary conduct photopoint monitoring and collect valuable water quality data at different depths.

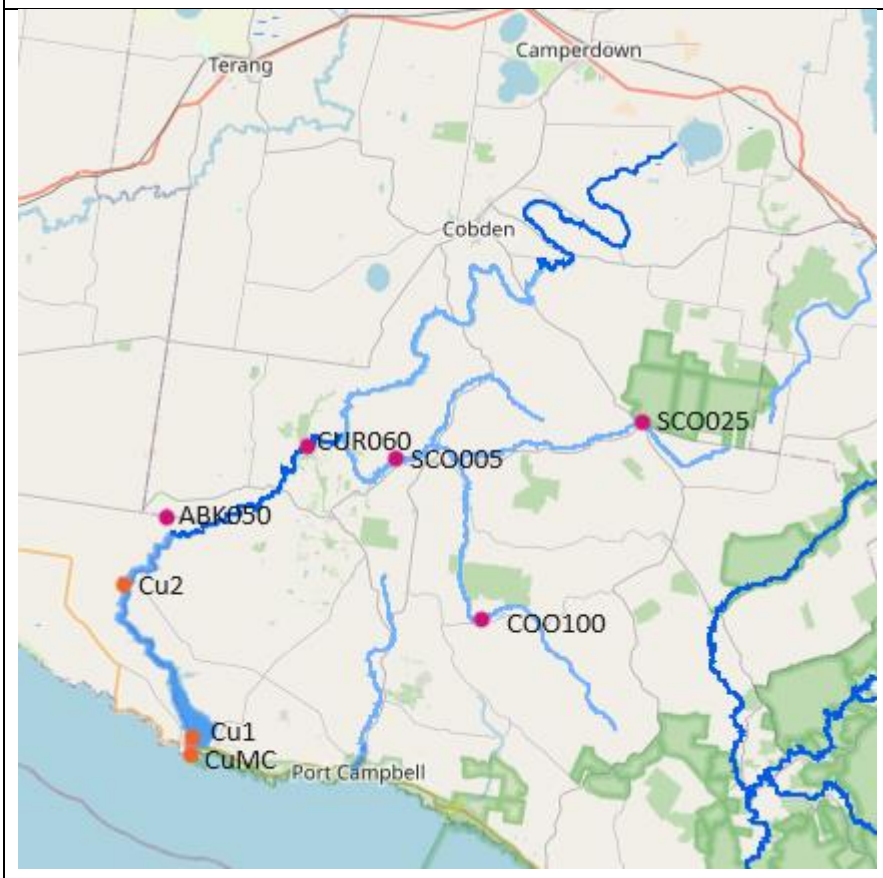
Data from the 2 programs is uploaded to the EstuaryWatch and WaterWatch Victoria data portals making it freely available to online users. The map below shows the 8 sites monitored in 2023.

10 citizen scientists have contributed data in 2023 at these 8 sites (Table 1). In addition, there have been presentations to school students and field days that have contributed further data about freshwater invertebrate (waterbugs) to National Waterbug Blitz

Table 1 Volunteers and sites monitored by the EstuaryWatch and WaterWatch program

Volunteers in EstuaryWatch program	7	Number of EstuaryWatch sites tested	3
Volunteers in WaterWatch program	3	Number of WaterWatch sites tested	5

Figure 1 – Map of WaterWatch and EstuaryWatch monitoring sites monitored in 2023



WaterWatch sites:

SCO005 Scotts Creek at Rowes Rd

SCO025 Scotts Creek at Woodheap corner

COO100 Cooriemungle Creek at Bornong Rd

CUR060 Curdies River Timboon-Camperdown rail trail trestle bridge

ABK050 Abecketts Creek at Cowens Lane

EstuaryWatch sites:

CuMC Curdies Mouth Condition

Cu1 Dorey St floating pontoon

Cu2 Boggy Creek Rd fishing jetty

Monitoring objectives

Curdies River catchment and its major tributaries, Scotts Creek and Cooriemungle Creek, enclose an area cited as 1245 square km. Curdies Inlet is the estuarine lagoon of the Curdies River at Peterborough in south western Victoria.

