

Improving Our Waterways

Victorian Waterway Management Strategy



The Department of Environment and Primary Industries proudly acknowledges and pays its respects to Victoria's Native Title holders and Traditional Owners and their rich culture and intrinsic connection to Country.

The department also recognises and acknowledges the contribution and interests of other Aboriginal people and organisations in waterway management.

Finally, the department acknowledges that the past injustices and continuing inequalities experienced by Aboriginal people have limited, and continue to limit, their proper participation in land, water and natural resource management.

COVER: Baker's Swamp is one of over 60 wetlands in the Moolort Plains wetlands complex, located on the Victorian Volcanic Plain between Castlemaine and Maryborough in north central Victoria. This privately-owned swamp has recently been permanently protected with a Trust for Nature Covenant, as part of the Moolort Wetlands Project. Almost 400 hectares of wetland area have been protected through activities such as fencing, revegetation, covenant protection and the development of wetland management plans. This project has been delivered by the North Central Catchment Management Authority and jointly funded through the Victorian Government's Waterway Management Program and the Australian Government's Caring for our Country. Photographer: Nick Layne

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Ministerial Foreword

Victorians take so much pride in the rivers, estuaries and wetlands that are the lifeblood of our communities.

Our waterways sustain environmental values such as River Red Gum forests, threatened native fish species and platypus. Waterways provide many of Victoria's best fishing, swimming, camping, boating and scenic attractions.

As the source of our first class drinking water supplies and water for agricultural production, the health of our waterways is vital to support our quality of life and our important food and fibre sector.

The health of these waterways also underpins many aspects of regional tourism, jobs and investment; particularly in coastal areas like the Gippsland Lakes and along the Great Ocean Road.

Managing our waterways to ensure they keep providing these important environmental, social, cultural and economic values requires a strategic approach to direct government and community resources.

The challenging conditions of the recent drought, from 1997 – 2009, compounded by bushfires and record floods, provided invaluable experiences and lessons that have informed the development of this new Victorian Waterway Management Strategy.

The Strategy provides a framework for government, in partnership with local communities (both rural and urban), regional agencies and authorities, Traditional Owners and other key stakeholders to improve the health of Victoria's waterways over the next eight years. It includes:

- a more flexible approach to manage the challenges of drought, floods and bushfire in our variable climate;
- a framework focused on regional-decision making with community input to determine priority management activities in each region;
- a comprehensively integrated approach that manages rivers, wetlands and estuaries together and combines traditional works such as revegetation, fencing and erosion control with the most recent advances in environmental water management.



The Hon Peter Walsh MLA



The Hon Ryan Smith MP

The Strategy provides clear direction for the Victorian Government's significant investment of more than \$100 million over four years (beginning in 2012/13) to improve the health of Victoria's waterways.

This funding, coupled with additional investment by other state and federal government programs, and the exceptional contribution made by landholders and community groups, provides a strong foundation for achieving real outcomes over the next eight years.

We congratulate everyone who helped develop this Strategy.

We encourage you to read through this Strategy and get involved in local activities for waterway management in your region. We hope you feel a sense of ownership and pride for our waterways and that the strong partnership between government and communities will continue into the future.

The Hon Peter Walsh MLA
Minister for Water

The Hon Ryan Smith MP
Minister for Environment
and Climate Change



Improving Our Waterways

Victorian Waterway Management Strategy

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Executive summary

This *Victorian Waterway Management Strategy* (the Strategy) provides the framework for government, in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands so that they can continue to provide environmental, social, cultural and economic values for all Victorians. The framework is based on regional planning processes and decision-making, within the broader system of integrated catchment management in Victoria.

The policies and actions in this Strategy have been the subject of extensive discussion and review as part of a strong consultation program. Four dedicated committees have met many times over the past three years and include a Stakeholder Reference Committee, Expert Scientific Panel, Internal Review Committee and the Victorian Waterway Managers' Forum. Additional stakeholders, such as water corporations and the Victorian Traditional Owner Land Justice Group, have been engaged on specific waterway management issues. Feedback was also invited from all Victorians during the six-week public consultation period for the *Draft Victorian Waterway Management Strategy*. This community input, and how it was considered in developing the Strategy, is outlined in the report *Community Feedback: Draft Victorian Waterway Management Strategy*.

The Strategy replaces the policy framework of the *Victorian River Health Strategy* with a single, integrated management framework for rivers, estuaries and wetlands. The Strategy describes the Victorian Government's policy on regional decision-making, investment, management issues and roles and responsibilities of management agencies.

Specifically, the Strategy establishes:

- a vision, guiding principles and management approach
- a transparent, integrated waterway management framework that:
 - facilitates regional decision-making with community input
 - sits within an integrated catchment management context
 - comprehensively integrates waterway management activities
- an adaptive management framework and flexible approach to manage through the challenges of drought, flood, bushfire and the potential impacts of climate change
- aspirational Strategy targets that summarise key regional management activities over the next eight years that aim to maintain or improve the condition of waterways
- clear policy directions for waterway management issues
- specific actions that will deliver more effective and efficient management of waterways.

The vision for Victoria's waterways is:

Victoria's rivers, estuaries and wetlands are healthy and well-managed; supporting environmental, social, cultural and economic values that are able to be enjoyed by all communities.

Improving the environmental condition of waterways in priority areas is a critical task to sustain populations of native plants and animals, provide opportunities for recreation, protect cultural values and support economic development through important industries such as tourism and agriculture. Therefore, the overarching management objective is to maintain or improve the environmental condition of waterways to support environmental, social, cultural and economic values. Management activities will be focused on maintaining or improving the environmental condition of priority waterways to provide public benefits.

The approach for managing waterways involves four key elements:

- recognising the importance of waterways with formal international, national and state significance
- implementing and maintaining onground works and managing environmental water in priority waterways
- fostering strong community partnerships
- using regulation (legislation and statutory processes).

Development and implementation of regional Waterway Strategies for each of the ten catchment regions across Victoria will deliver key elements of the management approach outlined in this Strategy. The regional Waterway Strategies, required under the *Water Act 1989*, will identify high value waterways and priority management activities over an eight-year period. They will be based on a transparent, regional priority setting process and be developed in close consultation with key partners and the community. This process will ensure that investment in onground works and environmental water management is targeted at priority waterways to achieve the greatest community gain.

This Strategy is intended for State government, waterway managers, land managers, local government, other regional agencies and authorities or management partners, Traditional Owners and landholders or community groups involved in waterway management or activities that may affect waterway condition.



River Red Gums on the Murray River. Courtesy DEPI



1

About the Strategy

About the Strategy

Guide to the chapter

1.1 Purpose of the Strategy

1.2 Policy context

- State
- Regional
- National
- International

1.3 The Strategy development process

1.4 Structure of the Strategy

1.1 Purpose of the Strategy

This *Victorian Waterway Management Strategy* (the Strategy) provides the framework for government, in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands so that they can support environmental, social, cultural and economic values for all Victorians.

The framework is based on regional planning processes and decision-making within the broader system of integrated catchment management in Victoria. The Strategy addresses the community expectations and obligations for waterway management expressed in the *Victorian Water Act 1989*, *Catchment and Land Protection Act 1994*, other relevant state and national legislation and policies, and international agreements (see Box 1.1). The Strategy replaces the policy framework of the *Victorian River Health Strategy*¹.

Box 1.1: Legislative and policy obligations addressed by the Strategy

The Strategy provides a single framework for addressing the community expectations and obligations for waterway management outlined in relevant state, national and international legislation, policy and agreements. These include:

- state legislation (such as the *Victorian Water Act 1989*, *Catchment and Land Protection Act 1994*, *Heritage Rivers Act 1992*, *Flora and Fauna Guarantee Act 1988*, *Aboriginal Heritage Act 2006*, *Traditional Owner Settlement Act 2010*, *Conservation, Forests and Lands Act 1987*, *Crown Land (Reserves) Act 1978* and the *Marine Safety Act 2010*)
- national legislation (such as the *Commonwealth Water Act 2007* and *Water Amendment Act 2008* (Cth), the *Environment Protection and Biodiversity Conservation Act 1999* and the *Native Title Act 1993*)
- national water reform through the National Water Initiative
- Murray-Darling Basin Authority policies (such as The Living Murray initiative and the Murray-Darling Basin Plan)
- international agreements (such as the Ramsar Convention on Wetlands, the East Asian-Australasian Flyway Partnership, the Convention on Conservation of Migratory Species of Wild Animals, Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement).
- United Nations Declaration of Rights of Indigenous Peoples.

The Strategy is intended for State government, waterway managers, land managers, local government, other regional agencies and authorities and management partners, Traditional Owners and landholders or community groups involved in waterway management or activities that may affect waterway condition (see Box 1.2 for definitions). It outlines the Victorian Government's policy on regional decision-making, investment, management activities and specific management issues for waterways. It provides clear guidance on the development and implementation of the regional strategies and management plans that are integral to the success of the waterway management program in Victoria. The Strategy also describes the institutional arrangements for waterway management in Victoria (Chapter 18).

Specifically, the Strategy establishes:

- a vision, guiding principles and management approach
- a transparent, integrated waterway management framework that:
 - facilitates regional decision-making with community input
 - sits within an integrated catchment management context
 - comprehensively integrates waterway management activities
- an adaptive management framework and flexible approach to manage through the challenges of drought, flood, bushfire and the potential impacts of climate change
- aspirational Strategy targets that summarise key regional management activities over the next eight years that aim to maintain or improve the condition of waterways
- clear policy directions for waterway management issues
- specific actions that will deliver more effective and efficient management of waterways.



Lake Boort. Courtesy DEPI

Box 1.2: Important concepts contained in the Strategy

The following important concepts are central to understanding the scope and intent of the Strategy.

Waterways

The Strategy focuses on the management of rivers, their associated estuaries and floodplains (including floodplain wetlands) and non-riverine wetlands. The Strategy refers collectively to these systems as 'waterways'. The use of the term 'waterways' in the Strategy does not replace other important definitions of the term (for example, the specific definition in the *Water Act 1989*).

The Strategy contains policy that applies to all rivers and estuaries across Victoria (with the exception of the Murray River channel that falls under the jurisdiction of New South Wales). The term 'reaches' is used to describe a section of a river (generally 20-30 km section) or a section of an estuary and is the common planning unit for management.

The focus for wetlands is largely on natural wetlands (including lakes). However, the Strategy also covers artificial wetlands such as reservoirs, salt evaporation pans, sewage treatment facilities and farm dams that provide substantial benefits to both individuals and the community. The Strategy does not include shallow marine waters except for those listed as internationally important wetlands (that is, Ramsar sites) or those listed in *A Directory of Important Wetlands in Australia*². Whilst the direct management of the marine environment is not a focus for the Strategy, it is recognised that activities in the catchment can affect marine receiving waters.

Rivers, as well as many wetlands and estuaries, have some dependence on groundwater. The Strategy includes groundwater-dependent ecosystems that are classed as rivers, wetlands and estuaries. It does not include management of groundwater fauna, wet cave ecosystems or terrestrial vegetation dependent on groundwater.

Waterway condition

Waterway condition (or waterway health) is an umbrella term for the overall state of key features and processes that underpin functioning waterway ecosystems (such as species and communities, habitat, connectivity, water quality, riparian vegetation, physical form and ecosystem processes including nutrient cycling and carbon storage). By maintaining or improving waterway condition the environmental, social, cultural and economic values that waterways provide can be preserved for both current and future generations. Waterway condition is measured by assessing a range of biological and physical factors.

Catchment management and waterway condition

The task of managing waterways cannot be conducted in isolation from the broader management of catchments and land, because the condition of catchments and land is a key driver of waterway condition (see Section 2.1.4). Some activities occurring on the land surrounding waterways can affect water quality, aquatic plants and animals and riparian vegetation. These linkages are recognised by the integrated catchment management framework that operates in Victoria. Waterway managers are encouraged to undertake management activities throughout catchments (in addition to activities in the channel of rivers and estuaries or within the boundary of wetlands) and consider broader issues such as connectivity, land use change and community participation, education and awareness raising.

Integrated catchment management

Integrated catchment management is the co-ordinated involvement of agencies, stakeholders and the community in policy making, planning, and management to promote sustainable use of natural resources. Integrated catchment management recognises the intrinsic linkages between land use in catchments and subsequent impacts on land, water and biodiversity and seeks a holistic approach to their management.

Waterway manager

In this Strategy, the term waterway manager describes an authority that is responsible for waterway management in a region (there are ten specified catchment management regions in Victoria, see Figure 3.4) in accordance with the *Water Act 1989* and the *Catchment and Land Protection Act 1994*. In the Port Phillip and Westernport region, Melbourne Water is the designated waterway manager. In each of the other nine regions the relevant catchment management authority (CMA) is the designated waterway manager. For further details on institutional arrangements see Chapter 18.

Marine Safety Act waterway manager

In this Strategy, the term *Marine Safety Act* (MSA) waterway manager applies to bodies appointed by the Minister for Ports as waterway managers under the *Marine Safety Act 2010*. MSA waterway managers are responsible for regulating vessel operations and on water activities by waterway users on Victorian State Waters.

1.2 Policy context

1.2.1 State

The *Victorian River Health Strategy* (VRHS) provided the state policy framework for managing river health over the decade 2002–2012. The VRHS was a significant milestone for river management in Victoria. It outlined clear principles for making regional decisions on river protection and restoration, identifying regional priorities for management activities and statewide direction on important management issues affecting river health. This Strategy replaces the VRHS and outlines the framework for government, in partnership with the community, to manage rivers, estuaries and wetlands so that they can support environmental, social, cultural and economic values now and into the future.

The policy framework outlined in the VRHS, and subsequently in this Strategy, incorporate State legislative obligations relevant to waterway management outlined in the *Victorian Water Act 1989*, *Catchment and Land Protection Act 1994*, *Heritage Rivers Act 1992*, *Flora and Fauna Guarantee Act 1988*, *Conservation, Forests and Lands Act 1987*, *Crown Land (Reserves) Act 1978*, *Aboriginal Heritage Act 2006*, *Traditional Owner Settlement Act 2010* and the *Marine Safety Act 2010*. Obligations relevant to waterway management under national legislation and international agreements (see Box 1.1) are also incorporated.

Victoria's water allocation framework provides the basis for the management of Victoria's water resources. Under the *Water Act 1989*, the Victorian Government retains the overall right to the use, flow and control of all surface water and groundwater on behalf of all Victorians. All water taken for consumptive purposes is done so under entitlements set out in the *Water Act 1989*. Like surface water, groundwater is allocated for commercial and irrigation purposes under strict licensing arrangements under the *Water Act 1989*. The *Water Act 1989* also defines the Environmental Water Reserve (EWR) as the amount of water set aside to meet environmental needs. The Victorian Environmental Water Holder was established in 2011, under the *Water Act 1989*, as an independent statutory body responsible for making decisions on the most efficient and effective use of Victoria's environmental water entitlements (see Chapter 8).

The Victorian Government is carrying out a comprehensive review of Victoria's water laws to deliver a streamlined and effective legislative framework for water management and use in Victoria. The revised legislation will provide for integrated and sustainable water management and use in Victoria, and give effect to new Victorian Government water policies, such as the *Living Victoria* policy (see Chapter 14).

The key statewide policy framework for water quality protection in Victoria is the *State Environment Protection Policy (Waters of Victoria)* under the *Environment Protection Act 1970*.

The SEPP(WoV) was first developed in 1988 and was updated in 2003. It provides a statutory framework for State and local government agencies, businesses and communities to work together to protect and rehabilitate Victoria's surface water environments. The SEPP(WoV) identifies beneficial uses of water and sets the environmental quality objectives and policy directions required to address higher risk impacts and activities. The Environment Protection Authority (EPA) Victoria and the Department of Environment and Primary Industries are jointly reviewing the framework for statutory policies (which includes the SEPP(WoV)).

1.2.2 Regional

The *Catchment and Land Protection Act 1994* establishes Regional Catchment Strategies (RCSs) as the primary framework for integrated management of land, water and biodiversity in each of the ten catchment regions of Victoria. Catchment management authorities (CMAs) are responsible for preparing an RCS for their region and co-ordinating and monitoring its implementation. The RCS is the overarching strategy, under which are a range of sub-strategies and action plans for each region. The long-term objectives and priorities for action in the RCSs that are related to waterways are reflected in the regional planning processes for waterway management (see Section 4.1).

Regional planning processes for waterway management were established in 2002 under the VRHS and implemented through ten regional River Health Strategies (RRHSs). Community input and participation in these regional planning processes was a critical element to ensure that RRHSs reflected the community values of waterways in each region. The RRHSs identified high value rivers and priority management actions to be undertaken over a six-year period. These RRHSs were the cornerstone of the regional planning framework for waterways (supported in some areas by regional wetland strategies), but have now passed their intended lifespan. The development of new regional Waterway Strategies is a statutory requirement under the *Water Act 1989* and these will replace the RRHSs (see Chapter 4).

Water resource planning in Victoria is addressed through development of regional Sustainable Water Strategies (SWSs) that set out long-term regional plans to secure water for regional growth, while safeguarding the future of rivers and other natural water sources. They investigate the range of potential changes to water availability under several climate change scenarios. The regional SWSs examine future consumptive demand and environmental needs and set out proposed options to balance and secure water for all users. The SWSs are where the Victorian Government, in partnership with regional communities, decides whether additional water is required for the environment.

1.2.3 National

At the federal level, water reform has been guided by the National Water Initiative (NWI) since 2004. Under this agreement, governments across Australia have committed to actions to achieve a more cohesive national approach to the way Australia manages, measures, plans for, prices, and trades water. The NWI recognises the need to build on the water reforms of the 1994 Council of Australian Government (COAG) agreement to ensure increased productivity and efficiency of Australia's water use. It includes clear steps to return river and groundwater systems to environmentally sustainable levels of extraction and achieve integrated management of environmental water.

There has also been significant legislative reform in water resource management at the federal level. The *Water Act 2007* (Cth) established the Murray-Darling Basin Authority (MDBA) and requires the MDBA to prepare the Basin Plan – a strategic plan for the integrated and sustainable management of water resources in the Murray-Darling Basin. The Act also established the Commonwealth Environmental Water Holder to manage the Commonwealth's environmental water. The *Water Amendment Act 2008* (Cth) transferred the functions of the Murray-Darling Basin Commission to the new MDBA. The MDBA is now the single body responsible for overseeing water resource planning in the Murray-Darling Basin. The Basin Plan sets legal limits on the amount of surface water and groundwater that can be taken from Victoria's share of the Murray-Darling Basin from 1 July 2019 onwards.

The Living Murray initiative is one of Australia's most significant river restoration programs. It aims to achieve a healthy working Murray River system for the benefit of all Australians. This includes returning water to the environment. The Living Murray has recovered almost 500 gigalitres of water to help improve the health of six icon sites.

The Living Murray program was established in 2002 in response to evidence showing the declining health of the Murray River system. It is a partnership of the New South Wales, Victorian, South Australian, Australian Capital Territory and Australian governments, co-ordinated by the MDBA.

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as matters of national environmental significance. The *Native Title Act 1993* (Cth) provides a framework for the protection and recognition of native title. The Act gives Indigenous Australians who hold native title rights and interests—or who have made a native title claim—the right to be consulted and, in some cases, to participate in decisions about activities proposed to be undertaken on the land.

1.2.4 International

The Australian Government has ratified several international human rights agreements that recognise and protect Indigenous peoples' special connection to land and waters and provide for the right to practice, revitalise, teach and develop culture, customs and spiritual practices and to utilise natural resources (for example, the United Nations Declaration of Rights of Indigenous Peoples).

The Convention on Wetlands of International Importance (the Ramsar Convention) provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources (see Section 12.2)

Migratory species that use waterways (such as birds) and internationally threatened species are protected under a range of international agreements (see Box 1.1).



Barmah Forest in flood on Steamer Plain. Photographer: Keith Ward

1.3 The Strategy development process

The Strategy has been developed over four years in collaboration with key stakeholders in waterway management, independent experts and the broader Victorian community (see Figure 1.1).

A Stakeholder Reference Committee was appointed to provide advice, direction and review of draft policies and actions, particularly in relation to the implications for stakeholder groups (see Appendix 1.1 for members and Terms of Reference). An Expert Scientific Panel was appointed to review the draft policies and actions to ensure that the scientific concepts that underpin the policy are accurate and based on best available science (see Appendix 1.1 for members and Terms of Reference).



Kayaking on the Yarra River. Photographer: Alison Pouliot

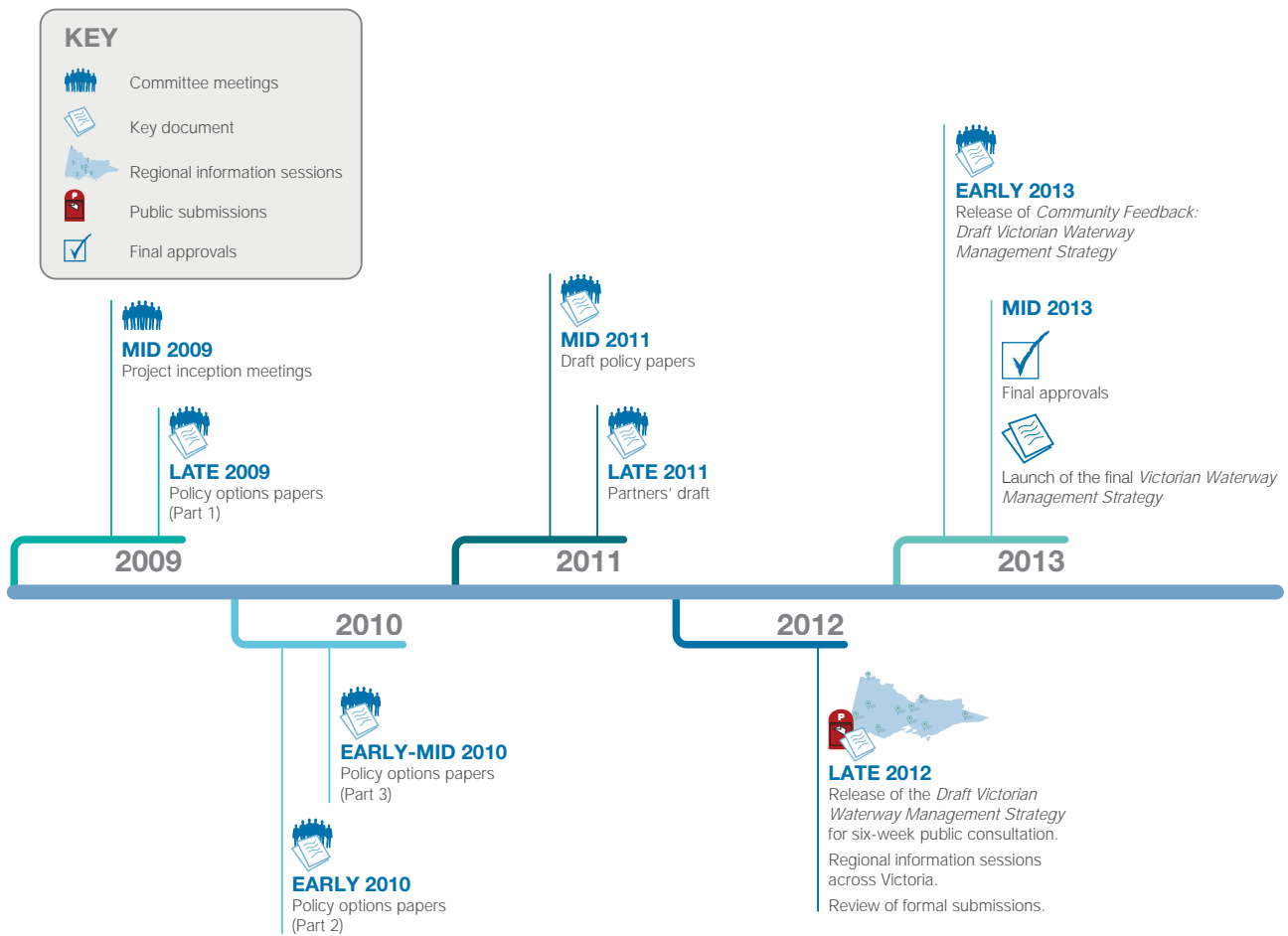


Figure 1.1: Timeline of key events in developing the Strategy.

Regional waterway managers have played a vital role in the development and detailed review of the draft policies and actions through the long-running Victorian Waterway Managers' Forum. The Forum provided advice regarding the regional implementation of the draft policies and actions.

An Internal Review Committee of the (then) Department of Sustainability and Environment (DSE), (then) Department of Primary Industries (DPI), Parks Victoria, Melbourne Water and EPA Victoria staff members ensured that the proposals in this Strategy are aligned with broader natural resource management directions and principles in Victoria.

The Stakeholder Reference Committee, Expert Scientific Panel and Internal Review Committee met seven times prior to the release of this Strategy. The Victorian Waterway Managers' Forum met 15 times.

All Victorians were invited to provide feedback on the *Draft Victorian Waterway Management Strategy* during a six-week public consultation period. Twenty regional information sessions were held at ten locations across Victoria during this period. A total of 78 formal submissions were received during the public consultation period. The key themes from the formal submissions, and how these were considered in developing the final Strategy, are outlined in the report *Community Feedback: Draft Victorian Waterway Management Strategy*³.

The public consultation period and community feedback report keeps the Victorian Government promise to keep

people informed, listen to their concerns and aspirations, and provide feedback on how their input was used in developing the final strategy (see Appendix 1.2).

Consultation with Traditional Owners has occurred primarily through the Victorian Traditional Owner Land Justice Group. Although each Traditional Owner group has its own unique way of operating and its own issues and aspirations, several key points were consistently made in relation to future waterway management in Victoria, including:

- the importance of healthy waterways to support Aboriginal cultural heritage and other values associated with waterways
- ensuring that there are opportunities for Traditional Owners and Aboriginal people to be partners and active participants in waterway management.

Traditional Owners were invited to attend the regional information sessions for partners (along with other agencies involved in waterway management) during the public consultation period, reflecting the aim to involve Traditional Owners as key partners in regional waterway management.

Input and advice was also sought from Native Title Services Victoria, the (then) DSE and Department of Justice Native Title Units, the (then) DSE Indigenous Facilitators Network, Catchment Management Authority Indigenous Facilitators Network, Aboriginal Affairs Victoria and the Victorian Aboriginal Heritage Council.

1.4 Structure of the Strategy

The Strategy is divided into four parts.

Part 1 – Strategy background (Chapters 1–2)

This part outlines the purpose of the Strategy (Chapter 1) and the importance of rivers, estuaries and wetlands (Chapter 2). It describes the different types of values associated with waterways with varying levels of environmental condition. It provides an overview of achievements from the past decade of waterway management, and the next steps that are required to improve the management framework for the coming decade (Chapter 2).

Part 2 – Strategy fundamentals (Chapters 3–6)

This part provides a vision, guiding principles, broad management approach and aspirational Strategy targets that summarise key regional management activities over the next eight years that aim to maintain or improve the condition of waterways (Chapter 3). It describes the integrated waterway management framework and provides direction for the regional implementation of waterway management programs (Chapter 4). This section also outlines principles for community participation and the strong Government commitment to a partnership approach with communities (Chapter 5). It includes the important role of Victorian Traditional Owners in waterway management and protection of Aboriginal cultural heritage and other Aboriginal values associated with waterways (Chapter 6).

Part 3 – Management issues (Chapters 7–16)

This part outlines the principles, policies and actions for specific waterway management issues relating to:

- recreational use of waterways (Chapter 7)
- environmental water management (Chapter 8)
- riparian management (Chapter 9)
- water quality (Chapter 10)
- the river channel (Chapter 11)
- wetlands (Chapter 12)
- estuaries (Chapter 13)
- waterways in urban areas (Chapter 14)
- extreme events of flood and bushfire (Chapter 15)
- invasive species management in waterways (Chapter 16).

Part 4 – Management arrangements (Chapters 17–18)

This part describes the updated adaptive management approach for the Victorian Waterway Management Program (Chapter 17) and the institutional arrangements for waterway management (Chapter 18).



2 Introduction

Introduction

Guide to the chapter

2.1 The importance of rivers, estuaries and wetlands

- Communities value their waterways
- Good waterway condition supports social, cultural and economic values
- Environmental values of waterways
- Understanding the factors that contribute to waterway condition
- Impacts of declining waterway condition

2.2 The types of waterways based on their environmental condition and values

2.3 Achievements of the Victorian River Health Program (2002–2012)

2.4 The next step: progressing the policy framework

- Managing all waterways within a single framework
- Directing investment to regional priorities
- Setting practical objectives for waterways
- Using environmental water efficiently and effectively
- Recognising working waterways need ongoing management
- Strengthening community partnerships in waterway management
- Managing through droughts, bushfires and floods
- Planning for the potential impacts of climate change
- Using new knowledge and an updated adaptive management approach

2.1 The importance of rivers, estuaries and wetlands

2.1.1 Communities value their waterways

Rivers, estuaries and wetlands (waterways) are the lifeblood of many towns and communities. Waterways provide places to relax, holiday, exercise, fish, bird watch, hike and swim. From cool mountain streams in alpine areas to popular estuaries along the coast, waterways underpin the well-being and productivity of individuals, communities and regional economies. Waterways also provide water for irrigation and fertile floodplain soils that support agriculture. A recent survey of 7,140 Victorians found that waterways are vitally important to community members, with 99 per cent of respondents having high aspirations for waterways (see Box 2.1).



*The annual Dimboola Regatta on the Wimmera River.
Photographer: Sarina Loo*

Box 2.1: Survey shows Victorians want healthy waterways

In 2009, the *My Victorian Waterway* survey was carried out with 7,140 Victorians taking part. The results offer an insight to community expectations, attitudes and behaviours regarding waterway management. The results provide waterway managers with critical information for developing regional waterway management programs and for guiding community engagement activities. In the future, the results may also be used to assess and evaluate long term effectiveness of community education and engagement activities.

Ninety-nine per cent of survey respondents had high aspirations for our waterways. Nearly all participants (98 per cent) agreed that it is important for waterways to be as healthy as possible so they continue to provide for our needs and 99 per cent of respondents want healthy waterways in their areas. An overwhelming majority of respondents (96 per cent) stated that they have a personal responsibility to do the right thing for waterways.

The majority of Victorians surveyed (83 per cent) felt most personally connected to a local waterway, usually the stretch of river or creek closest to where they live.

Most respondents visited waterways for recreational purposes:

- 92 per cent of people surveyed visit waterways to enjoy the scenery
- 85 per cent to enjoy native animals, plants and birds
- 76 per cent to walk, hike or cycle
- 68 per cent for picnics and barbeques
- 37 per cent to plant native trees and clear weeds
- 36 per cent to fish.

More than 67 per cent of people surveyed had a good or excellent knowledge of what makes a waterway healthy. Less than 2 per cent had little or no knowledge.

Understanding how Victorian communities feel about, and use, waterways is an essential component of waterway management. For more information on the results of the *My Victorian Waterway* survey visit: www.water.vic.gov.au/environment/rivers/community-connections-to-local-waterways



Cyclist on the Main Yarra Trail. Photographer: David Hannah

Waterways can play a vital role in the physical and mental well-being of people and communities. Our social and recreational activities often revolve around waterways and many Victorians, especially Traditional Owners and Aboriginal people, have deep social, cultural and historical connections to them. The comments below show how important waterways are to people's lives:

The fishing is good. There's lots of bird life. Water birds come to nest. And kids love fishing and swimming.

Glenelg River resident, Casterton¹

I once farmed along 2.5 km of Tullaroop Creek and loved to see the platypus, trout and yabbies. The River Red Gums are magnificent and the bird life, Water Rats and possums are a joy.

Carisbrook Resident¹

The Barwon estuary is as much a part of our lives as breathing.

Geelong resident¹

My children play there, so its health is important to the family.

Ivanhoe resident about Darebin Creek¹

The Gunai Kurnai people have strong cultural and social connections to the region's water bodies. Our people traditionally used the waterways for fishing, collecting mussels, catching eels, hunting animals, collecting swan eggs, gathering of various plants for food and medicine, and basket weaving.

Traditional Owners about waterways in the Gippsland region²

We love our swamp – visitors come up and are amazed, they love it, it's one of the first places to visit

Farmer from west Wimmera³

Box 2.2: Indicative economic value of rivers, estuaries and wetlands

Waterways in good environmental condition can provide many economic benefits (for example, water quality in the Gippsland Lakes is important to support regional tourism). Some other examples of economic value associated with waterways include:

- In 2010/2011, the Gross Value of Irrigated Agricultural Production in Victoria was approximately \$3.9 billion⁵.
- In 2008/2009, approximately 721,000 Victorians participated in recreational fishing and made an estimated 8.7 million fishing trips, spending an average of \$250 each time⁶.
- Economic research into the value of healthy wetlands concluded the Hattah Lakes in northern Victoria provide an annual economic value of \$14.5 million through tourism, water filtration, habitat, flood control and water storage⁷.

