

A photograph of four children in a natural setting, likely a stream or riverbank. They are crouching and examining small objects, possibly rocks or aquatic life, in the water. The scene is outdoors with trees and foliage in the background. The lighting is soft, suggesting late afternoon or early morning. The children are dressed in casual outdoor clothing. The overall mood is educational and exploratory.

Section 1

Introduction

1.1	The Victorian environmental watering program	5
1.1.1	Who is involved in the Victorian environmental watering program?	5
1.1.2	What is the program aiming to achieve?.....	6
1.1.3	What is the role of the VEWH?	6
1.1.4	How does the Victorian environmental watering program fit within broader integrated catchment and waterway management?.....	6
1.1.5	Where can I find more information about the Victorian environmental watering program?	7
1.2	The seasonal watering plan	8
1.2.1	What does ‘seasonal’ mean?	8
1.2.2	How does the seasonal watering plan fit into the planning process?.....	9
1.2.3	Who contributes to the seasonal watering plan?	10
1.2.4	Can the seasonal watering plan be changed?	10
1.2.5	What kinds of changes don’t require a formal variation to the seasonal watering plan?	10
1.3	Implementing the seasonal watering plan	11
1.3.1	How do program partners decide which watering actions are delivered?	11
1.3.2	When does the VEWH commit and authorise its water for use?.....	11
1.3.3	How does the VEWH prioritise different watering actions when there is not enough environmental water available?	12
1.3.4	Do seasonal conditions affect how environmental water is used?.....	14
1.3.5	How are shared recreational, cultural and economic benefits considered in environmental watering?.....	15
1.3.6	How are risks managed?	16
1.4	Managing available environmental water	17
1.4.1	How much water is available to use as part of the Victorian environmental watering program?.....	17
1.4.2	What options are available to effectively and efficiently manage environmental water?	20

1.1 The Victorian environmental watering program

The Victorian environmental watering program is the ongoing collaborative management of water available under environmental entitlements and used to improve the health of Victoria's rivers and wetlands and the native plants and animals that depend on them.

This seasonal watering plan previews the potential environmental watering that may be delivered across Victoria under the program in the coming year.

In this section ...

- ▶ **Who is involved in the Victorian environmental watering program?**
- ▶ **What is the program aiming to achieve?**
- ▶ **What is the role of the VEWH?**
- ▶ **How does the Victorian environmental watering program fit within broader integrated catchment and waterway management?**
- ▶ **Where can I find more information about the Victorian environmental watering program?**

Public land managers (such as Parks Victoria, Department of Environment, Land, Water and Planning [DELWP] and Traditional Owner land management boards) are closely involved in environmental water planning and delivery for public land (such as state forests and national parks). Their responsibilities include controlling infrastructure (such as pumps, outlets, gates and channels) and public signage. Some environmental watering also occurs on private land, in partnership with landholders or corporations.

To effectively manage environmental water, it is important to understand the environmental values of Victoria's rivers and wetlands. This understanding draws on the knowledge of local communities and scientists.

Local communities help identify the important environmental values in each region and help monitor the success of environmental watering. Local communities are often actively involved with local rivers and wetlands and bring important environmental, cultural, social and economic perspectives to the program.

Traditional Owners and their Nations in Victoria have a deep and enduring connection to Victoria's rivers, wetlands and floodplains. Many program partners have strong relationships with Traditional Owner Nations in their region and are working to improve relationships to better support Aboriginal Victorians' aspirations and incorporate Traditional Owners' objectives into environmental water management.

Scientists provide indispensable advice about how environmental water will support native plants and animals in the short and long terms and work with waterway managers to monitor, evaluate and report on the outcomes of environmental watering.

Citizen scientists are increasingly monitoring the outcomes of environmental watering. In some regions, Birdlife Australia volunteers help monitor environmental watering outcomes at wetlands and Waterwatch volunteers collect water-quality information to inform management decisions for some rivers. In Gunbower Forest, Barapa Barapa Traditional Owners are also monitoring environmental watering outcomes.

1.1.1 Who is involved in the Victorian environmental watering program?

The Victorian environmental watering program involves a range of groups and organisations. Relationships between local communities, waterway managers, storage managers, environmental water holders and land managers are the foundation of the program.

Many public authorities collaborate to deliver the program. These authorities are referred to as program partners.

Waterway managers (catchment management authorities [CMAs] and Melbourne Water) are the regional planning and delivery arm of the program. In consultation with local communities, waterway managers develop proposals for environmental watering in rivers and wetlands in their region. Waterway managers also order environmental water from storage managers and monitor the outcomes.

Storage managers (largely water corporations) deliver water for all water users, including waterway managers and environmental water holders.

Environmental water holders (the Victorian Environmental Water Holder [VEWH], Commonwealth Environmental Water Holder [CEWH] and the Murray–Darling Basin Authority [MDBA]) commit environmental water to different rivers and wetlands. They work together to ensure the coordinated delivery of water available under different environmental entitlements and often have to prioritise across large regions (such as northern Victoria).

1.1.2 What is the program aiming to achieve?

The Victorian environmental watering program seeks to collaboratively manage environmental water to improve the health of river and wetland systems including their biodiversity, ecological functioning, water quality and other uses that depend on environmental condition. This benefits plants, animals and broader environmental health, improves recreational opportunities, sustains healthy Country for Aboriginal communities and improves the quality of water available for irrigators and the urban water supply.

1.1.3 What is the role of the VEWH?

The VEWH is an independent statutory authority set up under the *Victorian Water Act 1989* to manage Victoria's environmental water entitlements to achieve environmental benefits for Victoria's rivers, wetlands and floodplains.

The role of the VEWH is to:

- ▶ make decisions about the most effective use of the environmental water entitlements, including for use, carryover and trade (see section 1.4.2)
- ▶ commit water and authorise waterway managers to implement watering decisions (see section 1.3.2)
- ▶ work with storage managers and other water holders to coordinate and optimise environmental outcomes from the delivery of all water (see section 1.4)
- ▶ commission projects to demonstrate the ecological outcomes of environmental watering at key sites and to help improve environmental water management
- ▶ publicly communicate environmental watering decisions and outcomes.

The VEWH consists of three part-time commissioners, supported by a small team.

The commissioners are Denis Flett (Chairperson), Geoff Hocking (Deputy Chairperson) and Chris Chesterfield (Commissioner). Commissioners were appointed by the Governor in Council on the recommendation of the Minister for Water.

In late 2017, the VEWH Commission will be strengthened with the appointment of a fourth Commissioner: an Aboriginal Victorian.

1.1.4 How does the Victorian environmental watering program fit within broader integrated catchment and waterway management?

The VEWH operates within Victorian Government policy. Key policy documents influencing the VEWH from a Victorian context include the *Victorian Waterway Management Strategy* (VWMS) (2013), regional sustainable water strategies and *Water for Victoria - Water Plan (2016)*. *Water for Victoria* is a plan for a future with less water as

Victoria responds to the impact of climate change and a growing population. The actions in the plan support a healthy environment, a prosperous economy with growing agricultural production and thriving communities. Implementing the actions in the plan will improve the operation of the water and catchment management industry, including the VEWH.

Water for Victoria recognises that protecting and improving waterway health is a long-term commitment needing coordinated action. Integrated catchment management is a holistic way of managing land, water and biodiversity from the top to the bottom of a catchment. Although better-integrated catchment management will greatly benefit Victoria's waterways, the full benefits of strategic, long-term investments in waterway health may not be realised for 30 years or more. *Water for Victoria* identifies 36 priority waterways for large-scale projects over this timeframe and many of these waterways are planned for environmental watering in this Seasonal Watering Plan.

