## Yanco and mid-Murrumbidgee Creek Systems Comunity Report

#### Murrumbidgee Flow Monitoring, Evaluation and Research program

Wetland scientists from Charles Sturt University (CSU) conducted monitoring in the Yanco Creek system and selected creeks in the mid-Murrumbidgee region (Murrumbidgee River, Old-Man Beavers, Sandy and Cudgel creeks) during the 2023-24 water year. This work builds on Yanco Creek system research from 2022-23, marking the third consecutive year of monitoring in this system. The project is supported by the Australian Government through the Commonwealth Environmental Water Holder's Science Program, Flow-MER. The monitoring was undertaken in partnership with Local Land Services (LLS), Yanco Creek and Tributaries Advisory Council (YACTAC), the Refreshing Rivers Program and the Nature Glenelg Trust, with a large focus of the work to collect baseline data.

The data collected helps us better understand how the delivery of water for the environment affects local ecosystems (Photos 1-7). In 2023-24 we focused on several selected wetlands and creeks in the Yanco Creek system, surveying them for fish, bats and frogs between September and April. We also carried out environmental DNA surveys for species occurrence, and assessment of riparian condition across all areas. The insights gained from these surveys inform water management decisions and conservation actions, ensuring we are able to support biodiversity in the Yanco and mid-Murrumbidgee creek systems.



Photo 3. Back Yamma Road. Photo: Nick Cardwell



**Photo 1.** Old Man Creek. Photo: Audrey Beard



Photo 2. Wangamong. Photo: Nick Cardwell



Photo 4. Bundure. Photo: Audrey Beard

## Environmental water delivery in the Yanco and mid-Murrumbidgee Creek Systems in the 2023-24 year

Two environmental watering actions which influenced the hydrology of the Yanco Creek system in 2023-2024 were monitored. Yanco Creek fish flows – nesting and dispersal (03/09/2023 to 6/12/2023) targeted stable flow rates of 600 ML/ds at the Yanco Creek offtake during the trout cod nesting period, followed by a dispersal pulse in December (Figure 1). This action was designed to remain largely in the creeks, but there is some evidence of minor reconnection to low lying wetlands (New Era, Broome, Bundure, Sheepwash, Cocketgedong and Wangamong) particularly during December, when flows exceeded 900 ML for 6 days.

The Yanco Creek system fresh and wetland connection (6/02/2024 to 20/02/2024) aimed to achieve some reconnection to low lying wetlands with targeted flow

400

200

rates of between 1000 and 1200 ML/day at the Yanco Creek offtake for 7 days, followed by a 15% recession back to operational levels (Figure 2). However, this target was unable to be achieved and the action only exceeded 900 ML for two days peaking at 968ML/day on 8 February 2024. As a result, this flow had minimal influence on wetland hydrology with only New Era and Bundure showing minor changes in the proportion of the wetland filled during February.

Two further watering actions were delivered (Table 1): Murrumbidgee Irrigation Area Wetlands & Creek (3287 ML delivered from 11/09/2023 to 15/06/2024), and Sandy Creek pumping (500 ML delivered from 15/03/2024 to 31/05/2024). These actions were outside the scope of our monitoring program.



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9/02/2024 20

Figure 1. Discharge ML/day during Yanco Creek fish flows (03/09/2023 to 6/12/2023)

Figure 2. Discharge ML/day during Yanco Creek system fresh and wetland connection (6/02/2024 to 20/02/2024)

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## Objectives of water delivery in the Yanco and mid-Murrumbidgee Creek Systems 2023-2024

The objectives of the releases of environmental water and the volumes released are detailed in Table 1.

