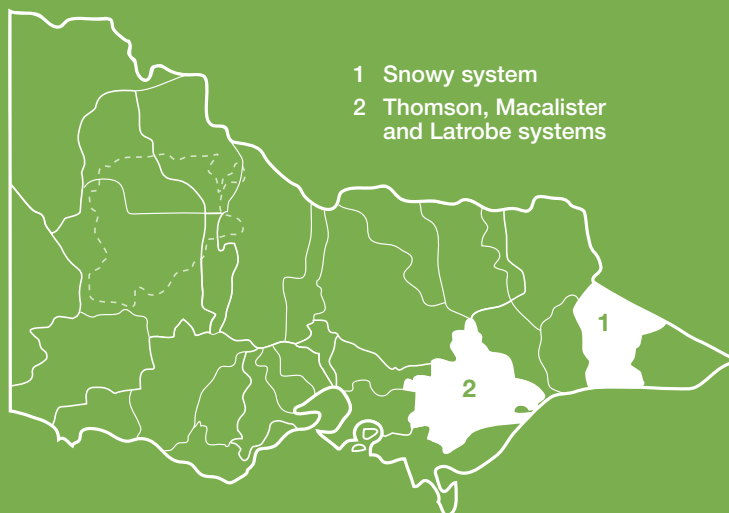




Section 2

Gippsland Region



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2.1 Gippsland Region overview

There are four systems in the Gippsland Region that can receive water from the Water Holdings (see sections 2.2–2.5): the Thomson, Macalister and Snowy systems, and the Latrobe system (including the Latrobe River and lower Latrobe wetlands).

The Latrobe, Thomson and Macalister rivers become linked near Sale, where the Macalister and Thomson rivers join the Latrobe River and flow past the lower Latrobe wetlands (Sale Common, Heart Morass and Dowd Morass) before entering Lake Wellington. These waterways and wetlands contain a range of significant environmental values and also support irrigated agriculture, tourism and mining industries.

The Snowy River flows south from the Snowy Mountains in New South Wales and into Victoria and Bass Strait. The Snowy Mountains Hydro-electric Scheme contains storages that are connected to the Murray and Murrumbidgee systems via a network of tunnels, pipelines and aqueducts. Water from the Snowy is transferred to the Murray and Murrumbidgee to supply irrigated agriculture in those systems.

There is some interconnectedness between systems in the Gippsland Region, and there are therefore opportunities to move water between systems through trade or substitution. Although moving water between systems is possible, most environmental water in these systems is prioritised to provide benefits in the waterways downstream of the storages in which the water is held.

Seasonal outlook 2015–16

Environmental water available for use in the Latrobe, Thomson and Macalister systems is held in Blue Rock Reservoir, Thomson Reservoir and Lake Glenmaggie respectively. Water allocations are made through various rules and mechanisms in each system. The Thomson system has relatively secure allocation, largely irrespective of catchment conditions. In the Latrobe and Macalister systems, water availability is more heavily dependent on seasonal conditions. However, the outlook for water availability in 2015–16 is reasonable, with environmental water availability likely to be sufficient to meet most identified demands in these systems, particularly considering available carryover. There may be a need for additional environmental water to be made available in the Thomson system to support important migration triggers for Australian grayling, which may be met through the planned recovery of an additional 8,000 ML of environmental water in the Thomson system in 2015–16. However, if necessary, additional water could be made available by transfer from another Gippsland system or from another region.

The Latrobe wetlands are not reliant on a volume set aside in upstream storages to meet environmental water demands. The wetlands have access to end-of-system flows whereby water can be actively diverted into Sale Common, Heart Morass or Dowd Morass when a river-level trigger in the Latrobe River is achieved. By and large, the Latrobe wetlands receive water from natural and unregulated flows.

Victorian environmental water available for use in the Snowy system is held in the Murray, Goulburn and Loddon systems. This water is made available for environmental flows in the Snowy River via a substitution method whereby Victorian environmental water replaces water that was earmarked for transfer from the Snowy to Victoria to support irrigation demands. Due to high allocations in Victorian systems in 2014–15, the full volume of high-reliability allocations held by the VEWH will be substituted to the Snowy system and made available for use in the Snowy River by the New South Wales Office of Water.

2.2 Latrobe system

Waterway manager – West Gippsland Catchment Management Authority

Storage manager – Southern Rural Water

Environmental water holder – Victorian Environmental Water Holder

Considered one of the most significantly modified rivers in Victoria, the Latrobe River system (which includes the Latrobe River and lower Latrobe wetlands) supports a range of plant and animal species of high conservation significance including several threatened vegetation types, waterbirds and fish and frog species. The Latrobe River also provides an essential source of fresh water to the Ramsar-listed Gippsland Lakes system, of which the lower Latrobe wetlands are an important component.

Engagement

West Gippsland CMA engaged key stakeholders when preparing the seasonal watering proposal for the Latrobe River and the lower Latrobe wetlands. Table 2.2.1 shows these stakeholders.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which incorporate environmental, cultural, social and economic considerations.

Table 2.2.1 Key stakeholders engaged in the development of the Latrobe River and wetlands seasonal watering proposal

Stakeholder engagement
<ul style="list-style-type: none"> ▶ Wetlands Environmental Taskforce, a registered environmental organisation that purchases and restores wetlands in Australia ▶ Field and Game Australia ▶ Southern Rural Water ▶ Parks Victoria ▶ Victorian Environmental Water Holder

2.2.1 Latrobe River

Environmental values

The Latrobe River contains a range of important estuarine and freshwater fish species including black bream, Australian bass and short and long-finned eel. Considerable habitat is provided in the lower Latrobe River through a diverse range of riparian vegetation including intact stands of swamp scrub, an endangered vegetation type that is characterised by dense stands of swamp paperbark and tea tree. The upstream reaches contain larger and more continuous stands of river red gums and a tall shrub layer. These mature river red gums adjacent to the lower Latrobe wetlands also provide nesting habitat for birds of prey (such as sea eagles) that hunt and range over the wetlands.

Social and economic values

The Latrobe River contains several important recreational fishing species including black bream and estuary perch. Research is under way to track black bream movement and spawning activities in the Latrobe River to improve flow recommendations and increase the population, which would have the flow-on benefit of improving fishing opportunities. The lower Latrobe River is also commercially fished for eel and carp. The waterways in the Latrobe system (including the Latrobe River) continue to hold significance for Traditional Owners. Waterways and wetlands in the region are important ceremonial places and for thousands of years the Latrobe River has provided resources such as food and materials to the Gunaikurnai people.

Environmental watering objectives in the Latrobe River



Enable formation of instream bars to help stabilise the structure and condition of the river channel. This will help to reduce the load of sediment and nutrients flowing into the Gippsland Lakes



Establish native plants on bars and lower parts of the banks to stabilise the river channel







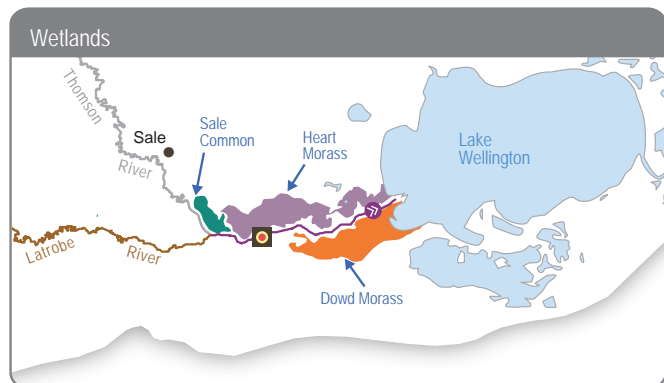
Improve habitat for native fish including black bream and estuary perch