Complementary water management activities are often needed to optimise environmental watering outcomes. These include invasive species control, riparian (streamside) land management, sustainable agriculture, sustainable land-use planning and development, integrated urban water management and other waterway management activities (such as providing fish passage and improved in-stream habitat, for example snags). A lack of fish passage due to dams and weirs continues to be a problem in some Victorian rivers where environmental flows aim to increase the breeding success and recruitment of native fish. Figure 1.1.1 shows examples of complementary waterway management activities in Victorian waterways that receive environmental water.

In most systems, water for the environment is delivered using existing infrastructure (such as dam outlet gates and water supply channels) built for and still used for the supply of water for agriculture, industry and communities. Permanent and temporary pumps are also used in some cases to deliver environmental water to wetlands. Capacity constraints with these types of infrastructure and the need to avoid flooding on private land restrict the size and timing of environmental water deliveries. In some systems, these constraints mean only a fraction of the required environmental water can be delivered to waterways, which significantly reduces the environmental outcomes that can be achieved.

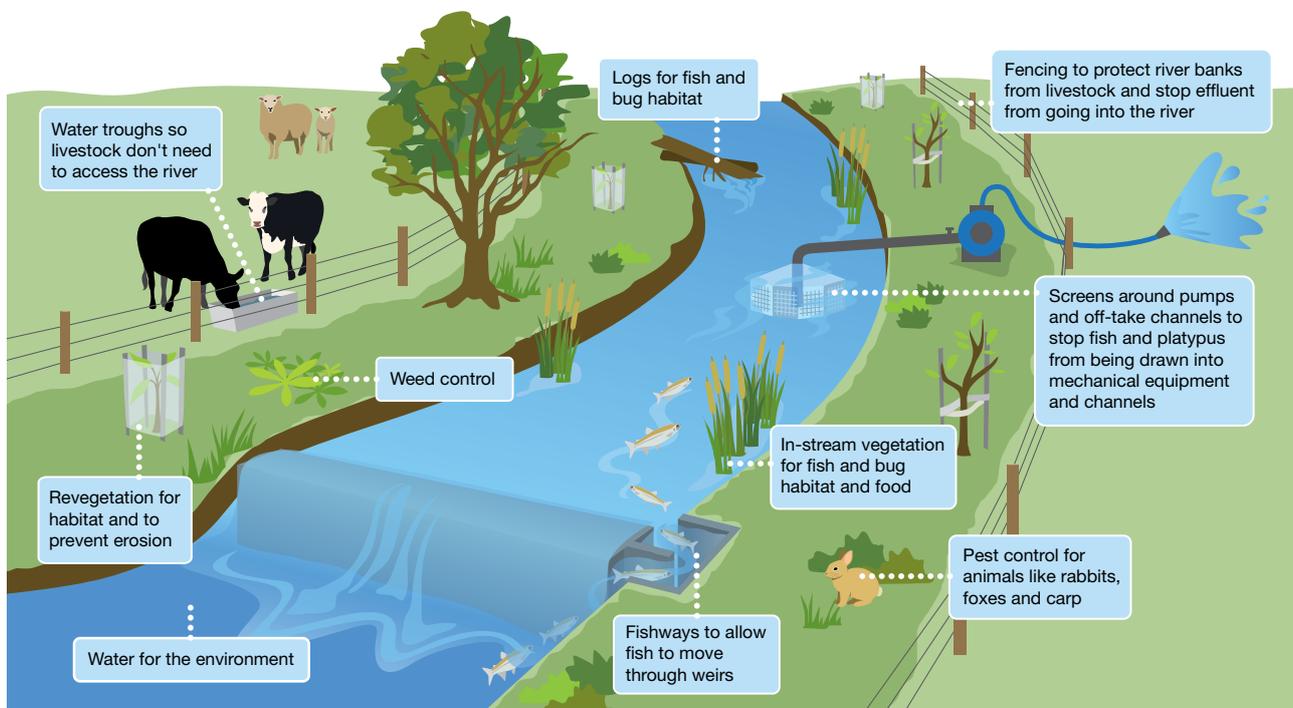
Victoria's environmental water management program is integral to the success of the following three strategies and plans.

Our Catchments, Our Communities (2016) is Victoria's first statewide strategy for integrated catchment management. Its aims are more effective community engagement, better connections between different levels of planning and stronger regional catchment strategies. The strategy also aims to clarify roles, strengthen accountabilities and coordination and improve monitoring, evaluation and reporting. CMAs will lead 10 new integrated catchment management projects across the state from 2016 to 2019 in collaboration with catchment management partners. Some projects involve environmental watering actions.

Protecting Victoria's Environment – Biodiversity 2037 (2017) aims to ensure Victoria has a modern and effective approach to protecting and managing Victoria's biodiversity. Providing water for the environment is essential to supporting Victoria's biodiversity. The plan will be implemented together with the outcomes of reviews of the *Flora and Fauna Guarantee Act 1988* and Victoria's native vegetation clearing regulations.

The *Basin Plan 2012* for the Murray–Darling Basin is another key reform influencing the VEWH's operations, particularly its planning and reporting framework in northern and western Victorian systems which form part of the basin. The VEWH continues to work closely with the Victorian Government and other agencies to implement the *Basin Plan 2012*.

Figure 1.1.1 Examples of complementary management actions



1.1.5 Where can I find more information about the Victorian environmental watering program?

There is more information about the program on the VEWH website at vewh.vic.gov.au, or contact the VEWH on (03) 9637 8951 or by email to general.enquiries@vewh.vic.gov.au.

You can get more detailed information about environmental watering in your region by contacting your local waterway manager using the contact details in section 6.3.

Environmental watering fact sheets

The VEWH's fact sheets answer questions about environmental watering. They are:

- ▶ What is environmental water?
- ▶ Why is environmental watering important?
- ▶ What does environmental watering aim to achieve?
- ▶ What does environmental watering involve?
- ▶ How do we know if environmental watering is successful?
- ▶ What is environmental water trading?

The fact sheets are on the VEWH website, or you can get hard copies by emailing general.enquiries@vewh.vic.gov.au.

1.2 The seasonal watering plan

The seasonal watering plan is a statewide plan that guides environmental watering decisions in Victoria. It provides program partners, stakeholders and communities with a sense of what to expect during the water year.

In this section ...

- ▶ **What does ‘seasonal’ mean?**
- ▶ **How does the seasonal watering plan fit into the planning process?**
- ▶ **Who contributes to the seasonal watering plan?**
- ▶ **Can the seasonal watering plan be changed?**
- ▶ **What kinds of changes don’t require a formal variation of the plan?**

The plan previews the potential environmental watering that could be implemented using water available under all environmental water entitlements held in Victoria. This includes water available under the VEWH’s environmental water entitlements and water held by other environmental water holders (see section 1.4.1).

