

# Annual Water Outlook

December 2021

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Excellence



Honesty



Accountability



Courage



Caring

# Document History and Distribution

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# Executive Summary

After average rainfall across large parts of northern Victoria in autumn 2021, inflows to all Goulburn-Murray Water (GMW) major storages were close to or better than average through winter and early spring. Reserves established in 2020/21, after all systems reached 100 per cent of high-reliability water shares (HRWS) by mid-February 2021, contributed to opening seasonal determinations in all systems on 1 July 2021.

At 15 November 2021, seasonal determinations had reached 100 per cent HRWS in all systems, with the Broken and Bullarook systems also having 100 per cent low-reliability water shares (LRWS). A LRWS seasonal determination in the other systems in 2021/22 is possible if wet conditions continue into summer and tributary flows can be used to meet demands.

The seasonal climate outlooks issued by the Bureau of Meteorology on 11 November 2021 indicate a 55 per cent to 70 per cent chance of exceeding median rainfall across the GMW region from December 2021 to February 2022.

Reserves for 2022/23 are being established in the Murray, Goulburn, Campaspe and Loddon systems, as the seasonal determination has reached 100 per cent of HRWS in each system. The Broken, Bullarook and Ovens systems are annual systems and water availability will depend on seasonal conditions and inflows closer to the start of 2022/23.

GMW, as delegated Resource Manager for northern Victorian systems, will issue a detailed outlook for seasonal determinations in regulated systems on Tuesday 15 February, 2022.

With good catchment conditions and a better than 55 per cent chance of exceeding the median rainfall in the next three months, further reserves for seasonal determinations in 2022/23 can be expected.

Unregulated systems across northern Victoria have started the 2021/22 season with minimal restrictions due to average rainfall. With the Bureau of Meteorology's favourable rainfall outlook, restrictions in the larger streams are unlikely, while the smaller tributary streams may experience restrictions.

The majority of groundwater licence holders have access to 100 per cent of their entitlement. Groundwater licence holders in the Loddon Highlands Water Supply Protection Area (WSPA) have now reached 100% allocation for all zones for the first time since 2013. Lower Campaspe WSPA users have a 75 per cent allocation for 2021/22. The allocation in the Katunga WSPA remains at 70 per cent, but good aquifer response occurred after lower than average use in 2020/21. With the Bureau of Meteorology predicting an above average chance of exceeding median rainfall across the region, further groundwater recovery may be observed in 2021/22 due to reduced extraction and increased recharge.

The risk of water quality incidents occurring over the next 12 months that would impact on supply to customers is considered low, although it is difficult to predict. The rainfall of the winter-spring period of 2021 has reduced the risk of hypoxic black water events occurring over summer 2021/22, although such events would not prevent the supply of water. The likely need to issue warnings due to high blue green algae levels cannot be predicted; however, such warnings would not normally prevent supply.

# Introduction

Part 4-2 of the Statement of Obligations (General) 2015 requires water corporations to prepare an Annual Water Outlook by 1 December each year. This document provides information in accordance with this obligation and will assist the development of the Water Outlook for Victoria.

The purpose of the Annual Water Outlook is to provide an outlook of water availability for the remaining months of 2021/22 and what conditions are possible at the start of the 2022/23 water year.

GMW's role is to efficiently manage, store and deliver water to more than 21,000 active customers involved in a diverse range of enterprises and interests across northern Victoria. Our customers include gravity irrigation, regulated and unregulated surface water diverters, groundwater, urban water corporations and environmental water holders. More information about GMW and its services are available on the GMW website, [www.gmwater.com.au/about](http://www.gmwater.com.au/about).

This water outlook covers the status and outlook for regulated, unregulated and groundwater sources as well as water quality.

## Current climate and streamflow in the longer context

Victoria's climate has shown a warming and drying trend over recent decades, and this trend is expected to continue over the longer-term future. In comparison to historical conditions, the GMW region is already experiencing:

- Higher temperatures;
- Reductions in rainfall in late autumn and winter and, in some locations, some increases in rainfall during the warmer months; and,
- In many catchments, a shift in the streamflow response to rainfall, with less streamflow generated for the same amount of rain.

Some of the rainfall decline in late autumn and winter can be attributed to global warming and changes in the weather systems that deliver rainfall to Victoria. The cause of the reduction in streamflow response to rainfall is not yet fully known and is the subject of continuing research.

Over the longer term, the GMW region can expect:

- the rainfall reductions in winter to persist;
- possible increases in summer rainfall;
- increases in potential evapotranspiration due to higher temperature and lower relative humidity;
- reductions in streamflow because of less rainfall and higher potential evapotranspiration; and
- the streamflow response to rainfall to no longer remain the same, and generally decline.