System overview

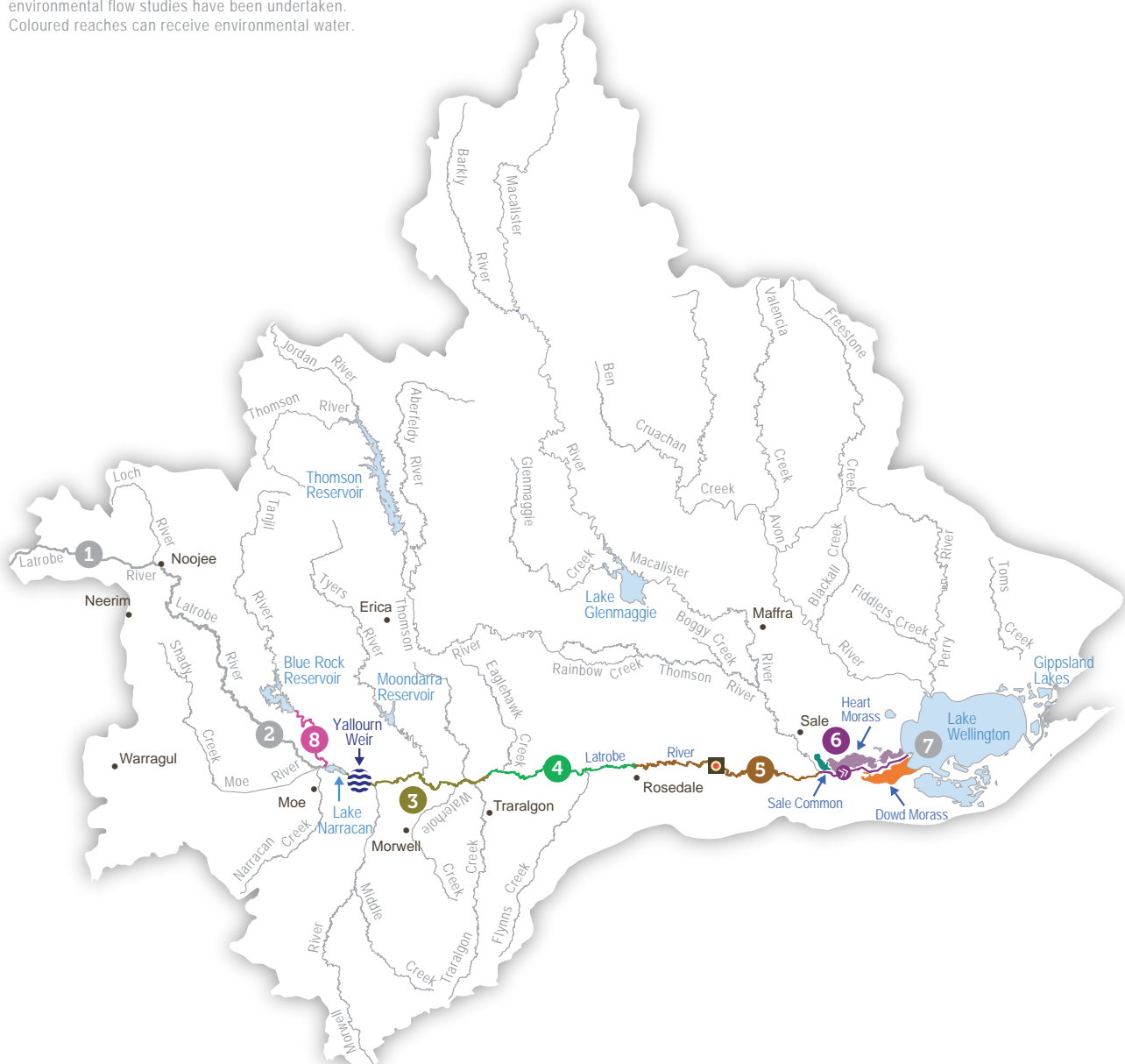
The Latrobe River arises on the Mount Baw Baw Plateau near Powell Town in West Gippsland and flows into Lake Wellington, the westernmost point of the Gippsland Lakes. While the upper Latrobe River is relatively intact, the lower Latrobe River that flows through the Latrobe Valley is modified and degraded due to past river and land management practices (including river desnagging and channelisation) that have reduced habitat availability and diversity.

Figure 2.2.1 The Latrobe system

- Reach 1 Upstream of Willow Grove
 Reach 2 Willow Grove to Lake Narracan
 Reach 3 Lake Narracan to Scarnes Bridge
 Reach 4 Scarnes Bridge to Rosedale
 Reach 5 Rosedale to Thomson River confluence
 Reach 6 Downstream of Thomson confluence
 Reach 7 Lake Wellington
 Reach 8 Tanjil River
-  Water infrastructure
 Measurement point
 Town
 Indicates direction of flow



Grey river reaches have been included for context.
 The numbered reaches indicate where relevant
 environmental flow studies have been undertaken.
 Coloured reaches can receive environmental water.



Major tributaries of the Latrobe River include the Tanjil River, Narracan Creek, Morwell River, Tyers River, Traralgon Creek and Thomson River. Environmental water is stored in, and can be released from, Blue Rock Reservoir.

Due to its good stands of endangered riparian vegetation, the Latrobe River from Rosedale to the Thomson River confluence (reach 5) is the priority reach for environmental watering. This reach also has the highest potential to improve its environmental condition through environmental watering, due to the degrading processes of past river management practices. The measurement point for environmental flows delivered to reach 5 is the Latrobe River at the Kilmany South streamflow gauge.

Recent conditions

The Latrobe catchment received average rainfall during 2014–15, with summer inflows being above-average. Throughout most of winter and spring, Blue Rock Reservoir was full and spilled regularly, resulting in most small- to medium-sized environmental watering targets being achieved naturally. The largest natural flow occurred in December 2014 and this caused some minor flooding of the lower Latrobe River. Larger floods that have been seen in recent years did not occur during 2014–15.

The first-ever delivery of environmental water from Blue Rock Reservoir occurred during April and May 2014. The release provided an autumn fresh of 1,300 ML per day to improve vegetation condition and channel structure in the Latrobe River. The flow was also delivered to improve water quality in the lower Latrobe River by flushing a salt wedge that forms during summer and autumn low-flow conditions.

There is evidence that the structure and condition of the river channel in the most downstream sections of the Latrobe River is improving, with instream bars being formed and vegetation being re-established. During the 2014 release of water to the Latrobe River, West

Gippsland CMA also collected information about the duration and magnitude of the river flows. This helped the CMA understand how much water made it to the bottom reaches, how long the water took to travel through the system, and how the release affected the salinity and water quality of the Latrobe River estuary. This information will assist in the planning and optimisation of future environmental watering including the coordination of releases from the Latrobe, Thomson and Macalister systems to achieve the greatest benefits in the Latrobe River estuary.

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are explained in Table 2.2.2 and illustrated in Figure 2.2.2.

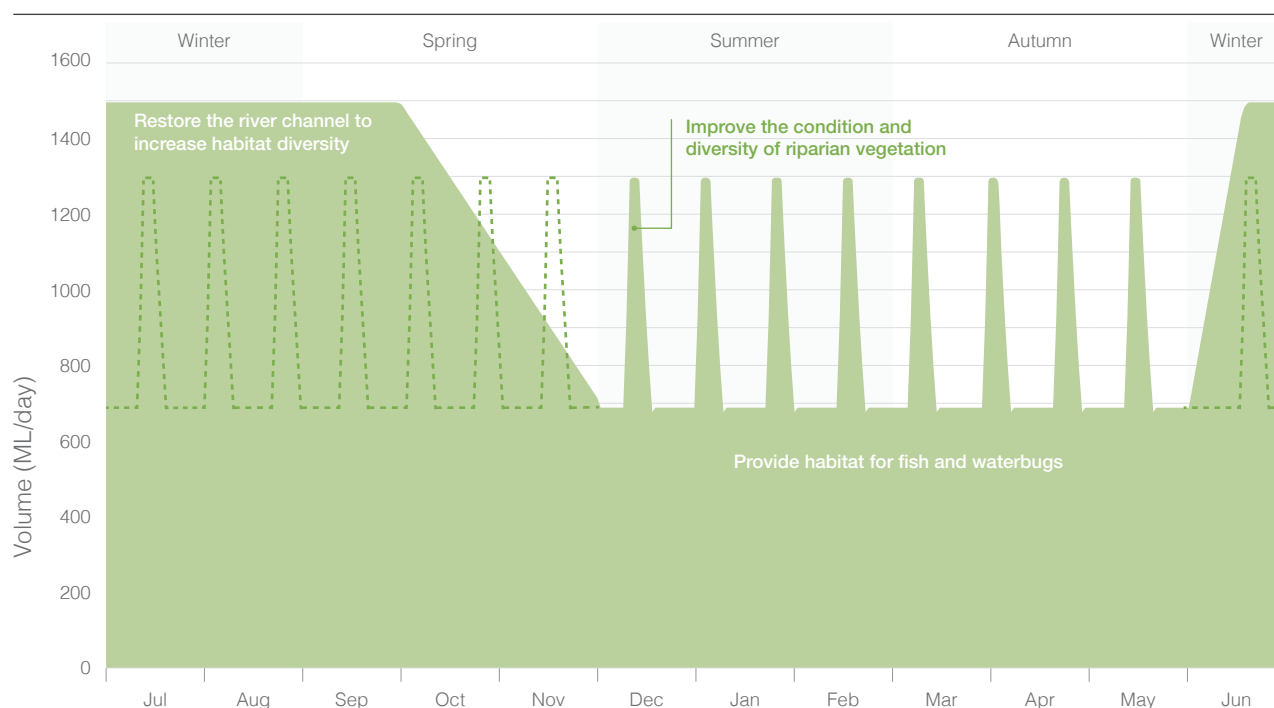
Table 2.2.2 Potential environmental watering actions and objectives for the Latrobe River