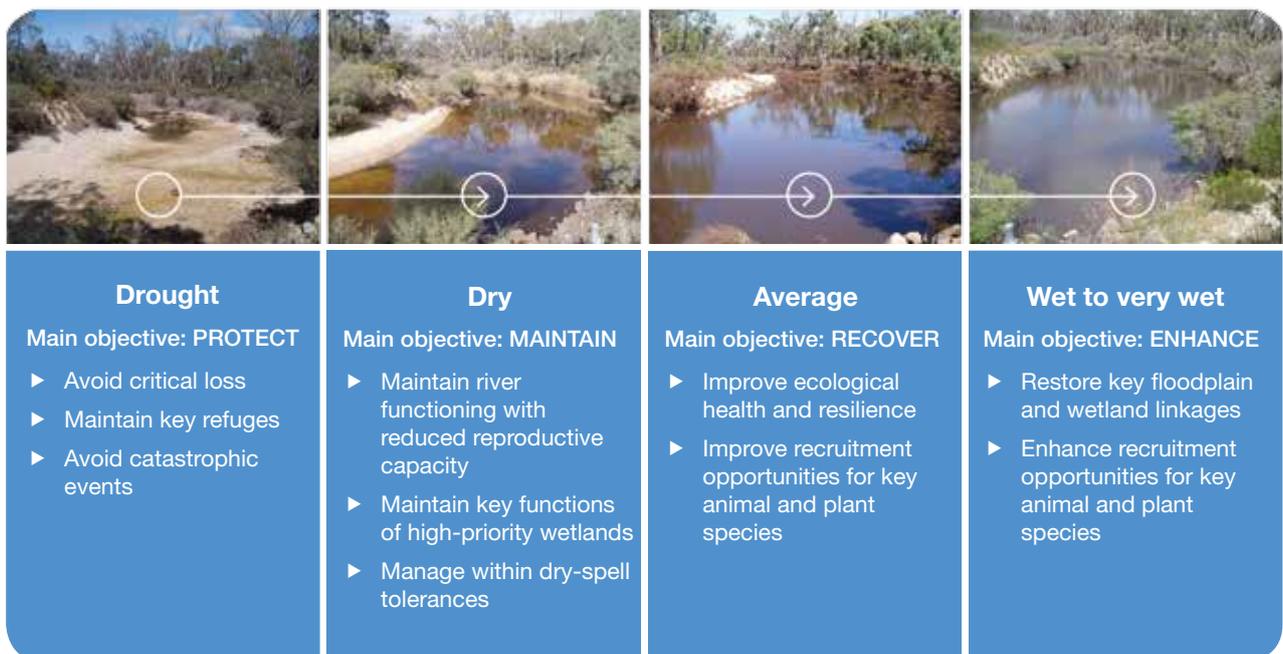
The plan for the upcoming water year is released by 30 June each year. The 2017–18 plan and any variations are valid for this water year (1 July 2017 to 30 June 2018) or until the subsequent seasonal watering plan is released.

1.2.1 What does ‘seasonal’ mean?

‘Seasonal’ refers to the variability of climatic conditions in a given year. Environmental watering objectives and water availability may differ depending on seasonal conditions, so it is important that environmental water planning considers the range of potential seasonal condition or water availability scenarios that may unfold, ranging from drought to very wet (see Figure 1.2.1). This scenario planning provides a guide for the VEWH and waterway managers throughout the year when it comes to deciding what environmental watering to go ahead with.

For each river and wetland system, the potential environmental watering under each water availability scenario is explained under ‘Scenario planning’ in the relevant chapter.

Figure 1.2.1 Examples of environmental watering objectives under different planning scenarios



1.2.2 How does the seasonal watering plan fit into the planning process?

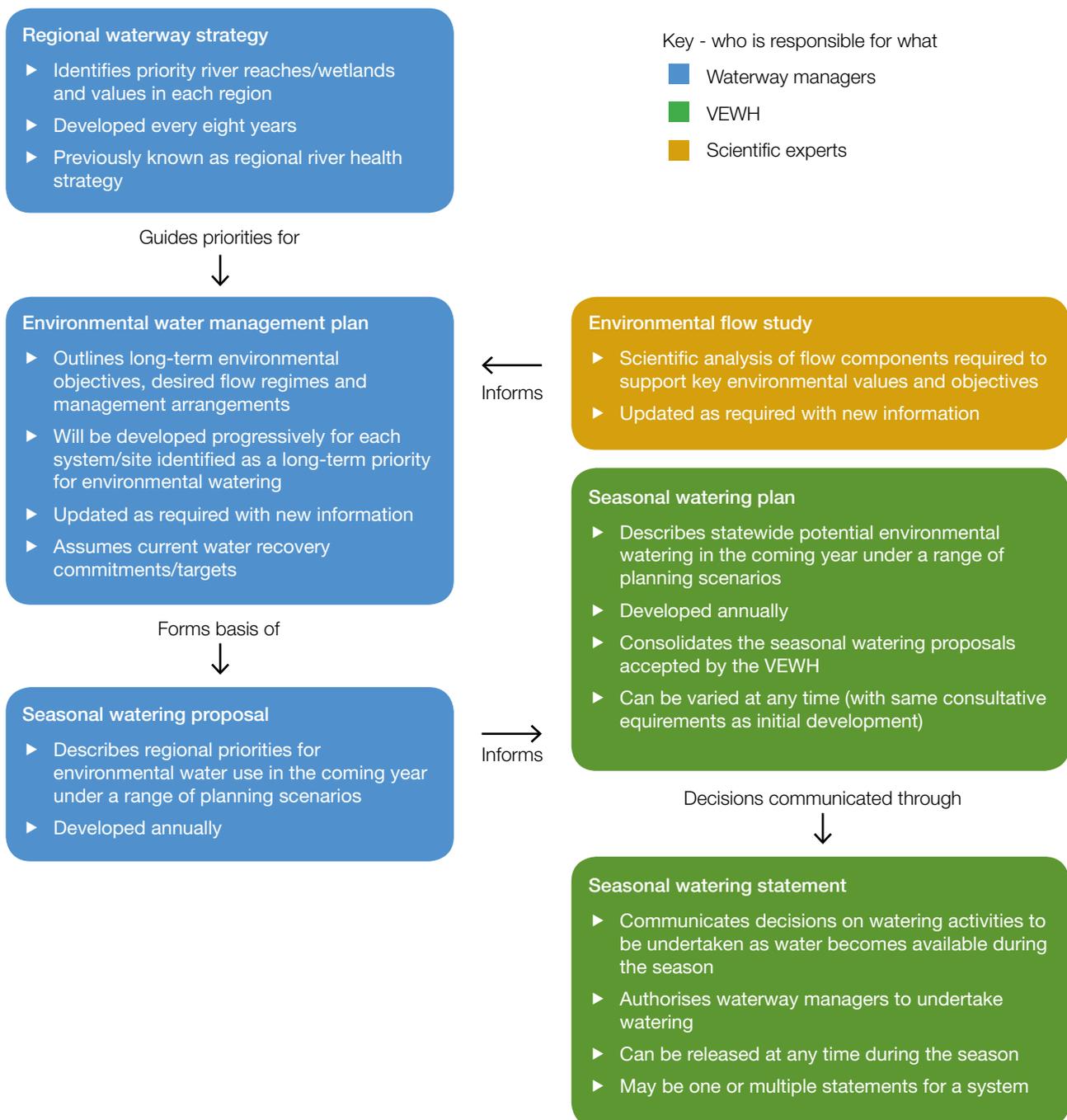
Each year, waterway managers scope the potential environmental watering actions for their regions for the coming year in seasonal watering proposals. The proposals draw on environmental flow studies and on longer-term plans (such as environmental water management plans, regional waterway strategies and regional catchment

strategies). The proposals incorporate information and advice from local communities.

This seasonal watering plan is a collated summary of the seasonal watering proposals.

The different stages of environmental water planning, including the different strategies and plans, are shown in Figure 1.2.2. There is more information about each of these strategies and plans at vewh.vic.gov.au.

Figure 1.2.2 Victorian environmental watering program planning framework



1.2.3 Who contributes to the seasonal watering plan?

Stakeholder engagement on potential environmental watering actions occurs during the development of regional seasonal watering proposals. The level and method of engagement varies across the state, reflecting the differing systems, watering actions and stakeholders. In some regions, formal environmental water advisory groups provide the opportunity for waterway managers and interested community members to discuss potential environmental watering in their system or locality for the coming year. In other systems, engagement occurs one-on-one between waterway managers and interested stakeholders. The most interested stakeholders tend to be Traditional Owners, irrigators, farmers, members of recreational groups and members of local environmental groups.

Land managers and storage managers also consider and endorse the seasonal watering proposals to ensure planned watering aligns with land and storage management objectives and can feasibly be delivered through planned system operations.

For each system, there is a summary of the engagement activities waterway managers undertook when developing seasonal watering proposals (see sections 2 to 5).