Even if there is an increase in summer rainfall, it is unlikely to offset the streamflow impact of rainfall reductions in winter because most of the runoff in Victorian catchments occurs over winter and spring. In the warmer months, rainfall is more likely to be absorbed by drier catchments, used by vegetation or evaporate.

Although there will still be a lot of variability in Victoria's climate and streamflow, the chances of experiencing warmer conditions and less streamflow is now higher than in past decades.

More information on the observed changes and longer-term future climate and water projections can be found at [www.water.vic.gov.au/climate-change](http://www.water.vic.gov.au/climate-change).

The Victorian Government is investing in further research to better understand how Victoria's climate is changing and the water resource implications, as part of implementing Water for Victoria.

# Regulated Systems

## Current seasonal conditions

The 2020/21 water year was drier than average, with storage inflows across GMW's catchments recording below average annual volume (based on climate conditions observed since 1975). Inflows into Lake Eppalock were 43 per cent of the average volume, while Lake Nillahcootie received 51 per cent. Cairn Curran received 33 per cent of average inflows. Dartmouth Dam and Lake Eildon benefited from above-average inflows during October 2020, which resulted in annual inflows being closer to average with 89 per cent and 86 per cent of average inflows respectively.

After near average rainfall in autumn 2021, close to average inflows were observed at most storages during winter and early spring. Rainfall across all of northern Victoria from July to October 2021 was average across the catchment areas (Figure 1) and this has contributed to close to average storage inflows (Table 1) over this period. Lake Eildon, Dartmouth Dam and Lake Hume received well above average inflows.

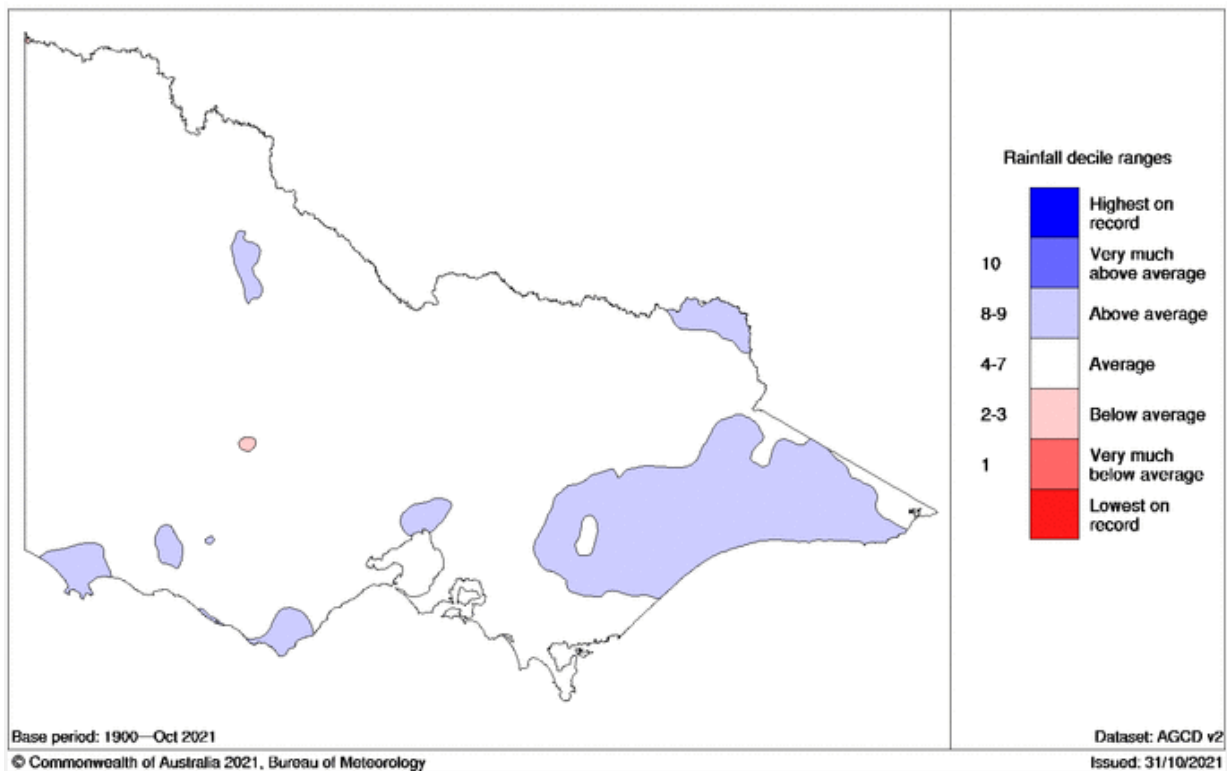


Figure 1. Rainfall deciles for 1 July to 31 October 2021

**Table 1. July to October 2021 inflows to the major GMW storages**

Storage	July – October inflow (GL)	Percent of average <sup>2</sup>	Chance of greater inflow <sup>2</sup>
Eildon	972.5	111%	37%
Goulburn Weir <sup>1</sup>	570.4	81%	53%
Hume <sup>1</sup>	2,036.4	137%	25%
Dartmouth	655.1	134%	27%
Buffalo	337.6	133%	26%
William Hovell	127	103%	45%
Nillahcootie	32.5	81%	48%
Eppalock	88.5	80%	45%
Cairn Curran	47.1	62%	52%
Tullaroop	29.6	86%	39%