#### Table 1. Objectives and volumes of water releases in 2023-2024

Water action & timing	<b>Total volume</b> 14,945 ML	Primary Objectives		
Yanco Creek fish flows – nesting and dispersal <b>Start</b> : 03/09/2023 <b>End</b> : 6/12/2023		<ul> <li>Maintain native fish populations by providing limited variation in river height to support breeding and cod nesting, and support native fish movement and dispersal.</li> </ul>		
Yanco Creek system fresh and wetland connection <b>Start</b> : 06/02/2024 <b>End</b> : 20/02/2024	4,646 ML	<ul> <li>Maintain and/or improve condition of water dependent native vegetation communities.</li> <li>Provide habitat, recruitment, movement and dispersal opportunities for water dependent species such as waterbirds, native fish, turtles, frogs and bats, including threatened species: southern bell frogs, southern myotis (fisher bat), Murray cod, trout cod, freshwater catfish and silver perch known to occur in the system.</li> <li>Support lateral connectivity of wetlands, including Molly's lagoon.</li> </ul>		
Sandy Creek pumping Start: 15/03/2024 End: 31/05/2024	500 ML (CEW)	<ul> <li>Maintain habitat for a range of waterbirds, native fish, frogs, turtles and other aquatic species. Maintain and build resilience of aquatic vegetation to consolidate recent inundation from rainfall and high flows.</li> </ul>		
Murrumbidgee Irrigation Area Wetlands & Cudgel Creek <b>Start:</b> 11/09/2023 <b>End:</b> 15/06/2024	3287 ML (2571 ML CEW; 716 ML NSW)	<ul> <li>Maintain and prevent further decline of wetland vegetation community condition.</li> <li>Provide habitat for waterbirds, including forage habitat.</li> <li>Provide base flows for Cudgel Creek for native fish and other water dependent animals.</li> </ul>		



Photo 5. Murrumbidgee River. Photo: Skye Wassens.

## Wetland and creek monitoring sites in the Yanco and mid-Murrumbidgee Creek Systems 2023-24

The sites monitored in the Yanco and mid-Murrumbidgee Creek Systems are shown in Figure 3, including fish surveys conducted at 16 sites and deployment of call recorders for frogs at 9 sites.



Figure 3. Distribution of fish, frog and eDNA monitoring sites in the Yanco and mid-Murrumbidgee Creek Systems.



**Photo 6.** Old Man Creek - very poor condition (right hand bank lacking layers of native vegetation and reeds). Photo: Skye Wassens.



**Photo 7.** Cudgel Creek - poor condition (lacking tussocky ground layer, reeds, understorey and regeneration). Photo: Skye Wassens.

## **Riparian condition**

A Rapid Appraisal of Riparian Condition (RARC) assessment was undertaken in December 2023 at 44 sites aligned with environmental DNA (eDNA) sampling (Figure 4). This approach helps establish baseline riparian condition, explain fish community and biodiversity patterns and identify sites for restoration and further monitoring.

The rapid assessment involves assessing five aspects of a watercourse:

- habitat (continuity along the watercourse, width and proximity to nearest patch of intact native vegetation),
- vegetation cover (canopy and ground) and structure (number of layers, understorey),
- proportion of native vegetation compared to exotic (canopy, understorey, ground layer),
- debris (leaf litter, fallen logs, standing dead trees), and
- indicative features (tussock grasses, reeds, regeneration of trees and understorey).

A RARC score out of 50 is determined for each site, with scores indicating the following:

- <25 very poor condition,</li>
- 25-30 poor condition,
- 30-35 average condition,
- 35-40 good condition, and
- >40 excellent condition.

The condition of surveyed sites ranged from very poor (RARC score of 7.5) to excellent (RARC score of 40). Average system condition ranged from very poor in Old Man Creek and Murrumbidgee River sites to poor in Sandy Creek, Cudgel Creek and the Yanco-Billabong (Table 2).

Restoration of 'very poor' and 'poor' sites to bring these stretches up to a 'good' or higher score should be prioritised, while continuing current management at the better sites.



Figure 4: Sample locations with circle markers colored according to RARC Score.

Table 2. Summary of average RARC scores and number of sites				
System	Average RARC score	Number of sites		
Cudgel Creek	28.96	7		
Murrumbidgee River	24.67	3		
(Currawana to Narrandera)				
Old Man Creek	18.70	10		
Sandy Creek	25.33	3		
Yanco	28.96	21		



Fish were surveyed in April 2024 at 16 sites through the Yanco, Columbo and Billabong Creeks using a combination of boat-mounted electrofishing and fyke nets. Boat-mounted electrofishing generates a field of electricity in the water, temporarily stunning fish within about 5 metres. Staff gently scoop up the stunned fish with dip nets and then identify and measure them before releasing the fish unharmed (Photo 8). Fyke nets are deployed at various habitats and at differing depths at each site to sample the range of fish in the community. After observations, the fish are released unharmed (Photo 9).

