

1.3 Effective Protection and Delivery of Environmental Water

Proposition

As the global climate changes, environmental baselines will no longer be stationary but change over time with patterns of rainfall and drought in south-east Australia. At the same time, water demands will change as human settlements expand and many river systems will suffer from high levels of consumptive water use.

In creating the Environmental Water Reserve (EWR), Victoria has made great progress in defining and delivering water to ecosystems. However, the greatest portion of the EWR is also the most vulnerable to change. To protect waterways from the pressures of over-extraction we need to provide greater legal protection to the water already in the EWR, expand the EWR where appropriate and use effective water accounting to address problem areas.

Context

Healthy rivers and wetlands (referred to as waterways) support ecosystems and provide a home for species important to Victoria – such as river red gums and the Murray cod. Appropriate flows of water through waterways are essential to ensure proper ecosystem function. Water thus provides numerous ecosystem services that are essential to our society. It underpins critical elements of the economy: agricultural production, tourism and recreation.

1.3.1 The importance of environmental water in providing ecosystem services for all Victorians



Boosey Creek, north-east Victoria

Appropriate flows of environmental water carry out a number of functions:^{97, 98}

- stimulate animals like native fish to feed and breed (to do this cod and yellowbelly fish need to be able to move on to floodplains)
- trigger plants to seed or germinate (river red gums need flooding for seeds to germinate)
- move carbon (important for food chains) between rivers, floodplains and estuaries
- allow fish and plants to move about the river system and colonise new areas
- help restore groundwater supplies
- stabilise river banks through better vegetation growth, reducing erosion into the river
- flush out the salt along river banks and floodplains
- prevent toxic blue–green algae blooms
- provide social and recreational uses such as boating and fishing.

The importance of environmental flows has been clearly demonstrated in the past decade. The Murray Hardyhead (a freshwater fish endemic to the lower Murray–Darling river system in South Australia, Victoria and New South Wales) is one of the most highly threatened fish in Australia. In 2008 the remaining populations were under threat from lack of water, driven by a decade of drought and greatly exacerbated by river regulation on the Murray, which was impairing breeding by severely disrupting connectivity between populations.⁹⁹

In this case, a suite of actions were taken to enable breeding and protect the species, including provision of environmental water and significant earthworks. These responses were, however, beset by tensions between government and the irrigator community. Rather than environmental water being delivered to habitat areas as a matter of procedure, it required the intervention of the Victorian premier.¹⁰⁰

1.3.2 Threats to environmental water

The threats to future water resources in Victoria are:

- reduced rainfall and inflow under a changing climate
- land-use changes (for example, forest plantations on previously unforrested land can reduce the amount of rainwater reaching waterways)
- declining groundwater and water-quality impacts, including pollution, bushfires and salination.

A changing climate in south-eastern Australia will increase the uncertainty of supply (see Foundation Paper One, *Climate Change Victoria: The Science, Our People and Our State Of Play*, Chapter 4) and compound the problems caused by over-extraction.

Recent projections of climate change impacts in the region estimate that for 1°C of warming, average annual rainfall is expected to decline by 0–9% – this reduction is expected to double with 2°C of warming.¹⁰¹

In many cases most of the Environmental Water Reserve is water left in rivers after other uses have been met. As a result, reduced flows caused by climate change disproportionately affect this water. For example, in the dry years of the Millennium Drought up to 95% of water was extracted from the Campaspe River system for towns and irrigation, greatly intensifying the pressures of drought on the environment.⁹⁷

Modelling of the environmental flow components of the Campaspe led to the conclusion that, even under baseline conditions, there are many occasions when the minimum flows needed to sustain populations of Murray cod are not achieved.

If conditions of either moderate climate change or the low inflows of the drought years are assumed, then environmental flows become even lower. Without some form of intervention, it is unlikely that the river will be able to support natural populations of native fish.¹⁰²

1.3.3 National Water Initiative

Action on environmental water has been led at the federal level by the National Water Initiative (NWI), guided by the National Water Commission (NWC), which oversees framework development and reports on implementation. The NWI seeks to improve productivity and efficiency while ‘establishing clear pathways to return all systems to environmentally sustainable levels of extraction’.¹⁰³

All states and territories were required to develop an implementation plan to meet commitments under the National Water Initiative (2004). Victoria’s plan was accredited by the National Water Commission (NWC) in 2006.