<sup>1</sup> Natural inflows excluding releases from upstream storages

<sup>2</sup> Historical flow records that have been adjusted to match climate conditions observed since 1975

Table 2 outlines the change in storage volumes and percentages from July to mid-November. Demand for water early in the season was reasonably low and with inflows to most storages remaining steady through winter into spring, storage levels steadily increased. Demands have remained variable with reasonably frequent rain events across the irrigation areas into spring.

**Table 2. Storage volume changes from July to mid-November**

Storage	1 July 2021 Volume (GL)	1 July 2021 Percentage full	15 November 2021 Volume (GL)	15 November 2021 Percentage full	Volume change (GL)	Percentage full change
Eildon	1,946	58.4%	2,861	85.8%	915	27.4%
Hume	1,733	57.7%	2,930	97.5%	1,197	39.8%
Dartmouth	2,559	66.4%	3,236	83.9%	677	17.5%
Buffalo*	14.4	61.6%	19.9	84.9%	5.5	23.3%
William Hovell	13.8	101.1%	13.8	100.9%	0.0	-0.2%
Nillahcootie	30.5	75.6%	40.7	100.7%	10.2	25.1%
Eppalock	109.6	36.0%	176.8	58.1%	67.2	22.1%
Cairn Curran	57.8	39.3%	100.2	68.1%	42.2	28.8%
Tullaroop	29.0	39.9%	54.4	74.5%	25.4	34.6%

\*Lake Buffalo level managed through winter and spring by passing inflows until gates lowered in late October

Water availability in northern Victoria early in 2021/22 was assisted by the reserves established in 2020/21 after seasonal determinations reached 100 per cent HRWS by mid-February 2021 and close to average rainfall during autumn across most catchments. This allowed an opening seasonal determination to be made on 1 July 2021 in all systems. There was also a high volume of carryover at 1 July 2021, with 791 GL available in the Goulburn system and 684 GL available in the Murray system.

Seasonal determinations as at 15 November 2021 are shown in Table 3. All systems have reached 100 per cent HRWS this water year. The Goulburn system and the Murray System early season reserves for 2022/23 have been established. The reserve volumes contribute to operating commitments for the following water year, aiming to ensure that any water carried over by entitlement holders from the current water year can be delivered at the start of the irrigation season.

Table 3. Seasonal determinations as at 15 November 2021

Water System	High-Reliability Water Share	Low-Reliability Water Share
Murray	100%	0%
Broken	100%	100%
Goulburn	100%	0%
Campaspe	100%	0%
Loddon	100%	0%
Bullarook	100%	100%

## Resource Availability

### *Murray System*

The Murray system started 2021/22 with a seasonal determination of 21 per cent HRWS. Good inflows through winter and spring enabled consistently solid increases to seasonal determinations. The seasonal determination reached 100 per cent at 15 October 2021.

The inflows to Lake Hume resulted in spills – in the form of pre-releases – from the storage in August 2021 and have continued intermittently into November. These spills meant deductions from water allocated to rules based entitlements, such as the Barmah-Millewa Forest Environmental Water Allocation, as well as water held in spillable water accounts. As at 15 November, about 292 GL has been deducted from spillable water accounts and the risk of spill remained above the 10% threshold to declare a low-risk of further spills.

As specified in clause 10.5 of GMW's Murray bulk entitlement, water was borrowed from the Barmah-Millewa Forest Environmental Water Allocation at the start of the 2021/22 water year to support early seasonal determinations for high-reliability water shares. After deductions for the volume spilled, and water used, the remaining volume of 200 GL borrowed from the Barmah-Millewa Forest Environmental Water Allocation was paid back incrementally when seasonal determinations were between 50 per cent and 100 per cent HRWS.

### *Goulburn System*

The reserves established in the Goulburn system from good inflows during autumn 2020/21 were enough for the system to commence the 2021/22 water year with a seasonal determination of 35 per cent HRWS.

Variable inflows during winter and early spring 2021 resulted in the Goulburn River below Goulburn Weir operating under unregulated conditions at times. Several large unregulated flows passed through to the lower Goulburn River as GMW managed the volume in Waranga Basin against a target filling curve. The volume in Lake Eildon has steadily increased from mid-June 2021 with good catchment conditions and reasonably consistent rain events. Waranga Basin remained effectively full (99 per cent) at 15 November 2021.

