



# RiverScan

Citizen Science Project  
River Health Snapshot Report 2023



North Central WaterWatch supports people to actively care for their environment by participating in Citizen Science programs that monitor and report on the health of the region's land, water, and biodiversity resources.

North Central WaterWatch and the Native Fish Recovery Project (NFRP) deliver a citizen science program called RiverScan. Now in its sixth year, the program engages the local community through regular water quality monitoring, other citizen science activities and community events. The program also supports the North Central River Detectives program – connecting young people to nature.

Citizen scientists and Traditional Owners play an important role in monitoring the ecological health of four priority waterways in the region: the Little Murray River, Box-Pyramid Creek, Gunbower Creek, and the Loddon River. The data collected helps staff at the North Central CMA make informed decisions about managing these priority waterways to continue to improve native fish habitat.

## Summary of Results

North Central CMA staff supported Traditional owners from Barapa Barapa and Wamba Wamba to collect samples from waterways within their respective countries during an engagement event in spring 2023.

The event enabled Traditional Owners to spend time on Country participating in water quality and eDNA monitoring activities. Thirteen Traditional Owners were engaged during the two-day event, monitoring 23 sites across the Native Fish Recovery project area.

## Environmental DNA Survey 2023

Environmental DNA (eDNA) is a powerful tool for monitoring aquatic vertebrates as species inevitably leave DNA within the environment. eDNA offers a means for enhancing traditional fish sampling methods, which commonly involves the use of nets or traps. However, as a net or trap relies on the direct interaction of a species in a set location, direct sampling relies on the presence of a species within at the site at the time of sampling and can only provide a snapshot. The advantage of eDNA is that DNA can remain in the location long after an individual has moved on, or move throughout a water column, and be detectable even if a species has not been present at a collection site.

Here we report on the results of eDNA surveys for fish fauna from samples collected by Traditional Owners with North Central CMA staff during April and November 2023 and analysed by La Trobe University and EnviroDNA respectively.

Seventeen fish species were recovered in the La Trobe study, including rare /threatened species such as Murray cod, southern purple-spotted gudgeon and silver perch, and a combination of large bodied species such as golden perch and smaller fish species such as carp gudgeon.

Carp DNA dominated the samples, representing more than 50 per cent of total DNA sequenced, with pest fish DNA representing about 75 per cent of the total DNA sequenced from these samples. The amount of DNA is not directly related to the number of individuals, but it can provide an indication of biomass and, combined with the prevalence data, confirms what is already known about carp abundance in these waterways following wide-spread flooding. Gambusia DNA represents 16 percent of all DNA sequenced, suggesting the species is very abundant.

The November EnviroDNA survey detected 16 fish taxa, five of which were pest species. Carp again dominated the biomass of fish DNA detected and were present at each site. Gambusia detections fell dramatically from being identified at 14 sites in April to only present at five sites in November, demonstrating the boom-and-bust nature of this species from season to season.

eDNA samples were also collected from several nearby lakes during autumn. Southern purple-spotted gudgeon, Murray hardyhead, golden perch and Murray cod were all present in the samples from Racecourse Lake, north of Kerang.

In addition to fish, members of Barapa Barapa Wamba Water for Country Steering Committee opted to test for other vertebrate species of cultural significance. During the November sampling period, qPCR tests were conducted of each water sample for platypus, rakali and decapods (crustaceans including Murray crayfish). Of the 22 sites analysed, the presence of platypus DNA was equivocal at four sites. Rakali DNA was also detected at four sites, though due to the ecology and behaviour of this species, it is expected they shed less DNA into waterways than true aquatic species. The non-detection of rakali at more of the sites should not necessarily be interpreted as an absence of this species from these waterways. Murray crayfish were not detected at any of the sites.



Identifying waterbugs

## 2023 RiverScan Citizen Science Activities

- Fish eDNA survey April 2023
- Fish eDNA survey November 2023
- Cultural Species eDNA survey – Rakali, Platypus, Murray Cray
- Carp Catch Cohuna
- Pesticide Watch
- 104 Water Quality tests entered into WaterWatch database
- Five schools registered for River Detectives delivering water science to students within the project area



Cohuna Carp Catch

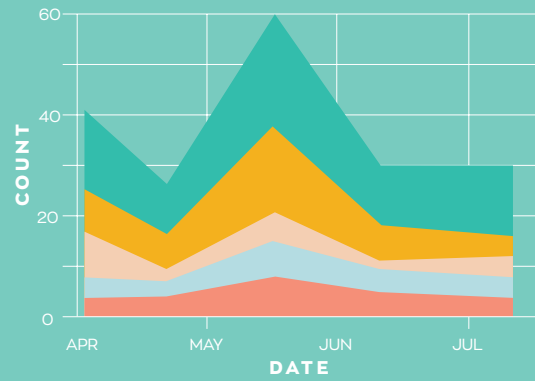
## Pesticide Watch

Overall, results as outlined within this report indicate an unbalanced ecosystem. Waterbug monitoring indicates poor health at most sites, with physical and chemical testing indicating poor turbidity and reactive phosphorous, while electrical conductivity and pH were consistently quite good at all sites. Pesticide monitoring highlights high instances of chemicals in the system, particularly herbicides.