Potential environmental watering	Environmental objectives
Spring/summer freshes (up to 8 freshes of 1,300 ML/day for 2–4 days during September–February)	► Improve vegetation diversity, condition and abundance along lower banks and increase recruitment of instream vegetation
Autumn/winter freshes (up to 8 freshes of 1,300 ML/day for 2–4 days during March–August)	
Winter/spring baseflows (690–1,500 ML/day from June–November)	► Facilitate the formation of instream bars (elevated deposits of sediment and gravel in the river channel)
Summer/autumn baseflows (up to 690 ML/day from December–May)	► Provide instream habitat for aquatic biota, especially macroinvertebrates, fish and vegetation



Release from Blue Rock Reservoir, by Chloe Wiesenfeld

Figure 2.2.2 Potential environmental watering in the Latrobe River reach 5



Note: This figure is for illustrative purposes only. Scheduling and delivery of particular watering actions within the stated timeframes will vary.

Scenario planning

Table 2.2.3 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

Environmental water availability in the Latrobe River will start well this year with at least 15,700 ML of water available in Blue Rock Reservoir on 1 July 2015. Even if a low inflow year eventuates, it is expected that allocations will reach the full entitlement volume.

Climatic conditions from July to November are an important driver for decision making and prioritising use of environmental water in the Latrobe River. The long-term aim for the Latrobe River is to rehabilitate vegetation and channel structure and so, in dry years, spring freshes are most important because they aid the establishment of riparian vegetation. It is likely that in dry years there will be low natural achievement of spring and early summer freshes, and therefore environmental water will be delivered to supplement flows to achieve desired flow rates and long-term environmental outcomes.

In contrast, if good inflows in winter and spring eventuate, Blue Rock Reservoir is likely to spill and most early-season watering actions are likely to be delivered naturally, reducing the amount of environmental water required to achieve the associated objectives. This would mean that there is little need to call on environmental water for spring flows, reserving water for use in late summer and autumn.

The variable volumes of environmental water required under each scenario reflect the different duration and timing of the potential watering actions and the expected river conditions during the delivery periods.

Risk management

In preparing its seasonal watering proposal, West Gippsland CMA considered and assessed risks, and identified mitigating strategies, relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.4.4).

Table 2.2.3 Potential environmental watering for the Latrobe River under a range of planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> ▶ Small contributions from unregulated reaches and tributaries of the Latrobe River with little opportunity for freshes to occur naturally ▶ Consumptive demand from Blue Rock Reservoir will be very high and regular releases to the Tanjil River will contribute substantially to baseflows 	<ul style="list-style-type: none"> ▶ There will be some unregulated flows that contribute to baseflows and freshes, however extended periods of high flow will be absent, and freshes will be infrequent ▶ Consumptive demand from Blue Rock Reservoir will be high and contribute to baseflows 	<ul style="list-style-type: none"> ▶ Unregulated flows will provide baseflows and multiple freshes, most likely during winter and spring ▶ A moderate amount of spills are likely and there will be releases for consumptive users which will partially contribute to baseflows 	<ul style="list-style-type: none"> ▶ Multiple spills from Blue Rock Reservoir will provide extended durations of high flow and overbank flow ▶ No significant releases from consumptive entitlements in Blue Rock Reservoir are likely
Expected availability of environmental water	▶ 16,200 ML	▶ 18,200 ML	▶ 18,700–23,200 ML	▶ 18,700–31,200 ML
Potential environmental watering	<ul style="list-style-type: none"> ▶ 1 spring/summer fresh ▶ 1 autumn/winter fresh ▶ Winter/spring baseflows 	<ul style="list-style-type: none"> ▶ Up to 3 spring/summer freshes ▶ Up to 2 autumn/winter freshes ▶ Winter/spring baseflows ▶ Summer/autumn baseflows 	<ul style="list-style-type: none"> ▶ Up to 3 spring/summer freshes ▶ Up to 3 autumn/winter freshes ▶ Winter/spring baseflows ▶ Summer/autumn baseflows 	<ul style="list-style-type: none"> ▶ Up to 4 spring/summer freshes ▶ Up to 4 autumn/winter freshes ▶ Winter/spring baseflows ▶ Summer/autumn baseflows
Possible volume of environmental water required to achieve objectives	▶ 12,300 ML	▶ 11,200 ML	▶ 15,900 ML	▶ 0–11,000 ML

2.2.2 Lower Latrobe wetlands

Environmental values

The Latrobe River provides a large source of freshwater to the Gippsland Lakes Ramsar site, of which the lower Latrobe wetlands are an important component. The lower Latrobe wetlands provide a variety of habitats to suit different birds at different times. For example, colonial waterbirds such as royal spoonbill, straw-necked and Australian white ibis find suitable breeding habitat among swamp paperbark trees in spring. Over summer during a drying phase, the mudflats provide feeding habitat for migratory shorebirds such as sandpipers, and open water is important all year round for waterfowl and fish-eating birds such as egrets.

In recent years, following the breaking of drought conditions, rare and threatened species such as freckled duck and green and golden bell frog have been found at Heart Morass.

Social and economic values

Sale Common is a state game refuge located close to the town of Sale that provides an excellent opportunity to observe plants and animals. Dowd Morass is a state game reserve and, along with Heart Morass, is commonly used by hunters. Preservation of an appropriate water regime in the lower Latrobe wetlands will, in the long term, increase waterbird abundance and provide opportunities for bird watching and hunting when the wetlands are in a wetting phase. The waterways in the Latrobe system (including the

lower Latrobe wetlands) continue to hold significance for Traditional Owners. Waterways and wetlands in the region are important ceremonial places and for thousands of years the lower Latrobe wetlands have provided resources such as food and materials to the Gunaikurnai people.

Environmental watering objectives in the lower Latrobe wetlands



Promote dispersal and germination of wetland plants



Provide habitat for waterbirds



Control carp abundance, particularly at Sale Common and Dowd Morass

System overview

The lower Latrobe wetlands are situated on the floodplain of the Latrobe River between its confluence with the Thomson River and Lake Wellington. River regulation and water extraction from the Latrobe, Thomson and Macalister rivers has reduced the frequency of small- to medium-sized floods that would naturally inundate the wetlands. Construction of levees and drains and the filling in of natural depressions have also substantially altered water movement.

The lower Latrobe wetlands that can be actively managed with environmental water are Sale Common and Heart Morass on the northern floodplain and Dowd Morass on the southern floodplain.

Recent conditions

During the four to five years before 2014–15, the lower Latrobe wetlands were continuously inundated with only partial drawdowns occurring each summer. No managed environmental watering was undertaken in 2014–15, as a summer drying remained the priority. However, Dowd Morass and Sale Common received natural flows in September 2014, and all three wetlands were partially inundated again in December. The climate in summer 2014–15 was mild and as a consequence the summer drying was not fully achieved; however, dry conditions persisted in autumn resulting in partial drawdown across all wetlands.

In general, there has been a decline in the diversity of native plants due to continuous inundation for several years. As a result, the value of the wetlands as feeding habitat for waterbirds is somewhat diminished. At Dowd Morass, the stands of swamp paperbark, which are important rookery habitat for waterbirds, are showing signs of stress and dieback due to constant inundation. Ibis and spoonbills which are typically abundant and breeding in the rookeries were absent in 2014–15.