The seasonal determination in the Goulburn system gradually increased from the start of the water year to reach 100 per cent HRWS on 1 October 2021. A low risk of spill was declared on 10 November 2021 in the Goulburn system.

### *Broken System*

The Broken system opened the 2021/22 water year with a seasonal determination of 5 per cent HRWS.



Inflows to Lake Nillahcootie rapidly increased through winter and early spring before reaching 100 per cent capacity in mid-September. The seasonal determinations steadily increased to reach 100 per cent HRWS and 100 per cent LRWS on 15 October 2021.

#### *Campaspe System*

The Campaspe system opened the 2021/22 water year with a seasonal determination of 15 per cent HRWS. The storage volume increased from mid-June to reach 56 per cent of capacity by mid-October, helped by the upper Coliban storages reaching capacity by late winter and spilling. The storage increases enabled the seasonal determination to increase to 100 per cent HRWS on 15 September 2021. A low risk of spill was declared on 10 October 2021 in the Campaspe system.

#### *Loddon and Bullarook Systems*

In accordance with the bulk entitlement rules, the Loddon system 2021/22 seasonal determination increased in line with the Goulburn system from mid-July after opening with a 33 per cent seasonal determination. The seasonal determination reached 100 per cent HRWS on 1 October 2021. Reserves are being established for 2022/23 water requirements. If the reserves are established, further resource improvements will be allocated to supplement water availability in the Goulburn system.

The Bullarook system is the smallest of the GMW systems with two relatively small annual storages. The Bullarook system opened with a 40 per cent HRWS seasonal determination on 1 July 2021. Rainfall and inflow improvement during winter enabled a seasonal determination of 100 per cent HRWS and 100 per cent LRWS on 15 July 2021.

#### *Ovens System*

Despite entitlement holders having water shares, the Ovens system does not receive seasonal determinations like the six other regulated systems operated by GMW. The system is managed similarly to an unregulated stream because of the high volume of inflows relative to storage size. Entitlement holders are restricted if the inflows into the system and the volumes held in Lake Buffalo and Lake William Hovell are insufficient to meet all the demand in the system.

Entitlement holders are currently not restricted, as inflows into the system are meeting any demands. The gates were lowered at Lake Buffalo in late October 2021 and will be filled to capacity as inflows began to reduce. Entitlement holders in the Ovens, Buffalo and King rivers currently have access to their spill-reliability entitlements. Access to the spill-reliability entitlements will cease later in the season once the storages commence regulated operations.

#### *Outlook comparison*

The outlook for seasonal determinations published on 15 July 2021 (

Table 4) indicated that with average inflows, 100 per cent HRWS was expected to be reached in all systems except the Murray (99 per cent) by mid-February. Based on the storage inflows outlined in Table 1, the seasonal determination increases to 15 October have followed the patterns suggested by the outlook. All systems have tracked close to or better than the average inflow scenarios to 15 October 2021.

Table 4. Outlook for seasonal determinations for 15 October 2021 as published on 15 July 2021

Water System	Inflow Scenario <sup>1</sup>		
	Wet	Average	Dry
Murray	81%	65%	46%
Broken	100%	100%	31%
Goulburn	100%	92%	50%
Campaspe	100%	100%	27%
Loddon	100%	92%	42%
Bullarook	100%	100%	100%

<sup>1</sup> Note dry conditions are defined as inflow volumes to major storages that are greater in 90 years out of 100, average conditions are inflow volumes to major storages that are greater in 50 years out of 100 and wet conditions are inflow volumes to major storages that are greater in 10 years out of 100

## Outlook for remainder of 2021/22

The Bureau of Meteorology's three month outlook for December 2021 to February 2022, issued on 11 November 2021, indicated the chances of exceeding the median rainfall over most of GMW's region range from 55 to 70 per cent (Figure 2).

