



Moorabool River 2023-24 Water Year in Review

July 2024

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Acknowledgment of Country

Corangamite Catchment Management Authority (Corangamite CMA) wishes to acknowledge the Wadawurrung People of the Kulin Nation, Traditional Owners of the land and waters of the Moorabool River. We pay our respects to their Elders past, present and emerging. We commit to continuing to work with all Traditional Owners to ensure their knowledge and culture is included and valued in Corangamite CMA planning and delivery.

1. Introduction

The Corangamite CMA is pleased to provide a review of the Moorabool River 2023-24 water year (July 2023 – June 2024). In previous years, the review of a water year (titled ‘seasonal review’ in previous Seasonal Watering Proposals (SWP) was integrated in the following year’s SWP. This year a separate document has been developed solely dedicated to the review of watering. Undertaking a review of the water year after the water year has occurred will allow for all environmental watering to be reported on after it has occurred, providing a more accurate depiction of the water years outcomes as opposed to a review that misses a significant portion of the year and speculates on future watering. By decoupling the review from the SWP, The Corangamite CMA adheres to the updated SWP guidelines set by the Victorian Environmental Water Holder (VEWH).



Figure 1. Morrisons gauge downstream of confluence

This document outlines the watering activities for the 2023-24 water year that were proposed in the 2023-24 Seasonal Watering Proposal which was published in April 2023 (Corangamite CMA, 2023) The 2023-24 water year and SWP period ended as of June 30th 2024, with the 2024-25 water year and SWP commencing on the 1st July 2024. While Corangamite CMA encourages referencing the 2023-24 SWP for additional context, a summary has been provided in table 1 for convenience.

Table 1. Summary of priority watering actions for the Moorabool River 2023-24

Environmental allocation: ~2500ML/year – Planning for an average year
Priority 1: Summer/autumn low flow (Dec-May) 5-40ML/day continuously
Priority 2: Winter/spring low flow (Jun-Nov) 5-60ML/day continuously
Priority 3: Summer/autumn fresh event (Apr-May) 60-80ML/day for 5 days
Priority 4: Summer/autumn fresh event (Jan-Feb) 60-80ML/day for 5 days
Priority 5: Little summer/autumn fresh event (Feb-Mar) 30-60ML/day for 3 days
Priority 6: Winter/spring fresh event (Sep-Nov) 80-90ML/day for 5-10 days
Priority 7: Winter/spring fresh event (May-Aug) 80-90ML/day for 5-10 days
Priority 8: Winter/spring fresh event (Sep-Nov) 80-90ML/day for 5-10 days

2. Climate in 2023-24

From July 2023 to June 2024, Australia/Victoria saw a combination of well above and well below average rainfall. Ambient rainfall conditions can be observed from Morrisons (Ballark) as described in figure 1, where an obvious combination of conditions is visible. From July 2023 - June 2024 the major global-scale influences included El Nino, a strong positive Indian Ocean Dipole and a positive phase of the Southern Annular mode.

The year 2023 was the equal eight warmest year on record for Australia and the warmest since 2020. August 2023 to October 2023 was the driest three-month period since rainfall records began in 1900 and for Australia winter 2023 was the warmest on record. For Victoria, the first three months of the 2023-24 water year (July, August, September) saw below average rainfall and statewide in September was the lowest rainfall on record. In 2023 Victoria's mean maximum temperature was above average, being the warmest since 2019.

In summer 2024 area-averaged summer rainfall totals were above to very above average for much of Victoria, excluding February 2024 which was below average. South-West Victoria had above average mean maximum temperatures during summer. February and March rainfall was very well below average for Victoria, with March being the seventh driest on record and the driest since 1986.

In April 2024, Morrisons Ballark experienced an above-average rainfall total (refer to Figure 1), albeit with more than 50% of the monthly rainfall occurring within a single day. Following a prolonged dry spell of two months, catchment flows exhibited a noticeable response to this isolated rainfall event that was not sustained given the isolated nature of the weather event.