In it, the government committed to:

- protect and where necessary repair stressed rivers and groundwater systems – the natural source of all our fresh water – by giving them legal water rights and conducting restoration works
- price water to encourage people to use it more wisely
- permanently save water in our towns and cities, through commonsense water-saving and recycling measures
- secure water for farms through pioneering water allocation and trading systems
- improve monitoring and reporting on the quantity and quality of the state’s water resources.

1.3.4 Water rights

The agencies in Victoria responsible for allocating and delivering environmental water are:

- the minister for water, who has broader water allocation responsibilities under the Water Act
- the minister for environment and climate change, who is responsible for the environmental watering policy framework
- DEPI, which manages the water allocation and entitlements framework, develops state policy on the management of water resources, waterways and environmental water, and has oversight of the Victorian Environmental Water Holder (VEWH)
- VEWH, which decides on the most effective delivery of water and communicates those decisions; is responsible for public engagement; and commissions projects to demonstrate ecological outcomes; and drafts annual watering plans developed in consultation with, and delivered by, waterway managers
- waterway managers (Melbourne Water and catchment management authorities), which identify regional priorities; undertake local flow studies, monitoring and reporting; and propose annual environmental watering actions to VEWH
- water corporations, which provide infrastructure (dams and irrigation) to hold and deliver environmental water; and ensure all passing flow commitments are delivered.

There are four different types of ‘rights’ to take water in Victoria, these are issued as entitlements:

- bulk entitlements
- environmental entitlements
- water shares
- water licences.

In addition to issued entitlements, sections 8.1 and 8.4c of the *Water Act 1989* allow individuals to take water for domestic and stock purposes.¹⁰⁴

In regulated rivers (where water is held in storage), rights to use water exist as bulk entitlements and are held by water corporations in perpetuity.

Within these bulk entitlements, water shares are allocated, urban customers are supplied and licences for irrigator usage are issued. Water-use licences do not specify a volume for use, only the conditions under which water can be used.

At present there are around 38,000 water shares in the state with a market value of over \$4 billion.¹⁰⁵ In groundwater and unregulated rivers, consumption of water is limited by permissible consumptive volumes (PCV) and sustainable diversion limits (SDL) respectively. These aim to prevent extraction of water that will damage the environment. However, limits on use often reflect historical allocation rather than a sustainable level of use for that river.

In areas of the state that fall within the Murray–Darling Basin, water use is also limited by the Murray–Darling Cap – a limit that was set at the volume that was extracted in 1993–94. Any new water shares or water licences cannot exceed these limits. In 2019, this cap will be replaced by an SDL.



Barmah redgum flooding 2011

1.3.5 Sustainable water strategies

Management of water in Victoria is guided by the regional sustainable water strategies (SWSs). These documents, produced between 2006 and 2011, describe the water supplies and requirements of four regional areas (Central, Northern, Western and Gippsland), as well as outlining current policy and challenges for issues such as changing land use, future threats to water supply or balancing consumptive needs.

Where necessary, the SWSs identify unregulated systems that are designated Water Supply Protection Areas (WSPAs). These are areas that are highly flow-stressed and require a statutory management plan to address problems of over-use.

The Victorian Government has introduced measures to prevent future over-allocation of water systems (incorporated into the regional SWSs), and has made significant investment in recovering water for environmental use. There are, however, still problems with pressures from existing over-allocation.¹⁰⁶

While Victoria does not issue new water licences that exceed the various allocation caps, it is a key feature of the state water allocation framework that the rights of existing water users be protected.¹⁵ When addressing the sustainable use of water, government plans specifically state that interventions should not affect existing water users (e.g. Northern Region SWS).

This policy applies even in river systems that are potentially over-allocated, such as the Campaspe.^{97, 102}

The present State Government position is that it does not explicitly identify systems as over-allocated. Instead, it manages the needs of the environment through the WSPA designation.

To date, the government has not provided data to the NWC on over-allocated systems in the state. However, the NWC identified 18 water systems in Victoria that are listed as WSPAs and, by implication, were over-allocated and/or overused in 2011 – rising from a total of nine in 2009.¹⁰⁷ This increase is a result of greater recognition of system stress as SWSs are implemented.