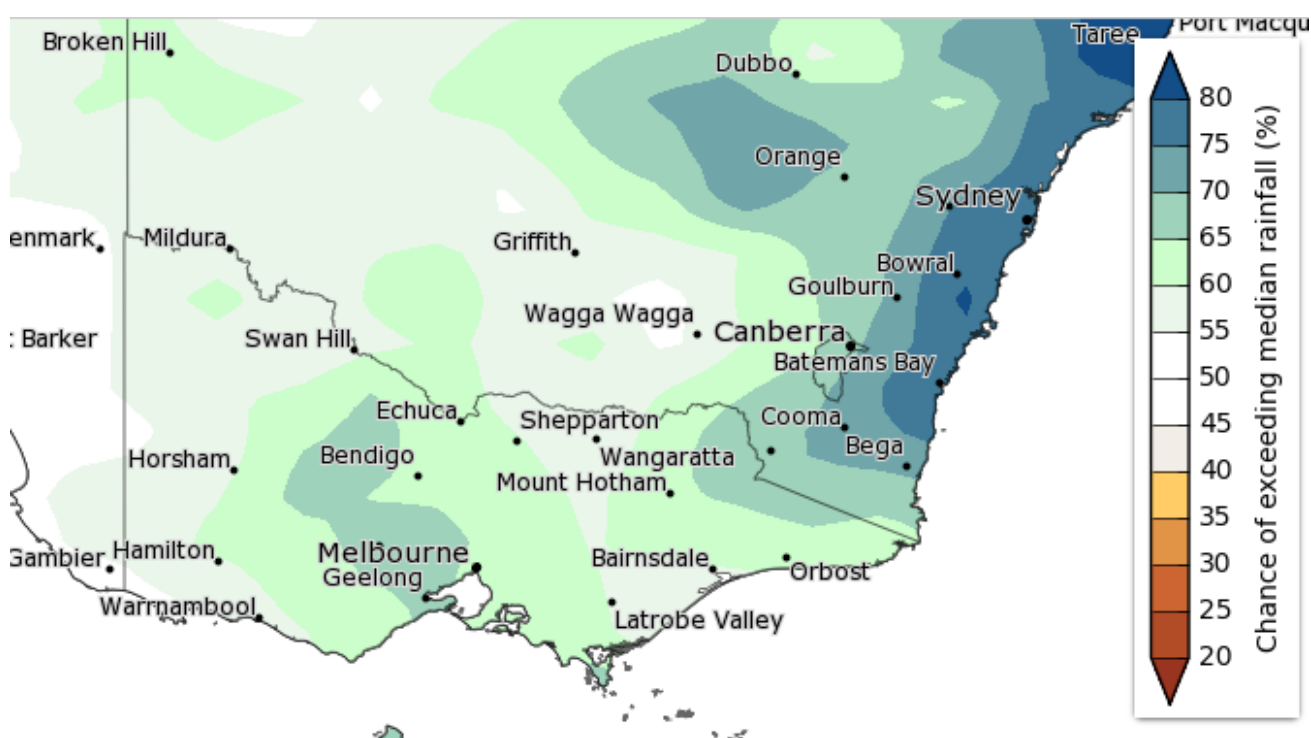


Figure 2. Chance of exceeding median rainfall for the period December 2021 to February 2022 (Source Bureau of Meteorology).

The Bureau of Meteorology's Climate Driver update issued on 9 November outlined an alert for La Niña conditions in the coming months, which is expected to deliver above average rainfall for eastern Australia.

Temperature and rainfall outlook updates are available from the Bureau of Meteorology website ([www.bom.gov.au/climate/ahead/](http://www.bom.gov.au/climate/ahead/)).

With recent rainfall events, catchments remain damp and stream flows are responding to any rainfall received. With the chance of above-average rainfall greater than 55 per cent over summer, further increases in storage levels are possible.

As the seasonal determination in the Murray, Goulburn, Campaspe and Loddon systems is 100 per cent HRWS, resource improvements for the remainder of 2021/22 will first go towards establishing reserves for 2022/23. Only when sufficient reserves enable a 100 per cent HRWS seasonal determination in 2022/23 will a seasonal determination against LRWS be made.

In these systems, the necessary reserves for HRWS in 2022/23 are yet to be established. It is possible that a LRWS seasonal determination will be announced in these systems this season, however, significant increases in resources are required. Significantly reducing this season's commitments from tributary flows and additional inflows to storage later in the season are the key drivers to enabling an allocation to LRWS.

Bullarook and Broken entitlement holders have their maximum seasonal determination and will not see any water availability changes for the remaining months of 2021/22.

Entitlement holders in the Ovens system may experience restricted diversion access this water year if storage inflows reduce and water from the storages is needed to meet demand before the end of December. History indicates that restrictions are not needed to manage demand when the storages are still at capacity in January.

Irrigation deliveries in the first two months of the 2021/22 irrigation season have been higher than the last two seasons, reflecting the variable conditions during spring and the healthy availability of water through high carryover volumes and new seasonal determinations. Weather conditions in the remaining months of the season will dictate how much water is used in 2021/22 and how much is carried over into 2022/23.

## Outlook for 2022/23

Reliable long-term weather outlooks for the start of 2022/23 are not available as the Bureau of Meteorology rainfall outlooks only extend for three months. GMW, as Northern Victoria Resource Manager, will release a detailed first outlook for the 2022/23 water year on 15 February 2022 based on historical inflows (adjusted for conditions since 1975) and update the outlook on 16 May 2022.