2.1.2 Good waterway condition supports social, cultural and economic values

Good waterway condition provides the essential building blocks for regional growth, liveability and prosperity. Rivers provide water for Victoria's five million people and support agriculture, recreational fishing and commercial industries (see Box 2.2). A 2007 study conservatively estimated that Victoria's rivers provide \$986 million per year worth of services and benefits to the community⁴.

Waterways also provide significant social and cultural benefits for communities. Waterways have always been a place for recreation and are often a hub or meeting place for local communities. Fishing, swimming, canoeing and water-skiing are all popular recreational activities that occur on waterways and can make a significant contribution to local economies. Waterways have a special place in the memories of many individuals and are deeply associated with their 'sense of place' and 'belonging'. This is particularly true for Aboriginal communities, for whom rivers are a spiritual and living entity. Many cultural heritage sites occur alongside waterways and totem species may depend on healthy waterways. Fishing is an integral part of the cultural and economic life of many Aboriginal communities. It provides an important source of food and is part of cultural and ceremonial activities. The Aboriginal dreamtime story of the Murray Cod and the legend of the Man from Snowy River are defining elements of Australian culture.



Good waterway condition supports recreational fishing in Victoria. Courtesy DEPI

2.1.3 Environmental values of waterways

Rivers, estuaries and wetlands (see Box 2.3) are important natural assets that support diverse populations of animals and plants. Wetlands provide habitat for brolga that were once spread across much of Victoria and rivers provide habitat for threatened fish species such as Macquarie Perch and Murray Cod. Mammals such as platypus and rakali also depend on healthy waterways. Riparian vegetation alongside waterways, such as the River Red Gum forests in northern Victoria, provides habitat for many terrestrial animal species and a source of energy (via leaves and organic matter) for aquatic invertebrate species. Waterways and floodplains are also vital for the movement and cycling of sediment and nutrients and underpin the rich agricultural soils in many areas of the state. Riparian vegetation is increasingly valued for its role in carbon storage and as habitat corridors in fragmented landscapes.

Wetlands are important for storing and filtering water. Rivers and wetlands are an important interface between the surrounding catchments and the downstream receiving waters of marine ecosystems or terminal lakes. Estuaries are an especially important link between catchments and downstream waters and provide unique habitats of mangroves, coastal wetlands and marshes that are also vital spawning and nursery areas for fish. The location of different types of waterways in a catchment is shown in Figure 2.1.

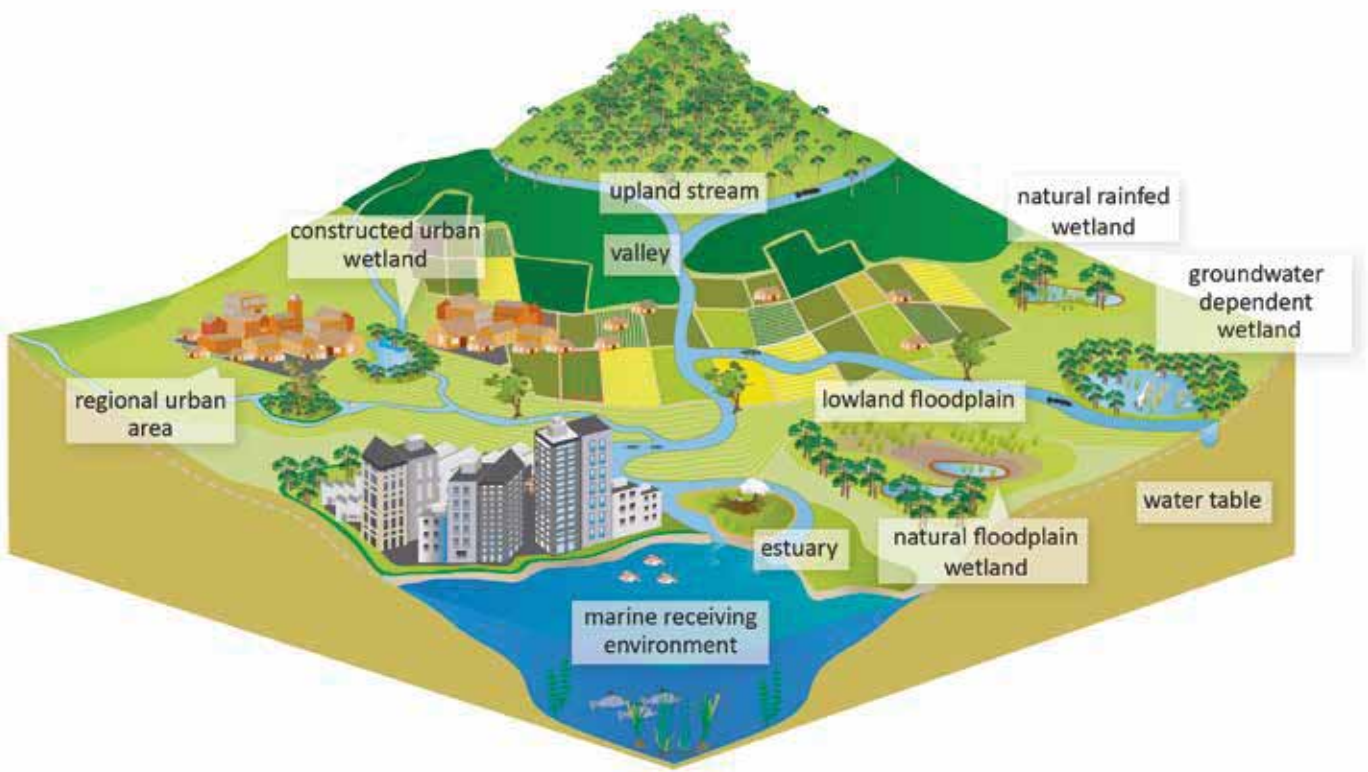


Figure 2.1: Rivers, estuaries and wetlands in a catchment.

Box 2.3: What are rivers, estuaries and wetlands?

The definition of a river encompasses rivers, streams and their tributaries and includes the water, the channel and surrounding land, known as riparian land. Riparian refers to land or vegetation that adjoins a river, creek, wetland or estuary.

Estuaries are where rivers meet the sea and the fresh river water mixes with the salt water of the ocean. The majority of Victoria's estuaries are brackish mouths of rivers and streams that flow directly into the ocean or into large marine bays (such as Western Port, Port Phillip Bay and Corner Inlet). There are more than 100 estuaries in Victoria; 83 of which exceed one kilometre in length. The definition of estuaries also includes coastal inlets (for example, Tamboon Inlet and Anderson Inlet), smaller bays (for example, Swan Bay and Limeburners Bay) and coastal barrier lagoons (for example, Jack Smith Lake and Lake Dennison). These inlets may also be classed as wetlands.

Wetlands are still-water environments, usually occurring where water collects in depressions in the landscape from either surface water or groundwater. Wetlands can include swamps, lakes and peatlands. Some wetlands are dependent on groundwater for their existence; others depend on surface water run-off or large floods from adjacent rivers. The 2013 inventory of Victoria's wetlands recorded 23,739 natural wetlands covering 604,322 hectares and 11,060 artificial wetlands covering 170,613 hectares. Some wetlands naturally have water in them all the time, whilst others naturally dry out for short or long periods of time.



The Mitchell River, East Gippsland. Photographer: Cuc Chong

2.1.4 Understanding the factors that contribute to waterway condition

Over a long period of time, a strong knowledge base about the factors that influence waterway condition has been established. This knowledge has been gathered through observations, scientific studies, experiments and adaptive management. The knowledge base is continually being expanded and improved over time. However, our understanding of the scale of management activities required to improve waterway condition is still far from complete.

Scientific knowledge about waterways was initially based on research and theories from waterways in the northern hemisphere, many of which feature steep catchments with deciduous forests. By contrast, waterways in Australia often include long stretches of meandering channels that flow through wide floodplains with many associated wetlands. Waterways and surrounding catchments are dominated by eucalypt species. Leaves, bark and twigs from these plants have a very different composition than those from deciduous forests and the supply of leaves to Australian waterways lacks the strong seasonal patterns common in the northern hemisphere. Summer shading from riparian vegetation in Australia is also reduced (compared to deciduous trees) due to the shape of eucalypt leaves; this allows a greater role for algae and biofilm production.

Highly variable flow regimes in Australia and the strong influence of global climate patterns, such as El Niño and La Niña⁸, have an overriding influence on the functioning of Australian waterways. Although waterways are located across a vast range of habitat types and land uses in Victoria, there are some fundamental principles from the knowledge base that must be considered when managing waterway condition. These include:

- **the importance of the catchment to waterway condition** – waterway condition is very strongly influenced by the characteristics, processes and actions in the surrounding landscape. For example, the type and extent of catchment and riparian vegetation, regional climate and land use, or landholder behaviour can all have a major influence on waterway condition. Estuaries are a critical link between catchments and the marine environment and poor health of catchments and waterways can affect these downstream environments.
- **recognising natural climate variability** – waterways in Australia experience naturally high levels of hydrological variability; some of the highest in the world. The strong influence of the El Niño has an overriding influence on rainfall patterns across much of eastern Australia. It is also strongly associated with the frequency of extreme events such as flood, and in some cases, bushfire. Communities and managers need to recognise and plan for this inherent variability and be flexible to account for extremes in temperature, rainfall and water availability.

- **maintaining physical and ecological processes** – waterway condition relies on maintaining a wide range of physical and ecological processes including appropriate rates of sediment transport, erosion, nutrient dynamics, processing of organic matter, carbon storage, the structure and functioning of food webs and two-way exchanges of organic material, energy and species between catchments and waterways.
- **understanding the role of connectivity** – human actions often fragment the natural landscape, but the long term survival of species and communities largely depends on their ability to move to different patches of habitat, food and mating partners when required. In waterways, many processes are reliant on the maintenance of water connectivity (longitudinal, lateral and horizontal) and managers must recognise connections between surface water, floodplains and groundwater. However, in some cases, human actions can create connections with negative impacts. The highly connected drainage systems of urban areas deliver large pulses of stormwater to waterways in urban areas with detrimental impacts on waterway condition.
- **facilitating resilience and resistance** – disturbance is a natural and common force affecting waterways, especially in the highly variable climate of Australia. Many species have evolved mechanisms to withstand the effects of disturbance (resistance) or to bounce back after a disturbance (resilience). Facilitating resilience through the identification and protection of refuges for species from disturbances such as drought, bushfire, predation and competition and maintaining connectivity, is vital for maintaining waterway condition. Improving riparian vegetation can help to restore resistance of waterways to events such as floods.
- **understanding patterns of species diversity and habitat requirements** – the occurrence and distribution of species across the landscape is regulated by a range of complex factors such as local catchment characteristics, species life history, competition, predation, colonisation ability and the lottery of species arrivals at new locations. The introduction of exotic species (for example, carp and mosquitofish) has long had serious impacts on native species. Different waterway species have very different habitat requirements and factors such as the location, structure, complexity and spatial arrangement of habitat can influence patterns of species abundance and distribution.
- **providing appropriate hydrological regimes** – altered patterns of flow (from dams, levees, water extraction, urbanisation and constructed drainage systems) can affect waterway condition. Maintaining (or improving) the quantity, quality and timing of water is a major factor for improving waterway condition. Changes in freshwater flows can have significant impacts on estuaries and cause changes to salinity regimes.
- **maintaining appropriate water quality** – the natural variability of the Australian climate results in highly variable water quality, which native plants and animals have evolved to cope with. Nonetheless, water quality can be limiting to their survival; this commonly occurs when salinity levels are too high or when oxygen levels drop too low. Within urban and agricultural environments, pollutants can also be a significant problem.



Growing Grass Frog. Courtesy Wimmera CMA



Salinity at Karadoc Swamp. Photographer: Brigid Hussey

2.1.5 Impacts of declining waterway condition

When waterway condition declines, the values that waterways provide can be degraded or lost. Values that are most dependent on environmental condition (such as clean drinking water) are lost first and those values with less reliance on condition are then gradually affected. Even irrigation water and drinking water for stock can become unusable if the water quality is too poor.

Recreation and tourism industries are heavily reliant on healthy waterways. Declines in waterway condition can have flow-on effects for regional and urban economies. The recreational fishing industry alone contributed approximately 5,200 jobs in Victoria in 2008/2009. When poor water quality or reduced environmental flows impacts on fish numbers, the opportunities for recreational fishing also decline.

Declining waterway condition can also lead to direct economic costs for communities (see Box 2.4). Poor land management can result in a deterioration of water quality and hence high costs for water treatment. Poor water quality, in turn, can trigger algal blooms leading to costs associated with providing alternative water supplies, cessation of irrigation, closure of recreational lakes and loss of recreational and tourism revenue. Accelerated erosion of riverbeds and banks may cause loss of valuable land or public infrastructure, such as roads and bridges. Other costs will not be able to be measured in economic terms. For example, over extraction of water affects diversity and abundance of many native aquatic plants and animals.

Communities have become increasingly aware of environmental problems and they value improvements in environmental condition. Farmers, Landcare networks and other community action groups play a significant role in contributing to improvements in the environmental condition of waterways through better on-farm management practices, local planting days and pest plant and animal control. Some of the gains in environmental condition from restoration work can be measured in economic terms. A study in the Goulburn Broken region on the economic value associated with improvements to the health of rivers found that protecting 30 km of riparian vegetation along a large inland river would generate around \$12.5 million worth of environmental health benefits⁹.

Box 2.4: Economic costs associated with declining waterway condition

Declining environmental condition in waterways can have significant economic (and other) costs for regional and urban economies. Estimates of the economic costs of algal blooms show that:

- the direct economic impact on the tourism industry of the blue green algae bloom that built up in the Gippsland Lakes in late December 2007 and continued into 2008 was over \$18.2 million¹⁰. A study is currently being undertaken to determine the effects of the late 2011/early 2012 algal bloom in the Gippsland Lakes.
- the net employment impact on the Victorian economy from the 2008 Gippsland Lakes algal bloom was 90 jobs¹⁰.

Aquatic invasive species control can also be very expensive:

- approximately \$10 million is spent annually controlling willows in Victoria
- the management of carp in Australia has been conservatively estimated at \$15.8 million annually¹¹.

River erosion can result in the loss of valuable land, private assets and public infrastructure (for example, bridges and roads), particularly during floods:

- the cost of river-related flood recovery programs in Victoria from the 2010/11 floods was approximately \$23 million¹²
- the cost of river-related flood recovery programs in Gippsland from the 2007 floods was approximately \$11 million¹².

2.2 The types of waterways based on their environmental condition and values

The environmental condition of waterways in Victoria varies from excellent through to very poor (see Section 3.2), reflecting the fact that some waterways are largely unmodified but others are intensively used and highly modified.

The environmental condition of a waterway has a strong influence on the types of values present. A waterway with excellent environmental condition often has many natural values. Waterways in moderate environmental condition may have few natural values, but high social and recreational values. For management purposes, it is useful to consider the typical values associated with waterways in different environmental condition because this assists with setting realistic targets and objectives that reflect the level to which a waterway is modified. Simple conceptual groupings have been developed to describe these different types of waterways (see Figure 2.2), although these groups are not necessarily mutually exclusive and do not have clearly defined boundaries between them.

Near natural waterways

Waterways that are in a near natural state contain almost all of the naturally occurring environmental values and are likely to be found within largely unmodified catchments. These environmental values may include most species that would have been present prior to European settlement and a high degree of naturalness for bird, fish, aquatic invertebrate and plant communities due to limited human impacts. Near natural waterways may also have special environmental features such as drought refuges, or important bird habitat for internationally protected species.

These systems are generally unregulated with close to natural water regimes and water quality. They are usually formally recognised for their environmental significance. All the major habitat features are present and both lateral and longitudinal connectivity exists. Near natural waterways are in a natural state along their entire length (for example, from 'the source to the sea') and generally occur in National or State Parks. Near natural waterways are enjoyed by those pursuing recreation in remote natural areas. Many indirect services are provided by waterways in a near natural condition, including nutrient cycling and water filtration. Some examples of near natural waterways in Victoria are small coastal streams and wetlands contained within the Great Otway National Park and in far East Gippsland.

Ecologically healthy waterways

Ecologically healthy waterways have the major ecological features and functioning of ecosystems prior to European settlement and generally exist where surrounding catchment condition is not heavily impacted. However, some change from a near natural state has occurred due to the level of human use that has impacted on environmental condition. These systems still have many important environmental values, including some rare or threatened species. Bird, fish, aquatic invertebrate and plant communities may still have a relatively high degree of naturalness. The risk that these environmental values will be compromised in the future is generally low. Linkages between rivers, floodplains and associated wetlands are still present to an extent that they are able to maintain important ecological processes. Riparian vegetation exists along the majority of the system and few exotic species are present.

Ecologically healthy waterways are often found in National or State Parks and largely forested catchments and may provide clean water supplies and habitat for rare or threatened species present. These waterways might also be important drought refuges in the landscape and be more resistant to the effects of flooding, which means lower costs for repair and maintenance after flood events. They are often enjoyed for their natural scenic values and are generally more accessible for recreational and tourist activities than near natural waterways. Ecologically healthy waterways may support Aboriginal cultural values, such as totem species. A river may be ecologically healthy along part of its length, such as the upland section, and become highly modified in other sections (for example, downstream of a major dam).

Sustainable working waterways

Sustainable working waterways have lost some environmental values due to more intensive levels of human use and modification. However, many environmental values that are required for key ecosystem processes and functioning are maintained. The condition of surrounding catchments is likely to be moderate or poor. This is due to the level of human activities and use that have degraded the environmental condition of the waterway. Water regimes are likely to have been significantly altered. However, there is sufficient water to maintain plants and animals through dry times and to provide for recovery in wetter years. There may be some threats present from poor water quality, but it should be adequate to maintain the key values present in the waterway. Several exotic species may be present and in some areas the riparian zone may be significantly degraded.

The capacity for fish to move up and down rivers may be restricted in places by barriers such as weirs and road crossings. Some areas of the floodplain, including floodplain wetlands, may be disconnected from the river. However, overall, many important natural features and functions are still present. It is important to note, however, that the environmental values will often require ongoing management for them to persist into the future.

Sustainable working waterways often support important social and economic values, especially in regional Victoria, and are not necessarily unhealthy. Importantly, these systems do continue to support some environmental values. They often occur in agricultural or peri-urban landscapes and provide for many recreational pursuits, such as water sports, camping and picnicking. Sustainable working waterways also typically supply water for urban and rural uses, for hydro-power production, and act as water carriers and wastewater discharges. A balance of different values is retained in working waterways despite the fact that some elements of environmental condition have been traded off to accommodate a certain level of use human use or activities.

Highly modified waterways

In highly modified waterways, most environmental values are lost or are at risk of being compromised. Surrounding catchment condition is often poor or very poor and may be highly modified or urbanised. Both the water quality and water regimes are often insufficient to maintain environmental values in the long-term. Many threatening processes (such as a loss of connectivity and riparian vegetation) are severe. There is a high level of human activity that has impacted on the environmental condition, but some economic values are provided. Highly modified waterways generally occur in areas of intensive agriculture or in highly urbanised environments.

Social values, such as recreational pursuits and amenity, may be low in agricultural areas where access is limited. However, some highly modified urban systems may provide significant social values due to their proximity to areas of high human population density. In urban areas, highly modified waterways often provide important values, such as flood protection and drainage.

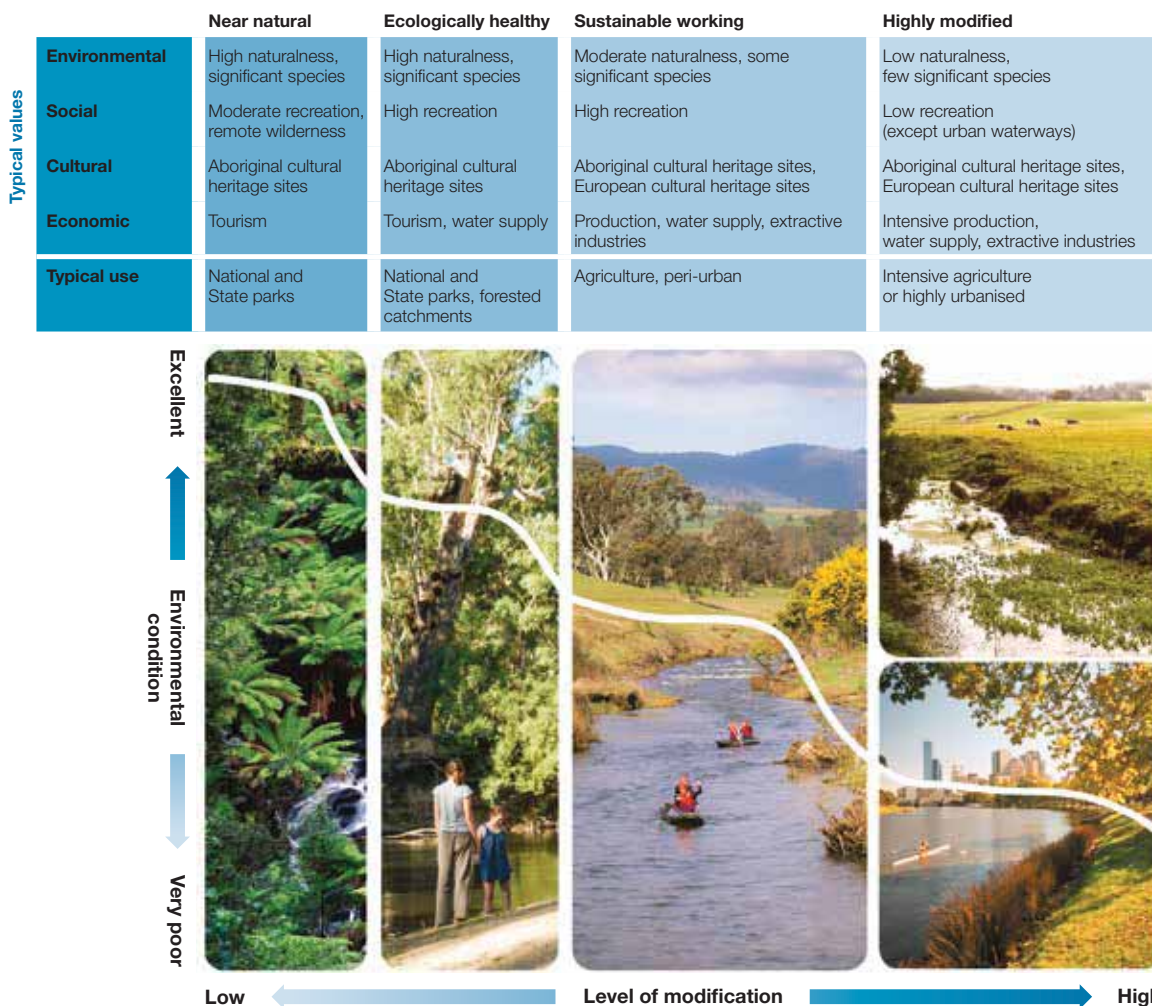


Figure 2.2: Types of waterways depending on their values, condition and typical uses.

2.3 Achievements of the Victorian River Health Program (2002–2012)

Over the past decade, the Victorian River Health Program has worked to improve river condition by undertaking a range of management activities including; environmental water management, improving instream habitat and revegetating or fencing off riparian areas through voluntary partnerships with landholders.

In Victoria these management activities are undertaken by waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) in partnership with government, landholders and community groups (see Section 3.6). Significant funding for these activities comes from water corporations, who are legally required to contribute towards initiatives to improve the sustainable management of water (called the Environmental Contribution). The Environmental Contribution (EC) provided \$54 million to undertake activities to improve waterway health from 2004–2008 and a further \$87 million for 2008–2012. The next phase (2012–2016) of committed funding from the EC is \$107 million, which will build on the success of past management efforts.

State government funding is also provided to waterway managers for undertaking statutory functions in relation to waterway management (see Section 18.4.1).

These fund sources are complemented by additional State government funding and federal initiatives, such as the Caring for our Country program (see Section 18.4 for further detail on funding arrangements).



Tree planting at Grangeburn Wetland. Courtesy Glenelg Hopkins CMA

Landholders and community groups also contribute, often by donating their own time and resources to undertake works, or applying for alternative sources of funding from local or federal government.

The *Victorian River Health Program Report Card 2002–2009*¹³ showed that progress on implementing management activities in priority areas has been excellent. The river length accessible to native fish has increased, some improvements to river and floodplain linkages have been completed, processes for improving environmental flows in stressed river reaches have been put into place and thousands of kilometres of riparian vegetation have been protected (see Box 2.5). A recent survey of riparian works and landholder attitudes found that the majority of landholders involved in managing riparian land reported no loss of productivity across their property and felt the health of the waterway had improved as a result of the works¹⁴. Nearly all survey respondents were willing to recommend riparian works to other landholders¹⁴. Work on local priority areas by landholders and community groups across the catchment complements the work undertaken by the waterway managers and extends the reach of environmental works beyond that which government investment can achieve alone.

Box 2.5: Victorian River Health Program Report Card 2002–2009

Improving the condition of waterways across the state is a long-term goal that requires strategic planning and investment by government and community. Despite the drought, the *Victorian River Health Program Report Card 2002–2009* showed great progress was made over the past decade. Some of the key achievements highlighted in the report include:

- 402 gigalitres of water was recovered; improving environmental flows in 71 river reaches – far exceeding the 2011 target set for improvements to 20 river reaches
- fish passage has been provided at over 150 locations by removing obstructions and building fishways and allowing fish to move into 7,000 km of rivers and streams - tripling the overall target
- 6,473 management agreements with landholders were established and 7,066 km of riparian fencing and other protection measures improved the condition of 25,351 ha of high priority frontage
- more than 600 groups, comprising of 2,300 volunteers, regularly monitored rivers in more than 1,900 sites across the state.

Management activities outlined in the *Victorian River Health Program Report Card 2002–2009* were undertaken against the backdrop of challenging climatic conditions. This period coincided with a severe 13-year drought that affected rainfall and streamflow across south-eastern Australia and degraded the condition of waterways across the state. Management activities by waterway managers, landholders and community groups helped slow the rate of decline for many systems (see Section 3.2). A shift towards protecting drought refuges to avoid critical loss of species and habitats during the drought helped to improve the resilience of waterways. The last few years have seen a return of high flows, which have improved the environmental condition of many waterways and species that inhabit them. Large-scale riparian revegetation programs have also proven beneficial during recent flood events by reducing the occurrence and scale of flood related channel change¹².

While excellent progress has been achieved in undertaking management activities, there is likely to be a time lag before all the improvements in river condition will be seen. Depending on the activity and the scale at which it is undertaken, this can be anything from less than one year for the installation of a fishway, to 25-50 years for the full environmental benefit of riparian management programs. Nevertheless, we are starting to see the benefits of our efforts. For example, entire sub-catchments in East Gippsland have now undergone riparian improvement through fencing, revegetation and other complementary works (Figure 2.3a and 2.3b). Benefits from this work include improved habitat for birds, insects and mammals; reduction in erosion and channel change during flood events; shading and organic inputs to waterways from trees; and improved water quality.



*Waterwatch volunteer monitoring, Kiewa River.
Courtesy North East CMA*



a)



b)

Figure 2.3: Genoa River, East Gippsland in a) 1989 and b) 2009 following riparian management programs.

2.4 The next step: progressing the policy framework

Although the progress of waterway management in Victoria over the last decade has been positive, many challenges remain.

A review of the *Victorian River Health Strategy*¹⁵ highlighted several key improvements required to progress the state policy framework. This Strategy provides an updated framework for managing waterways in Victoria that incorporates those lessons learnt over the past decade.

2.4.1 Managing all waterways within a single framework

Victoria has a long history of integrated catchment management that recognises improvements in the environmental condition of land, water and biodiversity cannot be achieved in isolation from each other. Similarly, rivers should not be managed in isolation from the management of wetlands, estuaries and marine receiving waters. This requires the policy framework outlined in the *Victorian River Health Strategy*¹⁶ to be expanded and updated to incorporate the management of estuaries and wetlands and consideration of impacts on marine receiving waters; providing a single management framework for all waterways in Victoria (see Chapters 3 and 4).

2.4.2 Directing investment to regional priorities

Priority setting is a key task in waterway management. Government investment must be directed to activities that provide the most efficient and effective long-term improvements in waterway condition and the greatest community benefits. A clear process for setting regional priorities is required. It should consider the environmental, social, cultural and economic values of waterways (see Section 4.2.3) and the level of risk to those values.

2.4.3 Setting practical objectives for waterways

The objectives for waterway management need to be practical and recognise the types of values present in a given waterway. If a waterway is in very good environmental condition, then aspirations to protect the current condition are appropriate. If a waterway is highly regulated and modified, the proposed environmental objectives and outcomes should be based on the concept of a sustainable working waterway and management activities should focus on balancing the key values still present. Aiming to greatly improve the environmental values of highly regulated and modified systems may be unrealistic and not cost effective. It is recognised that there can be different management objectives for waterways depending on their current condition and future outlook.

2.4.4 Using environmental water efficiently and effectively

Victoria has a clear framework for making decisions about water allocation and entitlements. This includes a share of water for the environment (see Section 8.1). The framework for making decisions about water allocation and entitlements has been strengthened in recent years with the development of the four regional Sustainable Water Strategies (SWSs) to plan for long-term water security across the state. This has been the main mechanism for making decisions about additional water required for environmental needs.

The key task for waterway management now, is to ensure that the water set aside for the environment is used as efficiently and effectively as possible and that its management is comprehensively integrated with other management activities. Efficient use of environmental water also means that less water recovery is required, which will help to reduce social and economic impacts on agricultural production and regional communities.

The establishment of the Victorian Environmental Water Holder and new planning processes for environmental water management are significant advances in this area (see Chapter 8).

2.4.5 Recognising working waterways need ongoing management

Whilst the protection of Victoria's few waterways that remain in excellent condition is vital, it must be recognised that the majority of onground works and active environmental water management will occur in systems where some decline in condition has occurred. Ongoing works include activities to improve habitat, water quality, water regimes and connectivity, such as riparian fencing and revegetation, erosion control, provision of fish passage, instream habitat improvements and the delivery of environmental water, where available. It is the waterways where trade-offs between human use and environmental condition have occurred that require high levels of ongoing management in order to prevent further degradation or improve their environmental condition where possible. Maintenance activities are also critical to ensure investment in onground works is protected over time (see Section 3.7).

2.4.6 Strengthening community partnerships in waterway management

Waterway management in Victoria is undertaken as a partnership between government, landholders and the community. The partnership approach will be further strengthened by providing opportunities for communities to participate in planning, implementing and monitoring regional work programs for waterways (see Chapter 5). Victorian Traditional Owners will be recognised as important partners in the regional management of land and water (see Chapter 6).

Community ownership and care of waterways are critical to maintaining waterway condition. Stewardship will continue to be encouraged and community engagement programs will build on the community's appreciation of the values that waterways provide. To assist in capacity building, access to knowledge will be provided by making data publicly available and through education programs.

2.4.7 Managing through droughts, bushfires and floods

The management framework outlined in the *Victorian River Health Strategy* did not have the flexibility to consider how priorities and management activities could be modified in response to events such as droughts, bushfires and floods. The recent prolonged dry period, followed by major flooding in many parts of the state in late 2010 and early 2011, proved very challenging to address under that framework. Drought, bushfires and floods have highlighted the need for a more flexible and adaptive approach that is robust under a range of conditions (see Section 4.2.5). Clearly defined response, funding and recovery mechanisms to address extreme bushfire and flood events are also required (see Chapter 15).

2.4.8 Planning for the potential impacts of climate change

The climatic conditions experienced in Victoria over the past 15 years included a severe 13-year drought but also some of the worst floods in the state's history. In the period 1997–2009, rainfall and runoff in south-eastern Australia

were reduced by more than 50 per cent in many areas¹⁷. This severe drought was followed by widespread flooding between September 2010 and February 2011, during one of the strongest La Niña events ever recorded. The range of current climate change scenarios show that Victorian waterways could be subject to longer and more frequent droughts punctuated with more severe large storms and floods. However, although climate scientists generally predict Victoria's climate will get drier and more variable, it is difficult to predict how climate change will affect long-term rainfall in individual catchments. It is important to plan for a full range of possible future climate scenarios and natural climate variability. Management objectives for waterways and regional work programs therefore need to consider the full range of possible climate conditions during planning phases (see Section 4.2.5).

2.4.9 Using new knowledge and an updated adaptive management approach

The current framework for the management of waterways in Victoria is an adaptive one. There is the capacity to change management strategies on the basis of improved knowledge, new research and better management processes. New baseline information on waterway condition and the Victorian community's perceptions of waterways will continue to be collected and inform waterway management decisions. Evidence-based logic models (see Section 17.2.1) will be used to identify the most appropriate management activities to reduce particular threats to waterways and highlight priority areas for further research (see Chapter 17).