1.2.4 Can the seasonal watering plan be changed?

Under the Victorian *Water Act 1989*, the VEWH can only authorise use of environmental water where it is consistent with a seasonal watering plan. This is to ensure transparency about what environmental watering is planned and how it is managed.

However, to also ensure flexibility to adapt to changing conditions, under the Act the VEWH can vary any section of a seasonal watering plan. This could be to incorporate new knowledge or to address any circumstances not identified before the start of the water year.

The VEWH makes all variations publicly available at vewh.vic.gov.au as separate attachments to the original seasonal watering plan. You can email general.enquiries@vewh.vic.gov.au for a hard copy.

1.2.5 What kinds of changes don't require a formal variation to the seasonal watering plan?

Changes that do not require a variation to the seasonal watering plan include:

- ▶ minor operational adjustments to specific environmental watering actions
- ▶ environmental water being used for environmental emergency management situations
- ▶ small volumes of environmental water being used for technical investigations
- ▶ facilitating the delivery of water held by other water holders for downstream objectives

- ▶ environmental watering actions that continue beyond the year of the plan (even if there are unforeseen delays releasing the following year's plan).

As the VEWH cannot anticipate the specifics of these changes, it cannot include further details about them in this plan.

Minor operational adjustments

Minor operational adjustments to environmental watering actions may occur from time to time and do not require a formal variation to the seasonal watering plan. For example, the targeted river reaches, flow rates, timing and durations detailed in sections 2 to 5 may need to be adjusted slightly due to changes in predicted rainfall or other water orders, or delivery infrastructure constraints. In all cases, environmental watering actions will still aim to optimise the environmental outcomes achieved.

Environmental emergency management situations

Environmental water may be needed for an environmental emergency management situation. This may include reducing the impact of natural blackwater or bushfire events, preventing fish deaths or mitigating the effects of blue-green algae blooms. It could also include smoothing the transition to or from a high-natural-flow event (for example, supplementing natural flows with environmental water to provide a more gradual rise and fall to minimise the threat of river banks slumping).

Small technical investigations

There may be instances where a small volume of environmental water may be used for research and development purposes or small-scale infrastructure testing. Such instances are considered on a case-by-case basis and must aim to enhance knowledge and improve environmental water management. It must not compromise the potential to achieve the environmental objectives in the seasonal watering plan.

Facilitating the delivery of water held by other water holders for downstream objectives

Some water held by other water holders is stored in Victorian storages and is sometimes called on to meet downstream demands beyond the scope of this plan (such as for the Coorong, Lower Lakes and Murray Mouth area in SA). Delivery of this water is sometimes needed at a time and flow rate that was not scoped in the seasonal watering plan. The VEWH facilitates and authorises such deliveries, provided the risk of adverse impacts on Victoria's rivers, wetlands and floodplains and other risks are appropriately managed.

Environmental watering actions that continue beyond the year of the plan

Nature doesn't keep to strict timelines, so some potential environmental watering scoped in a seasonal watering plan may begin before, or continue beyond, the year of the plan. This means environmental watering actions that start either before July 2017 or continue after June 2018 are still consistent with the plan, especially if there turn out to be unforeseen delays releasing the *Seasonal Watering Plan 2018–19*.

1.3 Implementing the seasonal watering plan

The seasonal watering plan scopes potential environmental watering for the coming year, but many factors influence decisions about what environmental water is actually committed and delivered.

In this section ...

- ▶ **How do program partners decide which watering actions are delivered?**
- ▶ **When does the VEWH commit and authorise its water for use?**
- ▶ **How does the VEWH prioritise different watering actions when there is not enough environmental water available?**
- ▶ **Do seasonal conditions affect how environmental water is used?**
- ▶ **How are shared recreational, cultural and economic benefits considered in environmental watering?**
- ▶ **How are risks managed?**

Some factors that influence decisions about committing and delivering environmental water are:

- ▶ seasonal conditions, weather forecasts and catchment conditions
- ▶ river and system operations (such as unregulated flows, catchment inflows, storage levels, other water users' needs and potential delivery constraints)
- ▶ ecological or biological factors and triggers (such as plant and animal responses to natural flows or temperature)
- ▶ water availability
- ▶ risks associated with an environmental watering action
- ▶ the opportunity to deliver shared benefits.

It is important there is flexibility to respond to these different factors, as they can significantly influence the environmental outcomes that can be achieved.

1.3.1 How do program partners decide which watering actions are delivered?

As the season unfolds, many of the uncertainties associated with seasonal conditions, water availability and operational context become clearer and this clarity informs decisions about what environmental watering should proceed. Many on-ground factors do not become clear until very close to the anticipated time of delivering the water.

To guide environmental watering decisions, a flexible and adaptive approach is adopted that involves the environmental water management stakeholders. This process of review and adjustment ensures that environmental water is used in an efficient and seasonally appropriate manner to optimise ecological outcomes across the state.

Waterway managers, environmental water holders, storage managers and land managers all help decide which watering actions are or can be delivered during the year. Decisions are often made collaboratively, as each program partner has a role in approving the delivery of environmental water (as explained in section 1.3.3).

If decisions are required as a result of unforeseen or consequential changes to planned watering during the season, further scientific or community input may be sought to inform decision-makers.

The VEWH regularly publishes updated information about current and anticipated environmental watering actions on its website at vewh.vic.gov.au.

1.3.2 When does the VEWH commit and authorise its water for use?

The VEWH aims to commit as much water as is sensibly possible, as early as possible, to provide waterway managers with as much certainty as possible to proceed with the planned environmental watering actions.

The VEWH (like other environmental water holders) can commit its water at any point before or during the water year. The VEWH commits water via seasonal watering statements, which authorise waterway managers to use environmental water. The VEWH publishes seasonal watering statements on its website at vewh.vic.gov.au.

The VEWH can make a seasonal watering statement at any time of the year. Depending on the nature of the system and the entitlement being used, it may make one or multiple statements for a particular system. Before issuing a seasonal watering statement, the VEWH must be sure the required delivery arrangements (including any risk management measures) are in place and any costs it must meet are acceptable.

Where many environmental watering actions planned across different systems require access to the same environmental water entitlement, decisions to commit water to particular actions may require more thorough consideration. This may require prioritisation of one river or wetland over another. Section 1.3.3 has further information about how prioritisation decisions are made.

In some instances, the VEWH may commit water very close to the anticipated delivery time. This may be necessary because the water demand arises at short notice due to environmental, operational or weather conditions triggering the need for environmental water. For example, if colonial waterbirds start nesting in Barmah Forest, this may trigger a need for environmental water to maintain shallow flooding long enough for the birds to breed and fledge.

There may also be instances where no environmental water is committed to a particular site. For example, there could be an ecological trigger or seasonal conditions that show watering should not proceed, or there may not be enough water for the planned watering action.

The CEWH and MDBA (through the Living Murray program) commit water for use in Victoria with similar logic to that outlined above. The VEWH then formally authorises the use of that water through seasonal watering statements.

Can environmental water holders change their minds after a seasonal watering statement has been issued?

The VEWH may withdraw a seasonal watering statement at any point during the year, in consultation with the waterway manager and storage manager for that river or wetland system. It might do so, for example, to address emerging risks or changes in operating conditions or water availability.

Similarly, a waterway manager or storage manager may decide, in consultation with the VEWH, not to proceed with an environmental watering action after a seasonal watering statement has been issued. This could occur as a result of environmental triggers indicating the water was no longer required, resourcing constraints or new information that the potential environmental or public risk of watering was too high.



Platypus at the Tarago River, by Keith Chalmers

1.3.3 How does the VEWH prioritise different watering actions when there is not enough environmental water available?

In any given year, the need for environmental water as outlined in the seasonal watering plan can be higher than the available water, so it is important to consider where water is most needed and how it can be used most efficiently to achieve the best environmental outcomes.