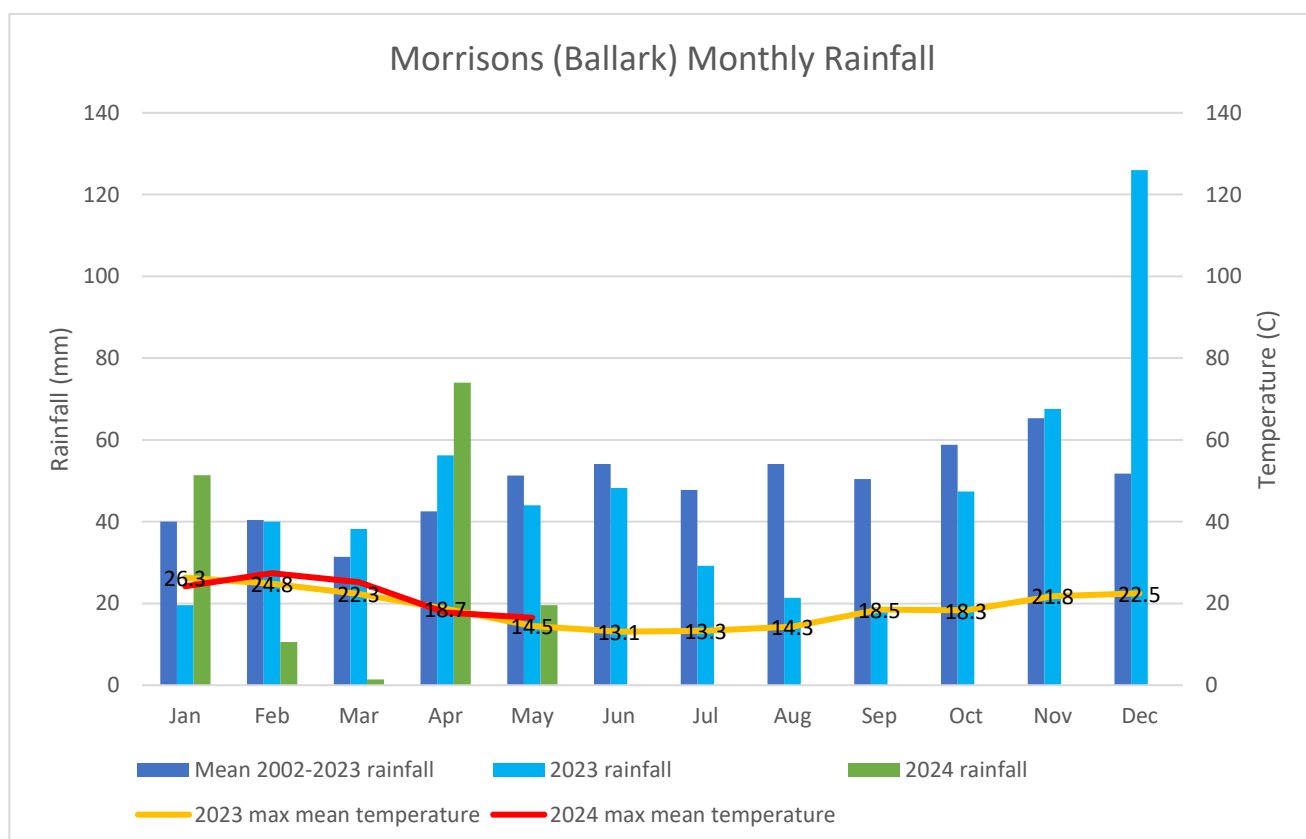


Figure 2. Average monthly rainfall and max mean temperature at Morrisons Ballark: 2002-2023, 2023, 2024

3. Hydrological Achievement

Table 2. Hydrological achievement of flow regime in the Moorabool River: 2002/03 – 2023/24

Flow component		Hydrological achievement and climatic conditions (dry/avg/wet) of flow components over time																			Ecological outcomes/observations relating to the achievement of the flow recommendation/ Priority watering action (PWA) in 2023-24					
		2002 – 03	2003 – 04	2004 – 05	2005 – 06	2006 – 07	2007 – 08	2008 – 09	2009 – 10	2010 – 11	2011 – 12	2012 – 13	2013 – 14	2014 – 15	2015 – 16	2016 - 17	2017 - 18	2018 – 19	2019 - 20	2020 – 21		2021 – 22 (wet)	2022 – 23 (wet)	2023 – 24 (avg)		
Summer/Autumn	Low flow	U	U	E	U	E	E	E	E	U	E	E	E	E	E	E	EO	EO	EO	EO	EO	EO	EO	U	Summer/autumn low flows were met through a combination of Corangamite CMA managed environmental water releases, passing flow and unregulated flow.	
	Freshes	E	E	E	U	E	E	E	E	E	E	E	E	E	E	E	E	(E)	E	E	EO	E	EO	EO	U	The three recommended freshes for a wet/average year were met by a combination of managed CMA environmental water releases, Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) temporary transfers and natural rainfall events.
Spring/Winter	Low flow	E	E	E	E	E	E	E	E	E	U	U	E	E	E	U	U	OU	OU	EO	EO	EO	EO	EO	U	Winter low flow for a wet/average year (10ML/d) met 100% of the time in 2023-24. Achieved through environmental water, natural flow and passing flow.
	Freshes	E	E	E	E	E	E	E	E	U	E	E	U	U	U	U	E	E	E	EU	OU	OU	EO	EO	U	Only one winter/spring fresh was achieved naturally and was met with a combination of environmental water, Barwon Water transfers and a small amount of passing flow. This occurred over nine days rather than the minimum recommendation of five.
	High flow	E	E	E	E	E	E	E	E	E	E	U	U	U	U	U	X	E	U	U	U	U	U	U	E	No high flow events were recorded during 2023-24. The highest daily average peaks of recorded streamflow were 253ML/d and 370ML/d.

	No significant part of the flow component achieved
	Flow component partially achieved
	Flow component has been completely achieved, i.e. complete duration, frequency and volume was achieved
E	Managed environmental water release
O	Consumptive water en route/other managed flow (including passing flows)
U	Unregulated (natural)
X	Unknown at this stage

4. Hydrological Narrative

The current environmental entitlement can only have a significant affect on the upper reaches (3a, 3b) of the Moorabool River. Compliance is measured at the Morrisons gauging station (WMIS ID: 232204) at the end of reach 3a. While it is understood that environmental releases from Lal Lal have limited ability to influence reach 4, flows are also monitored at the Batesford gauging station (WMIS ID: 232202) to get a sense of the significance of the flow stress in this reach, and to adaptively manage wherever possible to support its values, e.g., through a well-timed fresh delivery.

The achievement of flow objectives for reach 4 relies upon the ability of water to pass She Oaks Weir. If Barwon Water is not releasing water down reach 3a/3b to She Oaks Weir, it is difficult to achieve environmental objectives for reach 4. Higher and more regular flushes through reach 4 will move organic matter and silt that has accumulated behind weirs, improve water quality and habitat connectivity, and allow greater movement of macroinvertebrates, native fish, Platypus, and Rakali (Water rats).

Flows at both Morrisons and Batesford are shown comparatively in Figures 5,6, 7 & 8 for the 2023-24 year. Figures 5 and 6 present the same data from the same gauge (Morrisons), as do Figures 7 and 8 (Batesford), however the scales are different.