The Wimmera Rowing racecourse during drought. Courtesy Wimmera CMA



3

Strategy approach

*Royal Spoonbill on Reedy Swamp.
Photographer: Keith Ward*

Strategy approach

Guide to the chapter

3.1 Vision

3.2 Current condition of waterways

- Rivers
- Wetlands
- Estuaries

3.3 The role for government in waterway management

3.4 Management objective

3.5 Management approach

- Recognising the importance of waterways with formal international, national and state significance
- Implementing and maintaining onground works and managing environmental water in priority waterways
- Fostering strong community partnerships
- Using regulation (legislation and statutory processes)

3.6 Implementing the approach: the Victorian Waterway Management Program

3.7 Guiding principles

3.8 Program logic and Strategy targets

- Program logic for the Victorian Waterway Management Program
- Strategy targets

3.1 Vision

The Victorian Government understands that waterways are important to the community and are a fundamental part of our common heritage.

Waterways have many environmental, social, cultural and economic values that underpin productive and liveable cities and regional towns.

Managing our waterways is a long-term task that requires an understanding that many of the things we value (for example, high quality drinking water and recreational fishing opportunities) depend on the environmental condition of waterways.

The vision for Victoria's waterways is:

Victoria's rivers, estuaries and wetlands are healthy and well-managed; supporting environmental, social, cultural and economic values that are able to be enjoyed by all communities.



Looking out over the Morass. Photographer: Simon Dillinger

3.2 Current condition of waterways

The condition of waterways in Victoria is periodically assessed by the Department of Environment and Primary Industries (DEPI) using the Index of Stream Condition, Index of Wetland Condition and the pilot Index of Estuary Condition (see Section 17.3.4). These resource condition assessment programs collect detailed information about water quality, water regimes, physical form, vegetation and aquatic life and combine this information to score the overall health of a section of waterway (from very poor to excellent).

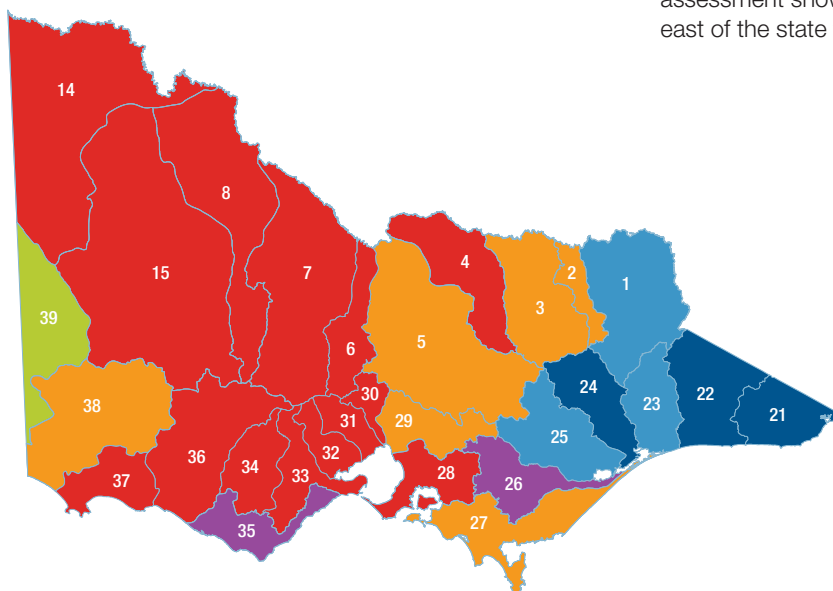
These assessment programs provide the most comprehensive, statewide information available on waterway condition in Victoria. The information from these assessment programs is also used by other organisations that have environmental reporting obligations. This includes the Victorian Catchment Management Council (who report on catchment condition every five years) and the Commissioner for Environmental Sustainability (who prepares the State of the Environment of Victoria reports). It is important to note that these organisations do not collect their own, independent sources of data on waterway condition.

The Victorian Catchment Management Council (VCMC) released their fourth assessment of the condition and management of land and water resources in Victoria in late 2012. The report highlighted that there is limited ongoing monitoring, reporting and evaluation of the condition of land and water resources on a systematic, statewide basis.¹ An exception to this is waterway condition assessment programs run by the DEPI. The Index of Stream Condition (ISC) program is described by the VCMC as a generally consistent, integrated method for reporting on the condition of rivers in Victoria.

For more information and copies of reports go to: www.depi.vic.gov.au/water/water-resource-reporting then follow the links to the Index of Condition System.

3.2.1 Rivers

The ISC was first used to benchmark the condition of Victoria's rivers in 1999. It provided a broad classification of the condition of Victorian rivers. In general, it showed that river basins in the east of the State were in better condition than those in the west. The second and third ISC assessments (representing 26,000 km of major rivers and tributaries) were conducted in 2004 and 2010 respectively. The second ISC found that no major changes had occurred to the condition of Victoria's major rivers and tributaries since the first assessment in 1999. While no general improvement was detected, overall deterioration in stream condition appeared to have been controlled. The third ISC assessment showed that condition remains better in the east of the state than the west (see Figure 3.1).



Environmental Condition

| | |
|--|-------------------|
| | >70% |
| | 51-70% |
| | 31-50% |
| | 11-30% |
| | <10% |
| | Insufficient Data |

Basin Names

| | | | |
|----------------|-------------------|--------------------|--------------------|
| 1 Upper Murray | 14 Mallee | 27 South Gippsland | 35 Otway |
| 2 Kiewa | 15 Wimmera | 28 Bunyip | 36 Hopkins |
| 3 Ovens | 21 East Gippsland | 29 Yarra | 37 Portland |
| 4 Broken | 22 Snowy | 30 Maribyrnong | 38 Glenelg |
| 5 Goulburn | 23 Tambo | 31 Werribee | 39 Millicent Coast |
| 6 Campaspe | 24 Mitchell | 32 Moorabool | |
| 7 Loddon | 25 Thomson | 33 Barwon | |
| 8 Avoca | 26 LaTrobe | 34 Corangamite | |

Figure 3.1: Percentage length of rivers in each basin with good or excellent condition in 2010.

Two basins in the east had more than 70% of their length in good or excellent condition including the East Gippsland and Mitchell basins (the Snowy basin had 69.7% of its length in good or excellent condition). However, the majority of river basins in Victoria had less than 10% of their river length in good or excellent condition (15 basins in total). These river basins are mostly located in the western part of Victoria and have generally been extensively cleared for agriculture.

Overall, river condition has remained relatively stable since the last ISC assessment. This is an encouraging result, given that the data collected in the third assessment period (2004-2010) coincided with the end of the severe Millennium drought in south-eastern Australia. Management activities (including fencing, revegetation, weed control and environmental watering) undertaken by the waterway managers in each region have likely played an important role in minimising the impacts of the drought and should assist with future improvement in condition. The major floods that occurred across most of Victoria in 2010/11 provided a critical opportunity for waterways to recover after the drought by increasing environmental water availability, re-connecting isolated pools and wetlands and triggering breeding events for many native fish and birds.

3.2.2 Wetlands

The health of Victoria's wetlands is assessed using the Index of Wetland Condition (IWC). In 2009/2010, the IWC was used to benchmark the condition of almost 600 high value wetlands. The assessment found that 24% of high value wetlands were in excellent condition, 32% in good condition, 30% in moderate condition and 13% were in poor condition and 1% in very poor condition. Overall, a higher proportion (65%) of wetlands on public land were in good or excellent condition than on private land (39%) (see Figure 3.2).

3.2.3 Estuaries

A pilot program, the Index of Estuary Condition (IEC), has recently been undertaken to trial methods for assessing the health of Victoria's estuaries. This preliminary program showed that estuaries were least modified in area's of West Gippsland and far east Gippsland. There were substantial modifications to some estuaries in western Victoria and Port Phillip Bay. Water quality data for Victorian estuaries was patchy, with no clear patterns across the state. There was also no clear pattern of bank erosion in estuaries across the state, although the central coastal region tended to have slightly worse bank condition.

It is clear from these assessments that there is still much work to be done to maintain or improve waterway condition across Victoria. This requires a strategic and co-ordinated program, coupled with significant investment in waterway management activities.

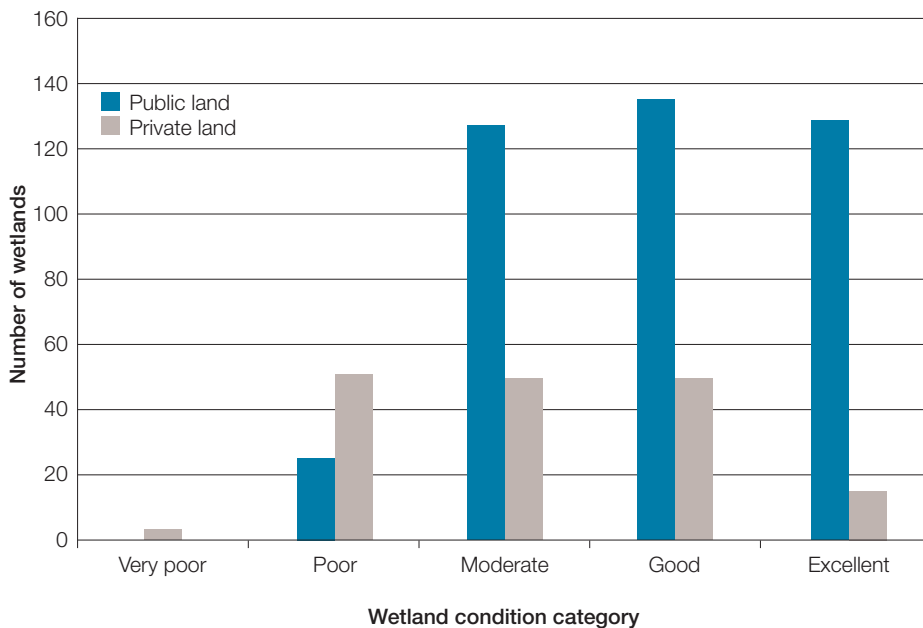


Figure 3.2: The condition of wetlands on public and private land in 2009/10.

3.3 The role for government in waterway management

Waterways provide a wide range of public goods and benefits for people and communities (for example, high quality drinking water, opportunities for fishing and swimming, or scenic places where people can observe wildlife and connect with nature).

However, public benefits can be affected by the actions of individuals, industry and government. This raises the question of who is responsible for maintaining public benefits? The answer requires consideration of some basic economic theory and the role of government regulation or intervention in a market economy.

Market failure in delivering public goods and benefits

In a free market, prices of goods and services provide signals to consumers and producers that should lead to an optimal allocation of resources that satisfies all parties. However, free markets can sometimes fail at providing socially optimal outputs of goods and services. Market failure can occur when an individual or business does not have to account for the full benefits and costs of their actions and they make decisions that are optimal for their purposes, but not optimal from a societal point of view.

The most common example is a business producing a good or service that does not have to pay the costs associated with pollution (instead these costs are spread across society). This is known as a negative externality. Market failure is also common in relation to the provision of public

goods or benefits, such as maintaining the condition of waterways or protecting biodiversity. This is because private firms generally can't make money from supplying public goods since they cannot exclude people from accessing the benefits without paying for them.

Where there are market failures in delivering public goods and benefits, this can be a trigger for government intervention. Government intervention to improve waterway condition is generally only warranted where the benefits of the intervention exceed the costs.

Types of tools to address market failure

There are a wide range of tools and approaches that can be used to address market failure in delivering public goods and benefits. These include direct government investment, market based instruments (for example, grants, subsidies, trading and auctions), information provision (research and development, or extension) and regulation. Different tools are appropriate for different situations depending on the mix between public and private benefits². For example, government should not invest heavily in information provision and extension activities for landholders if it requires landholders to undertake costly actions because they would be unlikely to implement those actions. In such a case, a more appropriate intervention by government might be a positive incentive (for example, a financial incentive to encourage behaviour change such as funding for fencing). Section 4.2.4 provides an overview of the main tools and approaches that can be used in waterway management and the general circumstances in which they should be applied.



Ramsar site; Kerang Wetlands. Courtesy DEPI

3.4 Management objective

Many of the values* provided by waterways rely on the environmental condition of those waterways. When environmental condition is degraded, some of these values may be diminished or lost. This means that communities are less able to enjoy and use waterways and, in some cases, significant social and economic costs can be incurred. For example, a reduction in waterway condition (such as from algal blooms) can reduce recreation and tourism opportunities while also affecting rare or threatened native species.

The environmental condition of waterways is determined by key drivers such as habitat, water quality, water regimes and connectivity (see Figure 3.3). Broader catchment condition, land use, natural events such as floods and bushfire, development and the potential impacts of climate change can all directly influence the environmental condition and values of waterways.

Waterway management needs to consider how all factors (both natural and anthropogenic) affect waterway condition and therefore the values of waterways. Waterway management activities will be targeted towards the key drivers of environmental condition that support the multiple values of waterways.

It is important to note that management activities will primarily focus on maintaining and improving the environmental condition of waterways to provide public benefits. Public benefits include environmental, social and cultural values, in addition to economic values where they are important to a region (for example, water sources for domestic use or production). Private individual benefits (for example, profits from grazing livestock in riparian areas) will be supported where they do not significantly compromise the public benefits.

*Key term – Values

'Values' of waterways include environmental, social, cultural and economic values. An agreed list of values for consideration in regional waterway management programs has been determined by the waterway managers and an expert panel (see Appendix 4.1 for the list of these values). Data on the values contained in each major waterway will come from the Victorian Government, regional agencies and local knowledge (see Chapter 4, Box 4.1).

Policy 3.1

The management objective is to maintain or improve the environmental condition of waterways to support environmental, social, cultural and economic values.

Management activities will focus on maintaining or improving the environmental condition of priority waterways to provide public benefits.

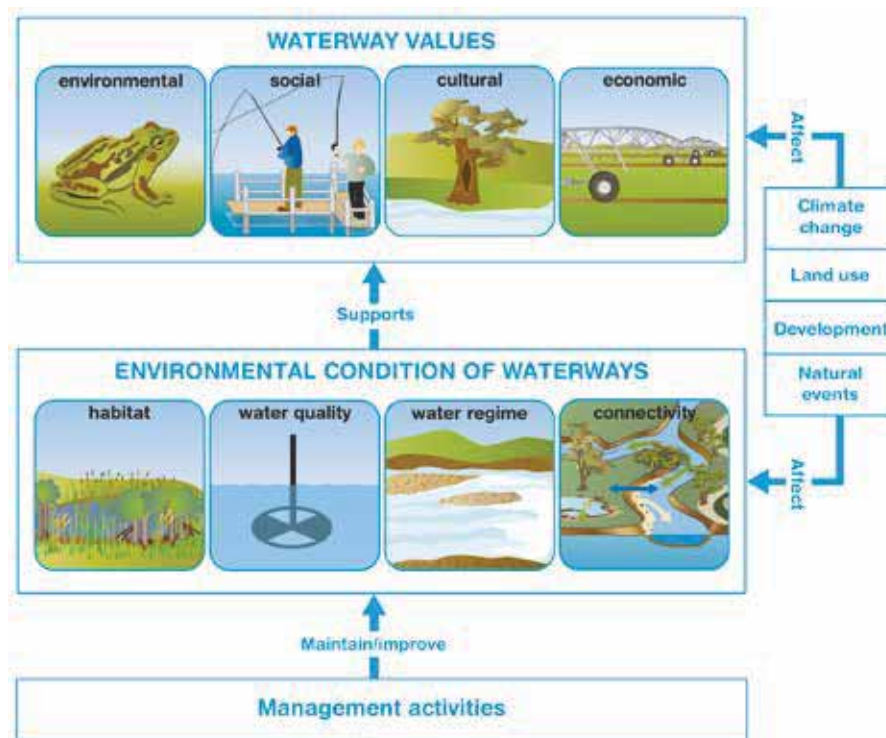


Figure 3.3: The drivers of environmental condition that support the values of waterways.

3.5 Management approach

Policy 3.2

The approach for managing waterways involves four key elements:

- recognising the importance of waterways with formal international, national and state significance
- implementing and maintaining onground works and managing environmental water in priority waterways
- fostering strong community partnerships
- using regulation (legislation and statutory processes).

Managing the serious risks to public infrastructure from waterway processes will be considered as part of implementing the management approach.

3.5.1 Recognising the importance of waterways with formal international, national and state significance

There is a small number of Victorian waterways that have been formally listed or are otherwise recognised as significant for their high conservation, recreation and/or cultural value. These include Ramsar wetlands, Heritage Rivers, waterways in National Parks and more (see Appendix 4.1). Formal recognition can occur at international, national and state level and may result from the passing of legislation, international agreements or state policy decisions.

Waterways with formally recognised significance are important to all Victorians, but also to all Australians and the broader global community. They will be protected by upholding any obligations that may exist under legislation and implementing government approved recommendations for their management.

Waterways with formally recognised significance will be identified as high value waterways in regional priority setting processes (see Section 4.2.3) and their management addressed through regional waterway management programs (see Section 4.2). Ongoing works will be targeted at maintaining or improving the environmental condition of these significant sites. Programs to promote awareness of these important waterways, and to foster community work in these areas, will also be undertaken.



*The Mitchell River is a designated Heritage River.
Photographer: Cuc Chong*

3.5.2 Implementing and maintaining onground works and managing environmental water in priority waterways

In addition to sites of international, national and state significance, there are also waterways that are regionally important for their high values. Although not formally listed or recognised through international, national or state processes, these waterways should also be considered for management activities to maintain or improve their environmental condition. These waterways will be identified as high value in regional priority setting processes and their management addressed through regional waterway management programs (see Section 4.2).

Regional waterway management programs will co-ordinate onground works and environmental water management for priority waterways. Ongoing works include activities such as riparian fencing and revegetation, erosion control, provision of fish passage and instream habitat improvements. Maintenance activities are also critical to ensure that investment in past onground works is protected. This is because physical works such as fencing or fish ladders can have their function impaired over time if they are not regularly maintained. The management of environmental water includes the delivery of specific environmental water entitlements to priority watering sites, development of local management plans for small stream diversions, operating agreements or passing flows through water storages (see Chapter 8).

Regional waterway management programs will also give consideration to managing the serious risks to public infrastructure from waterway processes (for example, floods, erosion and avulsion). The construction and function of public infrastructure, such as bridges, roads, weirs, pipelines and cables, is vitally important to communities. However, this infrastructure can have negative effects on waterways and must therefore be built and managed by the owner in a way that reduces these effects. Standards for the engineering design of public infrastructure are already in place to ensure any new structures are resilient to an acceptable level of risk from waterway processes. It is critical that these standards are enforced and regularly reviewed.

Additionally, public infrastructure can be affected by waterway processes. The protection of public infrastructure has long been a function of waterway management activities. Ongoing actions (for example, erosion control) to manage the serious risks to public infrastructure will be considered in regard to their costs and benefits in the development of regional waterway management programs (see Section 4.2.3). By identifying the risks to public infrastructure and managing them before they become severe, the long-term economic costs to the community will be reduced. More detailed management arrangements for new and existing structures in waterways are outlined in Section 18.6.

This Strategy provides policy direction to guide regional decisions about the use and integration of onground works and environmental water management. Ongoing works can be undertaken by communities in any waterway across Victoria, but limited Government funding means that State investment must be targeted towards priority management activities that are undertaken to a pre-defined standard.

A regional priority setting process for waterways is necessary to ensure that available funding is spent in the most effective way (see Section 4.2.3). Government may not initiate or fund work on sites of local priority if the work does not align with priorities identified in regional waterway planning processes. However, it is recognised that these sites may be targeted by local community groups and can attract other sources of funding such as local government or Australian Government grants and private or philanthropic donations. These groups will be supported by the provision of information to build local capacity.

3.5.3 Fostering strong community partnerships

Waterway management is an ongoing task that requires both long-term commitment and a true partnership between Government and communities. Individual landholders and businesses are relied on to manage their own actions and enterprises in ways that meet their 'duty of care' and recognise their role as stewards of land and water resources. Good land management is also vital to ensure that the condition of waterways downstream is not affected.

Strong management partnerships are also vital, particularly for the management of riparian land adjacent to farming land. Government can provide assistance to landholders to undertake management activities to improve waterway condition, such as fencing and offstream watering points for livestock. Government and regional agencies work closely with all landholders that have waterways on, or adjacent to, their property by providing advice, assistance and funding.

Victorian Traditional Owners are important partners to the Victorian Government in waterway management due to their long connection to the land and water. They have a vast knowledge of native plants and animals and can make a valuable contribution to integrated catchment management. This is recognised by the Victorian Government through formal agreements with Traditional Owner groups and joint or co-operative management arrangements for some areas. Further detail regarding Victorian Traditional Owner and Aboriginal involvement in waterway management is provided in Chapter 6.

All individuals across Victoria can be actively involved in improving waterway condition by participating in community groups and networks, such as Waterwatch, Landcare, EstuaryWatch and 'Friends of' groups. These groups often take part in habitat restoration or monitoring activities to help inform decision making and waterway management. They also provide an opportunity for interested community members to increase their knowledge about waterways and be actively involved in improving the environmental condition of areas that are of high local importance to them or their group.

Government funding cannot address all of the waterway management issues in every waterway across Victoria. Therefore, community groups are vital for undertaking work in areas that are a local priority and for attracting additional sources of funding for waterway management activities. Government provides support to these groups through actions such as the funding of Landcare and Waterwatch facilitators. Waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) also include education and awareness activities as an integral part of their regional waterway management programs.

All community members can participate in regional waterway management planning through input during the development of regional waterway management programs. These regional planning processes provide a mechanism for setting practical management objectives for waterways and making decisions and trade-offs about the types of values to be maintained or improved. To facilitate this involvement, waterway managers run community engagement sessions and public consultation periods during the development of regional waterway management programs. Further detail about community involvement in waterway management is outlined in Chapters 4 and 5.

3.5.4 Using regulation (legislation and statutory processes)

Regulatory approaches are commonly implemented through provisions in legislation, statutory processes or, in some instances, through the planning system.

Legislation

Controls over the use and management of land, water and biodiversity are already in place. These controls are generally in the form of legislation. There are many pieces of legislation that exist at both the Commonwealth and State level that are relevant to waterway management (see Appendix 3.1). Fulfilling the obligations of this legislation is a vital component of waterway management (for example, issuing works on waterways licenses in accordance with the *Water Act 1989*). This legislation also sets out important management frameworks, such as the water entitlement and allocation framework under the *Water Act 1989*. A review of the *Water Act 1989* is currently underway to streamline Victoria's water legislation (see Section 1.2.1).

Pollution control

The control of point source pollutants is achieved primarily through a range of regulatory mechanisms. The Environment Protection Authority (EPA) Victoria uses mechanisms provided under the *Environment Protection Act 1970* to prevent direct discharges of pollutants to waterways or limit discharges to levels that will ensure the environment is protected. The EPA Victoria uses a combination of works approvals and licences, issuing of notices and formal enforcement to achieve the levels of protection required by the *State Environmental Protection Policy (Waters of Victoria)*.

However, the control of more diffuse source pollutants is not always directly regulated and is an increasing challenge for management. Some regulatory frameworks and activities do exist for controlling diffuse pollution sources. These often involve more collaborative and co-regulatory approaches (for example, frameworks for managing stormwater and/or on-site domestic waste water systems and the role of local government). The EPA Victoria also works together with other agencies and industry bodies to identify water quality issues, prioritise high risk areas and help solve causal problems. Integrated catchment management and its role in identifying and creating joint action is the key to helping control many of the more diffuse pollution sources affecting Victoria's waterways.

Native vegetation regulations

In September 2012, the Victorian Government announced a review of Victoria's native vegetation permitted clearing regulations. The aim of the review was to improve and strengthen the regulatory system to deliver better outcomes for the environment and the community. In May 2013, the Victorian Government finalised and released the reform package, which aims to ensure impacts on biodiversity are appropriately considered when decisions regarding land use change and development are made.

These new regulations provide greater focus on managing risks and impacts to important biodiversity assets, while lowering costs to the community and providing more certainty for landholders. Changes resulting from these reforms do not affect the consideration of land and water protection within planning schemes or any waterways identified specifically in planning schemes, such as those covered by Environmental Significance Overlays.

Planning system

Planning refers to decisions that set out the way land may be used or developed.

Planning schemes are administered by local councils and contain the Victoria Planning Provisions and local planning policy. Zones, overlays and other provisions guide how land can be used and developed. Each municipality has a planning scheme that indicates if a planning permit is required to change the use of the land, construct a building or make other changes to the land. Every planning scheme in Victoria contains the same policy framework; the *State Planning Policy Framework*. This covers strategic issues of State importance, including clauses on environmental and landscape values, environmental risks and natural resource management. In relation to waterway management, most of these provisions help ensure planning is co-ordinated with the activities of waterway managers and other relevant agencies.

In 2012, the Victorian Government released guidelines for *Planning permit applications in open, potable water supply catchment areas*. The purpose of the guidelines is to assist water corporations and other referral and responsible authorities in their assessment of planning permit applications for use and development of land within all open, drinking water supply catchments in Victoria.

Planning controls are also used to help ensure that new infrastructure is located and developed with due consideration of physical hazards such as flood and bushfire risk. Within a planning scheme, overlays can be used to show land that has particular values such as significant environmental features or land subject to threats such as flooding. The overlay information will indicate if a planning permit is required.

Waterway managers are also designated referral authorities in relation to planning applications and planning scheme amendments that affect floodplains and land subject to inundation (including coastal locations). They also undertake flood studies to support strategic planning.



Planning controls guide how land can be used and developed.
Courtesy Melbourne Water

3.6 Implementing the approach: the Victorian Waterway Management Program

In Victoria, there are ten catchment management regions (see Figure 3.4) and each has a catchment management authority to co-ordinate integrated management of land, water and biodiversity.

Catchment management authorities also have specific responsibilities for waterway management (under the *Water Act 1989*), except in the Port Phillip and Westernport region where Melbourne Water have the waterway management responsibilities.



Figure 3.4: The ten catchment management regions in Victoria.

The management approach for waterways described in Section 3.5 will be implemented through the ‘Victorian Waterway Management Program’. The Department of Environment and Primary Industries (DEPI) is primarily responsible for oversight of the Program and establishing the state policy framework for waterway management. Regional implementation of the Program is led by the waterway managers (that is, nine catchment management authorities and Melbourne Water in the metropolitan region).

This Program is based on an eight-year adaptive management cycle, where learning occurs at all stages and is used to update and improve the program in subsequent cycles (see Figure 3.5) (see also Chapter 17). The exception is Melbourne Water, which operates on the five-year cycle regulated by the Essential Services Commission (see Section 18.2.2 for more information on management arrangements). The Victorian Waterway Management Program involves the following stages and components:

- **Strategy and planning** – statewide policy framework and targets, planning for waterway management through regional Waterway Strategies with priorities and regional targets.
- **Implementation and monitoring** – Government and other investment in regional priorities, implementation of priority management activities, monitoring of management activities (intervention monitoring) and long-term resource condition assessment.
- **Evaluation and reporting** – management reporting, resource condition reporting, program evaluation and improvement.

Community participation and research and innovation occur across all parts of the Program.

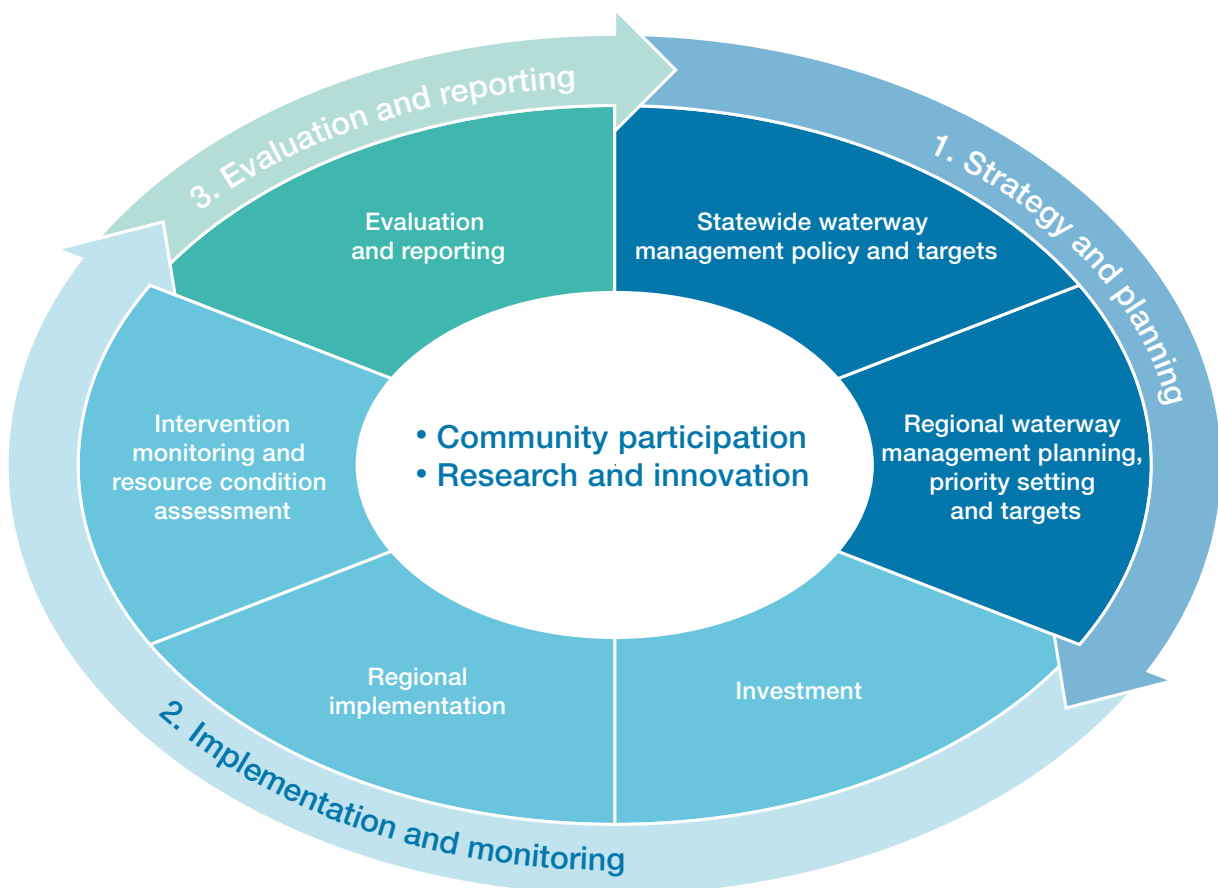


Figure 3.5: The eight-year adaptive management cycle of the Victorian Waterway Management Program.

3.7 Guiding principles

Achieving the vision for Victoria's waterways requires long-term commitment from the Victorian Government and communities, coupled with effective investment in regional waterway management programs across the state. The management approach for working towards this vision is guided by the following principles:

- **Partnership approach** – waterway management will continue to be a partnership between government, industry and the community.
- **Community involvement** – communities will have the opportunity to be involved in waterway management and this participation can help foster increased stewardship of waterways.
- **Integrated catchment management** – integrated management of waterways will occur within a broader framework of integrated catchment management. Management will recognise the importance of waterways as a connection between catchments, groundwater, coasts and the receiving marine environment and the strong influence of land use and catchment condition on waterway condition.
- **Appropriate tools** – the full complement of tools and approaches will be considered to improve waterway condition including; direct Government investment in onground works, grant and incentive programs, management agreements, market-based instruments, information and extension programs and regulation.
- **Value for money** – Government will direct investment to regional priority management activities that provide the most efficient and effective long-term improvements in waterway condition and the greatest community gain.
- **Regional Waterway Strategies** – facilitate regional decision-making with community input and use a risk-based approach to identify high value waterways and priority management activities. They will:
 - consider environmental, social, cultural and economic values of waterways
 - be holistic and integrate onground works with environmental water management
 - ensure efficient and effective management of environmental water
 - include maintenance as a vital activity to secure both past and future investment in onground works
 - be flexible in response to seasonal climatic variation and plan for the potential impacts of climate change.
- **Evidence-based decision-making** – best available knowledge will underpin decision making, policy and waterway management programs.
- **Adaptive management** – policy and programs are part of a broader framework of adaptive management (supported by effective monitoring, reporting, evaluation and research) to ensure continuous improvement.



Using partnership approaches to improve waterway health. Courtesy Melbourne Water

3.8 Program logic and Strategy targets

3.8.1 Program logic for the Victorian Waterway Management Program

Program logic is an approach to planning (commonly used in natural resource management) that uses a diagram to demonstrate the rationale for a program and express how change is expected to occur³.