A shortfall in supply might arise because of:

- ▶ significant, high-value environmental water demands
- ▶ drought or low water availability.

To meet a shortfall, the VEWH may look to use tools such as carryover and trade (as explained in section 1.4.2). If there is still a shortfall of water, the VEWH, in collaboration with waterway managers and other water holders if relevant, must prioritise environmental watering actions.

Many factors influence prioritisation decisions (such as the previous watering history in that river or wetland, environmental or public risk considerations and seasonal conditions in the region). Prioritisation decisions can be very hard and often involve trading off one watering action against another.

In deciding to prioritise one environmental watering action and site over another, the VEWH always seeks to optimise environmental outcomes across the state.

What criteria are used to guide prioritisation decisions?

Figure 1.3.1 shows the criteria considered when making the trade-off decisions and prioritising the range of potential environmental value from watering actions. Waterway managers provide information about how different watering actions meet these criteria, and about opportunities for shared benefits, in their seasonal watering proposals.

Figure 1.3.1 Criteria for prioritising environmental watering actions

Prioritisation criteria	Types of factors considered
Extent of benefit	<ul style="list-style-type: none"> ▶ Size of the area being watered ▶ Expected ecological outcomes ▶ Expected scale of response ▶ Conservation status of the species that will benefit
Likelihood of success	<ul style="list-style-type: none"> ▶ Evidence to support the desired outcomes will be achieved ▶ External threats that may affect getting the desired results
Longer-term benefits	<ul style="list-style-type: none"> ▶ Value added to previous watering investment at the site ▶ Longer-term environmental benefits expected ▶ Ability to sustain these values into the future
Urgency of watering needs	<ul style="list-style-type: none"> ▶ History of watering at the site ▶ Potential for irreversible damage if the watering does not occur ▶ Potential for species loss at a local or greater scale ▶ Risks associated with not delivering the water
Feasibility of the action	<ul style="list-style-type: none"> ▶ Capacity of infrastructure to meet the delivery requirements ▶ System or operational constraints ▶ Flexibility in the timing of delivery ▶ Feasibility of management actions in mitigating external threats
Environmental or third party risks	<ul style="list-style-type: none"> ▶ Adverse environmental outcomes that may arise ▶ Third-party risks associated with the event ▶ Effectiveness of actions to manage third-party and environmental risks
Costs of the watering action	<ul style="list-style-type: none"> ▶ Costs to deliver and/or manage water ▶ Costs of interventions for managing external threats and risks
Efficiency of water use	<ul style="list-style-type: none"> ▶ Volume of water needed to achieve the desired outcomes ▶ Volume and timing of return flows that may be used at downstream sites (see section 1.4.2) ▶ Alternative supply options such as use of consumptive water en route or augmenting natural flow events ▶ Risks of spills from storages in the upcoming water year and any carryover water (see section 1.4.2) that may be available

Who is involved in the prioritisation process?

Waterway managers, environmental water holders, storage managers and communities (recreational user groups, environmental groups, Traditional Owners and farming groups) all have a role in prioritising environmental watering actions, depending on the nature and scale of the decision being made. There is a list of partners and stakeholders engaged in developing the seasonal watering proposal for each system in this plan.

Waterway managers are best-placed to advise about the extent and significance of an environmental watering action and about the highest priorities in their region.

The VEWH and other environmental water holders determine the highest watering priorities across regions and have a mandate to commit environmental water to particular watering actions and sites over others. The VEWH's decisions are intended to provide the best-possible environmental outcomes for the state. The VEWH makes these decisions in consultation with waterway managers, which are the primary environmental watering representatives of their regions, and with other program partners as relevant.

Advice from storage managers is generally the key to understanding the feasibility of delivering a watering action, including the flexibility of delivery timing and operational constraints.

Land managers provide consent to environmental water delivery on their land and will advise on delivery feasibility in light of land management activities, public access and the risks and benefits of the environmental watering action.

The annual prioritisation process is informed by longer-term site prioritisation by waterway managers in consultation with their communities. This prioritisation is detailed in plans such as regional catchment strategies, regional waterway strategies and environmental water management plans. These plans draw on community and scientific knowledge and prioritise sites for environmental watering (and other river health activities) that have high environmental, cultural, social and economic value to the community.

Additional input from the community about prioritisation of environmental watering is provided annually where needed.

1.3.4 Do seasonal conditions affect how environmental water is used?

In the same way rainfall patterns influence how people water their gardens or paddocks, different climatic conditions influence how environmental water is managed.

Seasonal conditions drive what water will be available during the water year and the environmental watering objectives to be pursued (as explained in section 1.2.1). Waterway managers take seasonal conditions into account when prioritising the environmental water needed at each particular site. These are known as planning scenarios and describe the range of watering actions that may occur under drought to very wet climatic conditions.

Waterway managers work with the program partners to decide how to optimise the ecological outcomes they can achieve using environmental water by considering factors including:

- ▶ the environmental objectives under each climatic scenario including consideration of any essential environmental water needs
- ▶ how rainfall, natural flooding or the delivery of water for consumptive users may contribute to the achievement of the environmental objectives
- ▶ how environmental water may be used to build on natural flows or irrigation deliveries to meet the environment's needs
- ▶ natural climatic cues that might occur that increase the likelihood of achieving a particular ecological outcome.

Planning scenarios are presented in the seasonal watering plan and provide the basis for the adaptive management of environmental water as the season unfolds. They also provide an early indication of the amount of water that may be used at different sites and whether the VEWH may need to trade water during the season to meet identified environmental needs (as explained in section 1.4).

Figure 1.3.2 provides an example of how different planning scenarios may influence decisions about how environmental water is managed in a given year.



Water delivery to Lake Elizabeth, by North Central CMA

Figure 1.3.2 Example planning scenarios for a river system under a range of climatic conditions

Planning scenario	Drought	Dry	Average	Wet to very wet
Expected Catchment Conditions	No unregulated flows	One or two brief unregulated flow peaks in winter/spring	One to three unregulated flow peaks plus extended low flows in winter/spring	Extended unregulated high flows with some overbank flooding in winter/spring
Environmental Objectives	Protect critical refuge habitat for native fish	Maintain native fish habitat	Encourage fish movement and spawning Improve habitat for water bugs Support the establishment and maintenance of bank vegetation	Encourage movement and spawning of native fish Enhance condition and extent of bank vegetation Where possible, provide opportunities for the exchange of nutrients and carbon between the river and floodplain
Potential Environmental Watering	Provide low flows and trigger-based freshes to maintain water quality in deep refuge pools	Provide summer/autumn low flows to manage water quality and maintain connectivity Extend the duration of flow peaks to freshen water quality in deep pools	Provide year-round baseflows to maintain habitat connectivity and support fish movement Extend the duration and/or magnitude of peaks to provide spawning cues for fish Provide seasonal freshes to support the establishment of bank vegetation	Maintain year-round low flows and seasonal freshes to encourage the recovery of in-stream and bank vegetation and trigger the spawning and movement of native fish Where possible, maintain connectivity and the exchange of nutrients between the river and floodplain Slow the recession of natural peaks to avoid bank slumping and erosion Top up natural flows if needed, to meet targets for winter base flows and spring peaks

1.3.5 How are shared recreational, cultural and economic benefits considered in environmental watering?

Environmental water is essential for maintaining and improving the health of rivers, wetlands and floodplains. The plants, animals and broader health of these waterways provide shared benefits for recreation, cultures and economies. For example, environmental watering can improve conditions for fishing, camping and canoeing; sustain healthy Country and totem species for Aboriginal communities with a continuing connection to rivers, wetlands and floodplains; and improve water quality which can deliver economic benefits for irrigators.