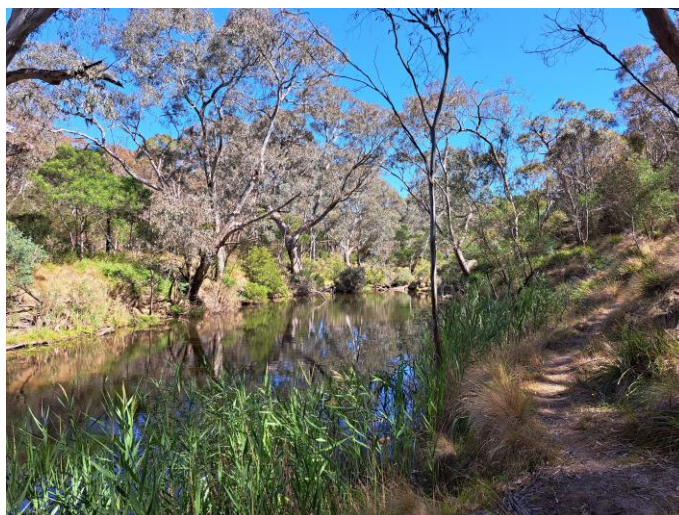


Figure 3. Moorabool River at Sharps Road crossing

The straight horizontal lines in all figures represent different priority watering actions and act as a reference to indicate when total river flow meets and exceeds these objectives. In addition to these aspects, the red line indicating CCMA releases highlights how environmental water contributed to the total river flow alongside passing flows and Barwon Water transfers.

Releases first began at 10ML/d on top of passing flows in late November to account for a near cease to flow event at Batesford (visible in Figure 7) that correlates with a drop in passing flows from Lal Lal. Shortly after releases began there was an unexpectedly large rainfall event, which led to a change to 5ML/d less passing flow and eventually cessation of environmental water releases. During early December, there was a short period where Barwon Water ceased transfers then recommenced at 10ML/d. This information can be found in Figure 5 where the dotted blue line overlaps the green low flow watering action.

Heavy rainfall throughout December and early January naturally achieved a summer/autumn fresh (priority 4). As February began there were no transfers being released and low recent rainfall, low flow releases recommenced with 5ML/d over eight days before it was raised to 10ML/d. A large spike in the hydrograph shortly after CCMA releases were raised to 10ML/d in February can be attributed to WTOAC's temporary transfers, whereby 200ML was released over seven days from Lal Lal Reservoir. The highest volume released in this fresh was 50ML/d. Barwon Water transfers (at 20ML/d) and CCMA releases (10ML/d) at the time aided in the little summer fresh (priority 5) watering action being achieved by this combination of authority and traditional owner managed water in the Moorabool.

WTOAC's fresh event from Lal Lal reservoir during a period of very low passing flows was a driving force in both maintaining and improving water quality to a standard whereby Barwon Water could increase their transfers to 25ML/d.

A large rainfall event in early April saw Barwon Water decrease their transfers from 25ML/d to 12ML/d and provided an opportunity to release a summer/autumn fresh (priority 3). 132ML of the environmental entitlement was conserved for later in the water year as the ramp days and portion of the 60ML/d required to achieve the watering action were already attributed to natural flows caused by the weather event.

A winter/spring fresh (priority 7) was planned and released in early June. The release volume was 70ML/d for nine days. This volume alongside a small amount of passing flow and 12ML/d of transfers kept the streamflow between 80-85ML/d. The water saved from the priority 3 summer/autumn fresh and late start to continuous summer/autumn low flow is what allowed for a more aspirational fresh event towards the end of the water year.

The highest daily average flow recorded in 2023-24 at Morrisons was 370ML/d (Figure 6) in January 2024, while Batesford's highest was 456ML/d (Figure 8).