1.3.6 Defining environmental water

The *Australian Environmental Water Management Report 2010* (NWC 2010) uses a commonly agreed definition of environmental water: 'Environmental water is the water regime provided to achieve environmental objectives.'

The pressures on environmental water were brought acutely to the fore during the prolonged dry conditions that Victoria experienced between 1997 and 2009. The Millennium Drought served to exacerbate the stress that many water systems were under due to high levels of extraction for consumptive use.

In response, reforms to the *Victorian Water Act 1989* in 2005 established the existence of the Environmental Water Reserve.

The Environmental Water Reserve (EWR) is made up of three parts:

- **Environmental entitlements (or held water):** This water has the same legal status as other bulk entitlements (e.g. water rights held by water corporations). It is the only part of the EWR that can be stored and actively managed,
- **Obligations on bulk entitlements (or planned water):** Water that can be destined for consumptive use (some passing flows are primarily for environmental outcomes) but must provide minimum flows at determined points to meet environmental needs, and
- **Above-cap water:** Water that remains in excess of all other entitlements and cannot be kept in storage. Above-cap water comprises the largest portion of the EWR and is the most susceptible to natural variation and climate change.

Environmental entitlements have identical legal status to bulk entitlements for consumption and represent water that is effectively ‘owned’ by the environment. In 2009, this portion represented 6% of the total EWR¹³ and is likely to have increased since then.

Some bulk entitlements specify that passing flows are reduced or stopped when inflows fall below a certain level.¹⁰² These conditions are likely to become more common in a changing climate.

There is more protected water available for environmental flows than in the past. However, because of the relatively high vulnerability of most of the EWR and the possibility that, in future droughts, environmental water could be used to bolster consumptive requirements at the expense of waterway health, there have been calls for a greater protection of environmental water outside of environmental entitlements.¹⁰⁸

In addition, a changing climate means that we can no longer rely on past trends of rainfall and drought to predict future conditions, and this is to be recognised when setting and reviewing targets for environmental flows.



Irrigation channel water wheel north-east Victoria

1.3.7 The Victorian water law review 2014

A review of the Victorian water law, due in 2014, intends to investigate the effectiveness of current water allocation and management arrangements. The review seeks to simplify the current framework 'without adversely impacting on current entitlements', suggesting that it is unlikely to recommend the reduction of existing consumptive entitlements.¹⁰⁹

However, the potential exists to reclaim water from consumptive use through mechanisms such as the sustainable water strategies purchase. These can set targets for water to be recovered via purchase on the water market.

It is critical that the review explicitly assess the potential outcomes of reducing consumptive entitlements through purchase.

Non-entitlement water in the EWR does not have equal legal status to water managed by the VEWH. This water (planned and above-cap water) is the most vulnerable to decreased flows in a changing climate.

It is important that any planned water listed as part of an environmental entitlement remains a part of that entitlement.

Where planned water cannot be converted to environmental entitlements, legal protection could still be ensured so that, when they are reduced in dry years, the impact on the previous beneficiaries (including the environment, and downstream domestic and stock users) is offset by the water corporation that receives the extra water.

This approach was applied by the government during the drought and makes sure that any consumptive reduction to passing flows during drought is not cost-free to users of the extra water.

The State Water Accounts provide a good tool for monitoring how water has been delivered and compliance with passing flow requirements. The government could push for the rapid release of these accounts to identify any problem areas in a timely manner, and be prepared to take enforcement action for any breaches.

RECOMMENDATION 5

It is recommended that the Victorian Government improve the protection of the existing Environmental Water Reserve.

ATTRIBUTES

Protection would be improved by:

- defining types of water outside environmental entitlements (e.g. planned water, conveyancing water, evaporation, flood) that cannot be managed
- identifying physical and policy barriers to efficient delivery of water options for managing non-entitlement water for environmental outcomes
- providing clear requirements to comply with terms and conditions of both bulk entitlements and environmental entitlements and include penalties for non-compliance
- including the conversion of non-entitlement water to environmental entitlements, with oversight of delivery passed to the VEWH where the conversion benefits the environment, water can be managed effectively and there is no impact on the reliability of water availability
- retaining any planned water listed as part of an environmental entitlement as part of that entitlement.