The simplified program logic for the Victorian Waterway Management Program is illustrated in Figure 3.6. It describes how each year, specific management activities (outputs) are delivered by regional agencies across Victoria in order to achieve particular management outcomes. Over the eight-year planning period, these outputs and outcomes collectively contribute to either maintaining or improving the environmental condition of waterways. For a small number of near natural waterways that are in excellent condition,

aiming to maintain their current condition is an appropriate goal. For some waterways where there are significant threats to waterway condition it may not be possible to improve their condition, even with a significant program of management activities. However, for the majority of waterways where management activities are undertaken the aim will be to improve their environmental condition. In the long-term, this will ensure that Victoria's waterways can continue to support environmental, social, cultural and economic values.

A more detailed version of this program logic and additional explanatory information is provided in Appendix 3.2. The specific wording of outputs is taken from the agreed list of 'standard outputs' used by the DEPI and waterway managers to describe the management activities undertaken in regional waterway programs.

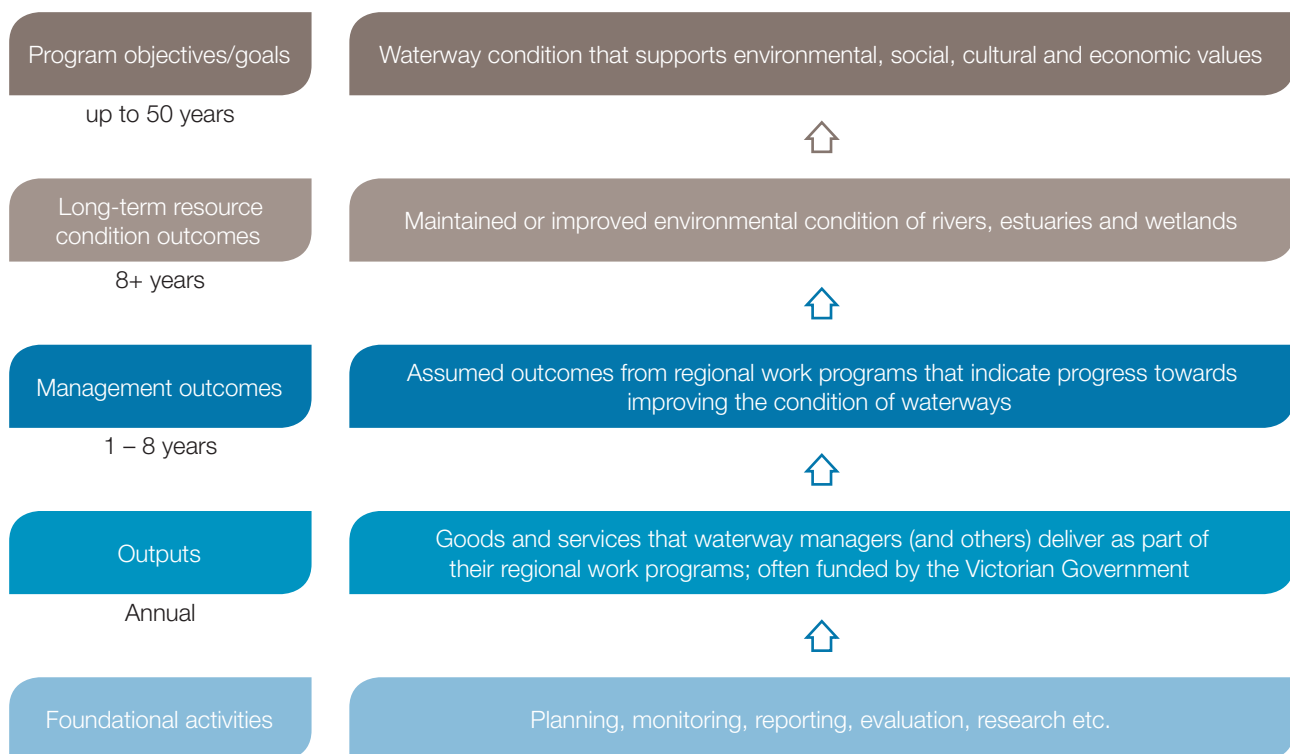


Figure 3.6: The simplified program logic for the Victorian Waterway Management Program.

3.8.2 Strategy targets

The latest assessment of catchment condition by the VCMC was hindered by the fact that there are generally no explicit, long-term targets for resource condition¹. The VCMC attributed this to a lack of clarity (and knowledge) about the quality of land and water resources required to maintain and enhance long-term land productivity while also conserving the environment.

This same issue (in the specific context of waterways) was discussed by the Expert Scientific Panel advising on the development of this Strategy (see Section 1.3 and Appendix 1.1). Following the public consultation on the *Draft Victorian Waterway Management Strategy*, the Panel was asked to provide advice about the current state of scientific knowledge regarding prediction of changes in waterway condition as a result of management activities (see Box 3.1)

Targets for this Strategy were developed based on the program logic structure and limited by available sources of data that can be used to confidently report against each one. Targets are set at the long-term resource condition outcome and management outcome level.

Box 3.1: Ability to predict future waterway condition

The Expert Scientific Panel advised in early 2013 that we currently do not have all the information required to accurately predict specific (quantitative) changes in waterway condition at the statewide level as a result of management activities. Current knowledge is only likely to be sufficient to support general, descriptive (qualitative) predictions about the directional changes in condition (for example, declining, maintaining or improving) that are expected as a result of regional work programs across Victoria. The focus for improving knowledge to enable quantitative assessments of condition change should be at the regional level. The use of evidence-based models, research and monitoring will ensure that knowledge and confidence about predicting the effect of management activities is improved over the next eight years.

Long-term resource condition outcome targets

Given the difficulties with setting accurate, quantitative targets for waterway condition at the state level, directional statements have been used to set aspirational targets for waterway condition in this Strategy. These directional statements provide guidance for regional waterway programs to aim for maintaining or improving the environmental condition of waterways. The information sources that will be used to report on these targets are the ISC, IWC and the pilot IEC.

This category of targets is therefore limited to 'priority/high value' waterways because these are the waterways that will be assessed as part of the Index of Condition programs (see Section 17.3.4) and therefore have data to enable assessment of whether condition has been maintained or improved over the life of the Strategy (compared to the last assessments undertaken). Priority river reaches will be defined in the regional Waterway Strategies and condition data is available for all of these waterways. High value wetlands are defined as wetlands with baseline information on condition collected in the 2009/2010 IWC assessment (which focused on wetlands of formally recognised significance). High value estuaries are defined as those with formally recognised significance that also have baseline information on condition collected as part of the pilot IEC program.

Management outcome targets

At the management outcome level, 10 categories of outcomes were selected based on availability of data for reporting and the outcomes towards which the majority of Victorian Government funding for waterway management is directed. The targets for management outcomes are aspirational estimates and were developed by summarising regional estimates of what would be required to maintain or improve the condition of priority/high value waterways over the next four and eight years, based on the assumptions of 1) no extreme events such as flood or bushfire, 2) not being limited to existing State funding and 3) using the achievements of the past decade as a guide to what is reasonably likely to be achieved (given time required for activities, capacity to implement etc.).

These aspirational targets reflect the wide range of fund sources that contribute to waterway management activities. This includes local, regional, State and Commonwealth funds as well as funding and in-kind contributions from landholders, community organisations and individuals. The targets may not necessarily be achieved if funding or priorities of investors change as the Strategy is implemented over the next eight years. For example, the priorities for the Commonwealth Caring for our Country program (2013-2018) are targeted to coastal areas and the western portion of Victoria, but may change in future programs.

At the output level (for example, fences constructed and waterway structures established) targets will be developed and outlined as part of the regional Waterway Strategies. This is because regional waterway managers deliver these activities according to the priorities within their region.

The Strategy targets are outlined in Figure 3.7.

Progress against the targets will be publicly reported through the Report Card series and the three Index of Condition reports (see Section 17.4 for further detail on reporting and evaluation).

Victorian Waterway Management Strategy aspirational targets

Example RWS Targets

Program objectives/
goals

N/A – change generally not measurable at this level of a program logic so targets are not set here, refer to achievement of the vision

N/A – change generally not measurable at this level of a program logic so targets are not set here, refer to achievement of the regional goals

up to 50 years

Long-term resource condition outcomes

Maintained or improved condition of priority river reaches
Maintained or improved condition of high value wetlands
Maintained or improved condition of high value estuaries

Population of Trout Cod in Seven Creeks is increased or maintained (either abundance or distribution) with evidence of recruitment

2020

Management outcomes

| | 2016 | 2020 |
|---|--------|--------|
| ha improved riparian vegetation | 2,730 | 5,450 |
| ha improved wetland vegetation | 5,780 | 7,220 |
| Number of sites with environmental water managed | 53 | 70 |
| ha managed for pest plants and animals | 29,400 | 42,800 |
| Number of sites with improved instream habitat | 92 | 168 |
| ha land with management agreements | 16,900 | 31,400 |
| Number of community members with increased capacity | 4,190 | 7,990 |
| Number of sites with improved waterway knowledge | 1,280 | 1,920 |
| % advice and approvals completed within statutory timeframes | 95 | 95 |
| % management activities undertaken on priority waterways (as defined in the regional Waterway Strategies) | 70 | 70 |

Instream habitat is improved from marginal to good
Livestock access is reduced from major impact to minor impact
Altered streamflow seasonality is reduced from moderate to minor

2016 & 2020

Outputs & Activities

N/A – regional agencies responsible for delivering outputs and activities

Install 1 waterway structure (fish ladder)
Install 3 waterway structures (instream habitat structures)
Deliver environmental water
Construct 5 km of riparian fencing

Annual

Foundational activities

N/A – ongoing implementation of planning, monitoring, reporting, evaluation and research activities to inform assessment against targets and improve confidence in target setting

N/A – ongoing implementation of intervention monitoring, reporting and evaluation activities to inform assessment against targets, improve logic models and improve confidence in target setting

Figure 3.7: Aspirational Strategy targets within the context of the program logic.



4

Regional waterway management



Regional waterway management

Guide to the chapter

4.1 The regional planning process for waterway management

4.2 Regional Waterway Strategies

- Overview
- Managing waterways with formally recognised significance
- Regional priority setting
- Tools and approaches for waterway management
- Implementing the seasonally adaptive approach
- Target setting
- A process to change management objectives

What are the issues with existing arrangements?

The current regional River Health Strategies have passed their intended lifespan. They did not cover estuaries and wetlands, which have now been incorporated into the Victorian Waterway Management Program. There is scope to improve the integrated waterway management planning framework by drawing on the experience gained during the implementation of the regional River Health Strategies. Implementation of regional waterway management programs requires a more flexible approach to ensure that the management activities undertaken are appropriate given the prevailing climatic conditions in a given year.

What improvements does the Strategy make?

The Strategy will:

- improve the integrated waterway management planning framework
- incorporate estuaries and wetlands in regional waterway planning arrangements
- improve the regional priority setting process
- incorporate increased flexibility for waterway managers to respond to varying climatic conditions
- better integrate environmental water management with other waterway management activities.

4.1 The regional planning process for waterway management

Regional planning processes for waterway management were established through the regional River Health Strategies (RRHSs).

The RRHSs were umbrella documents that co-ordinated all other river-related action plans and were developed by waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) between 2004 and 2006. The RRHS development process provided a mechanism for setting objectives for waterways in consultation with the community and balancing the environmental, social and economic values of waterways. A list of priority management activities was then developed to guide investment in waterway management in the region over a six-year period. The RRHSs were the cornerstone of the regional planning framework for waterway management, but have now passed their intended lifespan and will be replaced by statutory plans under the *Water Act 1989*, called regional Waterway Strategies (RWSs). The RWSs are the new centre-piece of an integrated waterway management planning framework for rivers, estuaries and wetlands (Figure 4.1). For some issues (for example, environmental water management) the RWSs will be supported by management plans that provide more detailed information on objectives, management activities and targets. The process for environmental water planning is outlined in Chapter 8.

The RWSs will be developed in accordance with regional decisions about water allocation and water recovery targets that have been made through the current regional Sustainable Water Strategies (SWSs). Each regional SWS sets out a long-term regional plan to secure water for local growth, while maintaining the balance of the area's water system and safeguarding the future of its waterways and groundwater.

The Regional Catchment Strategies (RCSs) are the primary integrated strategies for managing land, water and biodiversity in Victoria. The RCSs identify priority areas and a program of measures to protect and manage those places. The long-term objectives and priorities in the RCS that relate to waterways will be implemented through the RWSs.

There are many other strategies and plans that do not have waterway management as their primary focus, but need to be considered in regional waterway management planning. These include state strategies (such as the Victorian Coastal Strategy), plans for the management of public land (such as forests and parks plans, fire plans and regional coastal plans) and other relevant longer-term strategies such as regional growth plans.

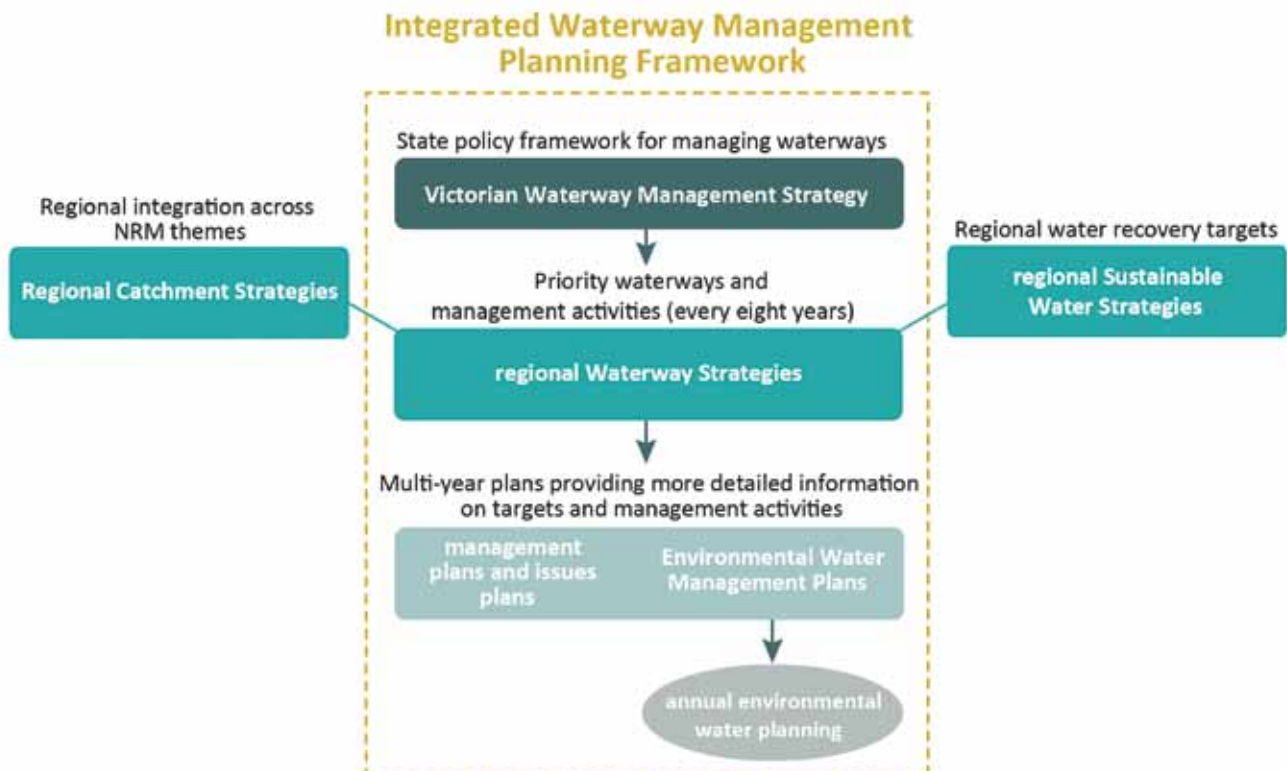


Figure 4.1: The Integrated Waterway Management Planning Framework.

4.2 Regional Waterway Strategies

4.2.1 Overview

The RWSs will provide a single planning document for river, estuary and wetland management in each region and will drive implementation of the management approach outlined in Chapter 3. The RWSs will be developed by waterway managers in partnership with other regional agencies and boards involved in natural resource management, plus Traditional Owners, regional communities and other key stakeholders. For coastal regions, the RWSs will include the management of estuary condition (see Section 13.3), highlighting the importance of estuaries as the link between catchments, coasts and the marine environment.

The RWSs will outline regional goals for waterway management that align with the objectives for waterways described in the RCSs. High value waterways will be identified and, from those, a subset of priority waterways will be determined for the eight-year planning period. A strategic regional work program of management activities for priority waterways will be developed and guide investment over an eight-year period (five-year period for Melbourne Water).

The regional work program will consider the full range of tools and approaches available for waterway management, including market-based instruments, government investment in onground works or environmental water management, research and community awareness raising or information provision and regulation (see Section 4.2.4).

The RWSs will also identify regional priorities for environmental water management over the eight-year planning period, together with the complementary management activities required at those sites. This information will be used as a key input to environmental water planning arrangements (see Section 8.4).

The regional work program will provide clear direction to guide investment in waterway management by the Victorian Government.

These work priorities will also provide guidance to local governments, the Australian Government and private or philanthropic donors about where investment is required in the region over an eight-year period. This provides investors with confidence that their annual funding of management activities is linked to a longer-term, strategic plan.

The required content of the RWSs is outlined in the *Regional Waterway Strategy Guidelines* published by the Department of Sustainability and Environment in December 2012. Additional direction is provided through a series of guidance notes on key topics, developed in partnership with the waterway managers.

Principles for identifying high value waterways

High value waterways are not just those with environmental values, they also include waterways that are important for their high social, cultural or economic values.

Waterways will be considered high value if they have one, or more, of the following characteristics (from Appendix 4.1):

- formally recognised significance
- presence of highly threatened or rare species and communities
- high naturalness values (for example, aquatic invertebrate communities or riparian vegetation) or special waterway features (for example, drought refuges or important bird habitat)
- high social, cultural or economic values (for example, recreational fishing, Aboriginal cultural heritage, urban or rural water sources).



Environmental water release to Glenelg River. Courtesy Glenelg Hopkins CMA

Policy 4.1

The regional Waterway Strategies will build on the success of the regional River Health Strategies by:

- expanding their scope to include wetlands and estuaries (where applicable)
- integrating environmental water management with other waterway management activities.

The regional Waterway Strategies will:

- identify high value waterways (based on environmental, social, cultural and economic values)
- determine priority waterways for the eight-year planning period

- include a regional work program of management activities for priority waterways (including environmental water management)
- guide investment into multi-year projects and annual work programs
- be developed in consultation with regional agencies and boards, Traditional Owners, the regional community and other key stakeholders
- seek comments on a draft strategy during a public consultation period of at least one month
- be endorsed by the Minister for Water and the Minister for Environment and Climate Change.

Action 4.1: Develop regional Waterway Strategies in accordance with guidelines published by the (then) Department of Sustainability and Environment in December 2012.

Who: Waterway managers, regional agencies and boards, in consultation with Traditional Owners, the regional community and other key stakeholders.

Timeframe: 2014

4.2.2 Managing waterways with formally recognised significance

There are some waterways of particularly high value that are formally recognised for their significance (see Section 3.5.1 and Appendix 4.1). Special provisions are already in place to protect many of these waterways. These provisions range from international conventions and partnerships, to statutory protection under state and federal legislation and special listings in reports and policy documents by state and federal agencies.

Policy 4.2

Waterways with formally recognised significance will continue to be managed to maintain or improve their condition.

The regional Waterway Strategies will consider all waterways with formally recognised significance as high value waterways.

Existing management plans or legislation to protect those waterways will be supported and the regional Waterway Strategies will identify any additional priority management activities that need to be undertaken or new management plans to be developed.



Edithvale - Seaford Wetlands. Courtesy DEPI

4.2.3 Regional priority setting

The asset-based approach

Threat-based approaches to natural resource management, such as investing in management of poor water quality or salinity over large geographic areas, have diminished across Australia over the past decade. Instead, asset-based approaches have become the primary framework for managing the natural environment, where planning focuses on important natural 'assets', rather than on threat-based issues. An asset is a spatially defined, biophysical component of the environment (for example, a river, estuary or wetland) that has particular values associated with it. The values associated with these assets can be classified as environmental, social, cultural or economic. The asset-based approach facilitates development of integrated work programs that can address multiple threats to the values of an asset. Asset-based approaches also direct public investment in natural resource management towards high value areas (rather than large areas in poor condition) and provide the basis for identifying priorities for investment. The focus on priority areas means that environmental condition may not improve, or might decline, in some other areas.

Regional priority setting for waterways

Priority setting is a core activity in planning. A transparent process for setting priorities using the asset-based approach requires detailed information on assets, their values, threats to values and levels of risk. This approach has previously been implemented at the regional level in Victoria through the development of the RRHSs.

The regional priority setting approach for the RRHSs involved assessment of information on the environmental, social and economic values of rivers, threats to these values, and the level of risk to the values. This information was then used to identify the high value rivers in a region and make decisions about which of those rivers were a priority for management activities over the life of the RRHSs.

This regional priority setting process will now be applied to rivers, estuaries and wetlands and will underpin the development of the RWSs. The environmental, social, cultural and economic values of waterways (and threats to those values) are a key consideration in this process. Supporting work has been undertaken by the Victorian Government and waterway managers to develop a transparent and consistent method for collecting data about values and threats and giving each a simple score. This information is housed in a central database, which also determines risk levels. Waterway managers use this information to assist with the regional priority setting process (see Box 4.1). Appendices 4.1 and 4.2 show the values and threats with consistent, statewide data that are included in the database and are therefore considered in the regional priority setting process.



Threatened species, Barred galaxias. Photographer: T.A. Raadik

Box 4.1 Consistent data to support the regional priority setting process

The regional priority setting process relies on information about values, threats and risks. It is vital that this information is collected and described in a consistent way and, where possible, that the information is based on real data (for example, data collected from onground monitoring activities). A database has been developed to house this information and support the regional priority setting process. The Aquatic Value Identification and Risk Assessment (AVIRA) database contains information about the values and threats associated with selected river, estuary and wetland assets. These selected assets are sections of rivers, estuaries or wetlands that are assessed as part of the Index of Stream Condition, Index of Wetland Condition or pilot Index of Estuary Condition programs (see Section 17.3.4) and therefore have detailed information available about environmental values and threats. Other types of values (for example, social values) require information to be collected at the regional level by waterway managers and entered into the database.

To ensure that all information is collected and entered into the database in a consistent manner, a process for collecting and scoring all values was developed by the (then) Department of Sustainability and Environment, in partnership with the waterway managers. All value and threat information is converted to a score between 0 and 5 (except for values that can only be yes or no, such as formally recognised significance). An example of the data sources and scoring rules for the values 'Heritage Rivers' and 'Non-motor boating' is shown to the right:

Value – Heritage Rivers (environmental)

| Score | Descriptor |
|-------|--|
| Yes | Asset forms part of a Heritage River |
| No | Asset does not form part of a Heritage River |

Data source: *Rivers and Streams Special Investigation: Final Recommendations* (Land Conservation Council 1991)

Value – Non-motor boating (social)

| Score | Descriptor |
|-------|---|
| 5 | Waterway used for annual (or more frequent) non-motor boating event |
| 4 | Waterway is popular for non-motor boating |
| 3 | Waterway is occasionally used for non-motor boating |
| 1 | Not known to be used for non-motor boating |
| 0 | Not suitable for non-motor boating |

Data source: Peak body (for example, Canoeing Victoria or Rowing Victoria), *My Victorian Waterway* survey, local knowledge

The database also includes a standardised risk assessment procedure that provides an automated assessment of the level of risk to all values present in a waterway. This assessment is based on evidence of associations between values and threats and also incorporates a level of confidence in each of those associations. The database also provides a suggested category of management response. For example, a waterway with high values and low threats would have a very low risk level and the suggested management response would be to maintain waterway condition (see Figure 4.2).

Once priority waterways are determined for the eight-year planning period, management activities are selected for those waterways. Depending on the level of risk, management activities will focus on protecting the current environmental condition of a waterway or aim to reduce threats and improve condition over time. Logic models (see Section 17.2.1) will be used to help select appropriate management activities, based on the best available knowledge.

Where multiple values exist, it will often be possible to identify management activities that will be beneficial for all values (for example, reducing threats to waterway condition will often protect environmental and social values). Where values potentially conflict (for example, managing threatened native fish and recreational fishing for salmonids within a single waterway) the RWS development process provides the mechanism for regional decision making about which values will be managed for (with reference to the regional goals and consultation with stakeholders).

Undertaking management activities on non-priority waterways

The majority of Victorian Government investment in regional waterway management is directed to management activities on priority waterways. However, there are also circumstances when investment can occur on non-priority waterways for example, it may be necessary to undertake work in upstream areas to reduce threats to downstream priority waterways (such as, erosion control works in highly modified waterways to protect downstream wetlands). Investment may also be required to protect public infrastructure or to support dedicated community groups who are actively working to improve the environmental condition of their local waterway. Finally, existing regulatory controls apply across all waterways in Victoria and work that is required to comply with any legal or statutory requirements must be undertaken.

Waterways that are not a priority in the RWSs may still be a priority for local communities, who can apply for grants from local government, the Australian Government and private or philanthropic donors to undertake management activities.

Managing serious risks to public infrastructure from waterway processes

In addition to maintaining or improving waterway condition, the protection of public infrastructure from waterway processes (see Box 4.2) is an important consideration in waterway management.

Managing risks to public infrastructure is primarily the responsibility of the owner of that public infrastructure (asset owner). New public infrastructure must be built to an appropriate standard to minimise these risks. Further information on responsibility for managing new and existing structures in waterways is provided in Section 18.6.

Management activities required to manage the serious risks to public infrastructure from waterway processes should be negotiated by asset owners, waterway managers and relevant beneficiaries of the public infrastructure. Waterway managers often have a detailed understanding of the location and rates of erosion, flooding, avulsion and other waterway processes that may threaten public infrastructure. The development of the RWSs provides a clear opportunity for stakeholders to have these discussions and determine management activities that the waterway manager or other regional agencies should undertake over the eight-year planning period. State funding for actions to manage serious risks to public infrastructure is discussed in Section 18.4.1.

The level of protection required for public infrastructure should be discussed by asset owners and waterway managers and informed by an assessment of risk that considers available information on:

- waterway processes affecting the infrastructure
- the value of the infrastructure
- the consequences to the community if the infrastructure is lost or damaged
- the likelihood of loss or damage and the costs of the work required (including both financial and environmental costs).

Box 4.2: Public infrastructure at risk from waterway processes

Public infrastructure is defined here as structures, facilities, buildings or areas of land that are used for public or community purposes and are located in, across or adjacent to waterways. Common examples include weirs, dams, bridges, roads, communication cables, levees, public buildings and sports fields. Public infrastructure is distinguished from private assets (such as private land or buildings).

Waterway processes that can pose risks to public infrastructure include erosion, sedimentation, floods and avulsion (when a river suddenly changes its course).

Action 4.2: Develop principles for managing serious risks to public infrastructure from waterway processes.

Who: Department of Environment and Primary Industries, waterway managers, floodplain managers, asset owners. **Timeframe:** late 2013

Policy 4.3

Waterway managers and asset owners will share information to assess risks to public infrastructure from waterway processes.

Management activities required to manage serious risks to public infrastructure from waterway processes should be negotiated by asset owners, waterway managers and relevant beneficiaries of the public infrastructure.

Management of serious risks to public infrastructure from waterway processes will be undertaken in accordance with the directions outlined in the Victorian Government response to the Environment and Natural Resources Committee Inquiry into Flood Mitigation Infrastructure in Victoria (where relevant).

Community input

Community input is a critical part of the regional priority setting process and there are multiple opportunities for this to occur. Local communities are an important source of information about many of the social values that waterways provide. Waterway managers involve communities in developing management objectives for waterways in the region during the development of the RWSs. The feasibility of many management activities depends on consultation with and agreement of local landholders. Regional communities also have the opportunity to comment on the overall regional waterway program when the draft RWSs are released for public consultation.

Policy 4.4

The regional priority setting process underpinning development of the regional Waterway Strategies must:

- develop regional goals for waterway management
- identify high value waterways (based on environmental, social, cultural and economic values)
- filter the high value waterways and select those that align with the regional goals
- identify threats to the values of those waterways and assess the level of risk
- determine priority waterways for the eight-year planning period
- identify high level management activities and assess their feasibility and cost effectiveness
- select priority management activities to form a regional work program for the eight-year planning period.

Principles for undertaking management activities on non-priority waterways

In some cases, management activities may be undertaken on non-priority waterways if:

- they are a source of threats to other priority waterways (for example, downstream priority waterways)
- they provide important connectivity between priority waterways
- there is a serious risk to public infrastructure from waterway processes or an opportunity to reduce risks associated with extreme events (such as floods)
- there is strong community commitment to improving the condition of their local waterway
- work is required to meet statutory or regulatory obligations.

Action 4.3: A transparent and consistent regional priority setting process will be run, in consultation with the community, to underpin development of the regional Waterway Strategies.

Who: Waterway managers, regional communities.

Timeframe: late 2013

A simple summary of the regional priority setting process described in Section 4.2.3 is shown in Figure 4.2.

| | Low risk to values | High risk to values |
|--------------------|--|---|
| Priority waterways | Management activities to maintain waterway condition | Management activities to reduce threats to waterway condition |
| Other waterways | Not a priority within the eight-year planning period | Management activities only if they: <ul style="list-style-type: none"> • reduce threat to high value waterways • provide connectivity • protect public infrastructure or reduce risks from extreme events • maintain or strengthen community commitment to improving the condition of local waterways • are required to meet statutory or regulatory obligations. |

Figure 4.2: Summary outcomes of the regional priority setting process.

4.2.4 Tools and approaches for waterway management

Section 3.3 outlined the role for government in waterway management and identified a range of tools and approaches available to address market failures in providing public goods and benefits, such as healthy waterways. This 'tool-kit' includes:

- market-based instruments
- direct government investment in onground works or environmental water management
- research
- information provision
- community awareness raising
- regulation.

Further detail on each, and the general circumstances in which they should be applied, are provided below.

In most cases, decisions about which of these tools to use are made at the regional level. The selected approach should address the underlying reasons why the market is failing to provide improved waterway condition and consider local circumstances. The choice of tool will depend on the relative levels of private net benefits and public net benefits¹. As a general rule, incentives and market-based instruments are the preferred tools for encouraging behaviour change rather than more interventionist approaches, such as regulation. Regulatory approaches can stifle innovation and may also lead to unnecessary costs for landholders.

Market-based instruments

Market-based instruments use grants or subsidies, trading mechanisms or market-type processes (such as, auctions or tenders) to encourage landholders to change their behaviour to achieve improved waterway condition.

Simple price signals can be achieved by providing subsidies, such as fixed grants, to landholders to undertake management activities such as fencing, riparian revegetation or control of invasive weeds. For example, the waterway managers provide cash incentives to landholders to undertake works to prevent or repair degradation along waterways. The provision of grants to landholders is a positive incentive to encourage landholders to change the way they manage their land and water resources. Positive incentives should be used when the public net benefits of land use change are high, and should not be used if landholders would adopt the land use changes without the grant incentives¹.

Market-type processes (such as auctions or tenders) are an increasingly common tool. One popular program in Victoria is Wetland Tender that is run in several regions. Through this program, financial payments are offered to landholders to protect or improve wetland condition using a competitive tender process. Landholders list the management activities they would undertake and the payment they would require and these bids are collectively assessed and payments offered to the bids that represent the best investment (that is, highest benefits at least cost). This approach provides a highly efficient way to achieve the required outcomes at a minimum cost. Market-type processes can also be used when there is not a clear understanding of the price landholders would require to undertake works (so the provision of fixed grants is difficult and may lead to overpayment of landholders).



Landholders can receive grants to undertake waterway management activities such as revegetation of riparian land. Courtesy DEPI

Government investment in onground works or environmental water management

In some cases, improved waterway condition can only be achieved by direct government investment. This may occur when the outcome is largely a public good, when it is difficult or uneconomic for the private sector to supply the service, or when there is expected to be significant public benefits.

The majority of management activities to improve waterway condition in Victoria are undertaken through direct government investment. Waterway managers receive funding from State and federal governments to undertake these activities and deliver improved waterway condition (see Section 18.4). Government may also set aside funds to purchase land that is offered for sale to protect high value waterways, or to mitigate the impacts of flooding or sea level rise.

Research

Research is required when there is a lack of information about the key factors that affect waterway condition, or the relationships between management activities and improved waterway condition. Once this information is known, it can then be used to provide information to landholders (extension activities) or to improve management practices.