Resource improvements in the Murray, Goulburn, Campaspe and Loddon systems in the remaining months of 2021/22 will contribute to reserves for 2022/23.

### *Murray System*

The 2022/23 early reserve has been secured for the Murray system. This volume contributes to system operating requirements in 2022/23 to enable delivery of carryover from the start of the season. With good catchment conditions, above average rainfall expected into summer and a good volume of water in storage, including the Menindee Lakes being greater than 100 per cent capacity, seasonal determinations in 2022/23 will be available under dry inflow conditions. Average inflow conditions should allow seasonal determinations to reach 100 per cent HRWS during spring 2022.

### *Goulburn System*

The 2022/23 early reserve has been secured for the Goulburn system. With the seasonal determination reaching 100 per cent HRWS, all further resource improvements will go towards 2022/23 water requirements until these are secure. Seasonal determinations in 2022/23 will be available under dry inflow conditions. Seasonal determinations could be low if inflows are low but if average inflows are received, seasonal determinations are likely to reach 100 per cent HRWS during spring 2022.

### *Campaspe System*

With the seasonal determination reaching 100 per cent HRWS, all further resource improvements will go towards reserves to operate the system next year and HRWS seasonal determinations for 2022/23 until these are established. With current catchment conditions and the three month climate outlooks, sufficient reserves to operate the system are likely to be established and provide for an opening seasonal determination on 1 July 2022.

### *Loddon System*

About 70 GL has been reserved for operating commitments in 2022/23. If conditions allow, seasonal determinations in the Loddon system will be the same as the Goulburn system in 2022/23. If inflows are insufficient in the Loddon system to maintain the same seasonal determination as the Goulburn system, the Loddon system seasonal determination will be lower than the Goulburn system. Schedule 3 of the Loddon bulk entitlement outlines the relationship between the seasonal determinations in the Goulburn and Loddon systems.

### *Broken System*

The Broken system is an annual system, so 2022/23 reserves will depend on how much water is used this water year and the inflows during the traditional inflow months in winter and spring 2022. Lake Nillahcootie is currently full and is expected to remain at capacity into December. There is currently about 3.2 GL available to support system operations in 2022/23.

### *Bullarook System*

Like the Broken, the Bullarook system is an annual system, so 2022/23 reserves will depend on how much water is used this water year and the inflows during the traditional inflow months in 2022.

### *Ovens System*

Water availability in the Ovens system depends on weather and stream flows, so it is difficult to determine what water availability will be in 2022/23. Restrictions are unlikely under wet and average inflow conditions, but remain possible under drier scenarios.

## **Unregulated Systems**

### **Current seasonal conditions**

Unregulated streams are monitored in accordance with relevant Local Management Rules (LMRs) or Water Supply Protection Areas (WSPA) management plans. Minimum streamflow requirements are outlined in LMRs and WSPA management plans. A minimum flow requirement of 3 ML/day is applied to streams that do not have a LMR.

If minimum flow requirements are not met, restrictions are put in place (Table 5). Restrictions range from Stage 1 Roster (access to 10 per cent of entitlement every 10 days) to Stage 5 suspension (only diversion for domestic and stock use is permitted). LMRs and the details of rosters and restrictions are available online at [www.gmwater.com.au/water-resources/diversions](http://www.gmwater.com.au/water-resources/diversions).

**Table 5. Current Stage 5 Suspensions on unregulated streams (as at 17 November 2021)**

<b>Catchment</b>	<b>Stream</b>	<b>Suspension start date</b>
Broken	Boosey Creek	13 January 2017
Kiewa	None	
Murray Tributaries	None	
Mitta Mitta	None	
King	None	
Ovens	None	
Goulburn	None	
Campaspe	Wanalta Creek	8 November 2016
	Cornella Creek	21 September 2017
Loddon	Muckleford Creek	20 November 2020
	Bullock Creek	14 December 2020

## Outlook for remainder of 2021/22

The Bureau of Meteorology is predicting an above-average chance of exceeding median rainfall across northern Victoria over the summer, which will likely result in larger streams not experiencing restrictions. However, smaller tributary streams may still experience restrictions.

The Bureau of Meteorology current seasonal streamflow forecast predicts near median to high streamflows for November to January across the GMW region ([www.bom.gov.au/water/ssf/](http://www.bom.gov.au/water/ssf/)).

### *Upper Murray Catchment*

- The Bureau of Meteorology predicts that flows are likely to be high and there is an 70 per cent chance of exceeding median rainfall in the Upper Murray catchment between December to February 2022.
- No restrictions are forecast for the main stem of the unregulated Murray River and the Mitta Mitta River above Lake Hume.
- Tributaries will most likely not experience restrictions.