Yarra River Parks Vic cleaning activities

1.3.8 Formation of the VEWH

Once environmental entitlement to water had been established, the need for an independent decision maker to guide the use of water drove the formation of the VEWH through an amendment to the Water Act. The VEWH began operation in 2011.

The VEWH was established to hold and manage environmental water entitlements and is not involved in defining water entitlements and allocations¹¹⁰ (see 1.3.4 Water rights).

The purpose of the VEWH is to manage the environmental water holdings to:

- maintain the Environmental Water Reserve in accordance with the Environmental Water Reserve objective
- improve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning and water quality, and other uses that depend on environmental conditions.¹¹⁰

The Victorian model has key differences to other existing water holding entities (such as the Commonwealth Environmental Water Holder):¹⁰⁰

1. **Management focus:** The VEWH owns a large water portfolio and is responsible for efficient, accountable and effective management rather than further water recovery, making the VEWH unique among environmental water management organisations.
2. **Increased independence:** There is a limit on the power of the environment minister to direct the actions of the VEWH; and its corporate form provides the VEWH with legal standing and the ability to enter into contracts in its own right.
3. **Increased flexibility:** Under its legislation, the VEWH may be able to trade water more freely than other government-funded agencies.

1.3.8.1 Delivery of environmental water

The VEWH works closely with waterway managers (Melbourne Water and the catchment management authorities) to produce seasonal plans for water delivery, and is a unique statutory environmental water management body in that the environment minister cannot direct its actions in respect to delivery or trade in water.

In 2011–12 (the first full year of operation), 92% of planned priority watering actions were fully or partially achieved by the VEWH and waterway managers.¹¹¹ However, it should be noted that this was a year of particularly high rainfall.

Total delivery across the state was 516,000 ML of water to 35 river reaches and 10 wetlands. Some key outcomes from these deliveries include:

- The first environmental water release into the Yarra, which maintained water quality and improved habitat for fish. Sightings of Australia grayling suggests successful upstream migration (see Case Study: Yarra River Environmental Flow Management).
- Inundation of Lake Carpul (a northern wetland) – an event that has not occurred since 1993. The lake is dominated by a black box community that generally requires inundation every one in eight years. Without the 2,062 ML of environmental water the lake would have continued to decline. This water made sure the environmental values were maintained while the CMA investigated a works program to make future watering more efficient. Over 20 species of waterbirds were recorded.
- Provision of environmental water to the Wimmera–Mallee wetlands through the Wimmera–Mallee Pipeline. This action supported a local population of Australian painted snipe (a nationally vulnerable and state-listed threatened species) and a variety of locally significant animals.

Case Study: Yarra River Environmental Flow Management

The water holdings in the Yarra River consist of:

- 17,000 ML per year
- minimum passing flows at various points along the river
- 55 ML per year in the Yarra River downstream of the confluence with Olinda Creek.

Objectives

The water holdings are used to provide a range of specific flow events in the Yarra River. These flow events have been identified by the Yarra River Environmental Flow Study,¹¹² a scientific study that considers the stream-flow-dependent environmental values of the Yarra River and the water required to support them.

The environmental flow objectives identified for the Yarra River include:

- Maintain channel geometry throughout all reaches.
- Improve access to suitable habitats for fish and macroinvertebrates by providing flows that scour sediment from pool and benthic surfaces in riffles.
- Maintain longitudinal connectivity for fish passage.
- Increase the zone of flood-tolerant vegetation on banks by drowning terrestrial vegetation encroaching on banks.
- Ensure minimum flows do not cause flow related declines in water quality.
- Preserve inundation of wetlands and floodplains.

Actions

Each year Melbourne Water submits a Seasonal Watering Proposal for the Yarra River that outlines the priority watering actions for the upcoming year. Following inclusion in the Seasonal Water Plan by the VEWH, Melbourne Water is issued with a Seasonal Watering Statement that enables them to deliver the Yarra water holdings in accordance with the Seasonal Watering Plan.

Management of the water holdings includes actions such as:

- Releasing specific flow events into the Yarra River for environmental benefit.
- Placing a temporary 'cease to harvest' order on the Yering Gorge pumps to allow stream flow to pass through the system.
- Working with storage operators to maximise the environmental benefit of operational releases of water into the Yarra River.