At Sale Common, the mostly high water levels controlled the abundance of giant rush, which is a positive outcome. The high water levels have also dispersed plant propagules through the entire wetland complex; these are expected to germinate when suitable conditions arise.

Despite some negative impacts due to a prolonged wet phase, the wetlands still provided important habitat for waterbirds. Restoring an appropriate regime of wetting and drying will eventually assist in promoting germination and growth of a range of vegetation to support a high diversity of birdlife in the wetlands.



Australian white ibis hatchlings, by West Gippsland CMA



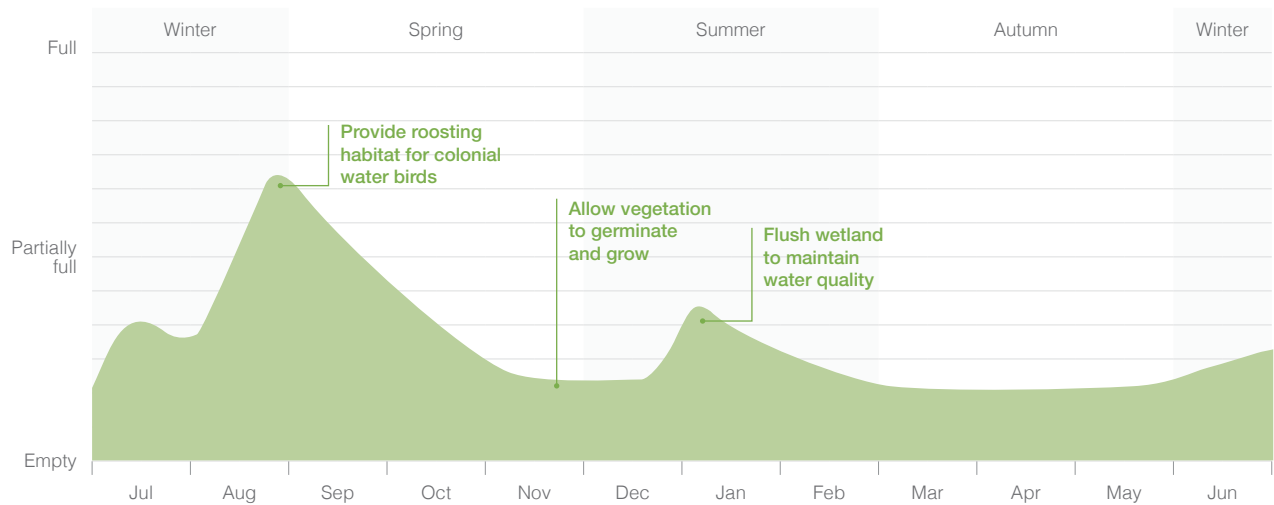
Sale Common, by Eleisha Keogh

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are explained in Table 2.2.4 and illustrated in Figure 2.2.3.

Table 2.2.4 Potential environmental watering actions and objectives for the lower Latrobe wetlands

Potential environmental watering	Environmental objectives
Sale Common	
Complete drawdown (primarily August–March)	<ul style="list-style-type: none"> ▶ Promote oxygenation of surface soils, breakdown of accumulated organic matter and nutrient recycling ▶ Encourage the growth and reproduction of wetland plants across the wetland bed ▶ Reduce the number and size of European carp
Wetting flow (February–May)	<ul style="list-style-type: none"> ▶ Provide feeding and sheltering habitat for wetland fauna, particularly waterbirds and frogs ▶ Discourage the spread of giant rush
Partial wetting flow (August–November)	<ul style="list-style-type: none"> ▶ Encourage the growth and reproduction of wetland plants, particularly tall marsh, aquatic hermland and aquatic sedgeland ▶ Provide feeding and breeding habitat for wetland fauna, particularly waterbirds and frogs
Wetting flow (anytime)	<ul style="list-style-type: none"> ▶ Mimic the natural inundation regime ▶ Control invasive vegetation
Dowd Morass and Heart Morass	
Substantial drawdown (primarily August–March)	<ul style="list-style-type: none"> ▶ Promote oxygenation of surface soils, breakdown of accumulated organic matter and nutrient recycling ▶ Encourage the growth and reproduction of wetland plants, particularly swamp shrub, tall marsh, aquatic hermland and brackish hermland ▶ Reduce the number and size of European carp
Wetting flow (February–May)	<ul style="list-style-type: none"> ▶ Provide feeding habitat for wetland fauna, particularly waterbirds
Wetting flow (anytime)	<ul style="list-style-type: none"> ▶ Avoid/mitigate risks to wetland plants and waterbird habitat from adverse salinity and exposure of acid sulphate sediment ▶ Mimic the natural inundation regime
Partial wetting flow (August–November)	<ul style="list-style-type: none"> ▶ Encourage colonial waterbird breeding ▶ Reduce salinity ▶ Encourage the growth and reproduction of wetland plants, particularly swamp scrub, tall marsh, aquatic hermland and brackish hermland ▶ Provide feeding and breeding habitat for wetland fauna, particularly waterbirds and frogs

Figure 2.2.3 Potential environmental watering in the lower Latrobe wetlands

Note: This figure is for illustrative purposes only. Scheduling and delivery of particular watering actions within the stated timeframes will vary.

Scenario planning

Table 2.2.5 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

It is expected that the primary objective for substantial drawdowns will be achievable under drought or dry scenarios and partial drawdown will be achieved under an average scenario. Natural conditions are very influential in the Latrobe wetlands. If conditions are wet, the ability to manage drawdown is diminished and uncontrolled flows will provide widespread inundation throughout the year.

Under these conditions, it is unlikely that environmental water will be required to contribute to wetting flows, as they will be achieved naturally.

The approach to achieve the objectives in 2015–16 is to allow water levels to fluctuate according to seasonal conditions, and to selectively undertake environmental watering and drawdown to augment this if required and when feasible.

Wetting flows may be delivered in the event that some inundation is needed to achieve the objectives (such as mitigating the risks associated with increasing salinity and acid sulphate soils and to provide habitat for waterbirds).



Table 2.2.5 Potential environmental watering for the lower Latrobe wetlands under a range of planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected catchment conditions	<ul style="list-style-type: none"> ▶ No natural flows from the Latrobe River ▶ Wetlands are likely to dry completely 		<ul style="list-style-type: none"> ▶ Moderate winter and spring flows and flushing flows ▶ Wetlands could be filled or partially filled with a minor drawdown in summer 	<ul style="list-style-type: none"> ▶ Major flows in winter/spring and possibly autumn/winter ▶ Wetlands will be filled naturally with very little drawdown over summer
Sale Common				
Potential environmental watering	<ul style="list-style-type: none"> ▶ Complete drawdown (July–June) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Complete drawdown (August–April) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Complete drawdown (August–March) ▶ Wetting flow (February–May) ▶ Wetting flow (August–November) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Flushing/wetting flow (August–November) ▶ Partial drawdown (December–March) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime)
Possible volume of environmental water required to achieve objectives	▶ 0–1,300 ML	▶ 0–1,300 ML	▶ 1,300 ML	▶ 0 ML
Dowd Morass				
Potential watering actions	<ul style="list-style-type: none"> ▶ Complete drawdown (July–June) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Substantial drawdown (August–April) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Substantial drawdown (August–March) ▶ Wetting flow (February–May) ▶ Wetting flow (August–November) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Flushing/wetting flow (August–November) ▶ Partial drawdown (December–March) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime)
Possible volume of environmental water required to achieve objectives	▶ 0–5,800 ML	▶ 0–5,800 ML	▶ 5,800 ML	▶ 0 ML
Heart Morass				
Potential watering actions	<ul style="list-style-type: none"> ▶ Complete drawdown (July–June) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Substantial drawdown (August–April) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Substantial drawdown (August–March) ▶ Wetting flow (February–May) ▶ Wetting flow (August–November) ▶ Wetting flow (anytime) 	<ul style="list-style-type: none"> ▶ Flushing/wetting flow (August–November) ▶ Partial drawdown (December–March) ▶ Wetting flow (February–May) ▶ Wetting flow (anytime)
Possible volume of environmental water required to achieve objectives	▶ 0–7,100 ML	▶ 0–7,100 ML	▶ 7,100 ML	▶ 0 ML

Risk management

In preparing its seasonal watering proposal, West Gippsland CMA considered and assessed risks, and identified mitigating strategies, relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.4.4).