WaterWatch in the Curdies catchment commenced in 2003 and the EstuaryWatch group began in 2013. With monthly testing, the programs aims to

- increase community participation in monitoring the Curdies River and estuary condition
- increase the availability of reliable and relevant Curdies River and estuary condition data and information to the community and waterway managers
- increase community awareness and knowledge of the Curdies River catchment management and condition.

In this report, the data is assessed against Victorian Environmental Reference Standards indicators and objectives for water dependent ecosystems and species GG2021S245.pdf (gazette.vic.gov.au) described in Appendix 2.

Indicators monitored and what they mean

Dissolved oxygen is a measure of how much oxygen is dissolved in the water and therefore available to aquatic organisms. It can be presented as a quantity (mg/L) or as percent saturation. Saturation values account for the impact of temperature and are useful for comparing available oxygen summer to winter.

pH is the measure of the acidity of water and should ideally be near neutral. The pH scale ranges from 1.0 (acid) through 7.0 (neutral) to 14.0 (alkaline). When it rains pollutants such as oil, detergents, industry and construction site runoff can enter our waterways and impact the pH levels. An increase or decrease in pH outside the normal range can be detrimental to the health of local waterways.

Electrical Conductivity (EC) is an indication of how much salt is in the water, as it measures the ability of water to conduct an electric charge. Increased conductivity can indicate pollution from greywater and septic system discharge, urban road runoff and agricultural runoff.

Temperature influences the kind of organisms that can live in a waterway. Colder water can dissolve more oxygen that warmer water, and sudden temperature changes can seriously impact on aquatic life.

Phosphorus is a nutrient that occurs naturally, however high levels of phosphorus from human activity can affect aquatic ecosystems and waterway health. Increased nutrients can come from greywater and septic system discharge, urban runoff and agricultural runoff. Waterwatch measures phosphorus as reactive phosphorus, one form of phosphorus that can be measured in the field. Total phosphorus represents soluble (reactive) and insoluble (organic and inorganic) forms.

Turbidity is the measure of water clarity. Particles such as soil, silt, sand and other substances in the water column that can impact on light passing through the water. This measurement can indicate the amount of sediment that is being washed into waterways.

Nitrogen forms nitrate, nitrite and ammonia and becomes a nutrient that can affect aquatic ecosystems and water way health.

What has happened in 2023?

Interest by community volunteers has resulted in an expanded monitoring program to include nutrient testing. The Curdies EstuaryWatch program began monthly field testing of reactive phosphate and nitrate in May 2023.

Unfortunately, the number of data points has been reduced because the Hach meter used for measuring dissolved oxygen and conductivity (salinity) failed in October and was sent for repair. A replacement meter was found for the start of 2024.

WaterWatch monitoring has been less frequent in the Curdies River, Cooriemungle Creek and Scotts Creek.

To get futher information on nutrients, water samples were also taken in 2023 for total phosphorus, nitrogen and sediment analysis by a laboratory.

Aquatic macro-invertebrate (waterbug) surveys have been conducted to assess waterway condition in Curdies River at Timboon Camperdown rail trail trestle bridge.

A timeline summary of citizen science activities is given at the end of this report (Appendix 1).

Data interpretation

Victorian Environmental Reference Standards are used to help assess the water quality of streams and estuary in Curdies catchment for water dependent ecosystems and species. The EstuaryWatch and WaterWatch data for 2023 has been compared with data from the Curdies Water Quality Summary (2011-2020) report to help measure change over time Corangamite CMA Knowledge Base - Curdies Water Quality Summary (ccmaknowledgebase.vic.gov.au). Water quality results for Curdies estuary is in Table 2.

Table 2. Water quality at Curdies estuary at Cu1 and Cu2					
Estuary – Cu1 Dorey St pontoon	Dissolved oxygen (top)	Dissolved oxygen (bottom)	Turbidity (top)	pH (top)	Reactive phosphorus (top)
2023 data	Fair	Fair	Fair	Fair	Good
Long term data	Fair	Excellent	Fair	Fair	na

Estuary – Cu2 Boggy Creek Rd	Dissolved oxygen (top)	Dissolved oxygen (bottom)	Turbidity (top)	pH (top)	Reactive phosphorus (top)
2023 data	Fair	Good	Fair	Fair	Poor
Long term data	Fair	Excellent	Excellent	Fair	na