In total, 3,361 fish from 14 species (nine native plus five exotic) were recorded from 16 sites across Yanco, Billabong and Colombo creeks, during Autumn 2024 sampling (fyke netting and electrofishing). Catch was dominated by the native carp gudgeon complex followed by the exotic common carp (Table 3). In ecology, a species complex consists of a group of closely related organisms which are so similar it is difficult to distinguish them. Large-bodied fish included Murray cod (Photo 18), golden perch (Photo 11), the cryptic freshwater catfish (Photo 20) and introduced species redfin perch (Photo 12) and oriental weatherloach (Table 3). Other species identified were predominantly composed of the native smallbodied Australian smelt, unspecked hardyhead, bony bream, Murray-Darling rainbowfish (Photo 10), and flathead gudgeon, which is a new species record from associated monitoring events in the system (Table 3). The remaining exotic species consisted of goldfish and the Eastern gambusia (Tables 3 and 4).



Photo 8. Boat launch at Hartwood for electrofishing, April 2024. Photo: Chris Sundblom.



Photo 9. Fyke net at Quiamong, April 2024. Photo: Chris Sundblom.



Photo 10. Murray-Darling rainbowfish. Photo 11. Adult golden perch Photo: Chris Sundblom



Photo: Chris Sundblom



Photo 12. Juvenile redfin perch Photo: Chris Sundblom

In ecology, recruitment relates to new individuals being added to a population. At the time of sampling most fish observed were considered adult or sub adult, with the exception of carp gudgeon, Murray-Darling rainbowfish and unspecked hardyhead, which exhibited strong recruitment with an abundance of young-of-year individuals.

Native fish recruitment was also detected amongst Australian smelt, bony bream, flathead gudgeon and Murray cod.

The two freshwater catfish sampled were of an adult size and likely underrepresented due to detectability.

## Fish species in the catch

Table 3. Native and exotic fish species in the catch, with the number of sites recorded at, and ages

Species	% of catch and number of fish	Number of sites	Age
native carp gudgeon complex	47% (1598 fish)	13	Mostly young-of-year individuals, with a small portion (<20%) of mature fish.
exotic common carp	23% (769 fish)	16	Mostly mature, but with a significant cohort (<20%) transitioning from juvenile to sub-adult, reflecting ongoing recruitment.
Australian smelt	14.7% (493 fish)	10	Mostly mature (with <5% young-of-year)
unspecked hardyhead	4.2% (142 fish)	2	Almost equal numbers of mature and young- of-year
bony bream	3.4% (115 fish)	6	Mostly mature (and <5% young-of-year)
Murray-Darling rainbowfish	2.7% (90 fish)	4	Mostly young-of-year (and <40% mature)
goldfish	1.5% (49 fish)	9	Mostly mature (with <20% young-of-year)
golden perch	1.25% (42 fish)	8	Mature - likely at least 4+ up to 8+ year old fish
Murray cod	1.1% (37 fish)	9	Over 95% mature. Ranged from young-of-year (95 mm) to sub-adult (250–335 mm) and then into maturity at ~4–5+ year old fish > 500 mm.
Eastern gambusia	<1% (17 fish)	6	Mature
flathead gudgeon	<1% (4 fish)	1	Mostly mature (<30% young-of-year)
freshwater catfish	<1% (2 fish)	2	Mature – likely 5-6 years old
redfin perch	<1% (2 fish)	1	Mature
oriental weatherloach	oriental <1% (2 fish)		Mature

### **Frogs and Bats**

Acoustic and ultrasonic call recorders have been deployed at 9 wetland sites across the Yanco Creek system in 2021. Two sites (The Yanco and Billamein) were discontinued in June 2022. To extract data, we processed all calls recorded, and then one day per week (from August 2023 to March 2024) was randomly selected and processed using a combination of analysis mode in a program called Kaleidoscope Pro, manual listening (frogs) and visual validation (bats). The exception was for the large-footed myotis, where all acoustic data was processed to check for the presence of this species due to its conservation status and significance as a water dependent species.