2.3 Thomson system

Waterway manager – West Gippsland Catchment Management Authority

Storage managers – Melbourne Water (Thomson Reservoir), Southern Rural Water (Cowarr Weir)

Environmental water holder – Victorian Environmental Water Holder

Environmental values

The Thomson River contains an abundant and diverse native fish population with seven species of migratory fish including the protected Australian grayling, short-finned eel and common galaxia.

Vegetation is intact and near-natural upstream of Thomson Dam in the Baw Baw National Park. Riparian vegetation upstream of Cowarr Weir is mostly in good condition, but infestations of blackberry and gorse are increasing. Downstream of the Cowarr Weir, the vegetation is threatened and degraded due to stock access and widespread weed invasions.

Social and economic values

The Thomson River between Thomson Reservoir and Cowarr Weir is a designated canoeing river. During high-flow releases, canoeists and kayakers benefit from improved conditions for paddling. West Gippsland CMA provides flow information to groups before releases so they can take advantage of the increased flows. Popular angling species (including Australian bass) have been introduced to the Thomson River. The waterways in the Thomson system (including the Thomson River) continue to hold significance for Traditional Owners. Waterways and wetlands in the region are important ceremonial places and for thousands of years the Thomson River has provided resources such as food and materials to the Gunaikurnai people.

Environmental watering objectives in the Thomson system



Protect and boost populations of native fish, specifically Australian grayling, by providing pool habitat and flows for fish to move upstream and downstream, and by encouraging fish to spawn (release eggs)



Scour silt build-up within the river bed to provide increased and diverse habitat for plants and animals to colonise



Provide water to for plant life to germinate, establish and grow on the river bank

System overview

The Thomson River flows from the slopes of Mt Whitelaw on the Baw Baw Plateau to join the Latrobe River south of Sale. The major tributaries of the Thomson River are the Aberfeldy, Jordan and Macalister rivers, with most of its unregulated flows originating from the Aberfeldy River. There are two major structures on the Thomson River: the Thomson Reservoir and Cowarr Weir.

Two sections of the Thomson River (which are upstream of Cowarr Weir) as well as the Aberfeldy River in the Baw Baw National Park are listed as heritage rivers for their significant environmental, recreational and cultural values.

Environmental water in the Thomson system is held in Thomson Reservoir, which is also the largest storage used for urban water supply for Melbourne. The Thomson Reservoir also supplies downstream irrigation districts.





The priority river reach for environmental watering in the Thomson system is from the Aberfeldy River confluence to Cowarr Weir (reach 3) due to its heritage river status, native riparian vegetation and fish populations. The measurement point for flows is at the Coopers Creek streamflow gauge.

At Cowarr Weir, the Thomson River splits in two and water can move down the old Thomson course (reach 4a) and Rainbow Creek (reach 4b). The preference is to pass environmental water down the old Thomson course to enable fish migration, as Cowarr Weir prevents migration through the Rainbow Creek course.

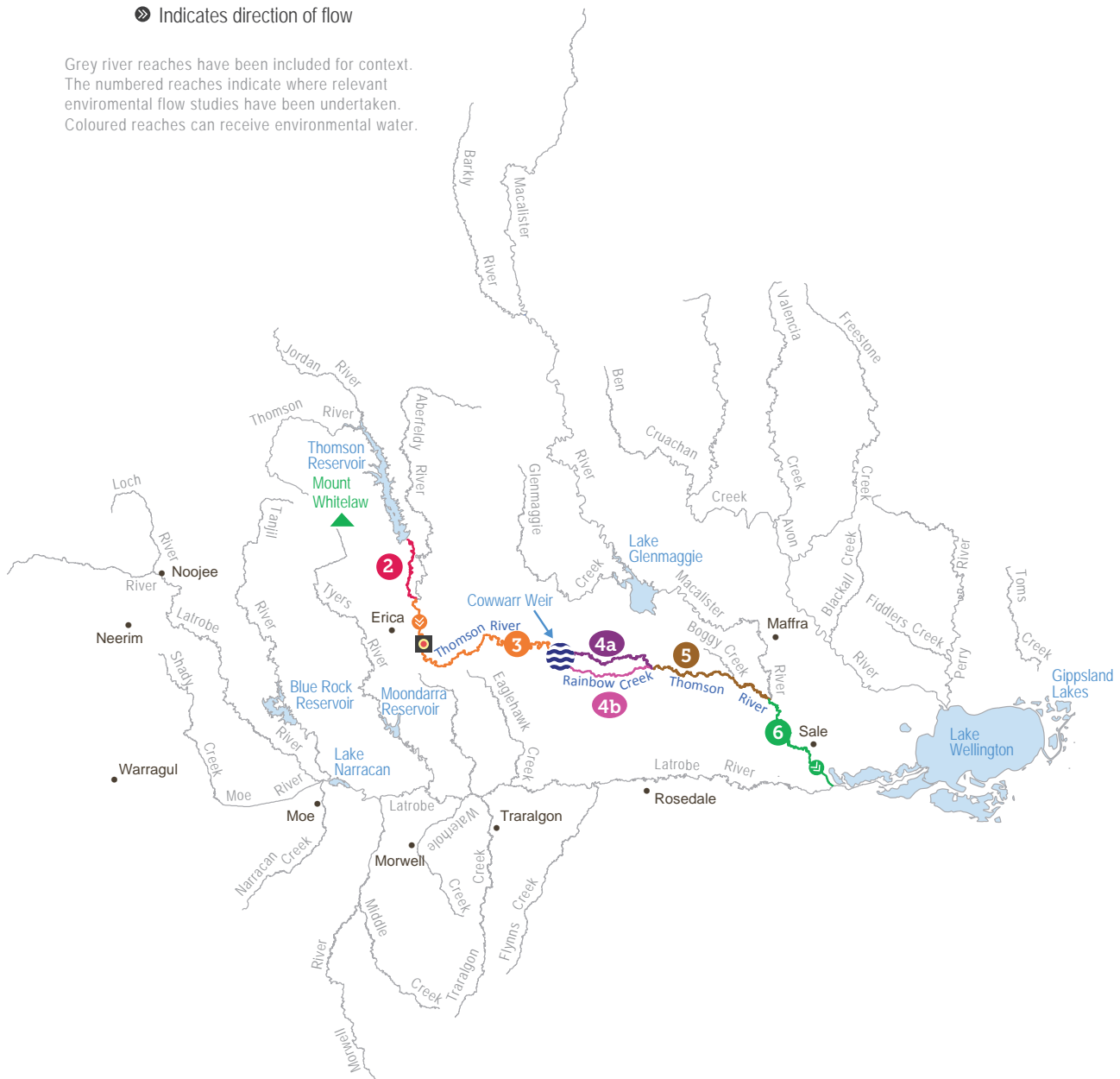


Thomson River, by West Gippsland CMA

Figure 2.3.1 The Thomson system

- Reach **2** Thomson River: Thomson Dam to Aberfeldy River
- Reach **3** Thomson River: Aberfeldy River to Cowwarr Weir
- Reach **4a** Old Thomson River: Cowwarr Weir to Rainbow Creek
- Reach **4b** Rainbow Creek: Cowwarr Weir to Thomson River
- Reach **5** Thomson River: Rainbow Creek/Old Thomson confluence to Macalister River
- Reach **6** Thomson River: Macalister River to Latrobe River
-  Water infrastructure
-  Measurement point
-  Town
-  Indicates direction of flow

Grey river reaches have been included for context.
 The numbered reaches indicate where relevant
 environmental flow studies have been undertaken.
 Coloured reaches can receive environmental water.



Recent conditions

In 2014–15 the Thomson River catchment received average-to-above-average rainfall throughout winter and spring, followed by a dry summer which resulted in high irrigation releases.

In recent years, environmental watering has focused on promoting migration and spawning of Australian grayling in autumn, by providing baseflows and freshes. However, spring flows that trigger the return of juvenile Australian grayling to upstream reaches have been absent since 2010–11. A spring fresh was provided using environmental water for the first time in 2014–15, in addition to the migration and spawning flows.