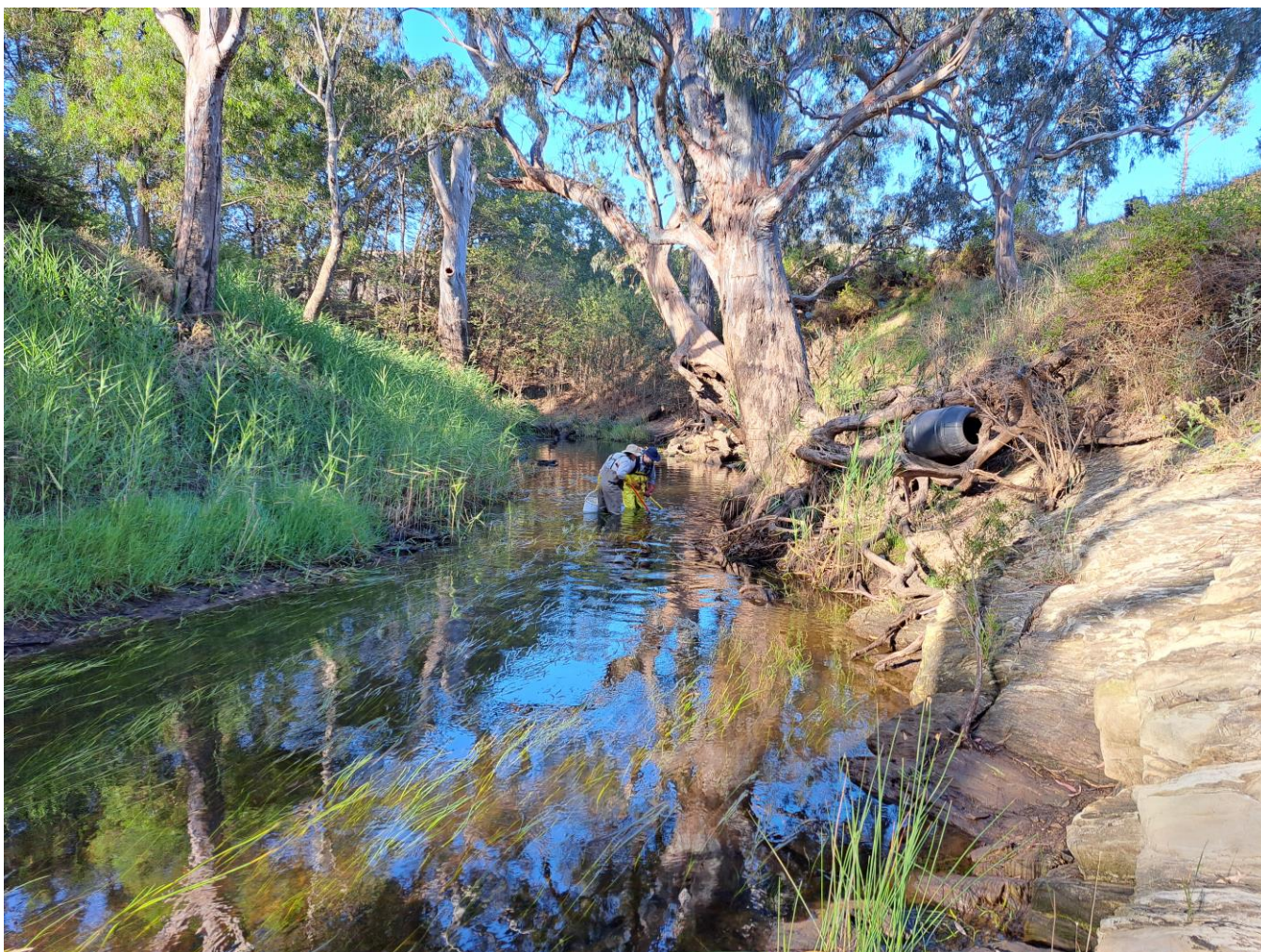


Figure 4. VEFMAP monitoring with ARI at Spiller's Bridge on Moorabool River

Morrison's: mean total river flow & recommended flows 2023-24 <100ML/d

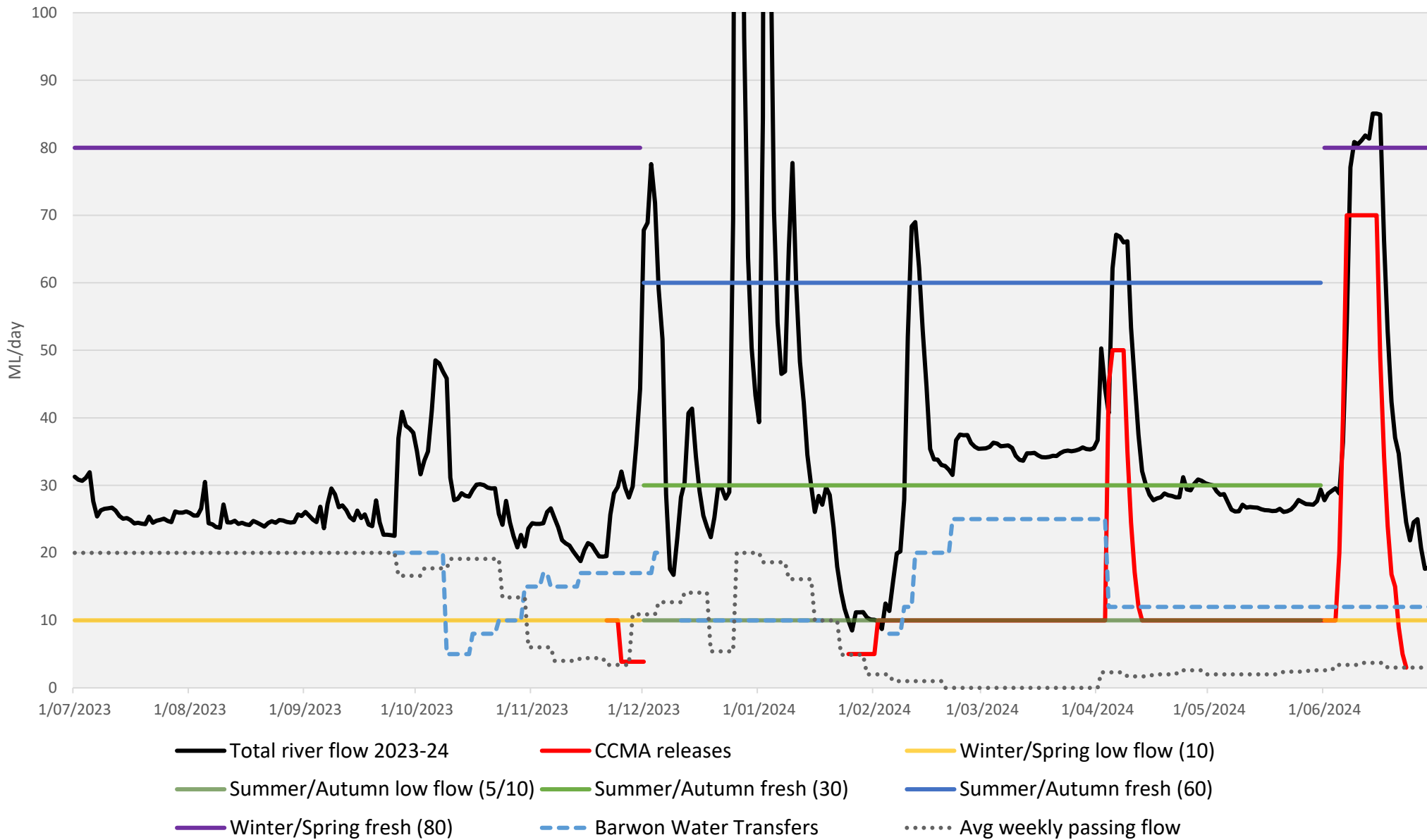


Figure 5. Morrison's mean total river flow & recommended flows 2023-24 <100ML/d

Morrison's: mean total river flow & recommended flows 2023-24

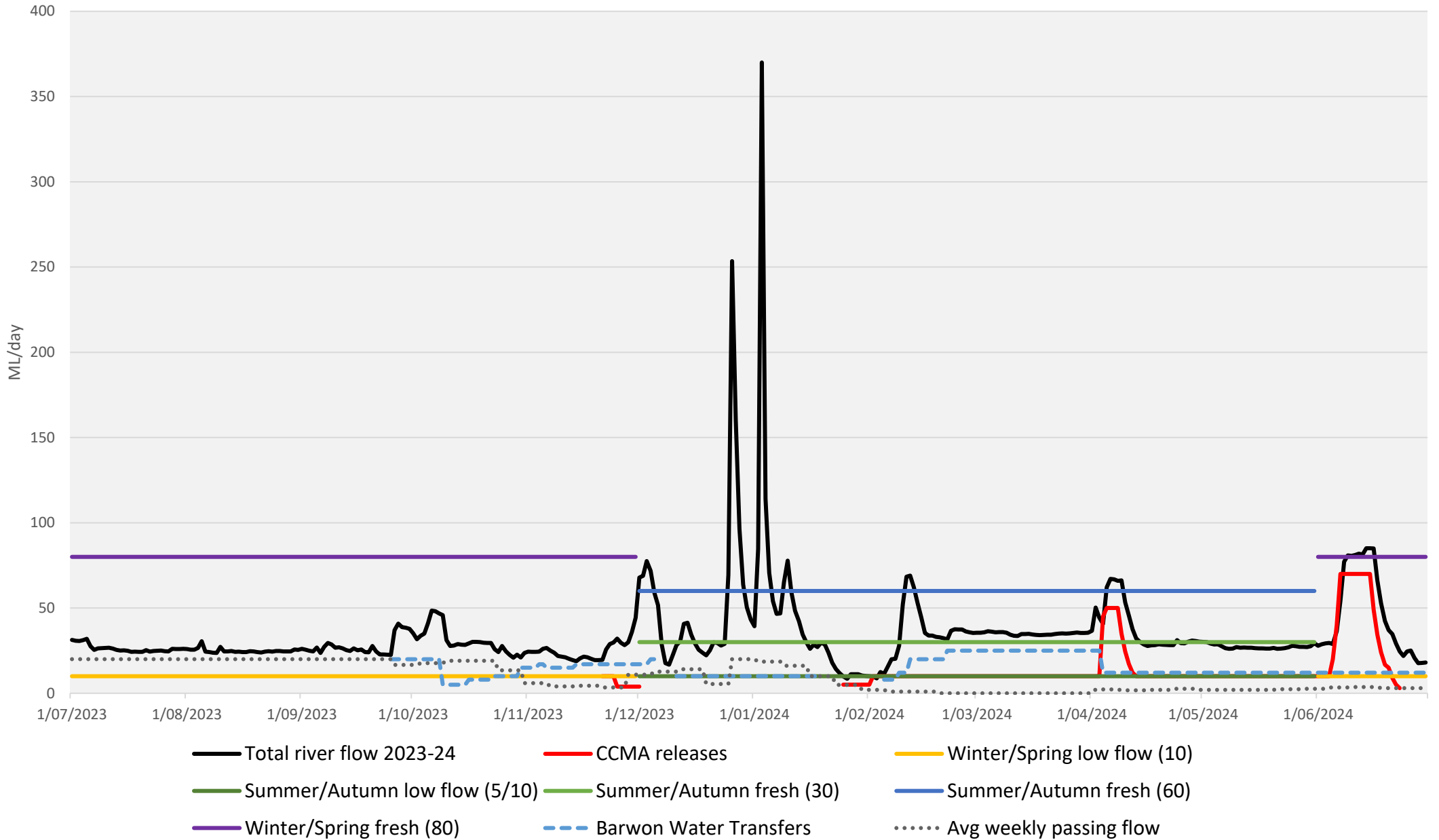


Figure 6. Morrison's mean total river flow & recommended flows 2023-24

Batesford: mean total river flow & recommended flows 2023-24 <100ML/d

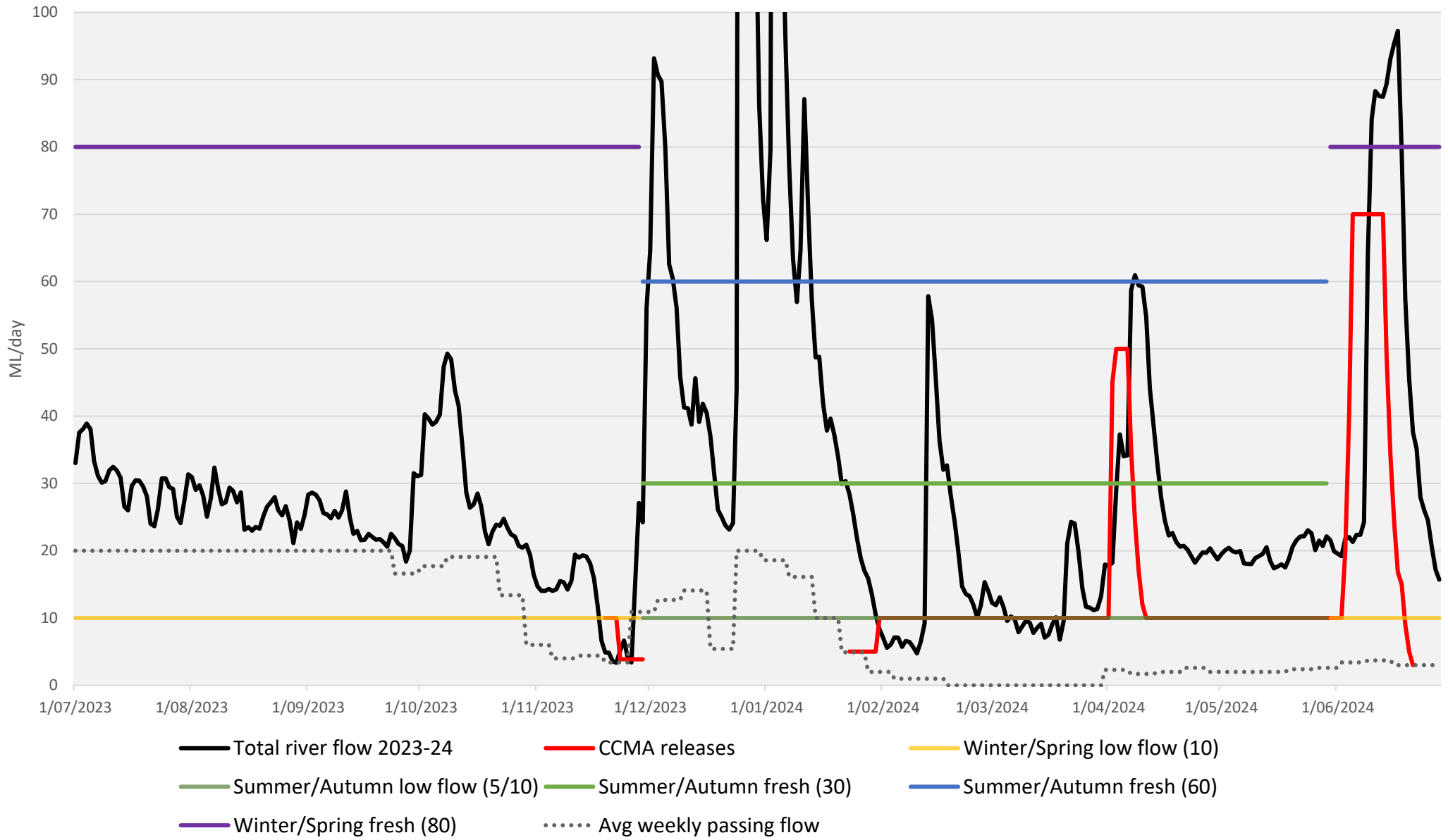


Figure 7. Batesford mean total river flow & recommended flows 2023-24 <100ML/d

Batesford: mean total river flow & recommended flows 2023-24

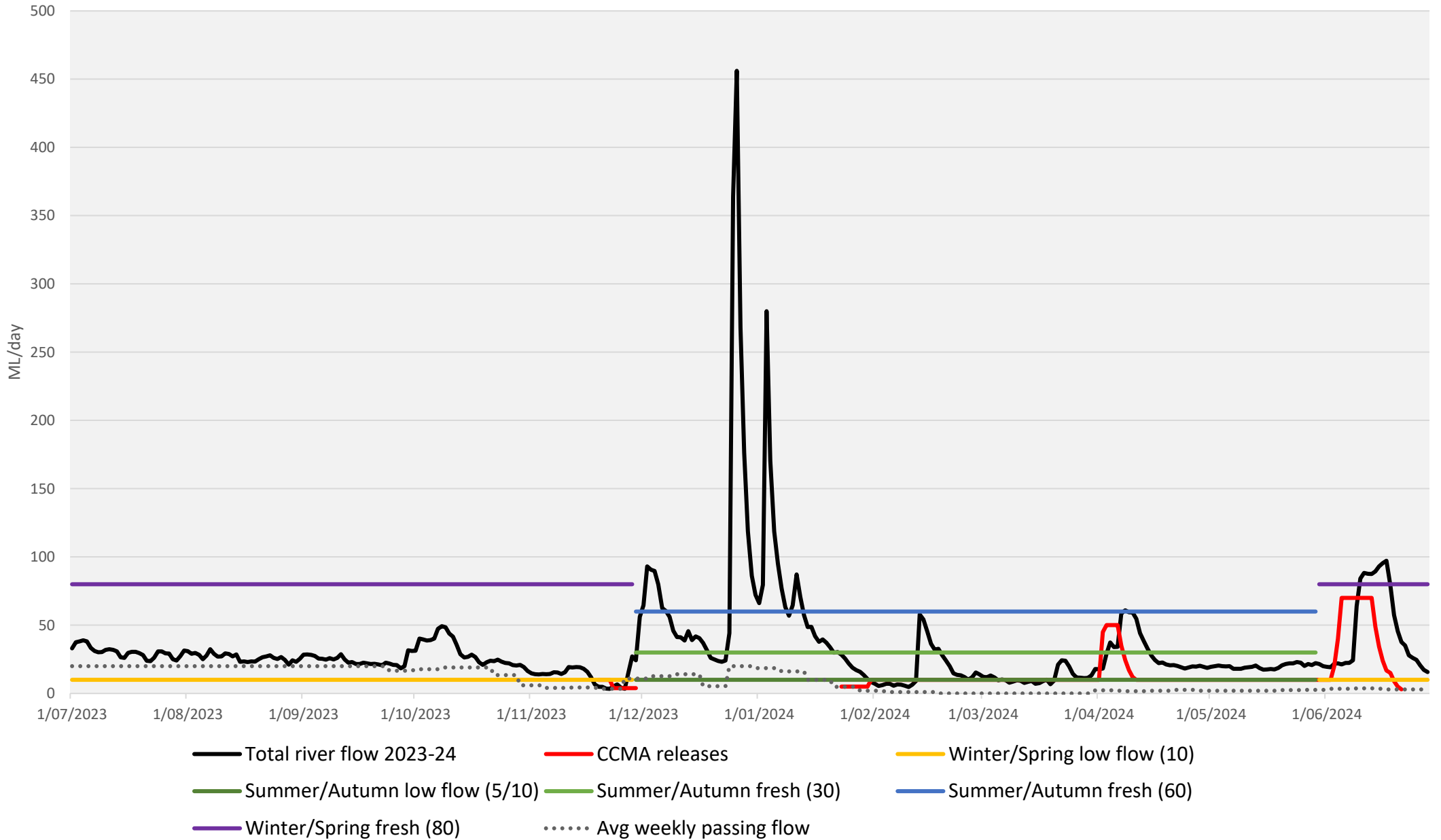


Figure 8. Batesford mean total river flow & recommended flows 2023-24

Table 3. Environmental watering program 2023-24

Priority Watering Actions	Rate	Duration	Total	Achieved?	How?
Priority 1: Summer/Autumn Low Flow (Dec-May)	5-40 ML/day	Varies	1187 ML	Yes	Environmental flows, transfers, passing flows and natural flows