Data summary for Curdies estuary

- Dissolved oxygen measured at the surface was fair at Dorey St pontoon (Cu1) and Boggy Creek (Cu2). In previous years it has been fair at both.
- Dissolved oxygen measured at the bottom was fair at Dorey St pontoon (Cu1) and good at Boggy Creek (Cu2). In previous years it has been excellent at both.
- Turbidity was fair at Dorey St pontoon (Cu1) and fair at Boggy Creek (Cu2). In previous years it has been fair at Cu1 and excellent at Cu2.
- pH at Dorey St pontoon (Cu1) and Boggy Creek (Cu2) was fair at both sites. This is consistent with fair condition at both sites in previous years.
- Reactive phosphorus was good at Dorey St pontoon (Cu1) and poor at Boggy Creek (Cu2). This parameter has not been monitored previously.

Algal blooms will be a factor impacting dissolved oxygen, turbidity and pH levels in this system. The mass of the bloom will impact the clarity of the water resulting in higher turbidity in the estuary. During peak periods of photosynthesis during a bloom, oxygen production is high with resulting carbon dioxide consumption. Gas levels in the water will eventually reach equilibrium but meanwhile pH can rise with loss of carbon dioxide buffering and oxygen levels can become supersaturated. These result in a temporary negative impact on the water quality.

Water quality results for Curdies catchment rivers and streams are given in Table 3.

Table 3. Water quality in Curdies catchment					
CO_CUR060 - Curdies River at trestle bridge	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data	Good	na	Good	Good	Poor

CO_SCO025 - Scotts Creek at Woodheap corner	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data	Good	Good	Good	Good	Poor

CO_SCO005 - Scotts Creek at Rowes Rd	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data	Good	Fair	Good	Good	Poor

CO_COO100 - Cooriemungle Creek at Bornong Rd	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data	Good	Poor	Good	Good	Poor

Data summary for Curdies freshwater reaches

- Electrical conductivity was good at all monitoring sites in the catchment.
- Dissolved oxygen was highest in upper reaches of Scotts Creek. Poor oxygen levels in Cooriemungle Creek will impact Scotts Creek below the confluence as evident in fair levels seen in lower reaches of Scotts Creek.
- Turbidity was rated good at all monitoring sites in the catchment.
- pH was good at all monitoring sites in the catchment.
- Reactive phosphorus was rated poor at all sites

Water quality from laboratory tests

Water was collected from key locations and tests were performed by ALS Geelong. Moderate flows were noted on the sampling dates 6/6/23 and 20/9/23 where there had been some rain recorded on the days prior (Cobden). Results are provided in Table 4.

Table 4. Laboratory testing of water quality in Curdies catchment before and after rainfall

Tests	Total P mg/L		Reactive P mg/L		Total Kjeldahl Nitrogen mg/L		Nitrate mg/L		Suspended solids mg/L	
	6/6/23	20/9/23	6/6/23	20/9/23	6/6/23	20/9/23	6/6/23	20/9/23	6/6/23	20/9/23
CO_SCO025 - Scotts Creek at Woodheap corner	0.17	0.13	0.015	0.26	2.2	1.5	1.9	1.1	3	6
CO_SCO005 - Scotts Creek at Rowes Road	0.4	0.29	0.091	0.08	3.9	2.2	2.0	1.4	11	5
CO_COO100 - Cooriemungle Creek at Bornong Rd	0.39	0.34	0.12	0.1	3.4	2.0	1.6	1.2	7	9

The reactive phosphorus load trends, highest in Cooriemungle Creek and lowest in Scotts Creek at Woodheap corner, were also seen in WaterWatch records. This indicates Cooriemungle Creek is a significant source of phosphorus in the Scotts Creek catchment.

Sediment load trends, highest at Scotts Creek Rowes Rd and lowest at Woodheap corner, was also consistent with WaterWatch records. This indicates sediments from Cooriemungle contribute to the sediment load in the Scotts Creek catchment.

Continued WaterWatch water quality monitoring at these 3 sites will help assess change in the catchment.