Monitoring in 2014 detected Australian grayling spawning activity, corresponding to the release of an autumn fresh in the Thomson River. Monitoring has also tracked the downstream migration of Australian grayling during the autumn fresh, indicating that the delivery of environmental water was successful in providing a trigger for the fish to migrate and spawn.

Vegetation surveys have identified natural recruitment of some native shrubs and trees among patches of remnant vegetation on the river bank. Waterway rehabilitation work to protect and restore riparian zones is undertaken to complement environmental watering outcomes.

Scope of environmental watering

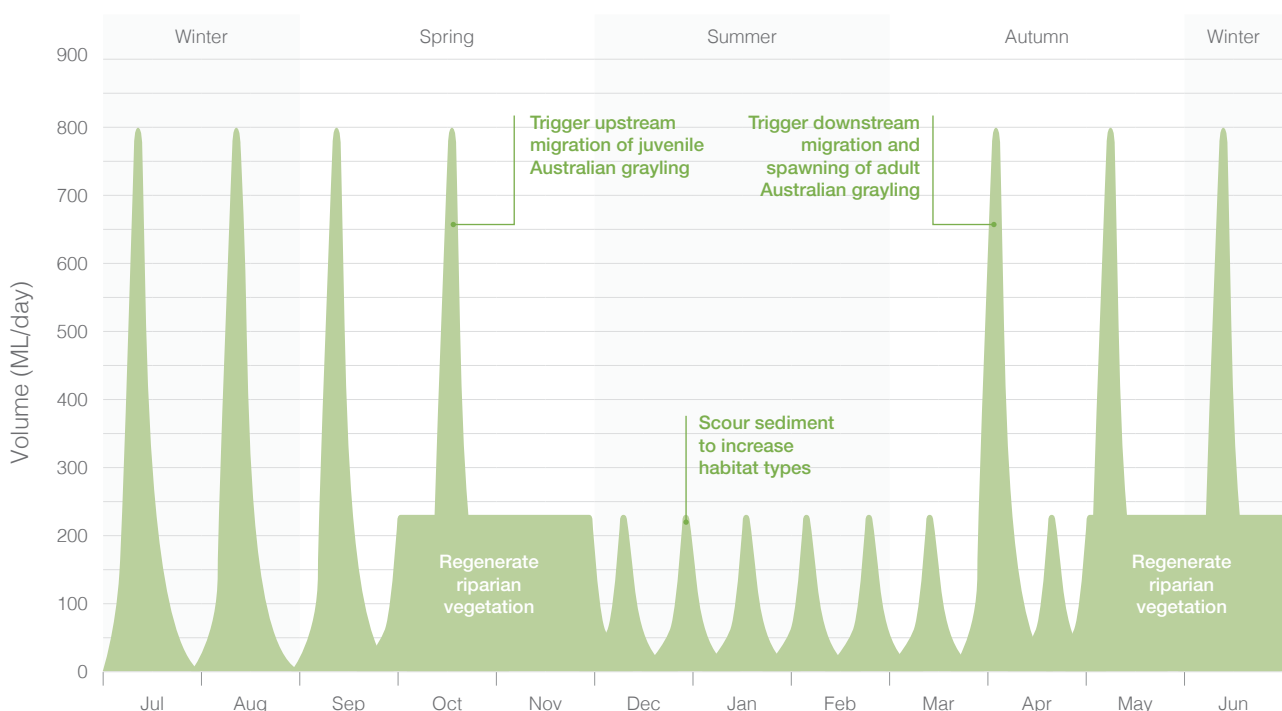
Potential environmental watering actions and their environmental objectives are explained in Table 2.3.1 and illustrated in Figure 2.3.2.

Table 2.3.1 Potential environmental watering actions and objectives for the Thomson River

Potential watering actions	Environmental objectives
Autumn freshes (1–2 freshes of 800 ML/day for 4 days each during April–May)	▶ Maintain/enhance native fish community structure by providing a migration and spawning cue for Australia grayling and other aquatic species
Autumn/winter baseflows (230 ML/day from May–June)	▶ Regeneration and inundation of riparian vegetation ▶ Sediment scour exposing fresh habitat areas
Spring freshes (1–2 freshes of 800 ML/day for 4 days each during September–October)	▶ Maintain/enhance native fish community structure by providing habitat availability, large woody debris inundation and fish migration cues for juvenile Australian grayling
Spring baseflows (230 ML/day from October–November)	▶ Regenerate and inundate riparian vegetation ▶ Sediment scour exposing fresh habitat areas
Summer/autumn freshes (up to 7 freshes of 230 ML/day for 4 days during December–April) ¹	▶ Maintain/enhance native fish community structure by providing habitat availability, large woody debris inundation ▶ Regenerate and inundate riparian vegetation ▶ Sediment scour exposing fresh habitat areas
Winter freshes (up to 4 freshes of 800 ML/day for 4 days during June–August)	▶ Maintain/enhance native fish community structure by providing opportunities for localised fish movement between habitats

¹ Whilst this flow component is a priority in the Thomson system, it is unlikely that sufficient environmental water will be available to meet this demand, and therefore these freshes will only be achieved through natural events.

Figure 2.3.2 Potential environmental watering in the Thomson River reach 3



Note: This figure is for illustrative purposes only. Scheduling and delivery of particular watering actions within the stated timeframes will vary.

Scenario planning

Table 2.3.2 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

Due to the short (2–3 years) lifespan of Australian grayling, regular spawning and the provision of flows to promote recruitment are critical to sustain a viable population. These flows have been achieved regularly in the last five years. This means, under a drought scenario, there is less urgency to provide a spawning flow release for Australian grayling, with releases focusing on the delivery of baseflows and reserving water through carryover to support the delivery of spawning flows in the following year.

Spring and summer flow components are important for providing habitat and encouraging the upstream migration of juvenile Australian grayling. The ability to deliver these flows depends on water availability as autumn freshes and baseflows are the highest priority. Under wetter scenarios, water will be used for all flow components to maximise opportunities for the upstream migration and spawning of Australian grayling, increasing the amount of environmental water required to achieve these objectives.

Critical carryover under drought and dry scenarios has been identified in the Thomson system to ensure baseflows and freshes can be delivered in 2016–17 for Australian grayling, particularly if the flows are not provided in 2015–16.

Table 2.3.2 Potential environmental watering for the Thomson River under a range of planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> ▶ Unregulated flows very limited ▶ Large volumes of consumptive water released from storage 	<ul style="list-style-type: none"> ▶ Unregulated flows from the Aberfeldy River and other tributaries contribute to baseflows and freshes ▶ Moderate volumes of consumptive water released from storage 	<ul style="list-style-type: none"> ▶ Unregulated flows from the Aberfeldy River and other tributaries contribute to baseflows, freshes and high flows ▶ Some consumptive water released from storage 	<ul style="list-style-type: none"> ▶ Unregulated flows from the Aberfeldy River and other tributaries contribute to baseflows, freshes and sustained high-flows ▶ Possible spills from Thomson Reservoir and minimal consumptive water released from storage
Expected availability of environmental water ¹	▶ 10,000–12,000 ML	▶ 10,000–14,000 ML	▶ 10,000–18,000 ML	▶ 18,000 ML
Potential environmental watering	▶ Spring and autumn baseflows	<ul style="list-style-type: none"> ▶ 1 autumn fresh ▶ Spring and autumn baseflows 	<ul style="list-style-type: none"> ▶ 1 autumn fresh ▶ Spring and autumn baseflows ▶ 2 spring freshes 	<ul style="list-style-type: none"> ▶ 1 autumn fresh ▶ Spring and autumn baseflows ▶ 2 spring freshes ▶ 1 winter fresh
Possible volume of environmental water required to achieve objectives	▶ 5,600 ML	▶ 10,500 ML	▶ 18,000 ML	▶ 23,000 ML
Critical carryover into 2016–17	▶ 6,400 ML	▶ 3,500 ML	▶ 0 ML	▶ 0 ML

¹ The first 10,000 ML of Thomson Reservoir inflows is allocated to the environment at the beginning of the water year. An additional 8,000 ML may be available in the system, subject to an entitlement amendment being completed to facilitate its use.

Risk management

In preparing its seasonal watering proposal, West Gippsland CMA considered and assessed risks, and identified mitigating strategies, relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.4.4).