Information provision (extension) and community awareness raising

In some circumstances, supplying information, guidance and advice about waterway management issues or good management practices will encourage landholders to make positive behaviour changes. For example, a landholder may

wish to adopt low-impact farming practices but be unsure about the available methods or likely effects on productivity. Similarly communities may require information to better understand how their actions can affect waterway condition.

Extension should not be used on its own if the practices are not in the landholders best interest, because they would be unlikely to adopt them¹. (For example, high cost to landholder)

Regulation (legislation and statutory processes)

Regulatory approaches apply mandatory standards to individuals, communities and industry and are commonly implemented through legislation, statutory processes or, in some instances, the planning system. There may be fines or other penalties when these regulations are breached.

Regulation can be an inefficient way to change behaviour because uniform standards may hinder innovation and costs to individuals may be high. Regulatory approaches should generally be a last resort for improving waterway condition.

Policy 4.5

Regional waterway management programs will consider the full range of tools and approaches available to maintain or improve the environmental condition of waterways and use the most appropriate tool or approach for the situation.



Tatong community members attend a field day on the Hollands Creek as part of information and awareness raising sessions. Courtesy Wayne Tennant, Goulburn Broken CMA

4.2.5 Implementing the seasonally adaptive approach

Regional waterway management programs need to account for Victoria's variable climate, where waterways undergo short or long periods of drought and also periods of high rainfall and floods. This range in conditions, from drought to flood, is part of the natural climatic variability experienced in Victoria. Rather than relying only on emergency management during these extremes of climatic conditions, we need a flexible management approach allowing annual implementation of management activities to be adapted to reflect the prevailing conditions.

The *Northern Region Sustainable Water Strategy*² established the 'seasonally adaptive approach' as a flexible way to manage rivers and wetlands. The seasonally adaptive approach takes into account recent climate history, climate outlook and available environmental water. In drought periods, the focus is on avoiding catastrophic events (such as major fish death events) and protecting drought refuges so that plants and animals can survive and begin recolonisation when conditions improve. In wet periods, the focus is on providing a water regime to restore values that were not maintained in drier periods, such as major bird breeding events.

Developing an eight-year regional work program through the RWSs provides certainty about the priorities for waterway management in a region. However, there also needs to be flexibility to adapt the types of activities undertaken in a given year to reflect the prevailing climatic conditions. Some priority management activities outlined in regional work programs may be inappropriate to implement during certain climatic conditions (for example, riparian revegetation during drought).

Annual implementation of the regional work program should be flexible so that the most appropriate activities for the current climatic conditions are undertaken. This may involve undertaking specific activities in some years but not others, or using a different approach to achieve the same goal. Funding towards research and monitoring to address these critical knowledge gaps has already begun. Drought and flood response planning activities should occur regularly to ensure that waterway managers are prepared for climatic extremes at all times.

Policy 4.6

The seasonally adaptive approach provides a flexible framework for managing waterways that takes into account variable climatic conditions.

The seasonally adaptive approach will be implemented through annual works and watering plans.

This will involve:

- recognising the long-term objectives and outcomes outlined in the regional Waterway Strategies and regional Sustainable Water Strategies
- setting short-term management aims through annual planning processes that reflect whether the current conditions are drought, dry, average or wet
- adapting management activities to prevailing climate conditions in any year
- monitoring and drought, flood or bushfire response planning in all years
- improving community awareness of the need to adapt management actions depending on current climatic conditions.



The Murray River near Barmah Township. Photographer: Keith Ward

4.2.6 Target setting

The priority management activities outlined in the RWSs will address the risks identified in the regional priority setting process (see Section 4.2.3).

Targets in the RWSs will be set at three levels to align with the program logic (see Section 3.8.1 and Figure 3.6). Long-term resource condition outcome targets describe the desired environmental condition or desired state for specific values (generally to be achieved beyond the eight-year planning cycle). Management outcome targets describe the desired change expected as a result of the management activities (for example, the level of threat reduction required within the eight-year planning cycle). Output targets describe the quantity of management activity required to achieve the management outcome and long-term resource condition targets. As knowledge of the quantity of management activity required to achieve change in waterway condition is unknown or incomplete (see Chapter 3, Box 3.1), output targets may often be estimates.

Logic models will be used to describe the known, or assumed, relationships between outputs, management outcomes and long-term resource condition outcomes (see Section 17.3.3) and will assist waterway managers in selecting appropriate management activities and setting targets for the RWSs.

Policy 4.7

Targets in regional Waterway Strategies will reflect the program logic of the Victorian Waterway Management Program and be set at three levels; long-term resource condition outcomes, management outcomes, and outputs.



Land use change requires careful management to ensure waterway values are protected. Courtesy DEPI

4.2.7 A process to change management objectives

The potential impacts of climate change and future land use change present major challenges to natural resource managers because they affect the environmental condition and values of ecosystems but are generally difficult to control. Some values may not persist into the future. In particular, values may change as the local climate or pattern of land use changes (for example, movement of populations of some species and communities). In some cases, values may be lost altogether. With limited funding and major challenges (such as, the potential impacts of climate change and population growth) natural resource managers need to be prepared to accept that some changes to the environmental condition of waterways may occur.

Climate change

We know that climate change has the potential to affect environmental condition and the values that waterways support. There are many predictions about the effects of climate change, ranging from relatively low climate change effects to a continuation of the low streamflows seen during the extended drought between 1997 and 2009. The reality could lie anywhere between these two. Currently, there is still uncertainty in the predictions and it is sensible to take a precautionary approach and plan for a range of plausible future scenarios.

A 2012 report by the CSIRO³ stated that policy makers can be very confident that ecological change in Australia in response to climate change is unavoidable and will be widespread and substantial. Management should therefore move from trying to preserve the current biodiversity states towards managing inevitable change in order to minimise the loss of values. The report states that the community should be involved in revising objectives and developing scientific knowledge should be considered.

Land use change

Consistent with Victoria's responsive rural sector, land use change is dynamic and evolves to meet different economic circumstances and other factors such as changing climatic patterns. Increased agricultural activity can in some cases increase demand for water, fertiliser and land; all of which require careful management to ensure waterway values are protected.

Growth of key regional urban centres and expansion of rural residential living also poses the need to respond to the consequences of such significant land use change in these areas. In particular, planning should ensure high quality waste treatment and management of stormwater runoff as vegetated areas are replaced with more impervious surfaces such as roads and buildings (see Chapter 14).

Management objectives in a changing environment

The RWSs require a process to change management objectives when there is real and defensible information to indicate that it is necessary. It is important to emphasise that this does not imply that Victoria is ‘giving up’ on valuable river, estuary or wetlands systems. Instead, management will be conducted with the recognition that not every value within every system can be maintained given the potential impacts of climate change and land use change.

Knowledge needs to be improved and the condition of waterways closely monitored to assess if, at the end of each eight-year planning period, management objectives for a waterway have been met. If the objectives have not been met and the scientific evidence exists to show that the values either have been, or most likely will be, lost some decades into the future, then the management objectives may need to be changed in consultation with the community. This should occur as part of the development of the RWS every eight years. Figure 4.3 outlines a clear and transparent process for considering whether objectives should be changed.

Policy 4.8

Should it become apparent with defensible scientific evidence that environmental objectives can no longer be met (as a result of irreversible changes in climate, water availability, land use or population) amendment of the objectives will be formally considered as part of the development of regional Waterway Strategies in consultation with the community.

Knowledge will be progressively improved to underpin informed reviews of management objectives at the end of each eight-year planning period.

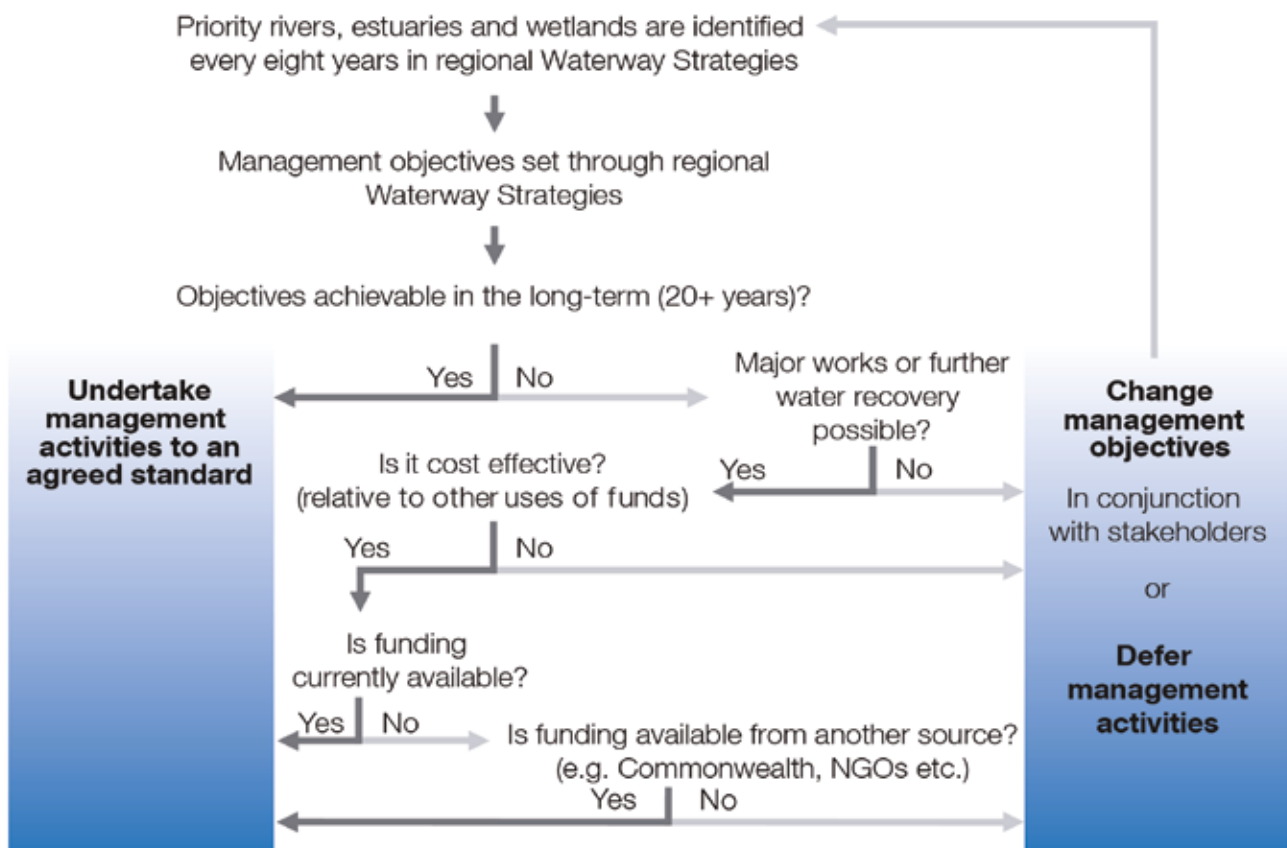


Figure 4.3: Process to change regional waterway management objectives in an eight-year planning period.



5

Community participation

*Promoting understanding of waterways.
Courtesy Melbourne Water*

Community participation

Guide to the chapter

- 5.1 Communities caring for Victoria’s waterways**
- 5.2 Principles for community participation**
- 5.3 Community participation in planning**
- 5.4 Community participation in onground work**
- 5.5 Community participation in monitoring**
- 5.6 Social research to inform waterway policy and management**
- 5.7 Promoting improved understanding of waterways**

What are the issues with existing arrangements?

Community participation in waterway management requires more explicit communication about the purpose and objectives of community involvement in planning, onground work or monitoring activities.

Community-based action to improve the health of catchments and waterways requires continued support from Government to maintain the decades of benefits provided through programs such as Landcare and Waterwatch.

What improvements does the Strategy make?

For community participation the Strategy will:

- adopt the International Association of Public Participation Spectrum as a transparent framework to help the Victorian Government and waterway managers clearly define and communicate the public’s role in policy development and management activities for waterways
- use social research to shape the development of policy and delivery of programs by investigating the barriers to, and drivers of, positive waterway behaviour by individuals and communities
- continue building capacity within Victorian communities so that they can keep caring for waterways and their catchments through programs such as Waterwatch, EstuaryWatch and Landcare.

5.1 Communities caring for Victoria's waterways

Rivers, estuaries and wetlands are important to everyone in the community and are a fundamental part of our common heritage. All Victorians, from our cities to the regions, have a stake in how healthy our waterways are and may want opportunities to be involved in their management.

In 2010, more than 7,000 Victorians took part in the *My Victorian Waterway* survey, which found that 99 per cent of respondents had high aspirations for our waterways. Nearly all participants (98 per cent) agreed that it is important for waterways to be as healthy as possible so they continue to provide for our needs. Ninety-nine per cent want healthy waterways in their areas. An overwhelming majority of respondents (96 per cent) stated that they have a personal responsibility to do the right thing for waterways and 83 per cent felt most personally connected to a local waterway, usually the stretch of river or creek closest to where they live (see Chapter 2, Box 2.1).

Victoria has a strong history of community-based natural resource management, particularly through the Landcare movement and programs such as Waterwatch. There are more than 750 Landcare community groups and networks, and more than 500 other community-based natural resource management groups in Victoria. These volunteers undertake activities such as engaging people and building partnerships, doing onground works, monitoring and sharing knowledge. These community participation programs also provide important opportunities for the Victorian Government and regional agencies to deliver education and awareness raising programs about sustainable waterway management and behaviours. Established community networks also deliver their own education and awareness raising activities and try to influence their peers to improve the management of land and water resources. These community-based organisations are often engaged in waterway activities through the waterway managers in each region (that is, catchment management authorities and Melbourne Water in the metropolitan region).

The *My Victorian Waterway* survey showed that people who live on, manage or work on waterfront properties with a membership in Landcare, Waterwatch or similar group have markedly better waterway behaviour than those who do not. Community participation is therefore critical for successful programs to improve waterway health.

Communities are increasingly working in partnership with government to undertake strategic planning, engagement activities and onground works that are co-ordinated, completed to a high standard and consider landscape-scale issues such as connectivity. Government support for individuals and groups undertaking this work is a highly cost effective way to improve the environmental condition of catchments and waterways, relative to the amount of public funds invested.

This is due to low co-ordination and administration costs, provision of volunteer labour and significant landholder contributions (both financial and in-kind) to projects¹.

Over the past decade, the role of local communities in waterway management has evolved to become a strong partnership with government and regional agencies. Through regional waterway planning processes (see Section 4.1), local communities are directly involved in planning for waterway management, as well as implementation of onground works, and monitoring or awareness raising activities.

In November 2012, the Victorian Government launched *Environmental Partnerships*², which is a pathway for action by government, communities and business in Victoria to maintain a healthy environment. Through strong environmental partnerships the Victorian Government aims to encourage a new sense of environmental citizenship, where communities take a more active and shared responsibility in efforts to support our environment. The Environment Protection Authority (EPA) Victoria has also released their *Environmental Citizenship Strategy*³ with a vision that 'communities are actively protecting their local environments across Victoria. In partnership with the EPA Victoria they report pollution, collect data and evidence, co-create solutions to problems and improve the environment'.

The task ahead for Government is to continue building capacity within Victorian communities so that they can keep caring for waterways and catchments. This support is particularly important in areas where communities may be facing difficult circumstances such as drought, economic hardship or major land use or demographic change. In addition to the environmental outcomes achieved through community-based natural resource management, there are also significant social and economic benefits for the individuals and communities involved, particularly for remote or isolated communities. For example, community-based natural resource management programs can provide free access to educational opportunities, social activities and engagement, and improved connections to local places and communities.



Waterwatch volunteers undertake important monitoring activities contributing to improved waterway health. Courtesy DEPI

5.2 Principles for community participation

Local communities and the general public should be able to participate and have their voice heard with respect to decisions and actions that might affect them.

It should be clear from the outset how community input will influence the decisions that are being made by Government and waterway managers. The International Association for Public Participation (IAP2) is a global organisation that advocates for best practice in public participation processes and has developed the IAP2 Public Participation Spectrum that helps decision makers select and communicate different levels of community participation (see Appendix 1.2). The IAP2 Public Participation Spectrum recognises that the nature of community participation in initiatives varies legitimately depending on the goals, time frames, resources and levels of concern in decisions to be made. This transparent framework helps community engagement practitioners clearly define and communicate the community's role in each initiative and, more importantly, sets out the promise being made to the community at each participation level.

Policy 5.1

The Victorian Government will continue to support community participation in planning, implementation and monitoring activities for waterway management programs.

Community participation in waterway management programs and activities will:

- *be inclusive* – all individuals and stakeholder groups will have reasonable and meaningful opportunities to participate
- *seek out affected and interested communities* – public participation activities will make additional efforts to facilitate the involvement of those potentially affected by, or interested in, a decision or activity
- *strive for balanced representation* – working groups, committees and other forums will seek to include relevant stakeholders with a wide range of views
- *have clear objectives* – the objectives of participation will be clearly articulated to the communities being engaged.



Training EstuaryWatch participants to monitor water quality on the Aire River. Courtesy DEPI

5.3 Community participation in planning

Planning for waterway management occurs at State, regional and local levels. At the State level, the Department of Environment and Primary Industries is responsible for developing policy on waterway management.

Regional agencies and boards, Traditional Owners, the community and other stakeholders play an important role in contributing to state planning and have all been involved in the development of this Strategy. The IAP2 Public Participation Spectrum was used to clearly define the level and objectives of stakeholder involvement. While four dedicated committees provided detailed input during the early development of this Strategy (see Section 1.3), every Victorian was given the opportunity to participate in the development of this Strategy during the six-week public consultation period in late 2012 that invited formal feedback on the draft policies and actions. During this time, regional information sessions were also held at 10 locations across Victoria to explain the draft policy directions and provide an opportunity for questions and discussion with state and regional agencies involved in waterway management.

A public report *Community feedback: Draft Victorian Waterway Management Strategy* was released by the (then) Department of Sustainability and Environment in March 2013 that outlined the key themes from the public consultation period and proposed changes for the development of the final Strategy.

At the regional and local levels, waterway managers work closely with local communities and community-based organisations when planning regional waterway management programs. Regional planning for waterway management is largely undertaken through the development of regional Waterway Strategies (RWSs) (see Chapter 4). This process provides the community with opportunities to participate in decision-making about the management of waterways in their region and to provide information about some values of waterways to inform regional priority setting (see Section 4.2.3). More detailed local planning occurs as part of implementing the RWSs. Waterway managers engage with local communities, community-based organisations or landholders, on a site-specific basis, as part of their action planning prior to undertaking onground works and management activities. Local knowledge from communities is vital to support this more detailed planning process.

Policy 5.2

Communities will have opportunities to be engaged in waterway management planning at State, regional and local levels.



Collecting and identifying water bugs as part of Waterwatch activities to monitor river condition. Courtesy DEPI

5.4 Community participation in onground work

Local communities in Victoria are strongly involved in ‘hands on’ work to improve catchment and waterway health. Landholders, particularly farmers, have a long history of looking after land and water resources by controlling weeds and invasive species, planting trees and fencing riparian land.

The *My Victorian Waterway* survey showed that 88 per cent of respondents who live, work or manage waterway frontage, actively work to restore or protect waterway health (66 per cent said they did this consistently). Ninety per cent of these respondents said they had removed harmful weeds and pests and 75 per cent had planted native vegetation along waterways.

Community-based natural resource management groups are also highly active across Victoria. Victoria has a long and successful history of community involvement in groups such as Waterwatch, EstuaryWatch, Landcare groups and networks, ‘Friends of’ groups, Coastcare, recreational and industry associations, conservation management networks and volunteer committees of management. Landcare Networks co-ordinate the actions of multiple community groups and include ‘Friends of’ groups, Waterwatch, EstuaryWatch, Coastcare, and conservation management networks working together to achieve more strategic and landscape-scale outcomes. From occasional tree-planting and weeding days, through to delivering complex, landscape-scale programs, these groups provide a broad range of skills, resources and aspirations to help protect and restore Victoria’s waterways. These community groups are a vital partner to government and regional agencies for achieving improvements in waterway health across the state. The Victorian Government provides important support to these groups by establishing co-ordinators (for Landcare, Waterwatch and EstuaryWatch) in the catchment management authority regions, who act as a link between the community participants and the regional agencies responsible for land and water management.

Communities and landholders are also involved in waterway management activities as part of implementing the RWSs. Each RWS will contain a regional work program of priority management activities for the region. Implementation will often require waterway managers and other regional agencies to engage and work with local communities. In particular, the protection and improvement of priority riparian land can only successfully be achieved with active partnerships between the community, riparian landholders and the Victorian Government.

Regional agencies also provide funding to landholders and community-based natural resource management groups to undertake management activities through market-based instruments (for example, programs such as Wetland Tender, see Section 4.2.4).

Other opportunities for community-based projects to improve catchment and waterway health include the *Inspiring Environmental Solutions* program run by the EPA Victoria. Under the *Environment Protection Act 1970*, companies or individuals found guilty of environmental pollution may be directed by a court to fund a community-based environmental project instead of, or in addition to, paying a fine. This provides funding for the *Inspiring Environmental Solutions* program. Recently funded projects include the Darebin Creek Pilot Raingarden Project and the Yarra Platypus Count.

Policy 5.3

The Victorian Government will continue to promote local action by supporting the work of individuals, community-based natural resource management groups and other volunteer groups to maintain or improve the environmental condition of catchments and waterways.



Community planting day on Morwell River. Courtesy West Gippsland CMA

5.5 Community participation in monitoring

Many community members are actively involved in monitoring waterways through the Waterwatch and EstuaryWatch programs. These community monitoring programs are supported by the Victorian Government through the establishment of regional co-ordinators, development and maintenance of databases, purchase of equipment and hosting of capacity building events. The waterway managers play a vital role in running these programs and facilitating the participation of interested community members.

The Waterwatch and EstuaryWatch community monitoring programs are also part of the broader waterway monitoring framework in Victoria (see Section 17.3) and can provide credible data to assist in waterway management (see Box 5.1). For example, in the Corangamite CMA region, Waterwatch and EstuaryWatch volunteers have played an active role in assisting with monitoring of estuary condition following estuary openings, early detection of blue-green algae outbreaks in the lower Barwon River and assessing the effect of management activities undertaken in waterways in the region.

Waterwatch, EstuaryWatch and Landcare volunteers also act as trusted conduits of information to waterway frontage landholders. Community involvement in resource monitoring therefore has multiple benefits such as:

- enhancing community knowledge regarding waterway health and related issues
- multiplying the spatial coverage and sampling frequency of formal data collection (where community collected data quality meets certain standards)
- providing an 'early warning system' for waterway management issues (such as algal blooms and weed invasion) through frequent surveillance and knowledge of local waterways.

Other innovative community monitoring programs are currently underway in Victoria (see Case study 5.1)

Policy 5.4

The Victorian Government will continue to support community-based waterway monitoring through regional delivery of the Waterwatch and EstuaryWatch programs.

Community monitoring will be aligned with waterway management programs so that the data collected can increasingly be used to inform the management of waterways and will be publicly available.

Box 5.1: Victoria's community waterway monitors

Waterwatch

For more than 20 years, Waterwatch has been the key community engagement program connecting local communities with river and wetland health and sustainable water management issues. Through Waterwatch, groups and individuals are supported and encouraged to become actively involved in local waterway monitoring, onground activities and awareness raising. In September 2013, there were 534 volunteers monitoring 1470 sites across Victoria. A network of Waterwatch co-ordinators supports local communities across Victoria. They provide water quality and biological monitoring training and support Waterwatch volunteers and a range of community groups. Over the last five years, the program has focused on improving the quality and usability of data collected. Volunteer monitors have expanded their monitoring capacity beyond water-quality testing, carrying out a range of onground activities of state and national importance, including:

- acid sulfate soil sampling at 130 sites across northern Victoria on behalf of the Murray-Darling Basin Authority
- monitoring before and after onground management activities to collect data to help demonstrate the outcomes achieved from investment, including the outcomes of environmental watering
- monitoring drought refuges
- post-bushfire water quality monitoring.

Waterwatch volunteer monitors contributed to the 2010 Index of Stream Condition, by collecting monthly water quality data at 264 sites. This illustrates the high level of quality assurance and confidence that the Victorian Government has in the Waterwatch data.

The program has a Waterwatch Data Management System to make over 20 years of water quality data publicly available to communities. The data can be viewed at:

www.vic.waterwatch.org.au

EstuaryWatch

In 2006, Corangamite CMA and the Western Coastal Board set up EstuaryWatch, a community estuary monitoring program aiming to help local communities learn more about the unique structures, functions and health of individual local estuaries and gather information to inform estuary management. The success of the Corangamite program sparked the expansion of the program in 2009, with EstuaryWatch information sessions and monitoring now occurring across the Victorian coast. Additionally, community water quality data collected by EstuaryWatch participants is now being incorporated into the Estuary Entrance Management Support System (EEMSS) which is used to make decisions regarding artificial estuary openings (see Chapter 13). In September 2013, there were 96 volunteers monitoring 17 estuaries.

Case study 5.1: Visual monitoring by communities

The Fluker Post Research Project (run by Victoria University) was established in 2008 as a community-based environmental monitoring tool. Wooden posts ('Fluker Posts') are installed at sites with the top of the post cut to 'cradle' any digital camera so that a photograph can be taken with the same perspective each time. Instructions on the Fluker Posts ask people to use their own camera to take a photo and then email it to FlukerPost@gmail.com. The image is then arranged in chronological order within a publicly accessible Picasa Web Album. This innovative project provides management agencies such as Parks Victoria and catchment management authorities with a means to engage with their communities and create historical records, in the form of a series of digital images, of particular environments. There are currently 80 Fluker Posts in the field with a total of over 1,200 images collected.

The pictures below are from Fluker Post BR1 at a river crossing in the Anakie Gorge in the Brisbane Ranges National Park. This community data shows the visual changes of the waterway as the site experiences dry periods, floods and changes in vegetation.



River crossing in a wet period. Courtesy Martin Fluker



River crossing in a dry period. Courtesy Martin Fluker

5.6 Social research to inform waterway policy and management

Social research about rivers, estuaries and wetlands can provide Government and natural resource managers with an improved understanding of community uses, expectations, attitudes and behaviours towards waterways. Social research can also identify the drivers and barriers of positive waterway behaviour (specifically with regard to community stewardship of waterways) and be used to inform policy development (see Section 17.5).

The *My Victorian Waterway* survey (see Chapter 2, Box 2.1) aimed to gather data in four areas.

1. How waterways are used by Victorian communities.
2. Community values and aspirations for their rivers, wetlands and estuaries.
3. Community knowledge about waterways and the issues that affect waterway health.
4. Trust in recommended waterway management practices.

The results helped shape the policy and actions contained in this Strategy and also provided:

- a better understanding of community expectations, attitudes and behaviours towards waterway management specifically and water resource management more broadly
- critical information for developing priorities for, and guiding evaluation of, community engagement activities
- a tool to assess the long-term effectiveness of community education and engagement activities.

The survey has also provided several key insights into the ways in which we should encourage community participation in waterway management and further detail of this can be found in the report *My Victorian Waterway*, online at:

www.water.vic.gov.au/environment/rivers/community-connections-to-local-waterways

In 2011, the Victorian Government conducted a social survey to assess the impact of investment in riparian works on landholder attitudes to riparian management⁴. The study found that the majority of landholders would consider future works on their properties and were willing to recommend the works to other landholders (see Chapter 9, Box 9.2). The report also highlighted several areas for improvement in the way that Government and waterway managers work with landholders to undertake riparian works. This provides valuable information to inform the design and delivery of future riparian works programs.

Policy 5.5

The Victorian Government will support social research to inform development of waterway policy and improve the Government's understanding of the drivers and barriers to positive waterway behaviour by communities. The Victorian Government will repeat the statewide *My Victorian Waterway* survey to:

- provide an improved understanding of community uses, expectations, attitudes and behaviours towards waterways
- provide information for the regional planning of waterway work programs
- help guide community engagement activities
- assess and evaluate effectiveness of waterway health community education and engagement activities.

Waterway managers will consider the findings from social research to help inform development and implementation of regional waterway management programs.

Action 5.1: Evaluate the use of information from the first *My Victorian Waterway* survey to inform the development of future social research into waterway management.

Who: Department of Environment and Primary Industries, waterway managers, Environment Protection Authority Victoria, Marine Safety Act waterway managers.

Timeframe: 2019

Action 5.2: Conduct the second *My Victorian Waterway* survey prior to the renewal of the *Victorian Waterway Management Strategy*.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2020

5.7 Promoting improved understanding of waterways

Although local communities feel highly connected to their local waterways and are generally concerned about waterway health, the *My Victorian Waterway* survey showed that actual knowledge about waterway health issues is lacking in some areas. While the majority of respondents had good knowledge, less than 14 per cent of respondents had excellent knowledge. However, there is goodwill in the community, with 87 per cent of respondents saying that they have a commitment and 96 per cent a personal responsibility, to do the right thing for waterways. Therefore, increasing knowledge and community understanding about waterways and waterway health could result in a significant increase in community stewardship of waterways and more sustainable waterway behaviour.

Under the *Catchment and Land Protection Act 1994*, one of the functions of catchment management authorities is to promote community awareness and understanding of the importance of land and water resources, their sustainable use, conservation and improvement. Waterway managers therefore have a strong role to play in undertaking waterway awareness raising activities. Community-based natural

resource management programs such as Landcare Networks (and groups) can also play a role in educating their peers and the wider community, as well as promoting the importance of volunteerism. Waterway managers are also responsible for discussing good management practices with landholders and improving the capacity for those practices to be implemented.

Policy 5.6

Waterway managers will undertake community engagement activities and provide educational material to further improve community understanding of waterways and increase the capacity of landholders to implement improved management practices.

Waterway managers will continue to act as a communication link between local communities and other relevant stakeholder groups on waterway management issues.

Action 5.3: Develop information for the public about the importance of healthy waterways, good management practices and waterway management issues.

Who: Department of Environment and Primary Industries, waterway managers, Marine Safety Act waterway managers, Environment Protection Authority Victoria.

Timeframe: 2016



BugBlitz event raising awareness around waterway health. Courtesy West Gippsland CMA



6

Victorian Traditional Owner involvement in waterway management

Protecting culture: A local Traditional Owner inspects an artefact at Hume Weir. Photographer: Richard McTernan

Victorian Traditional Owner involvement in waterway management

Guide to the chapter

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What are the issues with existing arrangements?

Until recently, Victorian Traditional Owners have not been able to participate in waterway management at a level that appropriately reflects their rights and interests. While Australian governments have ratified and established a range of international, national and state policies in relation to the rights of Indigenous people, there is still much work to do with regard to the effective implementation of these policies. Victorian Traditional Owners have strong interests in healthy waterways and a right to be involved in regional waterway management on their Country. Future partnerships with Traditional Owners will be more successful if they are supported by improved engagement processes and the provision of specific capacity building opportunities.

What improvements does the Strategy make?

For Victorian Traditional Owner involvement in waterway management the Strategy will:

- recognise the ongoing connection to Country of Victoria's Traditional Owners
- ensure Victoria's Traditional Owners have specific opportunities to participate in regional planning processes for waterways
- promote and facilitate partnerships with government in regional land and waterway management through formal agreements
- provide capacity building opportunities.

6.1 Connection to Country: the land and its waterways

6.1.1 Values of waterways

For Traditional Owners, land and waterways (also known as 'Country') are a part of who they are, just as they are part of it¹. Traditional Aboriginal culture revolved around relationships to the land and water and these relationships held physical, social, environmental, spiritual and cultural significance. Today, the land and its waterways remain central to Traditional Owners' cultural identity and aspirations¹.

Traditional Owners have a distinct cultural perspective on water that relates to their identity and attachment to place, environmental knowledge, resource security and custodial responsibilities for managing Country². Water is the lifeblood for Country and waterways are the basis of many creation stories, such as the Murray Cod dreaming story that celebrates the creation of the Murray River¹. Waterways are also an historical and ongoing source of food, fibre and medicine and an important place to camp, hunt, fish, swim and connect with traditional culture and stories, to ensure that they are passed on to future generations. Totem species, which connect people to Country and are a critical part of cultural beliefs¹, may also depend on healthy waterways.

Many Aboriginal cultural sites such as middens, initiation grounds, tools, fish traps, scar trees or other artefacts are located on or near waterways. Some significant sites may have no observable features but are important for their intangible links to past places of spiritual or ceremonial significance, resources, trade, travel or stories³.

A 2013 analysis of data in the Victorian Aboriginal Heritage Register found that almost 30% of known Aboriginal cultural heritage places were within 100m of a waterway.