### *Kiewa Catchment*

- The Bureau of Meteorology predicts near median flows and a 60 per cent chance of exceeding median rainfall in the Kiewa catchment between December and February 2022.
- No restrictions are forecast for the Kiewa main stem while some smaller tributaries may experience restrictions

### *Ovens Catchment*

- The Bureau of Meteorology predicts near-median flows and a 60 per cent chance of exceeding median rainfall in the Ovens catchment between December and February 2022.
- Restrictions are not likely for the main stem of the Ovens River upstream of Myrtleford
- Restrictions on irrigation is likely for smaller tributaries.

### *Goulburn Catchment*

- The Bureau of Meteorology predicts near median flows and a 60 per cent chance of exceeding median rainfall in the Goulburn catchment between December and February 2022.
- Small tributaries may experience restrictions.

### *Broken Catchment*

- The Bureau of Meteorology predicts near median to high flows and around 60 per cent chance of exceeding median rainfall in the upper parts of the Broken catchment between December and February 2022.
- The Broken River tributaries may experience restrictions.

#### *Campaspe Catchment*

- The Bureau of Meteorology predicts near median flows and a 60 per cent chance of exceeding median rainfall in the Campaspe catchment between December and February 2022.
- The Upper Campaspe, Coliban and all tributaries are likely to experience restrictions.

#### *Loddon Catchment*

- The Bureau of Meteorology predicts near median flow and a 60 per cent chance of exceeding median rainfall in the Loddon catchment between December and February 2022.
- The Loddon River upstream of Cairn Curran Reservoir and most tributaries may experience restrictions.

## Outlook for 2022/23

Access to unregulated systems in 2022/23 will depend on weather conditions (Table 6).

**Table 6. Unregulated systems outlook for 2022/23**

<b>Catchment</b>	<b>Worst on record weather conditions (greater for 95 of 100 years)</b>	<b>Dry weather conditions (greater for 75 out of 100 years)</b>	<b>Average weather conditions (greater for 50 out of 100 years)</b>
<b>Broken</b>	All streams on suspension.	All minor tributaries on suspension.	All minor tributaries on restriction or suspension.
<b>Kiewa</b>	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on suspension. Kiewa River on restriction	All minor tributaries on restrictions.
<b>Upper Murray</b>	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on suspension. Upper Murray River on restriction	All minor tributaries on restrictions.
<b>Ovens</b>	All minor tributaries on suspension. Upper Ovens River and larger tributaries on restriction	All minor tributaries on suspension. Upper Ovens River and major tributaries on restriction	All minor tributaries on restrictions. Tributaries of the Upper Ovens to be on the same level of restriction as the Ovens main stem above Myrtleford. Several smaller tributaries on suspension.
<b>Goulburn</b>	All minor and major tributaries on restriction or suspension.	All minor tributaries on suspension. All major Goulburn tributaries on restriction	Most minor tributaries on restriction or suspension.
<b>Campaspe</b>	All streams on suspension	All streams on suspension	All tributaries and the Upper Campaspe on restriction or suspension.
<b>Loddon</b>	All streams on suspension	All streams on suspension	All tributaries and the Upper Loddon on restriction or suspension.

Note: worst conditions on record are defined as instream flows that are greater in 95 years out of 100, dry conditions are greater 75 out of 100 years, average conditions are inflow volumes to major storages

that are greater in 50 years out of 100 and wet conditions are inflow volumes to major storages that are greater in 10 years out of 100).

## Groundwater

### Current seasonal conditions

Currently, groundwater licence holders the Katunga WSPA are on 70 per cent allocation and in the Lower Campaspe Valley WSPA are on 75 per cent allocation. The remaining Groundwater Management Units have access to 100 per cent of their entitlement (Table 7).

**Table 7. Groundwater allocation for 2021/22**

<b>Groundwater Management Unit (GMU)</b>	<b>2021/22 Allocations (% Licensed Volume)</b>
Barnawartha GMA	100%
Broken GMA	100%
Central Victorian Mineral Springs GMA	100%
Eildon GMA	100%
Katunga WSPA	70%
Kiewa GMA	100%
Loddon Highlands WSPA	100%
Lower Campaspe Valley WSPA	75%
Lower Ovens GMA	100%
Mid Goulburn GMA	100%
Mid Loddon GMA	100%
Shepparton Irrigation GMA	100%
Strathbogie GMA	100%
Unincorporated GMU	100%
Upper Goulburn GMA	100%
Upper Murray GMA	100%
Upper Ovens WSPA	100%
West Goulburn GMA	100%

\*WSPA = Water Supply Protection Area; GMA = Groundwater Management Area

### Outlook for remainder of 2021/22

Groundwater use and trading activity is likely to be average in 2021/22, which is similar to the 2020/21 season due to the Bureau of Meteorology predicting an above average chance of exceeding median rainfall across northern Victoria in early 2022.