Engagement

West Gippsland CMA consulted key stakeholders when preparing the seasonal watering proposal for the Thomson system. Table 2.3.3 shows these stakeholders.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which incorporate environmental, cultural, social and economic considerations.

Table 2.3.3 Key stakeholders engaged in the development of the Thomson River seasonal watering proposal

Stakeholder engagement
<ul style="list-style-type: none"> ▶ Southern Rural Water ▶ Melbourne Water ▶ Victorian Environmental Water Holder

2.4 Macalister system

Waterway manager – West Gippsland Catchment Management Authority

Storage manager – Southern Rural Water

Environmental water holder – Victorian Environmental Water Holder

Environmental values

Native fish are the main focus in the Macalister system. There are six species of migratory native fish in the Macalister River that must move between freshwater and marine environments to complete their life cycle. Australian grayling is a vulnerable fish species and a high priority for environmental water actions. Other migratory fish in the Macalister system include short- and long-finned eel, tupong and common galaxia. River blackfish and small-bodied fish (such as flat-headed gudgeon and southern pygmy perch) are also present.

The Macalister River contains some areas of dense woody riparian vegetation dominated by shrubs. In areas where stock exclusion has been undertaken, vegetation is in good condition but it is degraded in other sections. The distribution of non-woody plants that colonise the fringes of the river (such as reeds, sedges and rushes) appears to have reduced in recent years. The same can be said for instream aquatic vegetation. Environmental watering aims to assist with the recovery of these vegetation types, to improve habitat and biodiversity.

Social and economic values

The Macalister Irrigation District is the major economic driver in the area and water from the Macalister system is highly valued by the community. As a result, there is a genuine interest in the health of the Macalister River, particularly in relation to water quality, erosion and vegetation condition. The waterways in the Macalister system (including the Macalister River) continue to hold significance for Traditional Owners. Waterways and wetlands in the region are important ceremonial places and for thousands of years the Macalister River has provided resources such as food and materials to the Gunaikurnai people.

Environmental watering objectives in the Macalister system



Protect and boost populations of native fish (including Australian grayling, river blackfish and short-finned eel) prompting fish to move upstream and downstream and between the river and the ocean, and to spawn (release eggs)



Enable plants to germinate, establish and grow on the river bank



Restore communities of waterbugs, which break down organic matter, provide a source of food for other animals and support the river's food chain

System overview

The Macalister River extends from Mt Howitt in the Alpine National Park to join the Thomson River south of Maffra. The major storage on the Macalister River is Lake Glenmaggie, which supplies water to the Macalister Irrigation District. Lake Glenmaggie also stores water for the Macalister environmental entitlement, so environmental water can only be actively managed downstream of this storage.

Downstream from Lake Glenmaggie, the Macalister River meanders through an extensively cleared floodplain to the confluence with the Thomson River. The major land use in this section is dairy farming on pastures.

Before the operation of the Macalister Irrigation District, the Macalister River would regularly receive large floods in winter and spring. These are now rare. A notable impact is reversed seasonality, with high and sustained flows now occurring in summer rather than winter. The changed hydrology affects the migration patterns of fish as well as growth and dispersal opportunities for aquatic and riparian plants.

Maffra Weir is a major human-made barrier that prevents fish migrating to reach 1 during the irrigation season from August to May. Due to the obstruction caused by Maffra Weir, the priority reach for environmental water releases is downstream from Maffra Weir to the confluence with the Thomson River (reach 2). The measurement point for environmental water releases is at Maffra Weir.

Recent conditions

Rainfall and inflows in the Macalister River catchment in 2014–15 were not typical. Inflows were low during winter and spring, but recovered with higher rainfall in summer. At the beginning of autumn conditions turned dry once again, with March inflows to Lake Glenmaggie just 15 percent of the long-term average. Inflows to Lake Glenmaggie had improved sufficiently by mid-late autumn for late-season allocations of low-reliability entitlements to occur, increasing water availability.

Figure 2.4.1 The Macalister system



Winter baseflows in July 2014 were provided using water carried over from 2013–14. Delivery of autumn freshes and baseflows occurred in April to June 2015. These releases were made with the objective of restoring populations of native fish including Australian grayling.

Monitoring in 2014 showed that the abundance of adult Australian grayling was the highest since annual surveys started in 2005. Australian grayling spawning also occurred, with eggs detected during monitoring activities.

Environmental watering in the Thomson and Macalister rivers was coordinated to increase opportunities for Australian grayling to spawn, and these findings reinforce the well-known relationship between autumn high flows and the spawning success of Australian grayling.

Scope of environmental watering

Potential environmental watering actions and their environmental objectives are explained in Table 2.4.1 and illustrated in Figure 2.4.2.

Table 2.4.1 Potential environmental watering actions and objectives for the Macalister River

Potential environmental watering	Environmental objectives
Autumn freshes (1–2 freshes of 350 ML/day for 7 days each during April–May)	<ul style="list-style-type: none"> ▶ Restore and maintain self-sustaining populations of Australian grayling, long-finned eel and river blackfish ▶ Rehabilitate native riparian vegetation ▶ Rehabilitate the macroinvertebrate community ▶ Maintain the water quality in pools
Autumn/winter baseflows (140 ML/day during May–July)	
Spring baseflows (140 ML/day during October–November)	
Summer fresh (1 fresh of 350 ML/day for 7 days each during December–February)	

Scenario planning

Table 2.4.2 outlines the potential environmental watering and expected water usage under a range of planning scenarios.

Autumn freshes and autumn/winter baseflows are the highest priority watering actions under all scenarios, except drought, when freshes are not planned to be delivered. Autumn freshes for Australian grayling have been delivered consistently in recent years and therefore are not critical in a drought scenario in 2015–16. Autumn/winter flows

are most impacted by the filling of Lake Glenmaggie at that time of year, particularly under dry conditions, and are important to increase native fish populations.

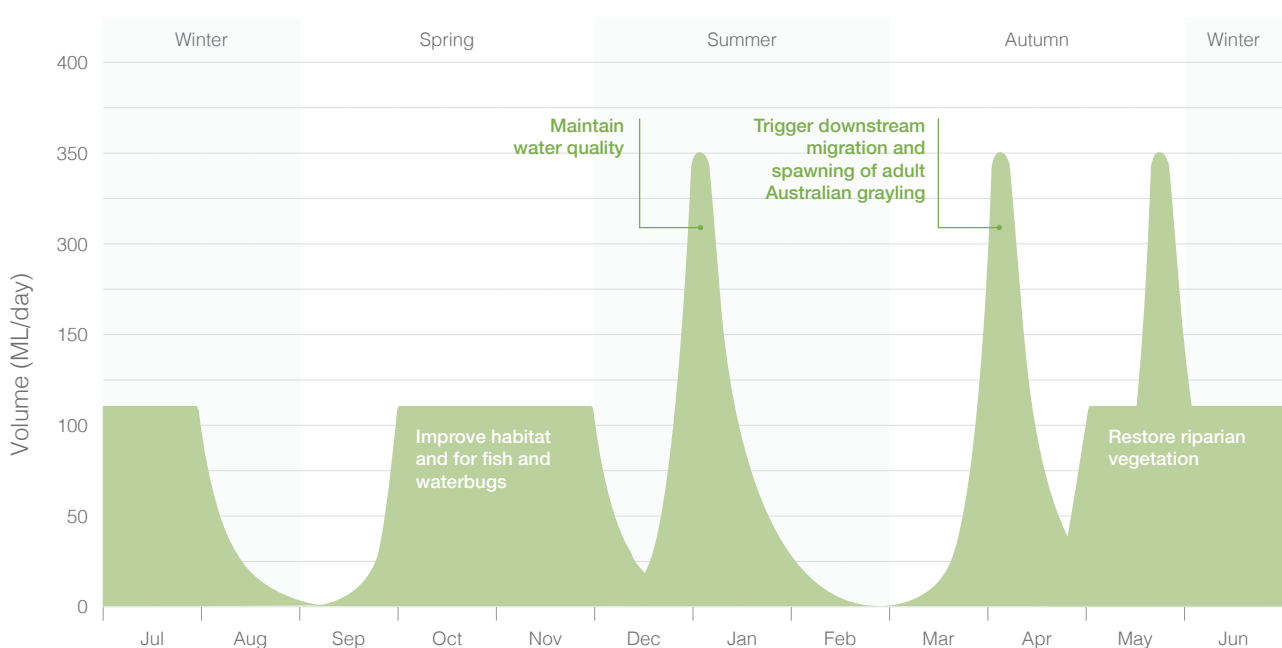
Under average and wet conditions, there is scope to provide summer freshes and spring baseflows, which have not previously been actively managed in the system. Under these scenarios, it is expected that irrigation demand will be low and therefore these flows will not be met by the delivery of consumptive use water to downstream users. If conditions are suitable, passing flows will be reduced during summer and accrued to support the delivery of autumn freshes. Environmental water releases during the irrigation season are challenging, with flexibility being critical to balance irrigation and environmental demands, and optimise the use of all water in the system to achieve objectives.