6.1.2 Aspirations related to waterway management

Aboriginal people view themselves as an integral part of water systems and Traditional Owners have strong cultural obligations to manage waterways in their own Country without affecting the ability of other communities to do the same³. Aspirations regarding waterway management span the full range of environmental, social, cultural and economic values that waterways provide. A recent summary of Aboriginal values and interests in the Murray-Darling Basin⁴ described how Aboriginal people seek:

- recognition of their cultural, social, environmental, spiritual and economic connections to land and water
- recognition and respect for their traditional knowledge, ongoing cultural practices and customary rights
- cultural flows; to ensure there is enough water for people to conduct their ceremonial business
- meaningful, active involvement in natural resource management and river operations
- proper resourcing to provide access to important places and help Traditional Owners be actively involved in caring for their Country.

Interviews with Traditional Owners in the Gippsland region⁵ highlighted a strong desire to improve future economic and social well-being and to protect the natural environment, which is a critical part of Aboriginal culture. Protecting and managing their cultural heritage sites is also a key aspiration.

Water can also be vital to support economic values and aspirations such as trading, hunting and gathering food that can reduce the need to purchase similar items. Water can also sustain businesses in industries such as aquaculture and horticulture, as well as ecotourism and cultural tourism.



Wadi Wadi Traditional Owner Cain Chaplin and film crew making a documentary about cultural flows. Courtesy Barmah-Millewa Collective.

6.2 Current legislative and policy framework

6.2.1 International

The Australian Government has ratified several international human rights instruments that recognise and protect Indigenous peoples' special connection to land and waters and provide for the right to practice, revitalise, teach and develop culture, customs and spiritual practices and to utilise natural resources⁶. They emphasise the importance of Indigenous peoples' traditional knowledge and involvement in environmental management and biodiversity conservation. These instruments oblige Australia (as far as possible and appropriate) to respect, preserve and maintain the knowledge, innovations and practices of Indigenous peoples relevant to the conservation and sustainable use of biological diversity. For example, Article 18 of the United Nations Declaration of Rights of Indigenous Peoples states that "*Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions*". Article 32, Section 1 states that "*Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources*"⁶.

Apart from supporting the implementation of these instruments and being consistent with international agreements, the involvement of Traditional Owners in land and water management on their Country is also very likely to result in more comprehensive and inclusive solutions to waterway management issues⁷.

6.2.2 National

Native title, and connection to Country more broadly, reflects the strong spiritual and cultural connection of Traditional Owners to traditional lands and waterways. Native title rights are the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws. These rights are recognised and protected through the *Native Title Act 1993* (Cth).

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) provides for the listing of Aboriginal places that are of outstanding national heritage value. Once a national heritage place is listed there are special requirements to ensure the site is protected and conserved for future generations. Heritage places include landscapes, sites and areas that are particularly important to Aboriginal people as part of their customary beliefs and

traditions. Many of these heritage places are associated with waterways, such as the Budj Bim National Heritage Landscape at Lake Condah in Victoria's south-west. This site is home to one of Australia's largest aquaculture systems that is thousands of years old and provides evidence of a large, semi-permanent Aboriginal community systematically farming and smoking eels for food and trade. The Gunditjmara community are actively involved in the management of this landscape and waterways, including as owners of certain areas in their own right.

The National Water Initiative requires that state water entitlement and planning frameworks recognise Indigenous needs in relation to access and management. It requires water plans to incorporate Indigenous social, spiritual and customary objectives and strategies for achieving these objectives wherever they can be developed. Water planning processes should include Indigenous representatives where possible and take account of the possible existence of native title rights to water. In June 2012, the National Water Commission released a position statement on Indigenous access to water resources directing governments to develop more effective strategies for incorporating Indigenous social, spiritual and customary objectives in water plans.

The *Water Act 2007* (Cth) requires the Basin Plan (see Section 1.2.3) to be developed having regard to the National Water Initiative and also social, cultural, Indigenous and other public benefit issues. The Basin Plan, finalised in late 2012, includes specific requirements for engagement with relevant Indigenous organisations, identification of objectives and outcomes based on Indigenous values and uses and having regard to Indigenous views on cultural flows.

The Australian Government has committed to halving the gap in employment outcomes between Indigenous and non-Indigenous Australians by 2018. Many Aboriginal and Torres Strait Islander people express a strong desire to be involved in managing natural and cultural landscapes, including employment and enterprise opportunities based around natural resource management and primary industries. In April 2010, the Natural Resource Management Ministerial Council and Primary Industries Ministerial Council endorsed the *Investment Action Plan and Investment Implementation Plan* as a roadmap for co-ordinated actions by Australian and State and Territory governments to increase the participation of Indigenous people in natural resource management and primary industries.

6.2.3 State

In partnership with the Department of Justice, the Department of Environment and Primary Industries (DEPI) plays an important role in settling native title claims, negotiating agreements relating to land, water and biodiversity outcomes and generally facilitating increased Traditional Owner access to land and natural resources. To date, four native title claims have been positively determined through the Federal Court under the *Native Title Act 1993* (Cth). The Victorian Government has established an alternative mechanism for negotiating comprehensive native title settlements, through the *Traditional Owner Settlement Act 2010*, that is designed to be quicker, more cost-effective and more equitable. Agreements under this State legislation can include:

- the hand back and joint management of parks and reserves (see Section 6.4.1) that are of significance to Traditional Owner groups (Land Agreement)
- a new simplified regime to guide consultation and negotiation with Traditional Owners for activities that have a substantial impact on their rights in relation to Crown land (Land Use Activity Agreement)
- increased access to, and sustainable use and management of natural resources (Natural Resource Agreement).

DEPI is also preparing an Aboriginal Inclusion Action Plan to guide its engagement with and inclusion of all Aboriginal Victorians.

Victorian water resource planning (through the regional Sustainable Water Strategies) includes specific engagement and consultation with Traditional Owners on all water plans. Governments across Australia (including Victoria) are in the early stages of formally recognising Traditional Owner relationships with water for spiritual, cultural and economic purposes. For example, recent changes to the *Water Act 1989* allow for members of a Traditional Owner group with a natural resource agreement to take and use water from a waterway or bore for traditional (non-commercial) purposes. However, the Victorian Government recognises that work needs to be undertaken to make it easier for Traditional Owners to access the water allocation framework.

The Victorian Government is enhancing capacity in Traditional Owner and Aboriginal communities to support them becoming more involved in water resource decisions and processes, as well as waterway management. Policies and actions are outlined in this strategy, in the regional Sustainable Water Strategies and the regional Waterway Strategies (see Section 6.4.2).

Aboriginal cultural values associated with waterways are explicitly recognised in this Strategy (see Section 3.4) and in regional waterway planning processes (see Section 4.2). Cultural values are also specifically referenced in the section on waterway management in the *Water Act 1989*.

Policy 6.1

The Department of Environment and Primary Industries and its regional service providers will include and engage with Victoria's Traditional Owners and Aboriginal people in its programs and related activities, consistent with policy direction set under the DEPI Aboriginal Inclusion Action Plan. This direction will align with the principles outlined in the *Victorian Aboriginal Affairs Framework 2013-2018*.

Action 6.1: Develop the Department of Environment and Primary Industries' Aboriginal Inclusion Action Plan.

Who: Department of Environment and Primary Industries.

Timeframe: late 2013



Midden Site. Courtesy West Gippsland CMA

6.2.4 Aboriginal cultural heritage and waterway management in Victoria

Many sites of cultural importance for Traditional Owners are located on or close to waterways. Traditional Owners are the custodians of their cultural heritage and the rightful decision makers for cultural heritage management. The *Aboriginal Heritage Act 2006* is the Victorian government's legislation for protecting Aboriginal cultural heritage. The Act established Cultural Heritage Management Plans and Cultural Heritage Permit processes to manage high impact activities that may harm Aboriginal cultural heritage. It also established the Victorian Aboriginal Heritage Council and Registered Aboriginal Parties to ensure that Traditional Owners throughout Victoria play a central role in the protection and management of their heritage.

Registered Aboriginal Parties (RAPs) are Traditional Owner organisations that manage their cultural heritage over a particular area of land and are appointed under the Act by the Victorian Aboriginal Heritage Council.

The Act was reviewed in 2012 and a response by the Victorian Government was released in June 2013. The Victorian Government also responded in mid 2013 to the findings of the Parliamentary Enquiry into the Establishment and Effectiveness of Registered Aboriginal Parties.

Under the Act, Aboriginal places and objects in Victoria, whether known or unknown, cannot be disturbed or destroyed. Cultural Heritage Management Plans are required for high impact activities proposed for listed areas of cultural heritage sensitivity, as defined in the *Aboriginal Heritage Regulations 2007*. Cultural Heritage Management Plans are a way of protecting and managing cultural heritage, while allowing for some development.

Outside the Act, places that are significant for their Aboriginal associations may also be protected by being recognised by local governments in Heritage Overlays as part of local planning schemes.

Waterway managers also consider Aboriginal cultural heritage values when planning waterway management programs in their region (see Section 6.4.2).

Policy 6.2

Waterway managers and other relevant state agencies will undertake their activities in a way that recognises and respects Aboriginal cultural heritage places and complies with national and State legislation.

6.3 Future policy directions

6.3.1 National trends in Indigenous engagement

While the level of recognition of Indigenous rights to access and use natural resources varies between jurisdictions across Australia, there is a general move towards explicit and comprehensive recognition of these rights. Examples of national trends in the way Indigenous Australians are engaging and being engaged in natural resource management include:

- the linking of Indigenous cultural and natural resource rights to the conservation and sustainable use of biodiversity
- a greater emphasis on the connection of particular Indigenous people (Traditional Owners) to particular areas (traditional Country) and recognition of area-based rights set out by formal agreements
- meaningful involvement of Traditional Owners in natural resource governance and use of traditional knowledge
- recognition that Traditional Owners' cultural connection to Country involves both a right to use resources and an obligation to manage them. The potential management outcomes therefore apply not only to particular resources that can be hunted or gathered, but also to other components of Country including the control of terrestrial and aquatic weeds and pests.

6.3.2 Water resource planning in the Murray-Darling Basin

The Basin Plan begins with a recognition and acknowledgement that the Traditional Owners and their Nations in the Murray-Darling Basin have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. It acknowledges the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the Basin. There are specific requirements in Chapter 10 of the Basin Plan that will have implications for future Indigenous involvement in development of water resource plans and how these plans consider Indigenous values, uses and views on cultural flows.



Courtesy DEPI. Photographer: David Hannah

6.4 Supporting partnerships in regional land and water management

Catchment management authorities (CMAs) are responsible for integrated planning and co-ordination of land, water and biodiversity management in each of the ten catchment regions in Victoria.

These regional agencies are therefore an important link for Traditional Owner involvement in regional land and water management. Partnerships between Traditional Owner groups and state or regional agencies can range from informal relationships initiated for individual projects through to formal agreements for land, land use activity or natural resources negotiated between the State and Traditional Owner groups (see Section 6.2.3).

6.4.1 Joint and co-operative management agreements

The Victorian Government is progressively strengthening partnerships with Traditional Owners through joint and co-operative management agreements over Crown land. These agreements recognise Traditional Owners' relationship to land, provide for certain rights on Crown land and for the establishment of Traditional Owner boards or councils whose purpose it is to prepare management plans and/or provide advice about the management of land within the agreement areas. Many of these areas contain waterways with significant environmental, social or cultural values. The Minister for Environment and Climate Change has established a Traditional Owner Land Management Board

in Gippsland, which will jointly manage areas including Gippsland Lakes Coastal Park, Lakes National Park, Mitchell River National Park and Lake Tyers State Park. Similarly, the Minister has agreed to establish a Traditional Owner Land Management Board for Barmah National Park, which will supplement existing co-operative management arrangements in respect of other Crown land areas within Yorta Yorta Country (see Case study 6.1).

The Minister in 2013 also entered into an agreement with the Dja Dja Wurrung to establish a Traditional Owner Land Management Board to jointly manage areas in their Country.

Joint and co-operative management agreements recognise the ongoing connection of Traditional Owners to Country and formalise their involvement in the management of their Country. This partnership approach aims to combine traditional ecological knowledge and cultural practices with contemporary land and water management to better protect natural and cultural values. The agreements also provide enhanced economic opportunities for Traditional Owners and a vehicle for their increased involvement in natural resource management.

6.4.2 Regional Waterway Strategies

Waterway managers (the CMAs and Melbourne Water in the metropolitan region, see Chapter 1, Box 1.2 and Section 18.2.2) are responsible for planning, implementing and monitoring waterway management activities. As outlined in Chapter 5, any individual has the opportunity to be involved in planning, management and monitoring in their region. This involvement is largely linked to the development and implementation of the regional Waterway Strategies (RWSs).

Waterway managers are responsible for leading the development of RWSs, which are the primary planning documents for waterway management in each region (see Section 4.2). In line with the principles for community participation outlined in Section 5.2, public participation activities must make additional efforts to facilitate the involvement of those potentially affected by, or interested in, a decision or activity. Given the strong aspirations and rights of Traditional Owners to be involved in waterway management on their traditional lands, they are considered critical partners in the development of the RWSs.

The RWSs identify high value waterways and then develop a regional work program of management activities for priority waterways over an eight-year period. Development of the RWSs is underpinned by a regional priority setting process that uses information about the environmental, social, cultural and economic values associated with waterways and the threats to those values (see Section 4.2.3). In the previous planning period, Aboriginal cultural heritage places were the only type of Aboriginal cultural value considered in this process. Further work is required to determine methods for identifying a wider range of Aboriginal values associated with waterways. These approaches will be informed by the findings of The National Cultural Flows Planning and Research Committee who are using case studies to identify Indigenous water values and uses.

Case study 6.1: Joint management of Barmah National Park

Barmah National Park, together with the adjacent Millewa forest in New South Wales, forms the largest River Red Gum forest in the world. The health and ecology of this iconic forest is intimately linked with the Murray River and its flooding regime and provides a diverse habitat for many species, especially waterbirds.

Traditional Owners have a long connection with the River Red Gum forest and Murray River in the Barmah area, with scarred trees, mounds, stone artefacts, middens and burial sites all found in the Barmah National Park.

In 2010, the State of Victoria entered into a Traditional Owner Land Management Agreement with the Yorta Yorta people, to establish a Traditional Owner board for Barmah National Park. The joint management of the iconic Barmah National Park by Traditional Owners and the State will integrate contemporary management practices with traditional culture and knowledge to ensure the natural and cultural values of the area are protected, while also providing tourism and educational experiences.

Traditional Owner organisations and natural resource management business enterprises may also be engaged in the implementation of management activities outlined in the RWSs. Traditional Owner businesses that collect seed and propagate tube stock, participate in pest plant and animal control programs and undertake riparian revegetation and fencing already work in partnership with waterway managers.

There are also considerable opportunities for waterway managers to work in partnership with Traditional Owners to improve waterway health through the implementation of the RWSs and Regional Catchment Strategies. For example, the North Central Catchment Management Authority has worked closely with the Barapa Barapa and the Dja Dja Wurrung people in setting up work crews that provide opportunities for Traditional Owners to work on Country, improve catchment and waterway health and protect cultural heritage.

Policy 6.3

Traditional Owner groups that have recognised native title rights or formal agreements with the State will be involved in the development of the regional Waterway Strategies. Where these groups have the capacity and desire to be engaged at a higher level, opportunities for collaboration will be provided.

Decisions on engaging other Traditional Owner groups will be made at the regional level by waterway managers. Decisions must reflect the existence of Traditional Owner Land Management Boards, Traditional Owner Corporations and Registered Aboriginal Parties.

Aboriginal values associated with waterways will be identified in the regional Waterway Strategies.

Waterway managers will seek to work with Traditional Owners to incorporate their traditional knowledge and values into the regional Waterway Strategies (where this is culturally appropriate, desired by Traditional Owners and consent is provided).

Action 6.2: Provide guidance to waterway managers regarding Traditional Owner engagement for the regional Waterway Strategies.

Who: Department of Environment and Primary Industries, waterway managers, Traditional Owners.

Timeframe: late 2013

Action 6.3: Investigate methods for identifying Aboriginal values associated with waterways and how they can be better incorporated in regional planning processes for waterways.

Who: Department of Environment and Primary Industries, waterway managers, Traditional Owners.

Timeframe: 2015

Action 6.4: Evaluate engagement of Traditional Owners in the development of the regional Waterway Strategies.

Who: Department of Environment and Primary Industries, waterway managers, Traditional Owners.

Timeframe: 2015

6.5 Improving capacity building opportunities

The Victorian Government recognises the strong aspirations of Traditional Owners and Aboriginal Victorians for an appropriate and meaningful role in natural resource management in Victoria.

However, a history of past injustice and inequality has meant that some Traditional Owners and Aboriginal Victorians are not as ready or able to participate in natural resource planning and management as other Victorians.

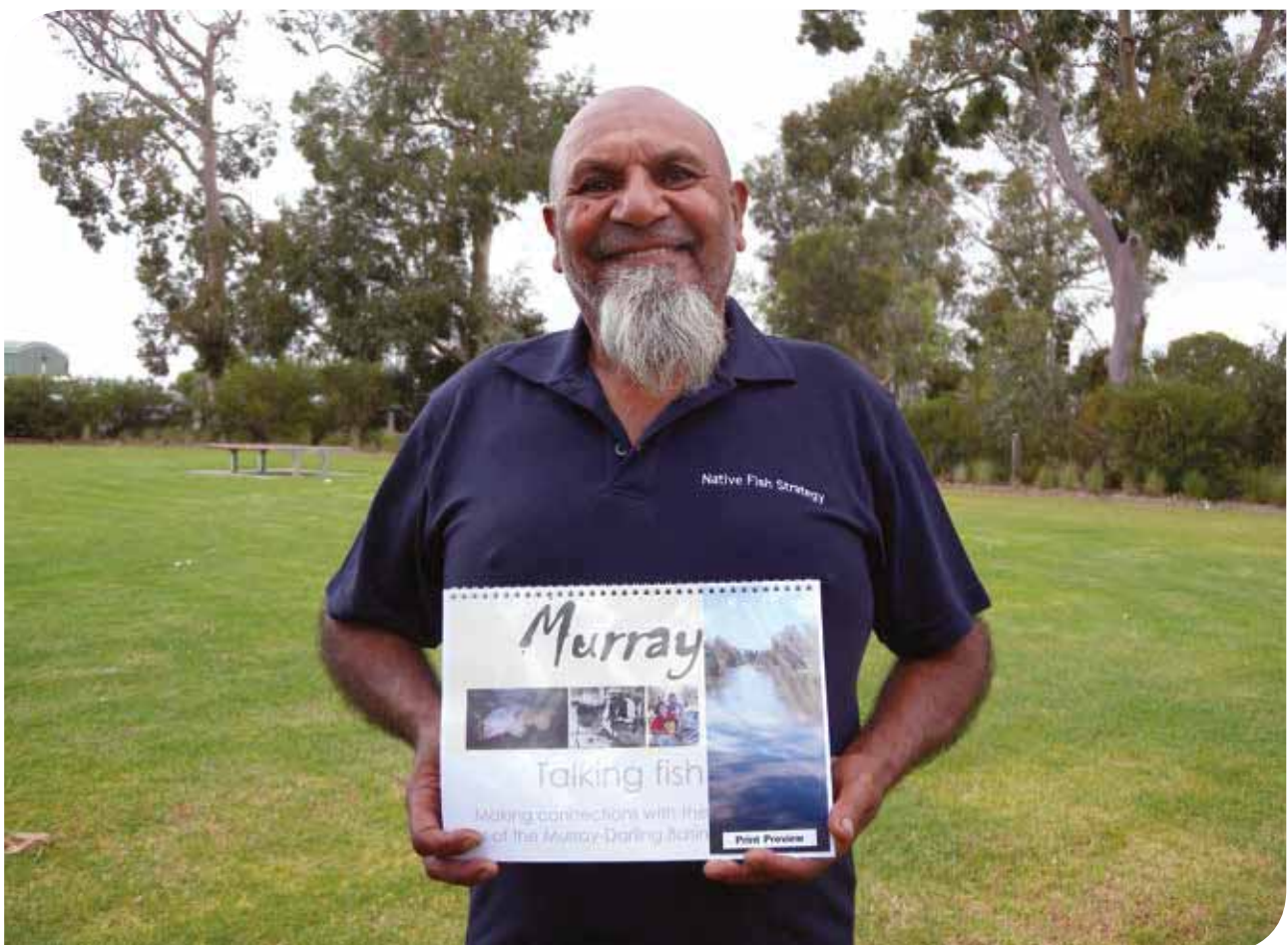
Areas where Traditional Owners are seeking increased participation include land and water management and involvement in government programs and initiatives. Consistent with emerging Commonwealth and State policy linking native title settlements with economic development outcomes for Traditional Owners, there is a strong aspiration to be able to use natural resources in a way that provides economic benefits for their communities.

Action 6.5: Education, training and capacity building for Traditional Owners and Aboriginal Victorians will be improved by inviting Traditional Owners and Aboriginal Victorians to nominate leaders or individuals with specific aptitude, knowledge or skills, for:

- a scholarship for the biennial Graduate Certificate of River Health offered by The University of Melbourne
- a position within the Department of Environment and Primary Industries Graduate Recruitment Program
- a scholarship for the Graduate Diploma of Natural and Cultural Resource Management offered by the Institute of Koorie Education, Deakin University.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: from 2012



Uncle Wally Cooper holds an oral history book including stories of his life on the river. Photographer: Fern Hames

6.6 Access to waterways

A key aspiration for Traditional Owners is to have access to waterways in their Country¹. Many Aboriginal cultural heritage places are located on or near waterways and access to these areas and their water is critical.

Waterways and riparian areas are important parts of the landscape for many cultural practices and values, such as fishing, collecting mussels, catching eels, hunting animals, collecting eggs, gathering various plants for food, medicine and basket weaving. Many of these practices are dependent on access to water and healthy waterways.

Waterways and riparian areas are also important as meeting places to come together as families and communities for cultural, social and recreational activities. Access to healthy waterways and riparian areas is vitally important for these activities to continue and for future generations to learn about their culture. Waterway managers may undertake management activities to improve access to waterways, but must also consider the potential negative effects on Aboriginal values that may arise by improving access for other users (for example, trail bike riding).

The *Traditional Owner Settlement Act 2010* provides rights for members of a Traditional Owner group with an agreement to access Crown land and use natural resources for traditional purposes including; hunting, fishing, camping and gathering in accordance with existing laws. These rights do not effect the access of existing users, such as recreational fishers. Currently, members of a Traditional Owner organisation with a native title determination and/or natural resource agreement can take and use water from a waterway or bore for traditional (non-commercial) purposes in accordance with a consent order given under the *Native Title Act 1993* (Cth) or an authorisation order given under the *Traditional Owner Settlement Act 2010*.

Policy 6.4

Government will facilitate Traditional Owner access to waterways and riparian areas on Crown land and use of natural resources in their Country through formal agreements.

Waterway managers will work with Traditional Owners where issues affect access to waterways and riparian areas and consider actions to remove impediments.



7

Recreational use of waterways

*Enjoying the Glenelg River.
Photographer: Johanna Slijkerman*

Recreational use of waterways

Guide to the chapter

7.1 Context

7.2 Recreational fishing

- Improving waterway condition to support fish populations
- Responsibilities for managing freshwater and estuarine fish in Victoria
- Recreational fish species

7.3 Recreational duck hunting

- Ensuring recreational duck hunting is sustainable
- Habitat conservation and game management

7.4 Recreational use of lakes and reservoirs

- Managing storage levels
- Agency roles and responsibilities for drying lakes

7.5 Recreational boating

7.6 Managing the impacts of recreational activities

What are the issues with existing arrangements?

The social and economic values that waterways provide should be more comprehensively considered in waterway management planning and management activities. In some cases, managing for social values (such as recreational fishing) can conflict with managing for environmental values (such as threatened native fish populations). Recreational use of lakes, reservoirs and storages can be affected by periods of drought so clear roles and responsibilities need to be defined for management during these times.

What improvements does the Strategy make?

For recreational use of waterways the Strategy will:

- encourage and support community involvement in waterway planning for, and management of, recreational use of waterways
- acknowledge the importance of waterways for recreation and promote sustainable recreational use
- manage risks associated with recreational use of waterways through guidelines, protocols and education.

7.1 Context

Victoria's scenic and diverse waterways provide vital opportunities for communities to engage with the natural environment and enjoy water-based recreational activities such as fishing, waterfowl hunting, swimming, canoeing, rowing, sailing and motor-boating.

There are also many recreational activities that occur beside waterways such as walking, hiking, cycling, picnics and viewing native plants and animals. Coastal waterways, like the Gippsland Lakes system, are a magnet for thousands of local and interstate visitors during the summer months. These iconic waterways, and the recreational and tourism opportunities they provide, deliver significant benefits to the well-being of individuals and to regional economies. In more remote parts of Victoria, waterways in near natural areas provide opportunities for recreational fishers and bushwalkers to enjoy fishing, hiking and camping along small mountain streams. Recreational activities (or access to waterways for recreational purposes) are also common on riparian land along waterways (see Section 9.3.7).

It is important that the condition of Victoria's waterways is maintained or improved to ensure that valuable recreational opportunities persist into the future. Fish populations, particularly native species, often cannot survive without appropriate habitat or water quality. Tourists and locals cannot swim or enjoy waterways when there are persistent algal blooms.

The *My Victorian Waterway* survey (see Chapter 2, Box 2.1) found that recreational users of waterways have very high aspirations for waterways. It is clear from this that recreational users understand that healthy waterways are vital to support the recreational opportunities they enjoy. Recreational users are important stakeholders in waterway management. The Victorian Government will encourage and support their involvement in waterway planning and management as part of the broader commitment to work together with relevant stakeholder groups on waterway management issues.



Fishing is enjoyed by many Victorians. Courtesy Parks Victoria

7.2 Recreational fishing

7.2.1 Improving waterway condition to support fish populations

Recreational fishing is an activity enjoyed by many people in Victoria and it makes an important contribution to the Victorian economy. A study in 2008/09, found that 721,000 Victorians participated in recreational fishing and contributed \$825 million per year to the total Victorian Gross State Product¹. Inland fishing, including estuarine recreational fishing, was found to account for around 60 per cent of all recreational fishing activity.

Inland Victoria sustains a range of freshwater recreational fisheries in rivers and lakes. The most popular are introduced species such as trout and redfin, although anglers are increasingly targeting native species such as Golden Perch, Murray Cod and Australian Bass. All of these fish species, other than redfin, are stocked regularly by Fisheries Victoria to enhance recreational fishing opportunities for anglers. Native fish are also stocked for conservation purposes; to re-establish locally extinct populations or to boost numbers within their natural range. Yabbies and Spiny Freshwater Crayfish are also targeted by recreational fishers, but are not stocked by Fisheries Victoria. Fishing for estuarine species, such as bream and Estuary Perch, is a popular activity for those enjoying coastal holidays.

Fishing has always been an integral part of the cultural and economic life of Victorian Traditional Owners. Fishing provided, and continues to provide, not only sustenance and trade but also a strong connection to Country (see Chapter 6). The Victorian Government recognises Aboriginal customary fishing as unique and separate to recreational fishing and is committed to working together with the Aboriginal community to sustainably manage fish resources in freshwater and saltwater Country. The Victorian *Aboriginal Fishing Strategy*² focuses on achieving protection and recognition of Aboriginal customary rights, sustainable fisheries management in collaboration with Aboriginal communities and better economic opportunities for Aboriginal people in fishing and related industries.

Victoria's inland waters have been impacted by human use and the degraded environmental condition of many waterways has adversely affected recreational fishing. Over the last decade, this impact has been exacerbated by the long period of drought and may be further affected given the potential impacts of climate change. Recreational fishing is highly dependent on the environmental condition of waterways. This means that there are mutual interests in recreational fishers working with waterway managers and other resource management agencies to support works that improve connectivity, water quality, water regimes and instream habitat. Recreational fishers spend considerable time on Victorian waterways and their interest and advocacy for river restoration is growing. Programs that bring together governments, recreational fishing groups and regional waterway managers are increasingly popular and often have a strong focus on improving fish habitat. The Fish Habitat Network is one example that brings together organisations and individuals that are dedicated to 'making more fish naturally by rehabilitating fish habitat'.

7.2.2 Responsibilities for managing freshwater and estuarine fish in Victoria

The Department of Environment and Primary Industries (DEPI) is responsible for managing the environment in which fish live. The DEPI has legislative obligations under the *Flora and Fauna Guarantee Act 1988* (FFG Act) to protect, conserve and manage threatened fauna, including native fish. Further obligations exist under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The DEPI is involved in developing and implementing Recovery Plans and Action Statements for fish listed under these Acts and also for monitoring these fish populations. The DEPIs Arthur Rylah Institute also undertakes extensive research on threatened native fish species.

In 2013, nine native freshwater fish species in Victoria were listed as being nationally threatened under the EPBC Act and 19 species (and one native fish community) were listed as being threatened under the FFG Act. The conservation status of many of our native fish, and hence the DEPIs legislative responsibilities, requires action to support native fish and implement recovery actions. Victorian communities also place high value on our native freshwater fish and have strong expectations that fish populations will be well managed.

Within the DEPI, Fisheries Victoria is responsible for regulating the commercial and recreational take of fish and for the ecologically sustainable development, use and management of fisheries in Victoria in accordance with the *Fisheries Act 1995* and the FFG Act. They also work with recreational fishers to improve their recreational fishing experiences. Fisheries Victoria manage the stocking of waterways with recreational fishing species, fishing licences, the movement of fish species and protection of fish of recreational and economic importance from invasive competitors. Regulations to ensure sustainable fish populations include setting limits on the size and amount of fish people can take, fishing gear restrictions and seasonal or area closures. Fisheries Management Plans have previously been developed for most catchments that sustain inland fisheries, within the broader context of the integrated waterway management framework.

Policy 7.1

The Victorian Government is committed to maintaining or improving the environmental condition of waterways to enhance native fish populations and recreational fishing opportunities. Priorities include protecting existing fish populations, restoring fish passage, environmental water management, improving instream habitat and providing strategic research into waterway condition, threatened species and impacts of invasive species.

Waterway managers and land managers will consider opportunities to work more closely with the recreational fishing sector to enhance the recreational fishing experience.

Victoria is a partner in the Murray-Darling Basin Authority *Native Fish Strategy*, which recognises that native fish populations in the Murray-Darling Basin have fallen to 10 per cent of pre-European settlement levels. The *Native Fish Strategy*³ for the Murray-Darling Basin 2003-2013 aims to increase native fish populations back to 60 per cent of their estimated pre-settlement levels, within 50-years, through a suite of key actions.

Waterway managers are responsible for implementing onground works programs (for example, fencing and revegetation, building stabilisation structures, controlling invasive species, improving public access to waterways and constructing fishways) that maintain or improve the environmental condition of waterways. They also regulate activities that could threaten native fish under the *Water Act 1989*.

7.2.3 Recreational fish species

For generations, Victorians have not only enjoyed catching native fish species (such as Murray Cod, Australian Bass and Golden Perch) but also exotic species (such as salmon, trout and redfin). Fishing for these exotic species is not only a popular hobby, but supports a large industry in regional Victoria. These exotic species are important recreational species that now permanently occur in many of our waterways. Exotic species can negatively affect native fish species by eating young or small bodied native fish, competing with native species for scarce food resources or through aggressive behaviours such as fin nipping. This means that there can be competing management priorities in some reaches where rare or threatened native fish species co-occur with exotic recreational fish species.

While protecting native fish populations remains a legislative responsibility for the DEPI, it is common for the DEPI and waterway managers to incidentally improve conditions for exotic fish species as a consequence of restoration works

aimed at providing improved condition of waterways for native fish populations. This is because all aquatic life benefits from healthy waterways, and the associated good water quality, adequate water regimes, appropriate habitat and ability to move freely up and down rivers.

Stocking of both native and exotic fish species takes place in Victoria to improve recreational fishing opportunities. Fisheries Victoria stocks approximately 2.5 million fish every year into public waters throughout Victoria for recreational fishing purposes. At the State level, the Translocation Evaluation Panel advises Fisheries Victoria on issues related to the translocation of live aquatic organisms in accordance with protocols and guidelines. Regionally, stocking is dealt with through a consultative process involving regional input from land and waterway managers and recreational fishers.

Policy 7.2

The Victorian Government aims to maintain or improve the environmental condition of priority waterways to support healthy, self sustaining or stocked fish populations, including species that are fished for recreational, customary (cultural) and commercial purposes. Within this framework, the government undertakes stocking to enhance recreational fishing opportunities and as a recovery method for threatened native fish species.

Stocking will be assessed in accordance with the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria* and controls specified in the *Protocols for Translocation of Fish in Victorian Inland Public Waters*, which take into account the Government's responsibilities under state and national biodiversity legislation.



Victorian's have enjoyed fishing for the Murray Cod for many generations. Courtesy Arthur Rylah Institute

Case study 7.1: Working together to save a rare native fish

In early 2013, a partnership between Government agencies, recreational fishing groups and scientists was instrumental in saving a rare alpine fish in danger of extinction.