In planning for environmental watering, the primary purpose is to optimise environmental benefits. Where consistent with this purpose, program partners also consider whether additional social, cultural and economic benefits can be achieved.

These shared benefits of environmental water can sometimes be actively optimised by making decisions around the storage, delivery and use of environmental water that support community events (such as local fishing, waterskiing or rowing competitions).

When planning for and delivering environmental water, the VEWH and program partners look for opportunities to achieve these shared benefits in both the short and long-term, where environmental outcomes are not compromised. Longer-term community benefits may sometimes require short-term community inconvenience. For example, floodplain watering in Gunbower Forest may inconvenience campers one year due to limited access, but this watering will increase the health of the forest in the longer term, which benefits tourism and recreational opportunities.

Waterway managers work with communities to identify the environmental, social, cultural and economic values of waterways through regional catchment strategies, regional waterway strategies, environmental water management plans and seasonal watering proposals. These values for each system are summarised in sections 2 to 5. Program partners will continue to work with stakeholders to look for opportunities to achieve shared benefits from environmental watering.

1.3.6 How are risks managed?

Risk management is an integral part of environmental watering. Program partners consider it throughout environmental water management (that is, during long-term and annual planning, implementation and review).

VEWH in collaboration with its program partners has developed a risk management framework which addresses interagency risk, respects the risk management practices of each partner, documents roles and responsibilities in operating arrangements and is applied as part of program management.

The seasonal watering proposals on which this *Seasonal Watering Plan 2017–18* is based identify potential risks associated with the specific watering actions proposed for the coming water year. As part of developing the proposals, partners jointly assess risks and identify and commit to

mitigation actions. Due to the shared nature of these risks, a collaborative approach is the best way to manage environmental watering risks.

Table 1.3.1 shows the main shared risks of environmental watering. Program partners consider and reassess these and other potential risks as the season unfolds and planned watering actions are due to commence.

Some risks may only eventuate at the time of delivery. For example, if there is significant rain forecast, there is a risk it could cause nuisance flooding if combined with a scheduled environmental watering action. To avoid this, risks are always reconsidered by program partners within the specific environmental and operational contexts of a watering action to inform decisions about whether delivery should proceed. Any measures or actions required to mitigate the risks identified are implemented as agreed by the responsible program partner. Watering actions will not be implemented if an unacceptable risk to the public or the environment is identified.

Even with best-practice risk management controls, there may be unintended impacts from environmental watering or situations where environmental watering cannot occur as planned. If so, it is essential partners work together to respond to risks and then learn and adapt their management of risks. The VEWB has developed an agreed approach to incident management to help program partners report, investigate and respond to risks.

Table 1.3.1 Main shared risks of environmental watering

Type of risk	Example mitigating actions
Environmental watering contributes to third-party impacts	<ul style="list-style-type: none"> Identify and understand water system capacities and monitor water levels at key locations to inform daily water release decisions and ensure impacts do not eventuate. Consider potential catchment run-off from forecast rainfall before deciding on the timing of environmental water releases. Implement a communication strategy which may include media releases, public notices and signage before environmental watering, to ensure people are informed of significant environmental water deliveries and can adjust their behaviour accordingly. This includes early liaison with potentially affected stakeholders. Restrict access by closing gates and tracks.
Inability to achieve or demonstrate ecological outcomes from environmental watering	<ul style="list-style-type: none"> Undertake intervention monitoring within available resources to identify the ecological response. Conduct research to better understand environmental watering responses. Communicate the outcomes of monitoring and incorporate learnings into future environmental watering. Consider the need for complementary works to help achieve environmental watering outcomes as part of integrated catchment management, and the likely timeframe for ecological responses to all management actions.
Environmental watering has negative effects on the environment (for example blackwater, bank erosion and the spread of weeds)	<ul style="list-style-type: none"> Monitor environmental watering outcomes and reassess future deliveries and/or scientific recommendations if necessary. Plan the timing, frequency, duration and variability of environmental watering to limit conditions that are favourable to non-native plants and animals or which have negative effects.

1.4 Managing available environmental water

Environmental water entitlements are held in 15 water supply systems across Victoria. Sections 2 to 5 detail where the water made available under these entitlements may be delivered in 2017–18.

In this section ...

- ▶ **How much water is available to use as part of the Victorian environmental watering program?**
- ▶ **What options are available to effectively and efficiently manage environmental water?**

To the extent possible, the VEWH and other environmental water holders try to avoid water supply shortfalls by efficiently using environmental water and by using tools such as carryover and trade. However, if despite these measures there is still a shortfall of water, the VEWH in collaboration with waterway managers (and other water holders if relevant) must prioritise environmental watering actions.

1.4.1 How much water is available to use as part of the Victorian environmental watering program?

VEWH environmental water entitlements

Environmental water is made available under the environmental water entitlements held by the VEWH. Table 1.4.1 shows the entitlements held by the VEWH as at 30 June 2017, including those held in trust for the Living Murray program. The VEWH's environmental water entitlements can be viewed at waterregister.vic.gov.au/water-entitlements/bulk-entitlements.

The water available to use under these entitlements varies from year to year depending on entitlement rules, seasonal conditions (including rainfall and run-off in the catchments) and the water already available in storages.



Leisure activities by the Yarra River, by Chris Kapa. Image courtesy of Melbourne Water

Table 1.4.1 Environmental water entitlements held by the VEWH (as at 30 June 2017)¹

System	Entitlement	Volume (ML)	Class of entitlement
Gippsland Region			
Latrobe	Latrobe River Environmental Entitlement 2011	N/A ²	Unregulated
	Blue Rock Environmental Entitlement 2013	18,737 ³	Share of inflow
Thomson	Bulk Entitlement (Thomson River – Environment) Order 2005 ⁴	10,000 8,000 ³	High Share of inflow
Macalister	Macalister River Environmental Entitlement 2010	12,461 6,230	High Low
Central Region			
Yarra	Yarra Environmental Entitlement 2006 ⁴	17,000 55	High Unregulated
Tarago	Tarago and Bunyip Rivers Environmental Entitlement 2009	3,000 ³	Share of inflow
Werribee	Werribee River Environmental Entitlement 2011	N/A ³	Share of inflow
Moorabool	Moorabool River Environmental Entitlement 2010 ⁴	7,086 ³	Share of inflow
Barwon	Barwon River Environmental Entitlement 2011 ⁵	N/A ²	Unregulated
Western Region			
Wimmera and Glenelg	Wimmera and Glenelg Rivers Environmental Entitlement 2010 ^{4,6}	40,560 1,000	Pipeline product Wetland product
Northern Region			
Murray	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	29,782 3,894 40,000	High Low Unregulated
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Barmah–Millewa Forest Environmental Water Allocation	50,000 25,000	High Low
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Living Murray	9,589 101,850 34,300	High Low Unregulated
	Environmental Entitlement (River Murray – NVIRP Stage 1) 2012	25,083 ⁷	High
	Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004	29,794	High
	Water shares – Snowy Environmental Reserve	14,671 6,423	High Low
Goulburn	Goulburn River Environmental Entitlement 2010	8,851 3,140	High Low
	Environmental Entitlement (Goulburn System – Living Murray) 2007	39,625 156,980	High Low
	Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012	34,428 ⁷	High
	Bulk Entitlement (Goulburn System – Snowy Environmental Reserve) Order 2004	30,252 8,156	High Low
	Water Shares – Snowy River Environmental Reserve	8,321 17,852	High Low
	Silver and Wallaby Creeks Environmental Entitlement 2006 ⁴	N/A	Passing flow only

Table 1.4.1 Environmental water entitlements held by the VEWH (as at 30 June 2017)¹ continued

System	Entitlement	Volume (ML)	Class of entitlement
Northern Region			
Campaspe	Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007	126 5,048	High Low
	Campaspe River Environmental Entitlement 2013	20,652 2,966	High Low
Loddon	Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005 ⁴	10,970 2,024	High Low
	Environmental Entitlement (Birch Creek – Bullarook System) 2009 ⁴	100	N/A ⁷
	Water Shares – Snowy River Environmental Reserve	470	High

¹ While the VEWH does not hold any entitlements in the Maribyrnong system, water allocation was purchased in this system together with Melbourne Water in 2014–15, 2015–16 and 2016–17.