Environmental water demands increase as potential watering actions change from drought to wet scenarios. Lake Glenmaggie is a small storage in relation to its inflows and regularly spills, so some loss of water carried over from 2014–15 to spills is expected.

Risk management

In preparing its seasonal watering proposal, West Gippsland CMA considered and assessed risks, and identified mitigating strategies, relating to implementing environmental watering. Risks and mitigating actions are continually reassessed by program partners throughout the water year (see section 1.4.4).

Figure 2.4.2 Potential environmental watering in the Macalister River reach 2



Note: This figure is for illustrative purposes only. Scheduling and delivery of particular watering actions within the stated timeframes will vary.

Table 2.4.2 Potential environmental watering for the Macalister River system under a range of planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected river conditions	<ul style="list-style-type: none"> ▶ No unregulated flows ▶ Passing flows at Maffra Weir reduced 	<ul style="list-style-type: none"> ▶ Possible spills from Lake Glenmaggie in spring, minor flood levels may occur ▶ Passing flows at Maffra Weir may be reduced 	<ul style="list-style-type: none"> ▶ Regular spills from Lake Glenmaggie in spring, minor flood levels may occur ▶ Passing flows at Maffra Weir may be reduced, with savings accrued during summer for use during autumn 	<ul style="list-style-type: none"> ▶ Large and frequent spills from Lake Glenmaggie, moderate to major flood levels may occur ▶ Passing flows at Maffra Weir may be reduced, with savings accrued during summer for use during autumn
Expected availability of environmental water	▶ 12,200 ML	▶ 15,900 ML	▶ 20,500 ML	▶ 25,300 ML
Potential environmental watering	▶ Autumn/winter baseflows	<ul style="list-style-type: none"> ▶ 2 autumn freshes ▶ Autumn/winter baseflows 	<ul style="list-style-type: none"> ▶ 1 autumn fresh ▶ Autumn/winter baseflows ▶ 1 summer fresh ▶ Spring baseflows 	<ul style="list-style-type: none"> ▶ 2 autumn freshes ▶ Autumn/winter baseflows ▶ 1 summer fresh ▶ Spring baseflows
Possible volume of environmental water required to meet objectives	▶ 7,500 ML	▶ 12,000	▶ 18,200 ML	▶ 20,800 ML

Engagement

West Gippsland CMA consulted key stakeholders when preparing the seasonal watering proposal for the Macalister system. Table 2.4.3 shows these stakeholders.

Seasonal watering proposals are informed by longer-term regional waterway strategies, environmental water management plans and environmental flow studies, which incorporate environmental, cultural, social and economic considerations.

Table 2.4.3 Key stakeholders engaged in the development of the Macalister River seasonal watering proposal

Stakeholder engagement
<ul style="list-style-type: none"> ▶ Southern Rural Water ▶ Victorian Environmental Water Holder



Macalister River, by West Gippsland CMA

2.5 Snowy system

Waterway managers – New South Wales Office of Water and East Gippsland Catchment Management Authority

Storage manager – Snowy Hydro Limited

Environmental values

The lower reaches of the Snowy River in Victoria (including the floodplain wetlands and river estuary) provide a diverse range of habitats for endangered plants and animals as well as feeding and breeding areas for migratory birds.

Over time, managed releases will improve ecosystem function, by promoting the scouring of fine sediment to improve instream habitat, flushing leaf litter and other material into the river to increase productivity and stimulate the food chain, mixing of pools in the upper reaches, and improving the salinity dynamics in the Snowy Estuary. By repairing these functions, it is hoped that the river will be able to support healthier aquatic communities, such as bacteria, plants, water bugs, fish and platypuses.

Social and economic values

The Snowy River is a renowned rafting and canoeing river and is ideally situated for bushwalking in the Snowy River National Park. Recreational fishing for native species (such as Australian bass) is also popular. The Snowy River is an iconic and culturally significant Australian river made famous by Banjo Patterson's poem *The Man from Snowy River*. The waterways of the Snowy system continue to hold significance for Traditional Owners and their Nations in the region.

System overview

The Snowy River originates on the slopes of Mount Kosciuszko and drains the eastern slopes of the Snowy Mountains in New South Wales before flowing through the Snowy River National Park in Victoria and emptying into Bass Strait.

The Snowy Mountains Hydro-electric Scheme was constructed in the Snowy Mountains in New South Wales between 1949 and 1974. The scheme resulted in the construction of four major dams (Guthega, Island Bend, Eucumbene and Jindabyne) and multiple diversion weirs in the Snowy River catchment. The scheme diverts water to the Murrumbidgee and River Murray valleys and resulted in the diversion of 99 percent of the Snowy River's mean annual natural flow (MANF) at Jindabyne until 2002. The relative hydrological effects of the construction of the scheme decrease along the course of the Snowy River with reductions in MANF to about 65 percent in the lower Snowy River. This difference is mainly due to the contribution to streamflow by the tributaries downstream of Dalgety.

While being essential for electricity generation and irrigation supply, flow diversion and other activities have affected all aspects of the river's hydrology and resulted in a deterioration in the health of the Snowy River and its tributaries in the Snowy Mountains.

The New South Wales, Victorian and Commonwealth governments have completed water recovery projects to attribute water to three environmental water release programs associated with the scheme:

- ▶ Snowy River Increased Flows (up to 212,000 ML per year)
- ▶ Snowy Montane River Increased Flows (150 gigawatt hours of foregone electricity generation equivalent of up to 117,800 ML per year)
- ▶ River Murray Increased Flows (70,000 ML per year).

The Victorian entitlements are held by the VEWH in trust for the Snowy River Increased Flows program partners.

A substitution arrangement is in place for VEWH Water Holdings in the Murray, Loddon and Goulburn systems to increase environmental flows in the Snowy system. Water savings in the Murray, Loddon and Goulburn systems provide additional water that can be supplied for consumptive use in northern Victoria. Similar arrangements apply for the New South Wales Murray and Murrumbidgee systems. This reduces the volume of water that must be supplied from the Snowy system to the Murray and Murrumbidgee rivers, thereby freeing up water for environmental flows in the Snowy.

Recent conditions

Daily flow targets are set on an annual basis to occur from May to April each water year in New South Wales. These daily flow targets are designed to maximise the environmental outcomes to the Snowy River using the available water for the year. The New South Wales Office of Water develops the daily flow targets and the Victorian and Australian governments and stakeholder groups are consulted about environmental water released to the Snowy River.

During the 2014–15 water year, 155,308 ML of water was released to the Snowy River in line with the daily flow targets. The releases aim to facilitate the rehabilitation of the Snowy River below Jindabyne Dam into a smaller but healthy river, recognising that it is not possible to restore or maintain the Snowy River to its former size with one-fifth of its former flow volume.

Scope of environmental watering

Environmental water releases occur every day during May 2015 to April 2016 and aim to mimic the typical flow pattern of a mixed snowmelt/rainfall river system

Figure 2.5.1 The Snowy system



characteristic of the Snowy Mountains. The flow regime provides hourly, daily, seasonal and annual flow variability within the bounds of a natural but smaller Snowy Montane river.

Five high flows are scheduled in winter/spring 2015. The larger flushing flow is scheduled for late October 2015 and includes an eight-hour peak of over 7,500 ML per day. This high-flow peak aims to improve the physical attributes of

the river by scouring sediment and limiting the growth of riparian plants that can block the river channel.

High flows are sustained from July to December to assist with water mixing in the estuary for the benefit of plants and fish (such as Australian bass and estuary perch). Low flows will then continue to be released until the completion of the water year in April 2016.

The total annual volume planned for release in 2015–16 is 147,741 ML.