In 2012–13 Melbourne Water released 12,693 ML of water into the river for various environmental flow events into the river including:

- A winter flow event targeted at scouring sediment from the bed of the stream to improve habitat for fish and macroinvertebrates.
- Two summer flow events aimed at improving water quality and providing connectivity between habitats for fish and macroinvertebrates.
- An autumn flow event targeted at the spawning of Australian grayling, a native threatened fish species.

Water Holdings throughout the state are managed adaptively, allowing the delivery of the entitlement to be tailored to the prevailing climatic conditions and new knowledge gained from the monitoring and evaluation of previous flow events.

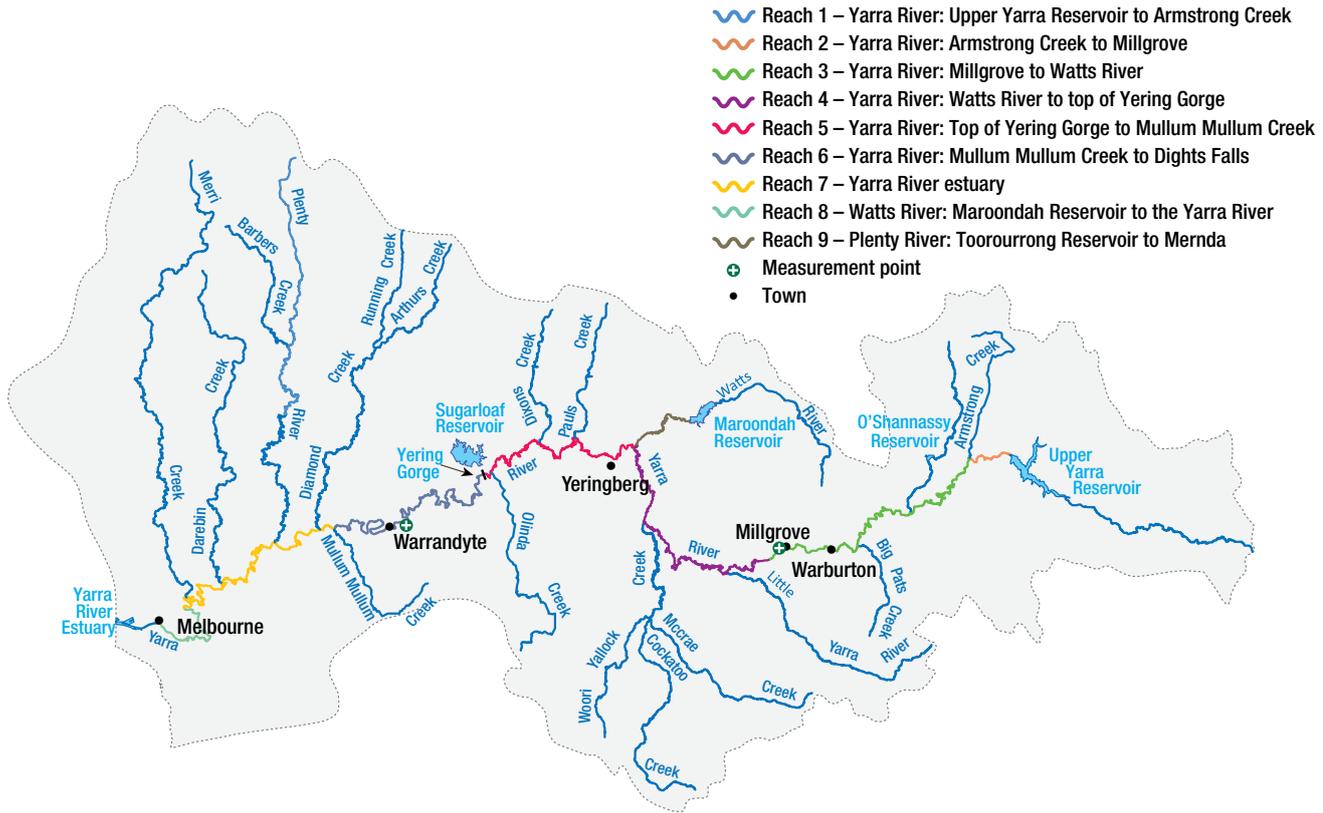


Figure B.1.4: The Yarra system showing the different ‘reaches’ of the river

The reaches are essentially the management units of the system, with each reach having specific flow recommendations.