Priority 2: Winter/Spring Low Flow (June-Nov)* <i>June 2021 is excluded as it is previous water year</i>	5-60ML/day	Varies	57 ML	Yes	Environmental flows, transfers, passing flows and natural flows
Priority 3: Summer/Autumn Fresh event (April-May)	60-80ML/day + ramp days	5 days	334 ML	Yes	Environmental flows, transfers, passing flows and natural flows
Priority 4: Summer/Autumn Fresh event (Jan-Feb)	60-80ML/day + ramp days	5 days	0 ML	Yes	Achieved naturally
Priority 5: Little Summer/Autumn Fresh event (Feb-Mar)	30-60ML/day + ramp days	3 days	30 ML	Yes	WTOAC temporary transfers of 200ML released over seven days from Lal Lal and environmental water
Priority 6: Winter/Spring Fresh event (Sep-Nov)	80-90ML/day + ramp days	5-10 days	NA	No	Not enough water in entitlement
Priority 7: Winter/Spring Fresh event (May-Aug)	80-90ML/day + ramp days	5-10 days	829 ML	Yes	Environmental flows (aspirational duration of nine days), transfers, passing flows and natural flows
Priority 8: Winter/Spring Fresh event (Sep-Nov)	80-90ML/day + ramp days	5-10 days	NA	No	Not enough water in entitlement