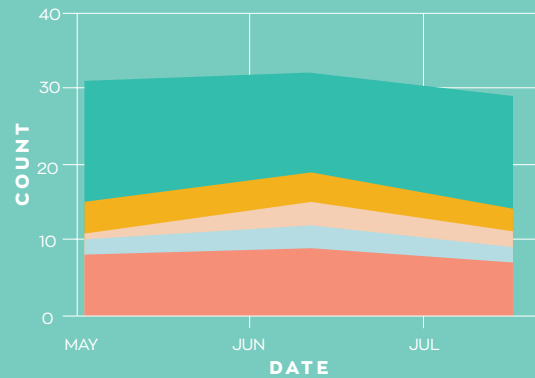
Pesticide Watch is a citizen science program delivered by Deakin University that aims to improve understanding of how pesticide residues impact our waterways. The program launched in 2023 and partnered with North Central WaterWatch to collect samples at 19 sites across the region. In the RiverScan project area, four sites on the Pyramid Creek, Loddon River and Gunbower Creek were sampled for pesticides between April and August. One site on the Pyramid Creek had more than 80 different herbicides detected. Graphs seen here summarise the abundance of pesticides detected from water samples over this period.

The full report can be accessed here: [https://www.nccma.vic.gov.au/media/documents/Pesticide\\_Watch\\_2023\\_Summary.pdf](https://www.nccma.vic.gov.au/media/documents/Pesticide_Watch_2023_Summary.pdf)

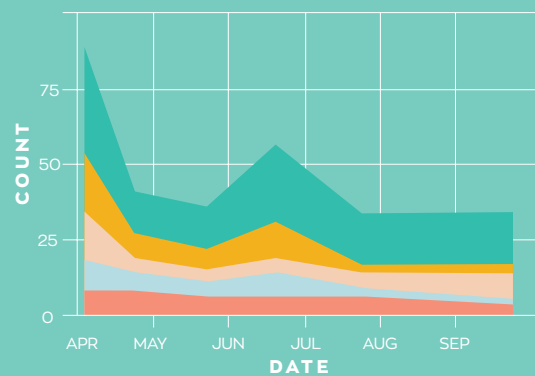
Pesticide Detections Over Time (GUN130)



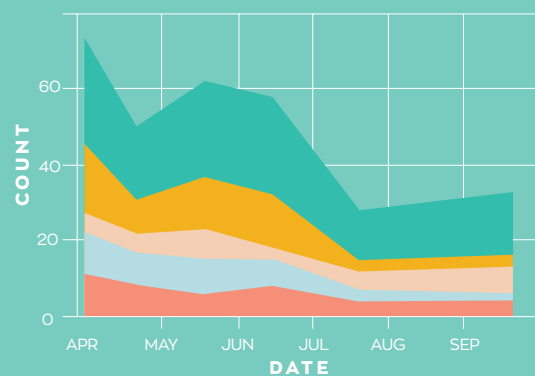
Pesticide Detections Over Time (LOD621a)



Pesticide Detections Over Time (PYR010)



Pesticide Detections Over Time (PYR030)



### Pesticide Type

- Herbicides
- Insecticides
- Fungicides
- Degradation Products
- Other

## River Detectives

River Detectives is an engaging education initiative connecting young people to nature by caring for their local waterway. Students learn about the importance of healthy waterways through water quality testing and the benefits to land, plants, animals, and people. Participating schools are provided with equipment, support, training, and teaching resources.

In 2023, participating schools in the local area included:

- Koondrook Primary School
- St Joseph's Primary School Kerang
- Lake Boga Primary School
- Murrabit Primary School



Students testing turbidity.

## Little Murray River

Site Code: LMU300, LMU600 and LMU900

Water quality in the Little Murray River is tested monthly and tends to be consistent and stable with pH and electrical conductivity being good, and turbidity poor. Water was noted as stained green from January to April and coincided with a blue green algae alert for the waterway. Water was otherwise brown and highly turbid, with high numbers of carp being noted in the shallows. Waterbug monitoring undertaken across all three sites provided an average rating of poor.

Murray cod DNA was detected at LMU900 during autumn, and golden perch was picked up at the same site during spring. Rakali were present at LMU900 and LMU600 in the spring survey.