² Use of these entitlements depends on suitable river heights, as specified in both the Latrobe and Barwon environmental entitlements (rather than a permitted volume).

³ Water is accumulated continuously according to a share of inflows (Blue Rock Reservoir 9.4 percent, Tarago Reservoir 10.3 percent, Werribee system 10 percent, Moorabool system 11.9 percent, Thomson Reservoir 3.9 percent) and this volume represents the maximum that can be stored at any time. The actual volume available in any year varies according to inflows.

⁴ In addition to volumetric entitlement, the entitlement also includes passing flows.

⁵ A new environmental entitlement of 1 GL for the upper Barwon River is awaiting approval and may be available for use in 2017–18.

⁶ In addition to volumetric entitlement, the entitlement also includes unregulated water.

⁷ This entitlement volume is equal to one-third of the total water savings from the Goulburn-Murray Water Connections Project Stage 1, as verified in the latest audit (including mitigation water).

⁸ Allocation against this entitlement is made subject to specific triggers, as specified in the entitlement.

Water donations

The VEWH may receive water donations from individuals, community groups and other organisations. This water could be used for environmental watering in the water year it was donated (including for actions identified in the seasonal watering plan), or it could be carried over for use in the future (see section 1.4.2 for more information about carryover). Some donors may identify a specific use for the water they donate (such as environmental watering in a specific wetland or to protect a certain tree species). The VEWH considers the costs and benefits of each donor proposal and may authorise a donation if it considers the donation environmentally beneficial.

Usually, when Commonwealth or Living Murray water is to be delivered in Victoria, the CEWH and MDBA transfer the agreed amount of water to the VEWH. That amount then becomes part of the Victorian environmental water entitlements until used or transferred back.

Table 1.4.2 shows the environmental water entitlements held by the CEWH and MDBA in Victoria. The CEWH and MDBA also hold water in NSW and SA, which could potentially be made available for environmental watering in Victoria.

Water available from other environmental water holders

In northern and western Victoria, the VEWH coordinates with other environmental water holders to deliver environmental outcomes at the broader Murray–Darling Basin scale. One of the VEWH's important roles is to coordinate with Murray–Darling Basin environmental water holders (the CEWH, MDBA and program partners in NSW and SA) to optimise the benefits of all environmental water delivery in Victorian waterways. The seasonal watering plan considers the use of all water holders' water held in Victorian river systems.

Table 1.4.2 Environmental water entitlements held in Victoria by other water holders (as at 31 March 2017)

System	Volume (ML)	Class of entitlement
Living Murray entitlements (held by MDBA)		
Murray	12,267	High-reliability water share
Goulburn	5,559	High-reliability water share
Commonwealth environmental water holdings		
Ovens	70	High-reliability water share
Murray	320,779 25,489	High-reliability water share Low-reliability water share
Broken	253 4	High-reliability water share Low-reliability water share
Goulburn	276,175 29,435	High-reliability water share Low-reliability water share
Campaspe	6,547 395	High-reliability water share Low-reliability water share
Loddon	3,356 527	High-reliability water share Low-reliability water share
Wimmera-Mallee	28,000	Low-reliability product

Environmental watering by nongovernment agencies

In 2007, the Murray Darling Wetlands Working Group (MDWWG) and The Nature Conservancy (both nongovernment organisations) partnered to own and manage the Environmental Water Trust. To date, the MDWWG has been very active in wetland protection and management in NSW through partnerships with state and federal governments. In 2017–18, the MDWWG plans to partner with Goulburn Broken CMA to deliver environmental water to wetlands in Victoria for the first time. The wetlands are on private land and the deliveries are outside the Victorian environmental water holdings and are therefore not specifically covered by the *Seasonal Watering Plan 2017–18*.

For more information about the MDWWG and the Environmental Water Trust, see www.murraydarlingwetlands.com.au and environmentalwatertrust.org.au.

1.4.2 What options are available to effectively and efficiently manage environmental water?

Other water sources

Environmental water is not the only type of water that can support river, wetland and floodplain health. Waterway managers and environmental water holders in consultation with storage managers consider the potential for environmental watering objectives to be met by other types of water. The timing of environmental releases can also be coordinated with other sources of water to achieve greater benefits than an environmental release alone could produce. Other sources of water can include:

- ▶ **system operating water** (including passing flows) which maintains a baseflow in many rivers to which environmental water can be added
- ▶ **heavy rainfall** (resulting in unregulated flows) which can naturally meet an environmental objective, so water available under environmental water entitlements is not needed
- ▶ **alterations to the timing and route for delivery of consumptive water** which, if possible without detriment to consumptive water users, can achieve environmental objectives.

These types of water are considered in the development and implementation of the seasonal watering plan to ensure effective system operations and efficient use of environmental water, and to achieve the optimal benefit to the environment.

Return flows

In some systems, environmental water delivered through upstream sites can be used again downstream. This helps to ensure environmental water is used efficiently and effectively to achieve optimal environmental benefits, as the Goulburn River example below illustrates.

This reuse policy, known as return flows, is available in many systems across northern Victoria. It increases the efficiency of environmental water use and helps reduce the volume of water needed to be recovered for the environment from consumptive water users.

The VEWH's access to return flows is enabled through rules in its environmental water entitlements. Reuse of return flows is also available to the CEWH and MDBA when the VEWH delivers water on their behalf.

Where possible, return flows are reused to provide benefits at Victorian environmental sites. If not needed in Victoria, the VEWH, Living Murray and CEWH return flows will continue to flow across the border to SA where they will be used to provide environmental benefits at sites such as the Coorong, Lower Lakes and Murray Mouth area.

Goulburn River: reusing return flows

Environmental water is delivered in the Goulburn River to provide environmental benefits (such as stimulating fish to breed and promoting the growth of vegetation on river banks). The water flows down the Goulburn River and into the River Murray. The VEWH can apply to the resource manager (Goulburn-Murray Water) to have the volume of environmental water that reached the River Murray re-credited in its accounts as a return flow. This water can then be reused at a priority environmental site in Victoria (such as at Hattah Lakes near Mildura) or used for River Murray environmental outcomes in SA. If the water is to be reused in SA, the VEWH trades the re-credited return flow volume to environmental water holders in SA.

Carryover

Some entitlements allow the VEWH to carry over unused water to the following water year. This means that water allocated in one year can be kept in storages for use in the following year, subject to certain conditions.

Carryover provides flexibility and enables environmental water to be delivered when it is of the greatest value to the environment. For example, carryover can help ensure environmental water holders can meet high winter and spring demands when there is a risk there will be little water available under entitlements at the beginning of the water year.

Carryover can also be used to set water aside to maintain key refuge areas and avoid catastrophic events in drought periods, as the Wimmera and Glenelg systems example below illustrates.

Using carryover to manage risks in dry periods in the Western Region

The VEWH will carry over water from 2016–17 to support water deliveries over the next few years if there is a return to dry conditions, but a better example of strategic use of carryover comes from two years ago.

Inflows to waterways and storages in the Western Region were extremely low in 2014–15. Weather forecasts suggested that conditions would remain very dry leading into 2015–16, with a high likelihood of low water availability.

As a result, program partners weighed up the opportunity cost of carrying water over for future use against using it in that season. They decided to reduce, and in some waterways temporarily cease, environmental watering in the Wimmera and Glenelg systems in autumn 2015 to ensure there was sufficient water available to meet essential needs in 2015–16 through carryover.