5. Ecological & Community Observations

VEFMAP

- Arthur Rylah Institute undertake yearly sampling of sites on the Moorabool River using electrofishing techniques to gather data on fish populations in the system. The sampling in 2024 took place on 19 to 23 February and 7 March and was developed into a field survey update (Appendix 1). Some key information captured from the monitoring include: 922 fish (eight native and six exotic species) were captured or observed, which is lower than previous years.
- A total of 38 River Blackfish were captured, which much lower than in 2023 but comparable to 2022. Almost half of the River Blackfish caught in 2024 were young-of-year fish, indicating good recruitment of this cohort.
- Native species: Short-finned Eel, River Blackfish, Tupong, Common Galaxias, Mountain Galaxias, Southern Pygmy Perch, Australian Smelt and Flat-headed Gudgeon. Mountain Galaxias (203) and Short-finned Eel (134) were the most abundant native species.



Figure 9. VEFMAP monitoring with ARI downstream of Sharps road on Moorabool River

People for A Living Moorabool (PALM)

PALM member Cameron Steele had described areas of the Moorabool he had seen that were noticeably more turbid than other reaches. A number of turbidity tubes were provided to him to supply to the group to undertake monitoring of these areas post-rainfall to gather baseline data and better understand which areas are impacted by runoff and activities such as illegal gold mining, trail bike impacts, and stock access in unfenced reaches.

eBird

eBird is a citizen science focused platform made for users to record and research bird species within certain areas. It provides valuable data on species extent and has excellent quality control methods. Further information about species observed along the Moorabool River can be found via the [eBird hotspots map](#).

WaterWatch

Citizen Scientists undertake water quality monitoring activities on the Moorabool River on a monthly basis. During these site visits they collect water quality data but also do habitat assessments where possible. Two sites within close proximity to each other were given a personal assessment on 2 January 2024 and have been included below.