Water Quality Indicators						Waterbug Indicators		
EC	pH (lower)	pH (upper)	Turbidity	PO4 (Mg/L)	DO%	Richness	EPT	Signal
340	7.7	8.1	105	N/A	N/A	7.7	1.3	2.7



Little Murray River

## Box-Pyramid Creek

Site Code: BOX002, PYR010, PYR020, PYR030 and PYR040

Water quality monitoring in the Box-Pyramid Creek indicates that electrical conductivity, pH, and dissolved oxygen all rated good, while turbidity and reactive phosphorous rated poor. Waterbug monitoring indicates a poor species richness and EPT, while the SIGNAL rating indicates the site is close to meeting ALT objectives for a healthy ecosystem.

Murray cod and golden perch were detected throughout the Pyramid Creek during both autumn and spring surveys. The endangered trout cod was present at during the spring survey at the Horfield School Road site (PYR010) and silver perch were detected at Dobson Road (PYR020) and BOX002. Interestingly, platypus eDNA was also detected at Dobson Road during spring.

Water Quality Indicators						Waterbug Indicators		
EC	pH (lower)	pH (upper)	Turbidity	PO4 (Mg/L)	DO%	Richness	EPT	Signal
750	7.1	8.2	80	0.07	89	5	0.2	3.4

## Loddon River

Site Code: LOD559, LOD575, LOD593, LOD602, LOD621, LOD643, LOD651, LOD901, and TMC010

When averaged across the nine sites, results indicate relatively good water quality within the lower Loddon River. Reactive phosphorous is moderate, turbidity is rated poor, while the other parameters rated good across the monitoring period. Waterbug monitoring indicates the Loddon does not meet ALT objectives for a healthy ecosystem, across all three indices.

Result from eDNA monitoring show that of the four waterways in this project area, the Loddon River had the least species diversity and was dominated by pest fish. Notable native fish eDNA detections include:

- Southern purple spotted gudgeon in the lower Loddon at LOD901 in autumn 2023
- The endangered Murray River rainbow fish at LOD602 in Spring
- Murray cod at three sites in autumn
- Golden perch at four sites during Spring
- Platypus in Twelve Mile Creek at TMC010
- Rakali at LOD575 in spring

Water Quality Indicators						Waterbug Indicators		
EC	pH (lower)	pH (upper)	Turbidity	PO4 (Mg/L)	DO%	Richness	EPT	Signal
581	7.3	7.9	80	0.05	82	6.3	0.9	3.2



Loddon River



Collecting eDNA samples, Loddon River.

## Gunbower Creek

Site Code: GUN110, GUN105, GUN115, GUN130 and GUN148

Five sites were monitored along the Gunbower Creek with data indicating reasonably good water. Turbidity rates were moderate, while all other parameters indicated good water quality.

Gunbower Creek Waterbug richness is the best across all waterways in the program area, with 12.2 waterbug family groups represented on average. EPT and SIGNAL scores rated poor however, and indicate the waterway does not meet ALT objectives for a healthy ecosystem.

eDNA sampling provided some interesting results, with Murray cod detected at all sites except GUN148, as was golden perch. The critically endangered silver perch was detected at GUN105 during the spring survey. There is a known platypus population in Gunbower Creek, and this was evidenced by positive eDNA detections at two sites. Rakali were also present at GUN115.

Water Quality Indicators						Waterbug Indicators		
EC	pH (lower)	pH (upper)	Turbidity	PO4 (Mg/L)	DO%	Richness	EPT	Signal
101	7.3	7.7	34	0.03	77	12.2	1	3.0

## Native Fish Recovery Project Cumulative Onground Achievements

- CREATION OF DEEP POOLS: 5
- INSTALLATION OF INSTREAM HABITAT STRUCTURES: 167
- FENCING INSTALLED AND MAINTAINED: 84.5KM
- WEED CONTROL: 330HA
- REVEGETATION: 284HA
- CAPTIVE BREEDING PROGRAMS: 5
- THREATENED WETLAND SPECIALIST FISH RELEASED: 15,000+
- FISHWAYS COHUNA, KOONDROOK AND TAYLOR'S: 3
- FISHWAY UPGRADE GUNBOWER
- AUSTRALIA'S FIRST SELF-CLEANING FISH SCREEN, COHUNA
- IRRIGATION PUMP FISH SCREENS: 2

## Interpreting results

Water quality parameters in this report have been analysed using new indicator levels for the North Central CMA region developed in 2022 by Leon Metzeling and David Tiller. These indicators advance upon the State Environment Protection Policy (SEPP) guidelines, used in previous snapshot reports, to determine the ecological health of a waterway. This project lies within the Murray Plains, Campaspe, Loddon and Avoca sub-segment of the surface water geographic region of the new Environmental Reference Standard (formerly the Murray Plains Bioregion).