Low flows	Low flows generally provide a continuous flow through the channel. This may either maintain the flow above a ‘cease to flow’, or provide habitat as a change from ‘high flows’.	Connects in-stream habitats and can have benefits for other system users, such as providing water for livestock.
Freshes	Small or short-duration peak flow events. These are flows that exceed the base flow and last for at least several days. Freshes are a key contributor to the variability of flow regimes, providing short pulses in flow.	Helps to maintain or improve water quality and prevents algal blooms from occurring.
High flows	Persistent increases in the seasonal base flows that remain within the channel. High flows do not fill the channel to ‘bankfull’.	Allows for fish migration and enhances recreational fishing opportunities.

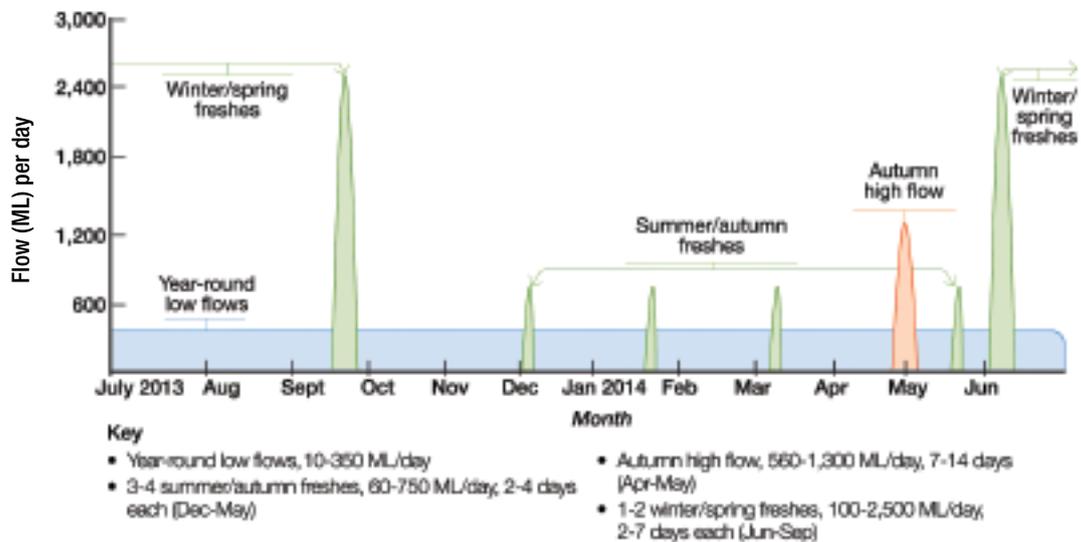


Figure B.1.5: Priority watering actions in the Yarra system 2012–13

This illustrates the range of watering events Melbourne Water could have supplied under the Seasonal Watering Plan.

1.3.8.2 VEWH activity in the water market

In managing its water holdings, the VEWH has access to the market in water shares and water allocations. It is able to engage in temporary trade of water holdings in order to meet its objectives.

In 2011–12, the VEWH sold 12,000 ML of allocation across several systems.¹¹¹ Proceeds from the sale of water are used for future watering priorities for waterways and direct environmental outcomes in rivers and wetlands. This may include funding the delivery of environmental watering actions, purchasing water allocation at a different time – or in a different system, or funding works and measures to improve water-use efficiency.

In this way, the VEWH can use trade to actively improve its overall objectives of improving environmental conditions. For example, the VEWH used sale funds to make a joint purchase – with Melbourne Water – of an additional water entitlement in the Werribee Basin, increasing the water available for priority watering actions in the winter of 2012.¹¹³

The need to achieve value for money in its management decisions creates an incentive for the VEWH to consider the marginal benefits of either using its water or using the funds generated by sale of the water. When the marginal benefit of selling the water and investing in an alternative activity is greater than using the water directly, it is reasonable to expect that the VEWH would sell. This capacity to sell water to achieve alternative benefits (such as infrastructure investment to improve efficiency of environmental watering, or investment in some of the many other elements of environmental health in aquatic ecosystems) extends the role of the VEWH beyond merely the provision of environmental water.