#### Frogs

Seven frog species were detected in the Yanco Creek system during 2023-2024. Southern bell frogs (Photo 17) have now been detected at an additional site (New Era in the Upper Yanco) with calling being detected at Broome and Bundure in 2021-22 (Figure 5). Incidental sightings of Southern bell frogs have also been reported from the Lower Billabong near Wanganella Swamp. However, no calling activity was detected in the monitored section of Wanganella Swamp, which was dry in 2023-24. Figure 5 displays the numbers of frog species recorded at monitored sites over the last three years, from 2021/22 to 2023/24.



Figure 5. Frog species richness at each of the monitored sites between 2021 and 2024

#### Bats

Three species or species complexes were detected at all monitoring sites (Figure 6). The forest bat complex contains four species whose calls are indistinguishable (inland forest bat; large forest bat; Southern forest bat; little forest bat) in addition to the chocolate wattled bat and white-striped free-tailed bat. Gould's wattled bat and inland broad-nosed bat were both detected at all sites except Wanganella Swamp. The lesser long-eared bat/ Gould's long-eared bat complex were detected at six wetlands, while largefooted myotis (listed as Vulnerable in NSW, Photo 13), was detected at five wetlands. Figure 6 displays the diversity of bat species recorded at monitored sites in the Yanco Creek system between 2021 and 2024 (note that the large-footed myotis is also known as Southern myotis). **Bats** 



Figure 6. Bat species diversity across 14 wetland sites in the Yanco Creek system between 2021 and 2024

Large footed myotis / Southern myotis is listed as vulnerable under the NSW Biodiversity Conservation Act 2016. Also known as fisher bats, they often roost in a colony of 10-15 bats (although up to 100) close to water in places including tree hollows and under bridges. They feed on small fish and aquatic insects, flying close to the water which they rake with their claws on their large feet. Large footed myotis appear to be widespread through the Yanco Creek system. The presence of large mature trees and permanent water along major creek lines is likely to be key to maintaining these healthy populations of the bats.



**Photo 13.** large footed myotis. Photo: Michael Pennay (Flickr under licence CC BY-NC-ND 2.0)



Photo 14. Dusk at Hartwood. Photo: Emmalie Sanders

## **Environmental DNA (eDNA) surveying**

Surveying DNA in the environment (eDNA) is increasingly used in biodiversity assessments and can detect a range of groups including amphibians, vertebrates, fish, decapods (crustaceans), macroinvertebrates (creatures visible to the naked eye and lacking a backbone such as beetles, snails, worms, dragonflies) and invertebrates (eg. creatures lacking a backbone that may not be visible to the naked eye). Surveying eDNA can complement conventional field survey techniques and can support detection of some cryptic species (species difficult to distinguish from one another). This technique involves drawing up 50mL of water from just below the water surface with a syringe to collect 1-litre water samples and then filtering them to capture genetic material left by various species in the water (Photo 15). These filters are then sent to a lab for analysis, allowing us to detect a range of species based on traces like mucous, skin cells, and faeces.

Over 500 species were detected using eDNA surveys, including an array of bacteria, algae, amoebas, freshwater sponges and jellyfish, several types of crustaceans, an abundance of insects, and freshwater bryozoans (moss animals), including the first record of the genus *Fredericella* in the Murray-Darling Basin. Unfortunately no platypus detections were recorded, although they are known to occur in the Yanco Creek system.

One of the benefits of eDNA is the ability to detect members of the carp gudgeon complex which are difficult to distinguish based on physical features. Five members of the carp gudgeon complex were detected in the Yanco Creek system using eDNA sampling: Western, bald, cryptic, Lake's and Midgley's carp gudgeon. Trout cod were also detected in the upper Yanco Creek system using eDNA surveying, but were not detected during field surveys.