Four water quality parameters were monitored by WaterWatch volunteers and Traditional Owners: pH, electrical conductivity, reactive phosphorous, and turbidity. Site data was analysed for monitoring sites where there were five or more data entries and water quality results are the 75th percentile of all data entries at each site during 2023. For pH, the 25th percentile was also analysed to give an indication of the range of pH and diversion from neutral. The 25th percentile denotes the lower end of the range and the 75th percentile the upper end of the range of pH results during the 2022 calendar year.

## 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.
- Very Poor:** Water Quality and aquatic ecosystems are severely impacted.

## Water quality indicator levels

Murray plains, Campaspe, Loddon and Avoca sub-segment

Indicator	Electrical conductivity (EC)	pH lower (25th percentile)	pH upper (75th percentile)	Turbidity	Reactive Phosphorus	Dissolved oxygen
Units	(µS/cm)	pH	pH	NTU	(mg/L)	% Saturation
Good	<1,500	≥7.0	≤8.2	≤20	<0.045	≥70
Moderate	>1,500 ≤2,000	<7.0 ≥6.0	>8.2 ≤8.5	>20 ≤50	>0.045 ≤0.050	<70 ≥60
Poor	>2,000 ≤4,000	<6.0 ≥5.0	>8.5 ≤9.0	>50 ≤100	>0.055 ≤0.100	<60 ≥40
Very Poor	>4,000	<5.0	>9.0	>100	>0.100	<40

## Waterbugs Colour Coding

Sites have been colour coded and interpreted as follows:

	Percentile of index values	ALT Richness	ALT EPT	ALT SIGNAL
<b>Meets or exceeds ALT objectives for a healthy ecosystem</b> Key processes and/or water quality may be slightly impacted, however, most habitats are intact.	30th	≥21	≥6	≥4.2
<b>Close to meeting ALT objectives for a healthy ecosystem</b> Many key processes are not functional; water quality and/or habitat are moderately impacted.	5th - 30th	>16 to <21	>3 to <6	>3.5 to <4.2
<b>Does not meet ALT objectives for a healthy ecosystem</b> Most key processes are not functional and water quality and/or habitat is severely impacted.	5th	≤16	≤3	≤3.5

## Glossary

**ALT** Agreed Level Taxonomy, is the current methodology implemented in Citizen Scientist macroinvertebrate surveying, to aid in the assessment of river and wetland health. The method involves identifying the features and movements of living organisms and means invertebrates can be returned to their waterway after data is collected.

**Richness** Refers to each unique genus identified using the ALT method. Generally, higher diversity of invertebrates reflects a healthier ecology.

**EPT** Ephemeroptera, Plecoptera and Trichoptera, refers to three orders of highly sensitive invertebrates, respectively, mayflies, stoneflies, and caddisflies (identified in their aquatic larval stages) found within Victorian waterways, with a particularly low sensitivity to pollution. Identification of a high count and richness of these invertebrates typically represents a healthy, unpolluted waterway.

**SIGNAL** Stream Invertebrate Grade Number - Average Level, is a simple index which determines each macroinvertebrate's tolerance of pollution. An abundance of macroinvertebrates with both high and low SIGNAL scores is indicative of a healthy waterway ecosystem.

## We need your help!

We are looking for volunteers to help with monitoring activities on the Gunbower Creek, lower Loddon River, and Box/Pyramid Creek.

Please get in touch if you are keen to be involved:

Email: [citizenscienceteam@nccma.vic.gov.au](mailto:citizenscienceteam@nccma.vic.gov.au)

Ph.: (03) 5448 7124

Office: 628-634 Midland Hwy, Huntly Victoria 3551

## Acknowledgement of Country

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

## Acknowledgments

The RiverScan Project would like to acknowledge and thank the tireless efforts of dedicated volunteer citizen scientists, who have contributed greatly to the program and this report.

Also like to thank Native Fish Recovery Plan project manager, Dr Peter Rose for his enthusiasm and dedication to the program.

We would also like to acknowledge Barapa Barapa, Wamba Wemba, and Yorta Yorta Traditional Owners for their interest, involvement and contribution to the program.

## References

Murphy, N., 2023, *eDNA Survey Aquatic Samples for Riverscan - Report prepared for NCCMA, La Trobe University, Department of Environment and Genetics (unpub).*



Kerang Carp Catch



Waterbug assessments with Traditional Owners, Kerang

The Victorian Government is supporting community partnerships through WaterWatch and other citizen science initiatives to address local waterway priorities. These priorities are being addressed as part of the Victorian Government's *Water for Victoria* initiative to improve catchment and waterway health across regional Victoria.