### Outlook for 2022/23

Groundwater recovery and drawdown levels in northern Victoria are dependent on rainfall recharge and groundwater extraction. The predicted below average groundwater use in 2021/22, coupled with average rainfall across the region, is expected to cause groundwater level recovery in the Loddon and Campaspe catchments, as well as the Katunga WSPA. Groundwater levels in other areas in northern Victoria are expected to remain stable.

Groundwater levels in the Lower Campaspe Valley WSPA and Katunga WSPA will be closely monitored with the impact of allocations on the resource (Table 8).

**Table 8. Groundwater outlook for 2022/23**

<b>Catchments</b>	<b>Groundwater Management Unit</b>	<b>Groundwater level outlook</b>	<b>Allocations outlook</b>
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Loddon/ Campaspe	Central Victorian Mineral Springs GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Mid Loddon GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Loddon Highlands WSPA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Lower Campaspe Valley WSPA	Seasonal drawdown and recovery likely to stabilise due to allocations and BOM rainfall predictions	75% allocation for all zones
Goulburn/ Broken/ Mid Murray	Broken GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Eildon GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Katunga WSPA	Seasonal drawdown and recovery likely to stabilise due to allocations and BOM rainfall predictions	Remain at 70%
	Mid Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Shepparton Irrigation GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Strathbogie GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	West Goulburn GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
Kiewa/ Ovens/ Upper Murray	Barnawartha GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Kiewa GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Lower Ovens GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Murray GMA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%
	Upper Ovens WSPA	Seasonal drawdown and recovery likely to remain stable	Remain at 100%

## Surface Water Quality

### Current seasonal conditions

During the winter-spring period of 2021, there have been ongoing impacts from the 2020 bushfires on surface water quality in north east catchments and several blue green algae blooms in the GMW region. The Lake Eildon blue green algae warning that commenced in July 2020 is still current more than a year later, with scums persisting. A blue green algae warning issued for Hepburns Lagoon in December 2020 is also still current. Blue green algae levels in most other storages were very low over winter and remained low into spring.

In the catchments of north east Victoria impacted by fire in 2020, significant sediment movement and elevated turbidity is still being observed following rainfall events, particularly in the Murray River. Dissolved oxygen levels have not been impaired to any great extent.

## Outlook for 2021/22

It is difficult to estimate the likelihood of adverse water quality events occurring over the next 12 months, as there are a range of influential factors and many are weather-dependent. GMW's region also consists of open catchments where a variety of land uses and activities occur around waterways and storages, which have the potential to impact water quality at any time.

Water storage levels currently range between 56 per cent and 100 per cent of full capacity and are not likely to fall to levels low enough to cause any water quality problems prior to winter 2022.

As the GMW region has experienced at least average winter-spring rainfall to date in 2021, the risk of hypoxic blackwater events occurring over summer and autumn 2021/22 is not considered high, with most areas having received a good flush.

The likelihood of blue green algae reaching levels that warrant the issuing of recreational warnings cannot be predicted. Elevated blue green algae levels have previously occurred under a range of weather, storage level and stream flow scenarios. A number of reservoirs have experienced algae warnings in all seasons and also over a wide range of storage levels. The storage inflows experienced to date in 2021 would have mobilised nutrients from land and instream sediment, which could in turn promote algal blooms. On the other hand, the possibility of higher than average rainfall and runoff due to a possible La Niña event could suppress bloom formation.

The occurrence of elevated blue green algae or hypoxic blackwater events is unlikely to affect GMW's supply to rural customers, as the phenomena are not considered harmful to irrigated agriculture (although the impact on stock is unknown). However, both events can impact aquatic life and recreational use of water bodies. Current blue green algae warnings in GMW systems can always be found on our website [www.gmwater.com.au/news/bga](http://www.gmwater.com.au/news/bga) along with links to further information.

Urban water corporations are generally able to treat water affected by blue green algae to provide safe drinking water, although some species of algae present greater challenges than others.

The impact of the 2020 bushfires in northeast Victoria is expected to continue into 2022/23, in particular the movement of sediment along waterways. While this is not likely to affect storage or channel operations in the short term, it may impact assets such as diverters' pumps and stream gauging sites.

High salinity in water systems is unlikely to occur under the current and expected water resource position.

## Information Updates

GMW update seasonal determinations on the 1<sup>st</sup> and 15<sup>th</sup> of each month, or next business day, until all seasonal determinations are 100 per cent HRWS. Seasonal determinations are then be updated on the 15<sup>th</sup> of each month, or next business day.

The first outlook for 2022/23 seasonal determinations will be issued on 15 February 2022. All resource management updates can be located on the Northern Victoria Resource Manager website at [www.nvrm.net.au](http://www.nvrm.net.au).