**Photo 15**. Field staff taking water samples for eDNA, December 2023. Photo: Nick Cardwell



**Photo 16.** Bundure Yanco-Billabong. Photo: Chris Sundblom

# What species were found during 2023-24 monitoring?



Native fish species



Electrofishing & fyke net surveys: 3,361 fish consisting of **14** species (9 native, 5 introduced), recorded from 16 sites across Yanco, Billabong and Colombo creeks (Table 4). Note that all fish were released at point of capture: no animals were harmed.

eDNA sampling at 44 sites in 7 watercourses (Cudgel Creek, Murrumbidgee River, Old Man Creek, Sandy Creek, Yanco Creek, Billabong Creek and Columbo Creek) found **17** species (12 native and 5 introduced).

**7** frog species detected via acoustic recorders mounted on trees at the water's edge over the duration of the field season from September to April.

Frog species



**7** 

Bat species



**5** bat species and **2** species complexes, detected via ultrasonic recorders mounted on trees at the water's edge over the duration of the field season (September-April).

![](_page_10_Picture_14.jpeg)

Threatened species

![](_page_10_Picture_16.jpeg)

Species found that are listed as **vulnerable** or **endangered** in NSW (NSW Biodiversity Conservation Act 2016) or nationally (Environment Protection and Biodiversity Conservation Act 1999) included:

- freshwater catfish
- silver perch
- Murray cod
- trout cod (eDNA)
- Southern bell frog
- large-footed myotis.

## Species Diversity: Species list 2023-24

Table 4. Species list 2023-2024 from monitored sites in the Yanco Creek System (excluding eDNA results)

#### Fish

**Native fish** Australian smelt bony herring/ bony bream

carp gudgeon group (Western carp gudgeon, bald carp gudgeon, cryptic carp gudgeon, Lake's carp gudgeon & Midgley's carp gudgeon)

flathead gudgeon freshwater catfish golden perch Murray cod Murray-Darling rainbowfish unspecked hardyhead silver perch river blackfish trout cod

#### Introduced fish

common carp gambusia goldfish oriental weather loach redfin perch

#### Frogs

<u>b</u>arking marsh frog common eastern froglet Peron's tree frog plains froglet Southern bell frog spotted marsh frog Sudell's froglet

![](_page_11_Picture_10.jpeg)

**Photo 17**. Southern bell frog at Fairfax Swamp. Photo: Emmalie Sanders

#### Bats

chocolate wattle bat Gould's wattled bat inland broad-nosed bat/ inland forest bat/ large forest bat/ Southern forest bat/ little forest bat large-footed myotis lesser long-eared bat/ Gould's long-eared bat white-striped free-tailed bat

![](_page_11_Picture_14.jpeg)

Photo 20. freshwater catfish Photo: Chris Sundblom

![](_page_11_Picture_16.jpeg)

Photo 18. Murray cod Photo: Chris Sundblom

![](_page_11_Picture_18.jpeg)

**Photo 19.** silver perch Photo: Anna Turner

## What's next? Monitoring, Evaluation and Research in the Yanco Creek system 2024-2025

- Fish and turtle surveys will be conducted at a minimum of 6 sites in the Yanco Creek system, February to April 2025.
- Wetland hydrology regimes and connectivity will be monitored using the depth loggers, digital elevation models and other tools such as Landsat imagery and the Wetland Insights Tool.
- Results from the 2024-25 monitoring will be published by CSU and the CEWH.

![](_page_12_Picture_4.jpeg)

Photo 21. Sandy Creek. Photo: Chris Sundblom

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For more information or to join the newsletter mailing list please visit: https://www.csu.edu.au/research/gulbal i/research/sustainable-aquaticsystems/projects/murrumbidgee-riverand-floodplains-supportingecosystems-and-biodiversity

We're on social media too! Stay up to date with our adventures on Instagram and X:

![](_page_12_Picture_9.jpeg)

The Murrumbidgee Flow-MER team would like to acknowledge the consortium partners and local landholders with whom we work.

![](_page_12_Picture_11.jpeg)

![](_page_12_Picture_12.jpeg)

Charles Sturt University

Gulbali Institute Agriculture Water Environment

![](_page_12_Picture_15.jpeg)

![](_page_12_Picture_16.jpeg)

![](_page_12_Picture_17.jpeg)

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