Table 4. WaterWatch habitat surveys January 2024

Site Location	Assessment
<p>Moorabool River confluence east & west branches, Dolly Creek Rd, Morrisons</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: right;"><i>Page 1 of 2</i></p> <p>MOO 001 Habitat Survey Notes Jan 2024 <i>Tuesday 2nd January 2024 10.50am Sunny, calm & 23°</i></p> <p>Access :- With care the river banks can be accessed on the West side, up and downstream from the monitoring area. I collect my monitoring water samples off the concrete causeway on the upstream side, near to the middle as possible using a sample bucket on a short rope.</p> <p>The weather is perfect so far today but the flies are very annoying, i can hear lots of birds but i can't spot any of them, some recent campers have left some firewood behind, the surrounding area seems clean and tidy, some rocks have been shifted into a half circle to make a smaller fire circle larger than it was before, i don't think this is a designated camping area but it seems to be becoming more popular.</p> <p>Bank Vegetation :- Seems to be an abundance of vegetation however I can see some blackberries on both sides of the banks in places so I will score a 6</p> <p>Verge Vegetation :- The verge here appears very well vegetated but it is only very narrow before it runs into the gravel road or fenced paddocks there are also patches of weeds in amongst the vegetation so I have to score it 4</p> <p>In Stream Cover :- Walking up & downstream there is a good variety of snags, logs, rocks & plants so i will score an 8</p> </div> <div style="width: 48%;"> <p style="text-align: right;"><i>Page 2 of 2</i></p> <p>Erosion & Stability :- I can only see a small amount of spot erosion in places, overall there seems to be enough vegetation to cover & stabilise some of the past erosion. The main erosion spots now appear to be from where animals? are accessing the river score a 4</p> <p>Pools Riffles & Bends :- There are a good variety of riffles, bends & pools some deeper pools and some shallow faster flowing areas, score (4 or 5?) I will say a 4</p> <p>Total Score :- 26 Stream Habitat Rating :- Fair</p> </div> </div>

[Moorabool River at ford \(Dolly Creek Rd bridge crossing\)](#)

MOO 004 Habitat Survey Notes Jan 2024

Tuesday 2nd January 2024 10.10am Sunny, calm & 23°

Access :- With a little bit of care this site can be accessed on all sides up & downstream. My monitoring water samples are always collected from the middle of the ford on the upstream side, using a bucket on a short rope.

It is fairly quiet here today there is a caravaner packing up and there are some campers further along in the camp area, I can hear lots of different bird calls but can not spot the birds, the water is clear & flowing nicely, I can't spot any fish in the river today.

Bank Vegetation :- The banks have a good variety of vegetation but there are some areas with weeds and blackberries so I will score it a 6

Verge Vegetation :- There is a lot of mixed vegetation making the verge look quite good but again there are some weeds amongst it also the vegetation is not 30meters wide so i also have to allow for paddocks, so I have to give it a score of 6

In Stream Cover :- There are a lot of snags, logs, rocks and overhanging vegetation up and downstream from the large pond so i will score it an 8

Bank Erosion & Stability :- It is hard to see any active erosion but there are spots here & there if you look closely, score 4

Pools, Riffles & Bends :- there are some good riffles, bends & pools of varying depths, score 5

Total Score :- 29

Stream Habitat Rating :- Good

References

Corangamite CMA, 2023, Moorabool River Seasonal Watering Proposal 2023-24

Arthur Rylah Institute for Environmental Research Applied Aquatic Ecology, Field Survey Update - VEFMAP Stage 7 Moorabool River fish population surveys 2024

Bureau of Meteorology 2024, Climate outlooks – weeks, months and seasons, July to September, Daily rainfall data Morrison's Ballark

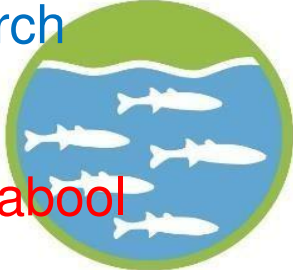
Water Measurement Information System, 2024, Morrison's and Batesford Surface Water Parameters, DEECA

WaterWatch portal 2024, sites MOO001 and MOO004 - habitat survey notes, 2 January 2024

Appendix

Appendix 1

Arthur Rylah Institute for Environmental Research
 Applied Aquatic Ecology



Field Survey Update – VEFMAP Stage 7 **Moorabool**
River fish population surveys 2024

Location	Moorabool River
Dates	19 – 23 February, 7 March 2024
Data collected and methods	Backpack and bank-mounted electrofishing surveys at 15 sites. This is the fourth consecutive year of VEFMAP surveys at these sites.
Survey notes, dominant species and highlights	<p>Fish community</p> <ul style="list-style-type: none"> • 922 fish (eight native and six exotic species) were captured or observed, which is lower than previous years. • Native species: Short-finned Eel, River Blackfish, Tupong, Common Galaxias, Mountain Galaxias, Southern Pygmy Perch, Australian Smelt and Flat-headed Gudgeon. Mountain Galaxias (203) and Short-finned Eel (134) were the most abundant native species. • Non-native species: Brown Trout, European Carp, Eastern Gambusia, Redfin Perch, Roach and Tench. Eastern Gambusia (161) and Brown Trout (68) were the most abundant exotic species. <p>Survey notes</p> <ul style="list-style-type: none"> • A total of 38 River Blackfish were captured, which much lower than in 2023 but comparable to 2022. Almost half of the River Blackfish caught in 2024 were young-of-year fish, indicating good recruitment of this cohort. • River Blackfish were caught at one site on the east branch for the second time since sampling started.
Survey team	Frank Amtstaetter, Liam Hogan, Lauren Johnson, Andrew Pickworth, Ruby Stoios (ARI staff)



Photos left to right: 1. young-of-year River Blackfish (Frank Amtstaetter), 2. adult River Blackfish captured in the east branch (Lauren Johnson), 3. Measuring fish (Lauren Johnson) and 4. adult tupong (Lauren Johnson).

Disclaimer – Please note these are field observations from a recent survey. This information will undergo quality assurance. Please contact Gabriel Cornell for further details
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Ph:0438 056 106)



Energy,
Environment
and Climate Action