Parks Victoria, the Department of Environment and Primary Industries' Arthur Rylah Institute (ARI), West Gippsland Catchment Management Authority, VRfish and the Australian Trout Foundation co-operated on a project to protect the tiny Shaw Galaxias.

It is estimated that just over 100 Shaw Galaxias remain in the wild, in only a short section of a single small creek in the upper reaches of the Macalister River catchment in the Alpine National Park. Their habitat was previously protected from introduced trout by several natural barriers (for example, rocks and waterfalls).

Severe storms and floods in 2010 and 2011 allowed trout to move upstream into the Shaw Galaxias' habitat, quickly limiting them to a 300-metre reach of a 30-centimetre-wide creek. Surveys in May 2012 showed a dramatic decline in the numbers of Shaw Galaxias as a result of the trout moving into their habitat.

To protect the species, several temporary and permanent barriers were installed to stop trout moving further upstream into the remaining habitat of the Shaw Galaxias. "Electro-fishing" was then used to catch more than 700 trout in the creek above the barriers and move them safely downstream.

This series of simple onground activities, undertaken as a partnership between key agencies and interest groups, provides a vital step towards securing the future of the Shaw Galaxias.



The rare Shaw Galaxias. Photographer: Rudie Kuitert



Artificial barrier installed to protect the Shaw Galaxias from introduced trout. Photographer: Michael Nicol

7.3 Recreational duck hunting

Recreational duck hunting is an important social activity in regional Victoria for both local communities and interstate or overseas visitors.

Recreational duck hunting is a popular water-based recreational activity that contributes to local economies through expenditure on licences, equipment, accommodation and travel. It also provides an opportunity to obtain wild game for food. Duck hunting is allowed in wetlands on private land with the owner's permission, in State Game Reserves and some other types of public land.

There are approximately 25,000 licensed duck hunters in Victoria and most are aware of the need to protect native biodiversity and preserve habitat for native wildlife. Opportunities for recreational duck hunting rely on the good environmental condition of waterways. Without appropriate habitat or water quality, these game species may not occur or only be present in low numbers that do not provide hunting opportunities. However, there are many different opinions about duck hunting in wetlands, with some groups opposed to any hunting in wetlands. Other groups are supportive of sustainable levels of duck hunting.



Dowds Morass State Game Reserve provides habitat for many game and non-game bird species. Courtesy West Gippsland CMA

7.3.1 Ensuring recreational duck hunting is sustainable

Regulation of hunting under the *Wildlife Act 1975* aims to ensure that game hunting is sustainably and ethically managed and has minimal impact on non-game species. Regulations allow for the declaration of an open season, restrictions on hunting times, bag limits and hunting methods and the prohibition of the use of lead shot. Provisions exist for the closure of wetlands to duck hunting to protect non-game species. Many initiatives have been put in place over the last two decades to improve the management of duck hunting. These include hunter education programs to improve waterfowl identification skills and encourage ethical hunting. Duck hunters must also be licensed and pass a Waterfowl Identification Test. An independent Game Management Authority is being established to improve the effectiveness of game management and promote responsible game hunting.

Waterfowl surveys and scientific information on waterfowl populations are important in the management of each duck hunting season to ensure that harvesting levels are sustainable, taking into account the prevailing environmental conditions. In 2009, the Victorian Government, Field and Game Australia and the Sporting Shooters' Association of Australia (SSAA) funded a panel of scientific experts to develop a framework for the sustainable harvest of waterfowl in Victoria.

Following the recent floods across Victoria, wetland availability and waterfowl numbers across Victoria increased dramatically and provided excellent hunting conditions for the 2011 duck hunting season. Over 130 (then) Department of Sustainability and Environment, Parks Victoria and Victoria Police officers actively monitored and enforced duck hunting on more than 20 major wetlands across the state on opening weekend of the 2011 season. The vast majority of hunters on monitored wetlands were compliant with regulations.

Policy 7.3

The Victorian Government will continue to support sustainable levels of duck hunting in wetlands. These activities will be managed and monitored in accordance with the *Wildlife Act 1975* and the *Managing duck hunting in Victoria* manual (2011).

7.3.2 Habitat conservation and game management

Many game hunting organisations have a long history of working to conserve habitat and restore wetlands. Hunting groups can assist with the management and conservation of waterbird species in Victoria by erecting nest boxes, restoring degraded wetlands, controlling invasive species and working with State wildlife authorities and other groups on monitoring and survey projects. Field and Game Australia has been active in the restoration of wetlands, such as the Heart Morass in Gippsland and has provided input to the management of wetlands and environmental watering. There is scope to strengthen the role of game hunters in game management by improving co-ordination of conservation and game management efforts.

On private land, Property Based Game Management (PBGGM) programs encourage landholders to increase habitat for game species on their properties.

The programs aim to:

- increase biodiversity across the Victorian landscape
- provide opportunity for the Victorian farming community to manage game species on their property
- provide hunting opportunities for licensed hunters across Victoria through the enhancement of game species.

Through PBGM, landholders will have access to expert information and advice on management practices that will enhance game species and increase biodiversity on their properties. Landholders are connected to responsible hunters to assist them with activities such as feral animal control, population management and onground conservation works.

Policy 7.4

Co-operative management arrangements with hunting organisations for game and habitat management on State Wildlife Reserves and other appropriate land categories will be encouraged and supported.

Property Based Game Management programs on private land will continue to be supported.

The Victorian Government will continue to work with recreational game hunting organisations to improve opportunities for access and input into habitat management, where appropriate.



Nesting boxes at Macleod Morass, erected with the assistance of hunting groups, as part of wetland conservation projects. Courtesy DEPI

7.4 Recreational use of lakes and reservoirs

7.4.1 Managing storage levels

Water storages in open catchments (that is, accessible to the public) often provide important recreational opportunities for local communities, in addition to their primary function of storing water for irrigation, stock and domestic purposes. Local, interstate and international visitors to Victoria enjoy experiences on and in the water (such as motor boating, sailing, swimming and rowing) and beside the water (such as picnicking, camping and walking). These recreational opportunities provide flow-on economic benefits to regional communities but require ongoing management to ensure that the values of these areas are protected into the future.

Lakes and reservoirs that are used for recreational purposes are generally managed by water corporations and/or by voluntary committees of management (where they are Crown land reserves). In some cases, water corporations may develop specific management plans for individual lakes. It is important for recreational users to understand that these areas are often primarily managed for water storage and/or supply and that recreational opportunities are opportunistic and must not affect public health issues, such as maintaining the quality of domestic water supplies. However, there may be opportunities for recreational users to participate in decision making to try to ensure recreational opportunities are maximised where possible.

Although many lakes across regional Victoria have a long history of recreational use, infrastructure upgrades across Victoria have made some water storages redundant for their original purpose of water supply. These storages are often the focus of intense community lobbying to maintain water levels for recreational purposes. In limited cases, a specific entitlement for recreational water is available. However, in the majority of cases there is no water entitlement for recreational purposes. Environmental water entitlements may be used to provide secondary social benefits. However, their primary purpose is to maintain environmental values (see Section 8.4.4 for specific policy on this issue).

7.4.2 Agency roles and responsibilities for drying lakes

Until recently, Victoria faced prolonged drought conditions that saw many lakes across Victoria become partially or completely dry. In regional Victoria, these lakes are often the social and economic hub of small towns and their reduction or loss can be felt very deeply by local communities (see Case study 7.2). As a lake dries, some natural events and processes may pose risks to human health and the environment, or have social and economic impacts. Common occurrences during periods of lake drying include fish deaths, blue-green algae blooms, growth of weed species, loss of recreational opportunities, development of insect swarms and illegal access by stock or vehicles.

The drying of lakes can therefore cause strong emotional responses from individuals and communities. There are often significant differences in opinion as to what actions should be undertaken and how lakes should be managed now and into the future. Although the pressure eased with the high rainfall events of 2010–2011, it is important to be prepared for the next dry period. Therefore, the need to accurately identify responsible agencies for issues associated with drying lakes remains a management issue. It is also important for waterway managers to raise awareness within communities that dry periods are a natural occurrence for many lakes in Victoria.

Many different agencies have responsibility for various aspects of lake management and these roles and responsibilities have often been unclear to communities in the past. In response to this issue, and the prolonged drought conditions across Victoria over much of the past decade, the (then) DSE initiated the Drying Lakes project in 2008. This project brought together a range of agency experts and lake community members to form an agreed approach to future planning for lakes on Crown land that have the potential to remain dry in the long term.

The outcome of the Drying Lakes project was a tool that assists with the way drying lake queries are handled by the different management agencies and provides clarity around the agencies' roles and responsibilities. The *Guide to agency management of drying lakes in Victoria* (2010) lists a range of issues associated with drying lakes, agency and private landholder responsibilities, the legislative basis for those responsibilities and potential management responses and treatment options.

Policy 7.5

The Victorian Government will manage drying lakes in accordance with the *Guide to agency management of drying lakes in Victoria* (2010).

The preferred management approach is to allow lakes to adjust to drying conditions with no or minimal intervention. Actions to deal with social, economic or environmental issues that may arise as a consequence of lakes drying will require the consent of designated land managers and appropriate authorities.

Case study 7.2: Drying of Lake Colac: community and agency responses

Lake Colac is the largest freshwater lake in Victoria and one of the defining geographic features of the Colac Otway Shire. The lake is valued for the recreational, environmental and economic opportunities that it provides. It is home to the Colac Yacht and Rowing Clubs. Provision of parking and camping areas, picnic tables, barbecues and boat ramps make the foreshore publicly accessible for a number of uses. However, a period of drought conditions between 1997 and 2009 saw water levels decline so dramatically that all water-based activities on Lake Colac ceased.

As the condition of the lake deteriorated during this dry period, many of the values associated with the lake were lost. Environmental stress became severe and had flow-on economic and social effects that were widely felt throughout the region. Over the summer of 2008-2009, Lake Colac dried out completely. The yacht club abandoned its regattas, losing its major source of income, fewer visitors used camping facilities and recreational and commercial fishing ceased. The mass death of over 300 tonne of carp caused major concerns for the local community and severely affected on the amenity of the area.

Community concern about the perceived threat of increased fire hazard from native Fairy Grass invading the dry lake bed was also high. Many individuals and

groups saw the dry lake as an opportunity to address some of the long-standing problems contributing to the lake's generally poor environmental condition and to restore and enhance the values of the lake.

As one of the numerous agencies having responsibility for the management of the lake, the local government took the lead to address and reduce the significant impacts on the local community. A Dry Lake Working Group was developed with representation by local residents, Councillors and numerous expert agencies. This group took a collaborative approach to determining appropriate and feasible actions to reduce immediate risk to human safety and improve environmental condition and opportunities for recreation. They also planned for future responses and responsibilities for managing Lake Colac through periods of low water levels.

With increased rainfalls the lake has partially refilled, alleviating many of the concerns held by the community and lake and land management groups. With rising water levels, the lake is beginning to see the return of some boating and fishing activities. There have been many other benefits from the partially full lake, such as growth of extensive grassy areas along the lake shores that have provided a haven for breeding water birds.



Recreation on Lake Colac stopped when water levels dramatically declined. Photographer: Alison Pouliot

7.5 Recreational boating

Victoria's waterways (particularly lakes and reservoirs) provide opportunities for canoeing, kayaking, rowing, sailing, motor boating and associated activities such as water skiing. Recreational and commercial vessels operate on many of Victoria's waterways and their use is regulated under the *Marine Safety Act 2010*.

Marine Safety Act (MSA) waterway managers (see definition in Chapter 1, Box 1.2) can make rules regulating the operation of vessels and persons using the waterways. Regulations may include permanent waterway rules regarding speed, special activity areas and prohibited activities. MSA waterway managers can also regulate events occurring on waterways

In many locations across Victoria, boating activities are an important economic driver for local towns and communities. These recreational opportunities can be compromised when water levels drop during dry periods and hazards such as logs and branches are exposed. Conversely, increased water levels from floods can wash additional timber into waterways that may pose a threat to boating activities. Recreational boating on waterways can have negative effects on the condition of waterways, for example, waves caused

Policy 7.6

Large woody habitat will not be removed from waterways unless it is demonstrated to be a serious threat to human health or safety because it occurs in a high use area. Where this has been demonstrated, the option of realigning the large woody habitat will be investigated to retain the environmental benefits within the waterway.

Marine Safety Act waterway managers will work with Transport Safety Victoria to identify risks to safety for recreational boating that may arise from instream works, where required.

by powered boats may contribute to bank erosion and the removal of large woody habitat from waterways, to reduce hazards for recreational boating, can be detrimental for native fish populations. These effects need to be carefully managed to ensure that the environmental condition of waterways is maintained and that the multiple values of waterways are not compromised. Some management activities may be mutually beneficial for waterway condition and recreational boating, for example removing invasive aquatic weeds or works to improve water quality.



Boating on Barmah Lake. Photographer: Keith Ward

7.6 Managing the impacts of recreational activities

The *My Victorian Waterway* survey (see Chapter 2, Box 2.1) found that the most frequently mentioned use of waterways was simply for ‘enjoying the scenery’, followed by enjoyment of native plants and animals and activities such as walking, hiking, cycling, picnics and barbeques.

However, there can be risks to waterways that are associated with these and other recreational activities. Impacts associated with recreational activities can include trampling of vegetation, dispersal of weeds, impacts on species habitat and bank erosion. These risks may be intensified for waterways in urban areas where population density is higher and people regularly use and enjoy waterways for recreational and social purposes (see Section 14.1.1). Managing access to waterways is a critical component to reducing the impact from recreational activities, particularly for sensitive ecosystems such as wetlands.

For example, the construction of raised boardwalks in wetland areas can minimise vegetation trampling and erosion and also ensure that visitors and their pets are kept at a suitable distance from bird breeding sites. In some catchments, community access may be restricted to ensure that the quality of drinking water supplies is protected. Management of waterway access also provides opportunities for connecting with the community and providing information about the functioning of waterways, or the importance of local onground works through the use of interpretive signage.

Policy 7.7

Where recreational activities occur that may affect waterway condition, the relevant waterway manager or land manager will identify and work with recreational users to manage those risks.



Boardwalks help manage impacts of recreational activities at Kinnairds Swamp. Photographer: Keith Ward



8

Environmental water management

Environmental water management

Guide to the chapter

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- Management of risks relating to delivery of large volumes of environmental water
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8.7 Maintaining environmental water availability

- Maintaining other types of environmental water
- Management of unregulated systems
- Better defining environmental water needs of groundwater-dependent ecosystems

8.8 Continual improvement of environmental water management

- Research to support environmental water management
- Monitoring and reporting

What are the issues with existing arrangements?

Planning arrangements for environmental water management need to be clearly outlined, including roles and responsibilities for the Victorian Environmental Water Holder, waterway managers, the Murray-Darling Basin Authority and the Commonwealth Environmental Water Holder.

Major water recovery initiatives in Victoria are completed or well underway and the focus is now on efficient and effective use of existing environmental water.

More work is required to ensure better management of groundwater-dependent ecosystems.

What improvements does the Strategy make?

For environmental water management the Strategy will:

- reaffirm Victoria’s approach to managing environmental water, in recognition of the advances that have been made in recovering water for the environment and establishing robust frameworks for its management
- clarify the roles, responsibilities and relationships between waterway managers, the Victorian Government, the Victorian Environmental Water Holder and the Commonwealth Environmental Water Holder, as well as Victoria’s interaction with the Murray-Darling Basin Authority and Murray-Darling Basin Plan
- provide policy direction to address complex environmental water management issues, such as considering social and cultural benefits that are supported by environmental water
- describe tools to achieve more efficient and effective use of existing environmental water
- outline actions to reduce risks to environmental water availability
- identify and manage groundwater-dependent ecosystems
- support research and monitoring to improve knowledge about the ecological outcomes of environmental water use.

8.1 Overview – managing Victoria’s environmental water

Water in Victoria’s rivers, estuaries and wetlands is vital to support environmental values and as a resource for people, agriculture and industry.

Historically, high levels of water extraction for people, agriculture and industry (consumptive uses) often resulted in changes to natural water regimes and insufficient water available to maintain the condition and environmental values of waterways. Considerable effort has been made to achieve a better balance between water for consumptive uses and water for the environment. Victoria has undertaken significant work since 2005 to set aside water specifically for the environment, referred to as the Environmental Water Reserve (EWR) (see Section 8.1.1). The focus for the next eight years is on innovative ways to improve how that environmental water is managed.

The efficient and effective management of Victoria’s environmental water is crucial to protect and improve waterway condition. Environmental water management has evolved rapidly in the past decade with the following key developments:

- a shift from environmental water with limited management opportunities to large-scale management of an increased number of specific environmental water entitlements
- innovative solutions for managing environmental water more efficiently, developed during the severe drought period, which has added to the complexity of environmental water management decisions
- emergence of environmental water management as an issue of national importance, with the Australian Government taking on a significant role in managing environmental water
- improvements to the transparency and efficiency of the institutional framework for environmental water management, notably, the establishment of the Victorian Environmental Water Holder (VEWH).

Making the most efficient and effective use of environmental water is also important because it will reduce the need to recover more water for the environment now and into the future.

Values of environmental water

Environmental water supports many values such as native plants and animals, habitat features such as drought refuges and is also vital to maintain the condition of important waterways with formally recognised significance, such as Ramsar wetlands.

Environmental water is important to:

- stimulate animals such as native fish to feed and breed (for example, Murray Cod and Golden Perch need to be able to move onto floodplains to feed)
- trigger plants to seed or germinate (for example, River Red Gums need flooding for seeds to germinate)
- move carbon between rivers, floodplains and estuaries
- allow fish and plants to move throughout river systems 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.

While being described as ‘environmental’ water, maintaining or improving water regimes in rivers, estuaries and wetlands also provides for other benefits including recreation and tourism, protection of cultural heritage, and regional economic values (for example, water quality benefits).

Flows in Victorian rivers and estuaries are naturally variable reflecting the rainfall and runoff within their catchments. They generally comprise low flows in summer with occasional small peaks in flow after rain (freshes), which help to maintain or improve water quality. Higher winter and spring flows, including overbank flooding, re-connect isolated pool habitats, provide soil and nutrients for floodplains, as well as being vital for the breeding success of water birds, native fish, turtles and frogs.

Wetlands and floodplains typically have wetting and drying phases, both of which are important for different plants and animals. For example, wetting phases are important in sustaining the health of River Red Gum forests and providing breeding habitats for waterbirds. Drying phases help to maintain an appropriate balance of aquatic and terrestrial plants.

The key values, threats and management activities for environmental water are shown in Figure 8.1.

Threats to environmental water

Victoria’s history of water extraction from rivers (via dams and other regulating structures, diversions from streams, groundwater bores and small catchment dams), and in some cases over allocation to consumptive uses, has altered the natural hydrology of our rivers, wetlands and estuaries. Water extraction, combined with the severe drought in the period 1997–2009, led to a decline in the environmental condition of many waterways, affecting environmental values such as River Red Gums along the Murray River and many native fish species.

Land use change within catchments, such as land clearing and urbanisation, has also modified the water regimes of many waterways. The potential impacts of climate change may affect future water availability and may have further effects on the environmental condition of waterways.

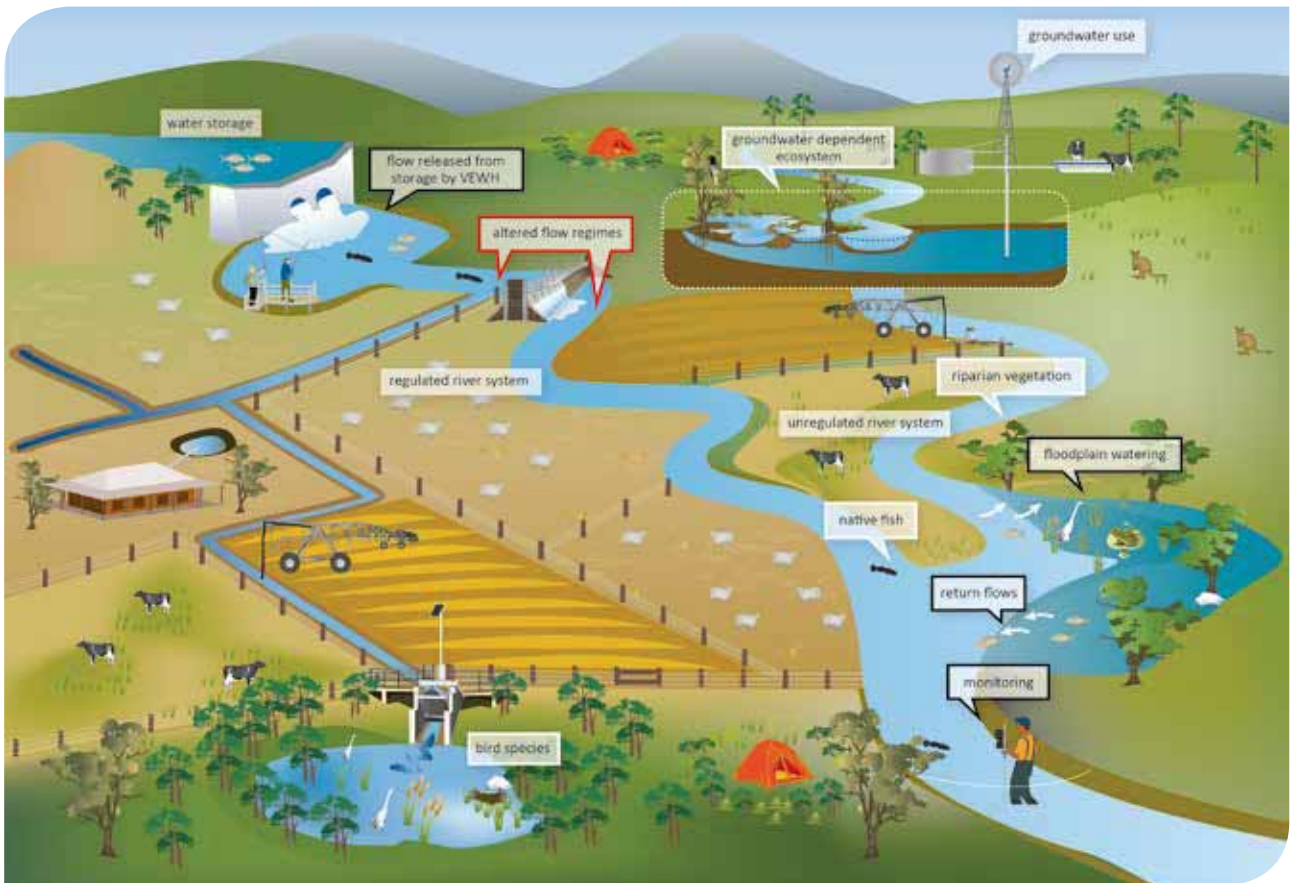


Figure 8.1: Values (white), threats (red) and management activities (black) for environmental water

8.1.1 Securing water for the environment

Environmental water in the EWR is provided in three ways:

1. **Environmental water entitlements:** a volume of water held by the environment in perpetuity. In general, the entitlements are a share of the available resource (inflows) in storages that can be released to meet specific environmental needs.
2. **Obligations on consumptive entitlements (passing flows):** the volume of water that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point before water can be taken for consumptive use.
3. **'Above cap' water:** the water available above limits on consumptive volumes of surface water and groundwater. Most water available to the environment is 'above cap' water, which can be a very unreliable source of water.

In regulated systems, environmental water is set aside mainly through environmental water entitlements. In unregulated rivers, environmental water is provided primarily through management of existing diversions via licence conditions, rostering and restriction rules.



The Messengers pumping station aims to water Hattah Lakes efficiently and maximise ecological outcomes. The Living Murray is a joint initiative funded by the New South Wales, Victorian, South Australian, Australian Capital Territory and Commonwealth governments, coordinated by the Murray–Darling Basin Authority. Courtesy Mallee CMA

Box 8.1: The Murray-Darling Basin Plan

Victoria's share of the 77,000 kilometres of rivers in the Murray-Darling Basin includes part of the Murray River and its Victorian tributaries including the Kiewa, Ovens, Broken, Goulburn, Campaspe and Loddon river systems. The Murray-Darling Basin Plan provides for the integrated management of water resources across the Basin (see Section 1.2.3) and as such forms a significant part of the framework within which waterway management in northern Victoria takes place.

The Basin Plan sets requirements for a range of issues regarding management of water across the Basin for environmental, social, cultural or economic outcomes.

Key components of the Basin Plan are:

- establishment of legal Sustainable Diversion Limits (SDLs) on surface water and groundwater diversions from 1 July 2019 onwards
- establishment of Basin-wide environmental objectives for water-dependent ecosystems and water quality and salinity objectives
- an environmental watering plan
- a water quality and salinity management plan
- requirements regarding water trade and protection of water for critical human needs
- requirements for development of water resource plans
- a monitoring and evaluation program.

The Basin Plan sets legal limits on the amount of surface water and groundwater that can be taken from the Basin from 1 July 2019 onwards. The Plan requires the recovery of sufficient water to provide environmental outcomes equivalent to those that would be achieved through recovery of 2,750 gigalitres per year.

Recognising that it may be possible to achieve the environmental benefits more efficiently, the Basin Plan allows for consideration of environmental works and measures and improvements to river operations that can secure environmental outcomes equal to those in the Basin Plan, but using less than 2750 gigalitres of held environmental water (see Section 8.3.2).

A key element of the Basin Plan is an Environmental Water Plan, which institutes a planning framework for use of environmental water across the Basin, including principles and methods for establishing priorities and making watering decisions. Decisions for the use of environmental water under the Basin Plan are made through the planning frameworks of each water holder to meet the Basin Plan's ecological objectives (see Section 8.4.2)

Victoria will work closely with the Murray-Darling Basin Authority and the Commonwealth Environmental Water Holder to implement the Basin Plan and establish arrangements and priorities for use of Commonwealth-held water in Victoria. Victoria is party to the Basin Plan Implementation Agreement, which clarifies Victoria's obligations including those related to long-term environmental water management, monitoring and reporting. Consistent with this, Victoria will be seeking to use existing state statutory frameworks to meet all related requirements under the Basin Plan.

8.1.2 Guiding principles for environmental water management

The objective of the EWR is to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning and quality of water and other uses that depend on environmental condition. It is the responsibility of the holder of an environmental entitlement to manage it accordingly.

The management of environmental water in Victoria is guided by the following principles:

Integrated waterway management

- priority rivers, estuaries, wetlands and groundwater-dependent ecosystems for environmental water management will be identified through regional waterway planning processes, in consultation with the community
- environmental water management will be comprehensively integrated with complementary onground works programs for rivers, estuaries and wetlands

Maximising efficiency and seeking multiple benefits

- management will be efficient and maximise the environmental benefit achieved from the available water resources and funding; to minimise the economic and regional impacts associated with water recovery for the environment
- adverse social, cultural and economic and environmental effects will be managed and, where possible, minimised
- social and cultural benefits will be provided if possible, where this does not adversely affect environmental outcomes
- consumptive water and/or recycled water should be used to provide environmental benefits where this does not adversely affect existing users of water for non-environmental purposes

Transparent and sound decision-making

- management will be accountable and transparent, with clear roles and responsibilities for agencies and clear communication of decisions and outcomes achieved
- key stakeholders will be engaged at appropriate stages of environmental water management
- management will be based on the best available knowledge

Being prepared for future conditions

- planning will consider the full range of climate scenarios
- management will aim to address the risks of severe droughts, floods and the potential impacts of climate change, while avoiding unacceptable costs if these events do occur
- ongoing monitoring, evaluation and reporting will be used to facilitate adaptive management and continuous improvement.

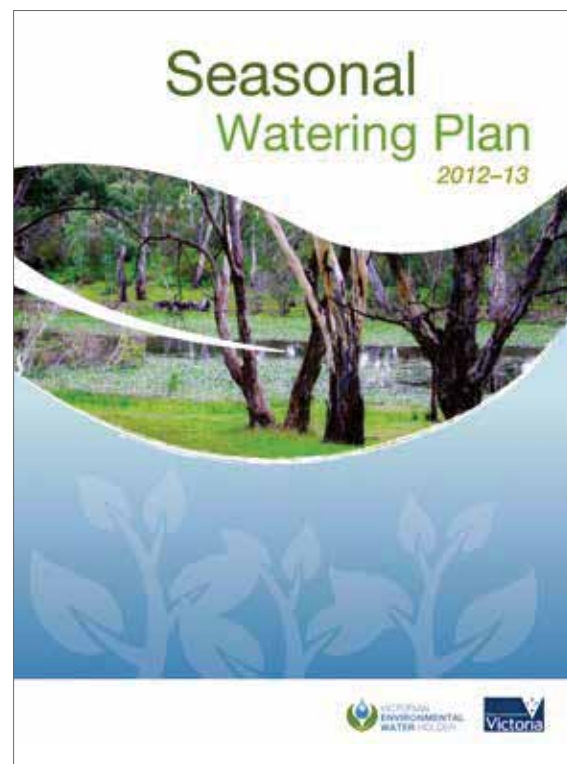
8.1.3 Roles and responsibilities for environmental water management

There are several agencies directly involved in environmental water management in Victoria (Table 8.1). Other important agencies, such as public land managers, play an important role in facilitating the delivery of environmental watering outcomes.

In 2010, the Victorian Parliament passed an amendment to the *Water Act 1989* to establish the independent Victorian Environmental Water Holder (VEWH). The VEWH took over responsibility for holding and managing Victoria's environmental water entitlements (the Water Holdings) from the Minister for Environment and Climate Change in July 2011.



Victorian Environmental Water Holder (VEWH) logo.



The VEWH annual Seasonal Watering Plan provides the blueprint for the Victorian environmental watering program each year.

Table 8.1: Roles and responsibilities for environmental water management in Victoria

| Minister/Agency | Responsibilities |
|--|--|
| Minister for Environment and Climate Change | <ul style="list-style-type: none"> oversee Victoria's environmental water management policy framework oversee the VEWH, including appointment and removal of commissioners and creation of rules ensuring VEWH manages the Water Holdings in line with environmental water management policy |
| Minister for Water | <ul style="list-style-type: none"> administer the broader water allocation and entitlements framework and the <i>Water Act 1989</i> |
| Department of Environment and Primary Industries | <ul style="list-style-type: none"> manage the water allocation and entitlements framework develop state policy on water resource management and waterway management approved by the Minister for Water and Minister for Environment and Climate Change develop state policy for the management of environmental water in regulated and unregulated systems act on behalf of the Minister for Environment and Climate Change to maintain oversight of the VEWH and waterway managers (in their role as environmental water managers) |
| Victorian Environmental Water Holder | <ul style="list-style-type: none"> make decisions about the most effective use of the Water Holdings, including use, trade and carryover authorise waterway managers to implement watering decisions liaise with other water holders to ensure co-ordinated use of all sources of environmental water publicly communicate environmental watering decisions and outcomes commission targeted projects to demonstrate ecological outcomes of environmental watering at key sites report on management of the Water Holdings |
| Waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) | <ul style="list-style-type: none"> identify regional priorities for environmental water management in regional Waterway Strategies, in consultation with the community assess water regime requirements of priority rivers, estuaries and wetlands to identify environmental watering needs to meet agreed objectives identify opportunities for, and implement, environmental works to use environmental water more efficiently propose annual environmental watering actions to the VEWH and implement the VEWH environmental watering decisions provide critical input to management of other types of environmental water (passing flows management, above cap water) report on environmental water management activities undertaken |
| Commonwealth Environmental Water Holder | <ul style="list-style-type: none"> make decisions about the use of Commonwealth water holdings, including providing water to the VEWH for use in Victoria liaise with the VEWH to ensure co-ordinated use of environmental water in Victoria report on management of Commonwealth water holdings |
| Water corporations | <ul style="list-style-type: none"> work with the VEWH and waterway managers in planning for the delivery of environmental water to maximise environmental outcomes operate water supply infrastructure such as dams and irrigation distribution systems to deliver environmental water ensure the provision of passing flows and compliance with management of diversion limits in unregulated and groundwater systems |

Effective collaboration and communication among key agencies is essential to the success of environmental water management programs. The VEWH engages directly with waterway managers through the development of seasonal watering proposals and the development and implementation of the seasonal watering plan. The proposals and plan are provided to other water holders to ensure planning is aligned and co-ordinated. Additionally, the VEWH is involved in the Murray-Darling Basin Authority's Environmental Watering Group which is responsible for planning the delivery of The Living Murray program environmental water (see Section 1.2.3).

Community engagement is also a critical part of the environmental water management framework. It provides an understanding of what the community values about waterways and supports the planning for, and delivery of, environmental water management programs. Waterway managers also engage public land managers and storage operators to ensure that appropriate delivery arrangements are possible or in place to enable environmental watering.