Although there were environmental risks associated with ceasing deliveries, they were preferable to the risk of not being able to provide flows in the following summer, when risks to native fish and other animals from poor-quality water were likely to be much more significant.

This proved to be a good decision. By summer 2015–16, low inflows to the system meant there was insufficient allocation available to provide refuge habitat for fish and other aquatic biota. Waterway managers were however able to call on the water carried over to meet these needs.

Although there was a decline in water quality, the waterway managers were able to provide habitat at critical times and to minimise the risk of fish kills.



Great egrets at Black Swamp, by Catarina Gregson

Water trading

Water trading allows the VEWH to move water to the systems where it is most needed and to smooth out some of the variability in water availability across systems and across years. The VEWH can trade water allocated to its entitlements by:

- ▶ administrative water transfers between the VEWH's entitlements
- ▶ administrative water transfers with other environmental water holders
- ▶ purchasing water allocation
- ▶ selling water allocation.

Administrative water transfers are the most common trades the VEWH undertakes. These occur between the VEWH's entitlements (or accounts) to move water to where it is most needed. Other environmental water holders also transfer their water to the VEWH for delivery in Victoria. These types of water trades are often referred to as administrative water transfers as there is no financial consideration associated with the trade.

The VEWH can also buy or sell water allocation where it is in line with its statutory objectives: that is, if it benefits the environment. The VEWH has bought or sold a small amount of water allocation each year since it was established in 2011. The wet conditions across Victoria in 2016–17 allowed the VEWH to sell 20 GL of water from the Goulburn and Murray systems in 2017.

Water has been purchased to enhance environmental outcomes in systems where insufficient environmental water was available, and it has been sold where foreseeable environmental demands could be met.

The VEWH can use revenue raised from the sale of a water allocation to:

- ▶ purchase water to meet shortfalls in any Victorian system
- ▶ invest in monitoring or technical studies that will improve future environmental water management
- ▶ invest in small structural works and other on-ground activities that will improve the performance of Victoria's environmental watering program.

Subject to the approval of the Minister for Water, the VEWH can also trade its water entitlements (referred to as a permanent trade). However, it has not undertaken permanent trades to date.

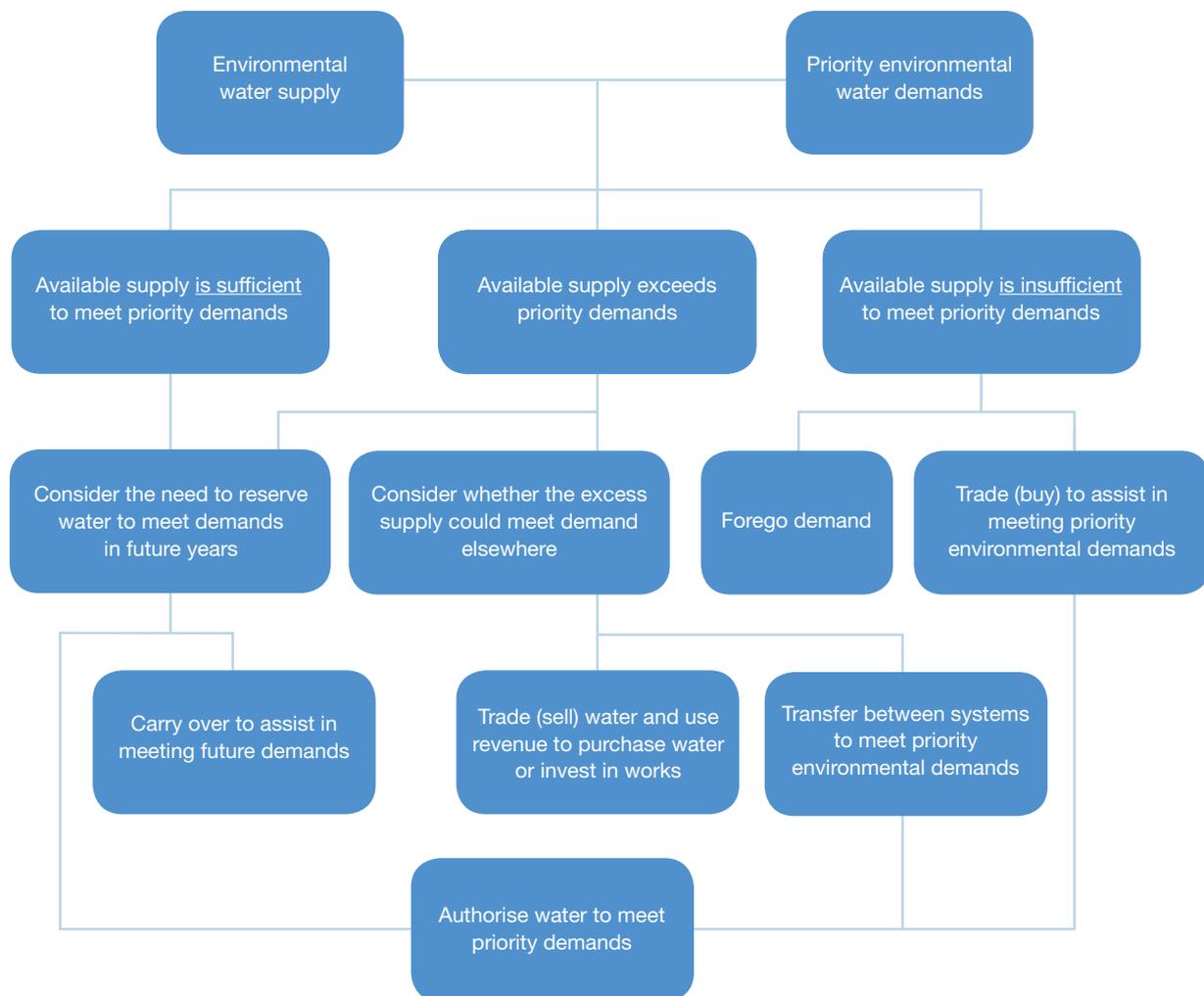
Figure 1.4.1 shows the key considerations that guide the VEWH's use, carryover and trade decisions.

There is more information about the VEWH's trading activity, including its annual trading strategy, on its website at vevh.vic.gov.au.



Christiane Jaeger canoeing in her favourite wetlands, courtesy Christiane

Figure 1.4.1 Key considerations guiding use, carryover and trade decisions



Transferring between regions to meet priorities

Wet conditions in 2016–17 meant the VEWH did not need to transfer water between regions to address specific needs or shortfalls, but it made transfers to meet high-priority water demands during the last dry period.

In 2014 and again in 2015, there was not enough environmental water to provide spring freshes in the Thomson River to encourage the migration of juvenile Australian grayling. In both those years, the VEWH decided to transfer environmental water from the Yarra system to the Thomson system to deliver on this environmental watering priority.

Australian grayling spawn in downstream reaches of coastal river systems. The juvenile fish then spend time in the sea before migrating back upstream. Flows of specific duration and magnitude are required to trigger both the spawning and the returning migration. In recent years, there

have been regular spawning opportunities for Australian grayling in the Thomson River, and monitoring showed that successful spawning and recruitment of Australian grayling had occurred. Until the flow event in 2014, there had been no flows since 2010 to trigger the return of juvenile Australian grayling to the upstream reaches.

Unused environmental water had been carried over in the Yarra system from previous years, and there was sufficient water remaining to provide the planned environmental watering in the Yarra system that year. A risk assessment determined that the transfer posed a low risk to achieving environmental outcomes in the Yarra system but would provide benefits in the Thomson system.

These transfers are an example of how water may be prioritised across different regions. It also shows how use, carryover and trade decisions can optimise the value of available water across the state to achieve environmental outcomes.