In time, this may lead to competition between the waterway managers for access to available water resulting in a de facto extension of the role of the VEWH into broader aquatic ecosystem management, by rewarding those waterway managers who best achieve efficient environmental watering through integrated catchment management.¹⁰⁰

The most recent research in the Southern Murray–Darling Basin by the NWC¹¹⁴ concluded that: ‘Water markets are making a major contribution to the achievement of the [National Water Initiative]’s overall objective of optimising the economic, social and environmental values of scarce water resources.’

The VEWH is able to act in the state and interstate water markets to manage the EWR and there is scope for investigation on how water holdings can be best managed through those markets, particularly in dry years.

Research focusing on the Murray–Darling Basin has been undertaken by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) – investigating how sophisticated market transactions can be used to improve environmental outcomes.¹¹⁵ CSIRO models the environmental flow outcomes of using time-limited products, such as entitlement leasing and options contracts.

Products of this type allow private entitlement holders a greater sense of security while still allowing water to be used for environmental purposes at optimal times. Indeed, trading by the VEWH is in allocations, which is temporary trade.

Further research will provide useful insights into the optimal balance between the various forms of water products and irrigator attitudes to using the water market in this way. This can inform the government’s ability to develop sophisticated trading products, such as time-specific leasing, to manage environmental water.

1.3.9 Future challenges – monitoring and demonstration of outcomes

It can be difficult to determine the extent to which planned environmental water is being made available, as most reporting methodologies are established to monitor water managed through entitlement provisions.

In the long term, it is critical that the VEWH demonstrate the benefits of environmental watering, in terms of both the maintenance of healthy waterways and the benefits and services that we accrue from them.

Research

Outcomes for environmental water delivery are based on environmental objectives used to set delivery of volumes of water. Therefore operational plans for releases of water would best be guided by an extensive research program to maximise those outcomes. Targets would also incorporate input from community engagement to identify benefits taken from waterways and community-identified values that would be improved by investment.

Long-term research, guided by the VEWH, could be conducted into strategies for the most efficient delivery of water for the provision of ecosystem services.

It would also be advisable to assess strategies such as the creation of dedicated infrastructure and the use of sophisticated water market products.



Water landscape Murchison north-east Victoria

Monitoring

Maximising the efficiency of water delivery in providing outcomes will depend on demonstrating the effects of those deliveries. DEPI has a monitoring system for assessing the response of rivers to environmental watering and is developing a similar system for wetlands.¹⁷ This can form the basis of long-term monitoring of the outcomes of environmental water delivery – the benefits generated, and the identification of problem areas.

Effective delivery, accounting, research and monitoring will ultimately identify systems where ecological outcomes are not being met. The VEWH and water managers can drive the process of improving outcomes either through investment in restoration or infrastructure, or securing additional water for these systems.

Target setting

Each site that is provided with environmental water has specified environmental objectives that are set annually. Examples of these outcomes that the VEWH are seeking from 2012–13 to 2015–16 include:

- increased fish, bird and bird breeding pairs
- improved water quality
- increased diversity of aquatic species
- regeneration of riparian vegetation.

Providing environmental flows will require considerable investment and it is crucial, therefore, that the benefits can be observed. This requires an effective ecological monitoring program that can demonstrate effective use of the water holdings and is supported by timely and transparent reporting.

To this end, the Victorian Government has developed and is undertaking the Victorian Environmental Flow Monitoring and Assessment Program (VEFMAP),¹¹⁶ and is developing a similar program to monitor wetland responses to watering.¹⁵ These programs will provide a sound scientific basis for the link between particular flow components and the ecological response.

To further improve knowledge of ecosystem responses, waterway managers carry out targeted ecological monitoring following environmental water deliveries and provide the information to the VEWH (see Case Study: Yarra River Environmental Flow Management).¹¹⁷

Effective delivery, accounting, research and monitoring will ultimately identify systems where ecological outcomes are not being met and could be the focus of future investment.



Wimmera River

RECOMMENDATION 6

It is recommended that the Victorian Government use research and monitoring to protect environmental water and set targets.

ATTRIBUTES

Statewide water targets are best established through a consideration of ecosystem services benefits. Targets would be reviewed and updated regularly using a transparent framework.

Indicators to measure progress towards targets are:

- environmental flows necessary to maintain services
- waterway health
- standard indices of water health
- social and recreational benefits.

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