National Waterbug Blitz

Aquatic macro-invertebrate assessments are performed to evaluate the condition of the waterway over time. At these surveys, community members work alongside Corangamite CMA staff to gain knowledge and new skills in identifying waterbugs. Assessments are performed using ALT (agreed level taxonomy) where each aquatic invertebrate is given an ALT SIGNALT (Stream Invertebrate Grade Number – Average Level) score depending on their sensitivity to pollutants (Chessman 2003) adapted to the NWB methodology. A site that has abundant diversity with many sensitive aquatic invertebrates will have a high ALT SIGNALT score.

At Curdies River at the trestle bridge Timboon p-12 and Timboon Agricultural Program took part in an aquatic macroinvertebrate survey. 15 taxa were observed and the site had a SIGNAL score of 3.7 indicating the site is heavily impacted. More information on NWB and SIGNAL scores can be found here www.waterbugblitz.org.au.

Timeline

The timeline in Appendix 1 demonstrates the range of citizen science activities that have occurred in 2023. It includes awareness raising activities associated with fish habitat restoration works, education activities delivered through the River Detectives program, photopoint and water quality monitoring, training in water testing and data management, observations associated with blue green algae, monitoring of mouth condition (openings/closures). It demonstrates how information is communicated between citizen scientists, agencies and community groups.

More info about the EstuaryWatch and WaterWatch programs can be found here Curdies River Estuary (estuarywatch.org.au) and https://www.vic.waterwatch.org.au/ .

Future Opportunities

There are some key activities that can be done to share important data and demonstrate vital waterway stewardship

- Continue monitoring - photopoint monitoring at the estuary mouth, water testing at established Waterwatch sites and annual National Waterbug Blitz
- Promote access to the EstuaryWatch and Waterwatch portals and reports.
- Encourage community participation by sharing of information such as photos and stories through newsletters and social media.

Appendix 1. Timeline – What citizen science has been happening in the catchment in 2023?

Raising community awareness of fish habitat restoration

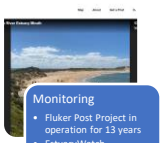
- Summer by the Sea - Fish Hotels 19/1/23

Raising community awareness of fish habitat restoration

- Curdies Fish Hotel Electrofishing 4/3/23

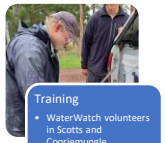
River Detectives with Timboon P-12 and TAP

- Excursion to trestle bridge 23/3/23
- TAPs On 9/11/23
- Contribution to Curdies Tales 15/8/23



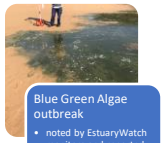
Monitoring

- Fluker Post Project in operation for 13 years
- EstuaryWatch photopoint site throughout 2023



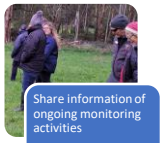
Training

- WaterWatch volunteers in Scotts and Cooriemungle catchments 21/4/23 and 23/6/23



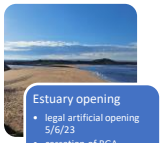
Blue Green Algae outbreak

- noted by EstuaryWatch monitors and reported to CCMA and DEECA 1/4/23



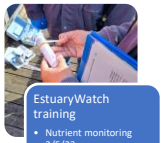
Share information of ongoing monitoring activities

- CRCC bus tour 23/5/23



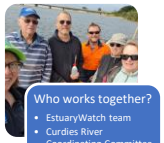
Estuary opening

- legal artificial opening 5/6/23
- cessation of BGA outbreak



EstuaryWatch training

- Nutrient monitoring 2/5/23
- Data entry workshop online 23/10/23



Who works together?

- EstuaryWatch team
- Curdies River Coordinating Committee

Appendix 2

Benchmarks used for assessing 2023 data

The report Data Interpretation and Analysis of Citizen Science Data from the Curdies Landscape Zone provided benchmarks for use in interpreting water quality for estuaries and streams and is based on the State Environmental Protection Policy (Waters) Corangamite CMA Knowledge Base - Data Interpretation and Analysis of Citizen Science Data from the Curdies Landscape Zone (ccmaknowledgebase.vic.gov.au). While the indicators and objectives from SEPP (Waters) has now been updated to the Environmental Reference Standard, the same water quality ratings can be applied.

SEPP (Waters) Segment - Central Foothills and Coastal Plains - Lowlands of the Barwon, Moorabool, Werribee and Maribyrnong basins and the Curdies and Gellibrand Rivers.

Rating	Electrical conductivity (µS/cm)	Dissolved oxygen (% saturation)	Turbidity (NTU)	pH (pH units)	Reactive phosphate (mg/L)
Excellent	< 1,500	85 -110	< 10	6.8 -7.6	< 0.03
Good	1,500 – 2,000	70 - 130	10 - 25	6.8 - 8.0	0.03 - 0.06
Fair	2,001 - 4,000	50 - 70 or >130	25 - 100	6 - 6.8 or 8 - 9	0.06 - 0.1
Poor	> 4,000	< 50	≥ 100	< 6 or > 9	> 0.1

SEPP (Waters) Segment – Victorian Estuaries.

Rating	Top (% saturation) Dissolved oxygen	Dissolved oxygen — Bottom (% saturation)	Turbidity (NTU)	pH (pH units)	Reactive phosphate (mg/L)
Excellent	85 - 125	50 - 110	< 10	7.5 – 8.0	< 0.09
Good	80 - 130	30 - 130	< 10	7.0 – 8.0	< 0.09
Fair	60 - 80 or >130	10 - 30 or >130	10 - 100	6 - 7 or 8 - 9	0.09 – 0.10
Poor	< 60	< 10	> 100	< 6 or > 9	> 0.10

Excellent and good indicate objective is met, SEPP (waters) and ERS beneficial uses are protected, fair and poor indicate objective is not met, beneficial uses may be at risk.
Assumptions are made that most of the phosphorus present in water samples will be in reactive P form.

2023 Observations

Curdies estuary

Interpreting water quality data into water quality rating uses the report statistics from monthly data collection. Ideally, 11 data points are used per year, however in 2023 introduction of P tests occurred midyear and Hach HD40 failed later in the year resulting in 8-10 observations to analyse. Available data for the estuary is given in Table 2.

Table 2 (a). Water quality ratings at Curdies estuary site Cu1					
Estuary – Cu1 Dorey St pontoon	Dissolved oxygen (top)	Dissolved oxygen (bottom)	Turbidity (top)	pH (top)	Reactive phosphorus (top)
2023 data	Fair	Fair	Fair	Fair	Good
Report statistics	25th perc 75, max 128%sat	25th perc 77, max 108%sat	75th perc 15 NTU	25th perc 7.5 75th perc 8.5	75th perc 0.07 mgP/L

Table 2 (b). Water quality ratings at Curdies estuary site Cu2					
Estuary – Cu2 Boggy Creek Rd	Dissolved oxygen (top)	Dissolved oxygen (bottom)	Turbidity (top)	pH (top)	Reactive phosphorus (top)
2023 data	Fair	Good	Fair	Fair	Poor
Report statistics	25th perc 63, max 145%sat	25th perc 41, max 128%sat	75th perc 17 NTU	25th perc 7.3 75th perc 8.1	75th perc 0.18 mgP/L

Curdies Catchment freshwater reaches

Data collection in freshwater reaches have been conducted on a less frequent basis (3 or 4 times per year) which is lower that the ERS method of interpreting monthly observation using data percentiles. Instead, an average value is compared with ERS but this results in lower confidence in the analysis. Available data for freshwater reaches is given in Table 3.

Table 3 (a). Water quality ratings at Curdies River					
CO_CUR060 - Curdies River @ confluence with Limestone Creek above Timboon-Camperdown rail trail trestle bridge	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data average	1,287	na	10	7.3	0.08
Interpretation	Good	na	Good	Good	Poor

Table 3 (b). Water quality ratings at Scotts Creek					
CO_SCO025 - Scotts Creek at Woodheap corner	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data average	838	71	16	7.5	0.11
Interpretation	Good	Good	Good	Good	Poor

Table 3 (c). Water quality ratings at Scotts Creek					
CO_SCO005 - Scotts Creek at Rowes Rd	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data average	1,391	66	23	7.4	0.36
Interpretation	Good	Fair	Good	Good	Poor

Table 3 (d). Water quality ratings at Cooriemungle Creek					
CO_COO100 - Cooriemungle Creek at Bornong Rd	Electrical conductivity (µS/cm)	Dissolved oxygen (%sat)	Turbidity (NTU)	pH	Reactive phosphorus (mgP/L)
2023 data average	896	59	19	7.3	0.43
Interpretation	Good	Poor	Good	Good	Poor