Other stakeholders with an interest in environmental watering include Traditional Owners, environmental groups, recreational users, local government, other water entitlement holders, landholders and local communities. It is important that the interests and values of these groups are incorporated in planning for, and management of, environmental water.

Policy 8.1

The Victorian Environmental Water Holder will proactively seek opportunities to communicate with delivery partners and key stakeholders in the development and implementation of its environmental water management policies and plans.

Action 8.1: The Victorian Environmental Water Holder will identify and create engagement opportunities for stakeholders who have an interest in environmental watering.

Who: Victorian Environmental Water Holder.

Timeframe: 2014

8.1.4 Interactions with the Australian Government and Murray-Darling Basin Authority

As part of its role as statewide co-ordinator of environmental watering activities in Victoria, the VEWH liaises with other environmental water holders to co-ordinate delivery of their water with the delivery of Victorian Water Holdings. The key relationships for the VEWH are with the Murray-Darling Basin Authority (MDBA) and the Commonwealth Environmental Water Holder (CEWH).

The CEWH is responsible for managing the Commonwealth's environmental water holdings to protect the environmental assets of the Murray-Darling Basin. The CEWH holds the water recovered to meet the Basin Plan's environmental water recovery target. A substantial proportion of this water is held in Victorian storages. Victorian waterways benefit from its use either directly for Victorian sites, or from its delivery en route to downstream locations – such as in South Australia.

The MDBA coordinates The Living Murray (TLM) program, through which decisions are made about use of approximately 500 gigalitres of environmental water across TLM Icon sites. These include four large Victorian Murray floodplains.

Further detail on how planning and management of environmental water in Victoria is integrated across the VEWH, CEWH and MDBA is outlined in Section 8.4.

Policy 8.2

The Victorian Environmental Water Holder will co-ordinate the use of The Living Murray and Commonwealth Environmental Water Holder water entitlements in Victoria to maximise environmental outcomes.

Delivery of Commonwealth environmental water that is allocated to Victorian sites will be co-ordinated by waterway managers through the Victorian Environmental Water Holder processes under Victoria's water entitlement framework.

Each government will fund (through appropriate mechanisms) the delivery, monitoring and management of its own environmental water.



Hattah Lakes Wetlands. Environmental watering regulator gate. Courtesy Mallee CMA

8.2 Adaptive and integrated management of environmental water

Adaptive management involves learning from management activities to improve the next stage of management (see Chapter 17). It is an iterative process that requires ongoing monitoring, evaluation and reporting.

Adaptive management allows environmental managers to continuously improve knowledge and make more informed future management decisions. It can also provide the information required to periodically assess objectives and environmental values at sites.

The current adaptive management approach for environmental water will be refined by:

- adapting watering decisions to prevailing climate conditions in any year (using the seasonally adaptive approach, see Section 4.2.5)
- identifying a clear and transparent process to change environmental objectives if current objectives are no longer feasible (see Section 4.2.7).

Integrated management focuses on achieving environmental outcomes through an appropriate mix of environmental water, complementary (non-water related) onground works, and environmental works such as regulators and pumps.

This adaptive and integrated approach to environmental water management involves seven steps, which are reflected in planning documents (see Figure 8.3) within the environmental water management framework.

1. Identification of environmental (and other) values and regional priorities for environmental water management to determine river, estuary and wetland health objectives through regional Waterway Strategies (see Section 4.2).
2. Determination of the water regime required to maintain those environmental values using best-practice, scientifically-based methods and identification of shortfalls in water required to maintain environmental values (see Section 8.3.1).
3. Identification of targets for water recovery to address shortfalls in environmental water (where required) through regional Sustainable Water Strategies (see Section 8.3.2).
4. Effective and efficient planning and use of water available to the environment (see Sections 8.4 and 8.5)
5. Consideration and implementation of environmental works and measures to address shortfalls in water, assessing benefits against feasibility and cost-effectiveness (see Section 8.5.1).
6. Maximise environmental outcomes through complementary (non-water related) measures such as riparian revegetation and fencing (see Chapter 9), and the provision of fish passage (see Section 11.4.4).
7. Monitor, report and evaluate effectiveness of environmental water use.

Environmental values of waterways are reassessed periodically, informed by ongoing monitoring (see Section 8.8.2) and take into account outcomes that have already been achieved. This may result in repeating some or all of the seven steps.



Wallawalla Wetlands after receiving environmental water in 2010. Photographer: Shar Ramamurthy

8.3 Providing water for the environment

Balancing the needs of the environment and other water users continues to present challenges for environmental water management. It requires a transparent approach to identify environmental water needs to ensure any efforts for future water recovery are well-considered.

8.3.1 Identifying the required water regime

The Victorian Government's environmental flow assessment methodology (the FLOWS method) determines the water regime required to support environmental values identified for river systems. The water regime requirements are used to inform water allocation decisions. Environmental flow studies using the FLOWS method have been completed for 42 rivers across Victoria and can be found at www.ourwater.vic.gov.au/environment/rivers/flows/environmental-flow-studies

For wetland systems, similar principles will be applied to determine their required water regime. This will be captured as part of the planning and management of environmental water (see Section 8.4.1).

Less information is available about the freshwater requirements of estuaries compared to rivers and wetlands. However, it is known that the inflow of freshwater from rivers or groundwater is important for maintaining the environmental condition of estuaries. Freshwater inflows can trigger fish breeding, help to maintain an entrance to the sea, can improve water quality and maintain associated floodplains and vegetation communities. To support management decisions the Victorian Government developed the Estuary Environmental Flows Assessment Method (EEFAM), a consistent and systematic approach to determine the required water regime for estuaries. The Estuary Environmental Flow Assessment Method will be used to determine the water regime requirements of priority Victorian estuaries and to inform water allocation decisions that may affect the environmental condition of estuaries.

Policy 8.3

Best practice, scientifically-based methods will be used to determine the required water regime for priority river, wetland and estuarine systems. This will include the use of quantitative data, multi-disciplinary expert panels and community-based consultative committees to identify environmental values, set environmental water objectives and specify a water regime (including wet and dry cycles where appropriate to support environmental values).

8.3.2 Recovering water for the environment

Increasing the share of water to the environment can affect existing water users and important economic activities, such as irrigated agriculture. In Victoria, decisions to recover additional water for the environment have been made through regional Sustainable Water Strategies (SWS's, see Section 1.2.2), which undergo a comprehensive consultation process with regional communities, water users and environmental managers. In doing so, it is also important to minimise economic and regional impacts by looking for opportunities to maximise environmental outcomes from held water.

Where it has been deemed necessary to recover water for the environment (for example, as part of the Basin Plan), the Victorian Government's strong preference has been that it occurs through water saving infrastructure projects. Upgrades to irrigation infrastructure to reduce evaporation or seepage and leakage mean that less water is lost en route through water delivery and the resulting water savings can be used to meet environmental objectives.

Water obtained through savings has been set aside in environmental entitlements. Since the creation of the EWR in 2005, the number of environmental entitlements has increased from 1 to over 20 and the volume of water provided under these entitlements will increase from 27 gigalitres to over 620 gigalitres per year.

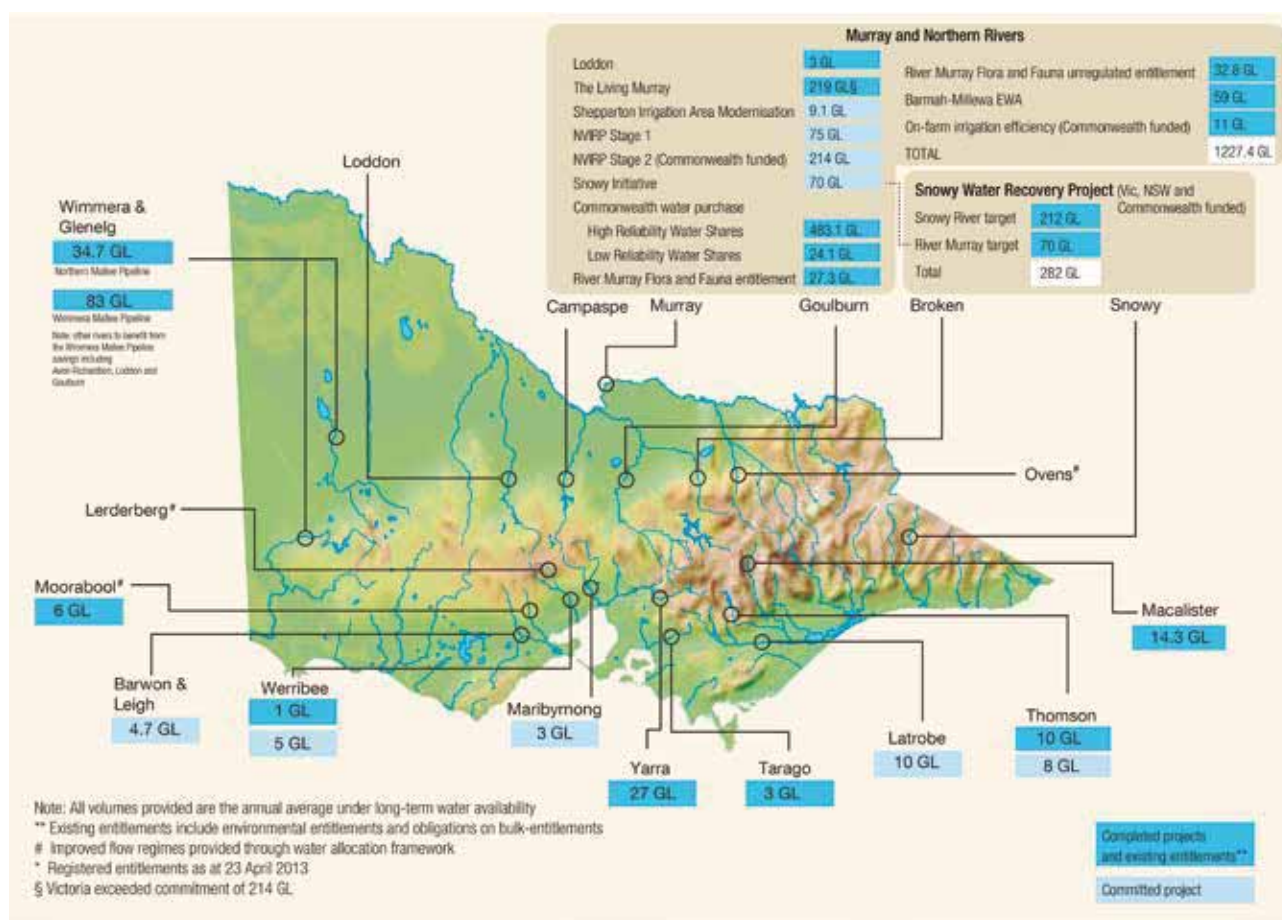


Figure 8.2: Victoria's water recovery projects (including jointly funded projects) up to April 2013.

Over the past decade, there has been significant investment by several state governments and the Australian Government to return water to the environment. Key Victorian water recovery projects are shown in Figure 8.2. Projects include TLM, Snowy River initiatives, Goulburn-Murray Water Connections Program (formerly the Northern Victoria Irrigation Renewal Project), Wimmera-Mallee Pipeline project and, more recently, water recovery by the Australian Government to meet the Basin Plan targets. The recovered water is held by jurisdictionally based agencies, such as the VEWH or the CEWH.

In Victoria, the major water recovery projects are largely complete or well underway, and no further water recovery is expected, other than to meet the requirements of the Basin Plan.

Beyond the projects outlined in Figure 8.2, the Basin Plan will recover sufficient water to provide environmental benefits equivalent to those that would be achieved through recovery of 2,750 gigalitres per year. If the full volume of water needs to be recovered, Victoria's share of this is 1,075.3 gigalitres. The focus of future investment will be to maximise the efficiencies in using environmental water.

The Basin Plan includes a mechanism to adjust the SDLs, in recognition that it may be possible to achieve the environmental outcomes more efficiently using works and measures or changed river operations.

This could reduce the amount of water needed to be taken out of productive use to secure these outcomes by up to 650 gigalitres.

The majority of Victoria's water recovery obligations have already been met through purchase of water entitlements or are contracted to be recovered through infrastructure efficiency projects, such as the Goulburn-Murray Water Connections Program (over 700 gigalitres). The remaining obligations won't be clear until 2016, following assessment of proposals for water efficiency measures to offset water recovery. If offsets total 650 gigalitres, no further Commonwealth general buyback tenders for high reliability water shares will be needed in northern Victoria. If offsets are less than the expected 650 gigalitres and additional water purchase is required, it is expected to include a proportionate mix of low reliability shares. Previously the purchase program in Victoria focussed almost solely on high reliability shares.

Policy 8.4

Victorian environmental water management will focus on making the most efficient and effective use of water available.

Victoria will continue to encourage the Australian Government to achieve water recovery through water saving infrastructure projects and reinforce that this should be done in a way that recognises that water recovery obligations for each jurisdiction have now been fully apportioned under the Basin Plan and associated intergovernmental agreements.

8.4 Managing environmental water entitlements

Most water recovery for the environment has occurred in regulated river systems and has been converted to environmental water entitlements.

Entitlements are the most reliable type of environmental water and can be managed to meet specific environmental objectives (that is, by delivering water to specific sites at

a chosen time by arranging for the release of water from storages). Environmental entitlements represent about four per cent of water available to the environment in Victoria.

In order to achieve the best environmental outcomes with the available environmental water, efficient and effective management of environmental water entitlements is required. This management is planned and implemented through a framework of key documents (see Figure 8.3).

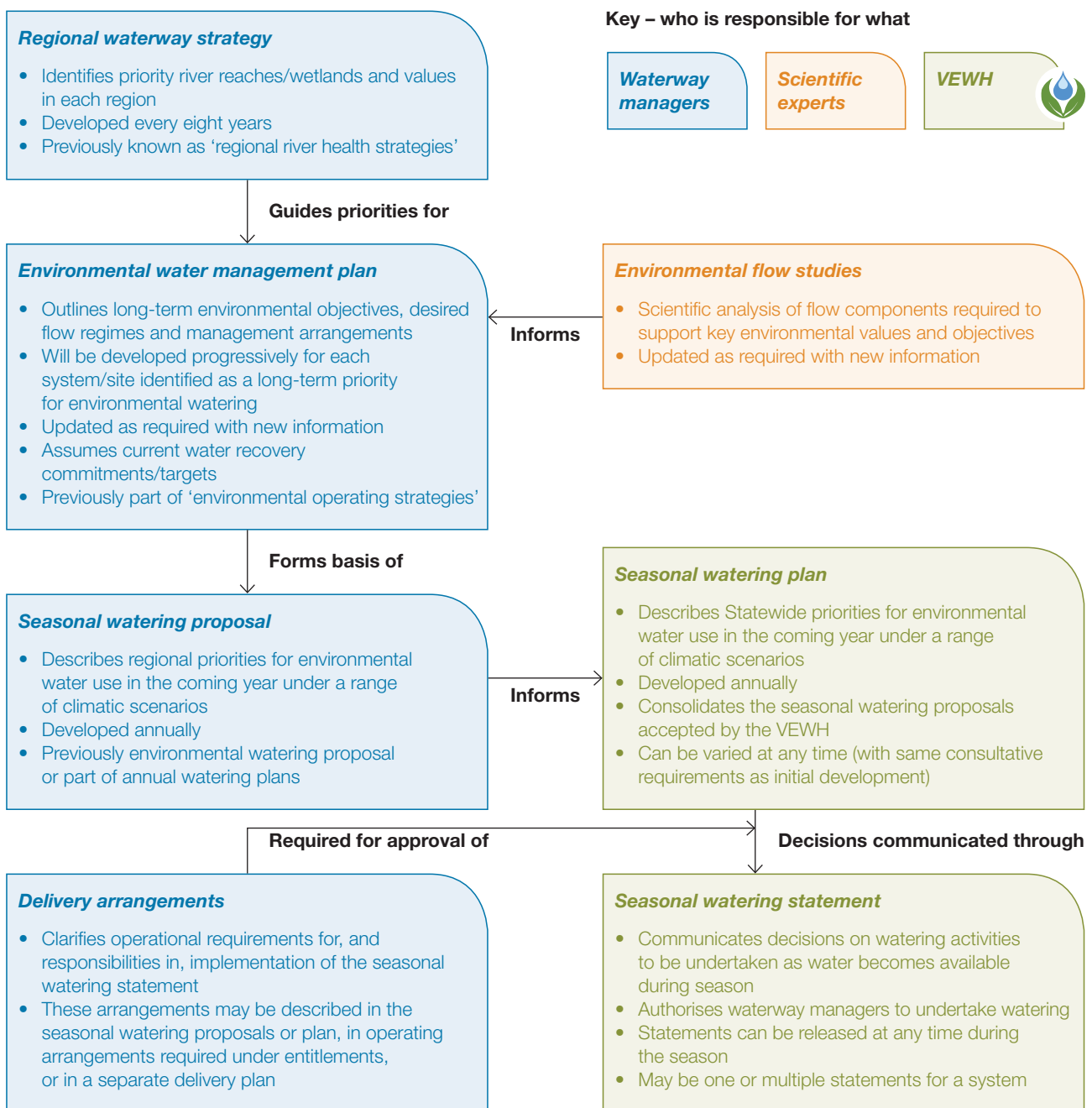


Figure 8.3: Planning framework for decisions about environmental water management in Victoria.

8.4.1 Planning processes for the use of environmental water

Regional Waterway Strategies (RWSs) identify priority waterways where environmental values are at risk from altered water regimes (see Section 4.2) and identify high level management objectives. These management objectives take into account the other values of the waterway, including social, cultural and economic values.

To develop detailed environmental objectives for regional priority waterways where environmental water can be delivered, environmental water management plans (EWMPs) are developed for particular sites. EWMPs outline longer-term management objectives for a site and detailed operational planning for use of environmental water. They are developed in consultation with regional communities (and, where possible, identify opportunities for social and cultural benefits) and include environmental watering objectives, water regime targets and ecological tolerances for the site. The EWMPs provide additional information such as management arrangements and delivery constraints. EWMPs will initially focus on individual sites but, as knowledge increases, they may extend to planning at the broader system scale.

Informed by their RWSs and EWMPs, waterway managers prepare seasonal watering proposals each year to identify annual priorities for environmental water use in their region. The Basin Plan also includes requirements for Long Term Environmental Watering Plans for environmental assets, which will be similar to Victoria's EWMPs. Victoria's EWMPs will need to be consistent with the Long Term Environmental Watering Plans.

Policy 8.5

Environmental water management plans will be prepared for priority waterways that have environmental values at risk from altered water regimes (identified in regional Waterway Strategies) and are able to receive environmental water allocations.

8.4.2 Integration of Commonwealth and State planning processes and environmental watering in Victoria

The VEWH, CEWH and MDBA are each responsible for different portions of the environmental water available for use in Victoria's Murray-Darling Basin waterways. Planning for the use of this water requires an approach that recognises the objectives and planning frameworks under which each of these bodies operates, and integrates these to achieve delivery through the VEWH's operational framework.

The Basin Plan sets objectives and targets to guide the use of water recovered for the environment. This then relies on the planning framework of each water holder to guide water management to meet the Basin Plan's ecological objectives. The Basin Plan includes a planning framework for environmental water that aligns with Victoria's framework (see Figure 8.4).

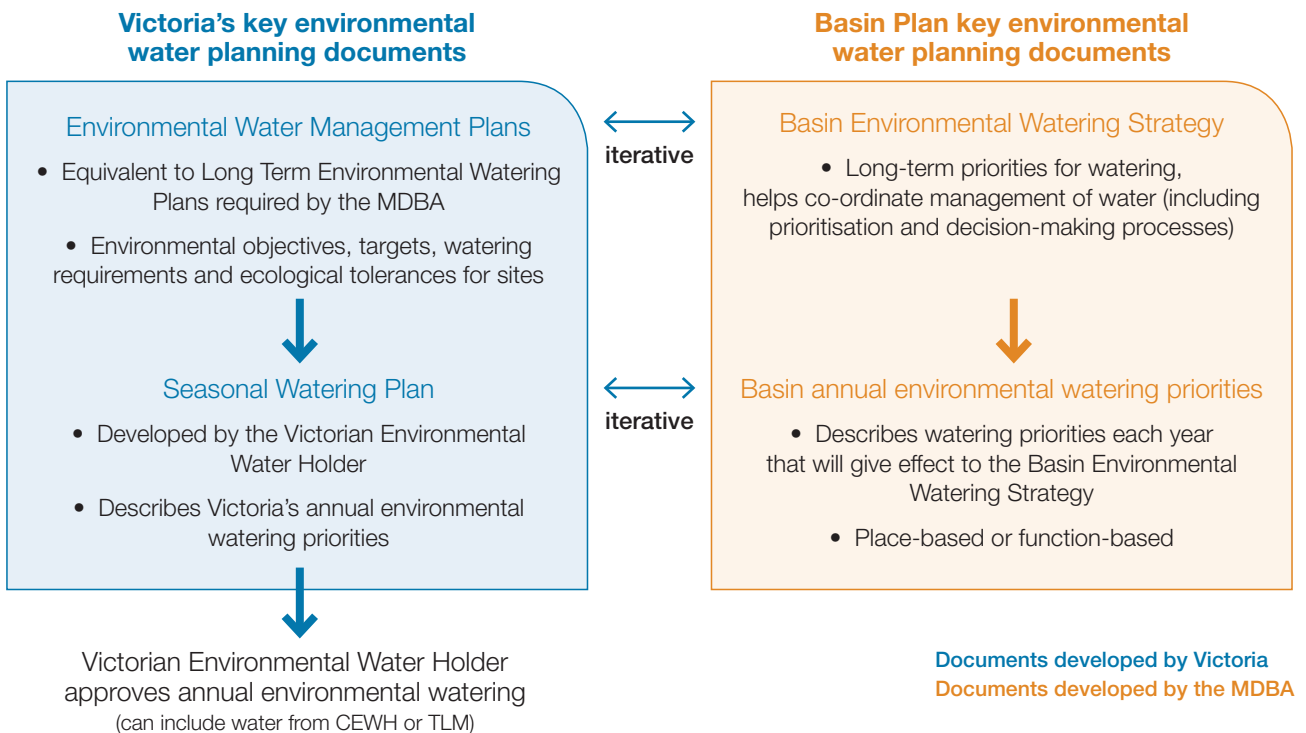


Figure 8.4: Alignment of key Victorian environmental water planning documents with the Basin Plan environmental watering framework

8.4.3 Criteria for prioritising use of environmental water

The VEWH is the key decision-maker for prioritising the use of environmental water entitlements across Victoria. Decisions are based on an analysis of seasonal watering proposals prepared by waterway managers. The VEWH makes decisions about the way available environmental water will be used each year and communicates these decisions through its seasonal watering plan and seasonal watering statements (see Figure 8.3).

Decisions on how and where to use environmental water are made in line with the principle of *'maximising environmental outcomes with the available resources'*. Criteria specific to regulated systems have been developed to guide the prioritisation of environmental watering activities between sites with differing values and in varying condition. These criteria were tested through the extended dry period from 1997–2009 (see Policy 8.6 and Figure 8.5).



Barmah Forest receives environmental water in 2010/11 to sustain bird breeding. Photographer: Keith Ward

Policy 8.6

In considering the seasonal watering proposals, developing the seasonal watering plan and prioritising the use of the Water Holdings, the Victorian Environmental Water Holder will make decisions on the basis of balanced and evidence-based consideration of all criteria listed below:

Criteria to prioritise water use to 'maximise environmental outcomes with the available resources'

| Criteria | Examples |
|---|--|
| Extent and significance of the environmental benefit expected from the watering | The area watered, size of the breeding event to be triggered, conservation status of species that will benefit |
| Certainty of achieving the environmental benefit and capacity to manage other threats | Water has been provided before with demonstrated benefits, relevant complementary works are being undertaken to manage other threats |
| Capacity to provide ongoing benefits at the site | Ongoing arrangements with managers or private landholders rather than one-off or short-term agreements |
| Watering history and implications of not watering the site | An upper threshold is being reached and there is the potential for critical or irreversible loss |
| Risks associated with the watering | Risks to third parties (such as adjacent landholders) or for negative environmental outcomes (such as salinity or blackwater) |
| Feasibility of the watering | Whether operational arrangements (including equipment) are finalised, flexibility in timing of delivery |
| Cost effectiveness of the watering | Amount of benefit for the volume of water, amount of benefit for the cost of delivery, opportunities for return flows to provide downstream benefits |
| Opportunity to provide social and cultural benefits | After consideration of other criteria, the Victorian Environmental Water Holder will consider whether it can contribute to social and cultural benefits through environmental watering (see Section 8.4.4) |
| Long-term condition of one system should not be jeopardised in order to provide optimum short-term condition in another priority system | Other than in drought, critical flows ¹ should be provided at all priority sites before decisions are made on allocation of any remaining water |

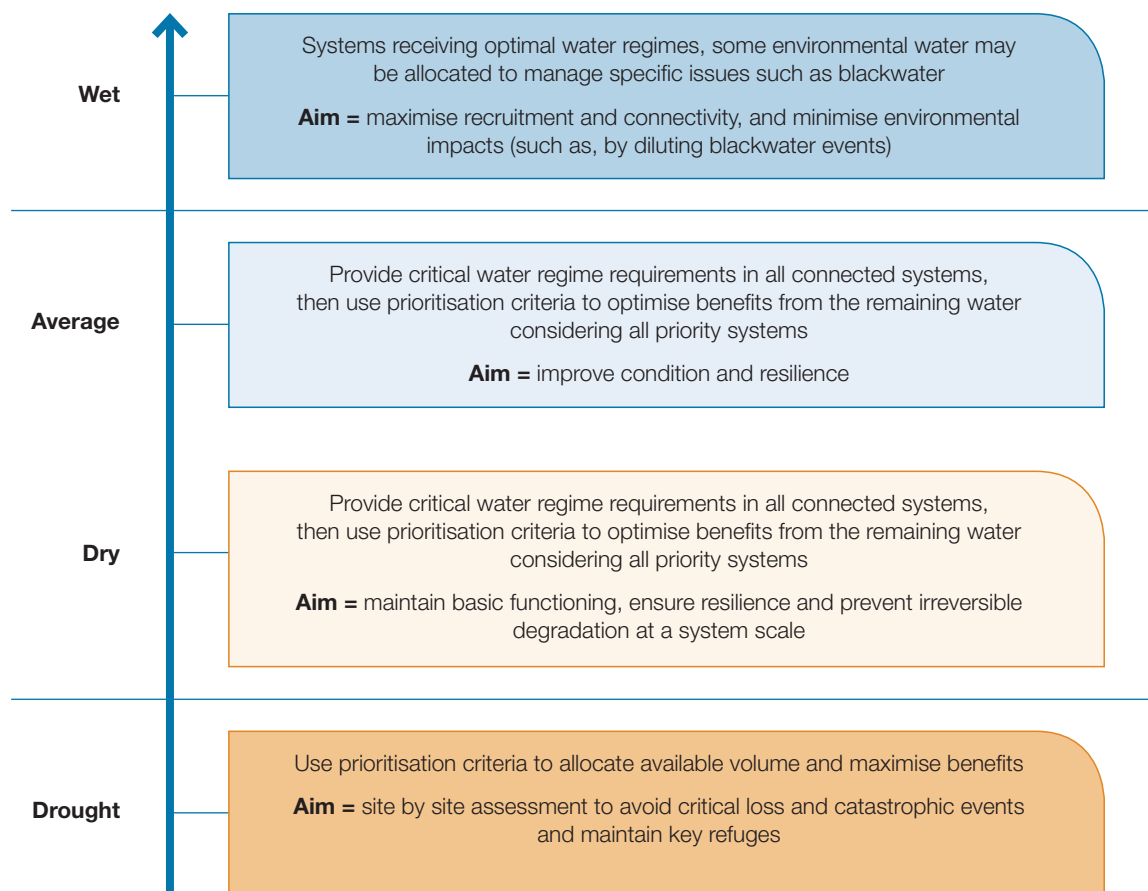


Figure 8.5: Prioritising environmental watering actions in different climatic conditions

8.4.4 Considering social and cultural values in the use of environmental water entitlements

The primary purpose of environmental water entitlements is to achieve environmental benefits. However, the delivery of environmental water for this purpose is likely to provide other benefits that depend on the condition of our waterways (see Figure 3.3), such as supporting social and cultural values.

Waterway managers identify the environmental, social, cultural and regional economic values of waterways as part of regional waterway planning processes (see Section 4.2). They also prepare EWMPs for priority sites where environmental water can be delivered (see Section 8.4.1). EWMPs are developed in consultation with regional communities, including recreational interest groups and Traditional Owner groups and, where possible, identify opportunities for social and cultural benefits. Through this consultative process, social and cultural values that are dependent on water can be captured to enable the VEWH to consider the other benefits of its decisions.

In most situations, social and cultural values (such as fishing, camping, cultural heritage protection and visual amenity) are compatible with environmental watering objectives.

Access to water by Victorian Traditional owners is outlined in Section 6.2.3.

Policy 8.7

Waterway managers will engage regional communities, including recreational interest groups and Traditional Owner groups, to capture social and cultural values of waterways through regional waterway planning processes, environmental water management plans and seasonal watering proposals.

In planning for and making discretionary environmental watering decisions, the primary purpose is to maximise environmental benefit. Where consistent with this objective, environmental water managers must also consider whether social and cultural benefits can be achieved.

Detail of Victorian Environmental Water Holder environmental watering actions that incorporate social and cultural values will be included in the Victorian Environmental Water Holder's annual environmental watering booklet.

The statutory objective of the VEWH² also allows for this to occur, however, the use of environmental water to provide specific social or cultural benefits cannot be prioritised at the expense of achieving environmental objectives. In a few instances where water has historically been used at environmental sites specifically for social purposes, there may be a case to consider options to manage the water in a way that clearly reflects these historic uses.

8.4.5 Costs of managing environmental entitlements

Water corporations that act as storage or system operators provide services to water customers, including environmental water holders, and recover the costs of providing those services from the customers that use them. There are several costs applicable to the management and operation of water entitlements used in Victoria, in addition there are costs specific to environmental water management. These include costs for:

- headworks (also called storage operator and bulk water services), carryover and delivery services
- resource management, metering and reporting
- environmental water planning and intervention monitoring.

Headworks and resource management charges

Historically, where environmental entitlements share the same properties as other entitlements, environmental water holders pay the costs of these services provided by water corporations just as other water users do. However, some of the charges attached to environmental water entitlements have been varied in relation to the following:

- the nature of the product – where the entitlement (or related right allocated to the environment) – is less reliable or certain than other consumptive entitlements
- recognition of Government investment in water savings projects to recover water for the environment where there have also been significant benefits to irrigators and other users.

Additionally, headworks and resource management charges have been historically varied to take into account the marginal use of storages and services by environmental water holders at the time. However, in recent years the number of environmental entitlements has increased substantially and the environment may no longer be considered a marginal water holder in some systems. For example, in northern Victoria the CEWH now owns a significant amount of entitlements held in the Victorian storages, as a result of the Australian Government environmental water recovery initiatives. In these situations, it is not appropriate that an environmental water holder pays different headworks and resource management charges to other water users.

Environmental water delivery charges

The increased volume of environmental water entitlements can also add to costs borne by storage/system operators through more sophisticated planning and scheduling of environmental water (for example through the delivery of freshes or accounting for return flows). In addition, where this activity has not historically been undertaken by storage/system operators, there will also be initial establishment and some new ongoing costs in performing these services. The nature of these increased costs needs to be better understood to ensure the VEWH and other environmental water holders are paying appropriate charges.

In the vast majority of cases, the delivery of environmental water entitlements will utilise river channels to meet environmental objectives (for example, for instream, overbank and wetland requirements). In a few systems where these natural distribution pathways have been interrupted or modified due to irrigation or other infrastructure, access to irrigation distribution systems may be required to deliver environmental water to priority sites.

This access to irrigation distribution systems might arise where there is a critical need to deliver water to a site at the same time as irrigation demands are high and there would otherwise be no spare channel capacity. For example, access to the delivery system is required in the Gunbower Creek (which is also used to supply irrigators) to ensure that water can be delivered to the Gunbower Forest to prevent water birds abandoning their nests after a breeding event. It is proposed that delivery shares will be acquired in this instance by environmental water holders, ensuring that there is equitable use of the channel capacity and that the environmental water holders are contributing to the ongoing maintenance of the irrigation distribution system they use.

At other times, watering of Gunbower Forest can be undertaken outside of the irrigation season or in non-peak periods during the irrigation season as a casual user. This means that the delivery of environmental water does not need to 'compete' with irrigation demands in peak periods in Gunbower Creek.

Delivery charges should reflect the principle that charges for environmental water services should be reflective of equivalent levels of service provided to water users, ensuring that there is a fair and reasonable contribution towards the upkeep of the irrigation distribution system.

However, there are concerns that the charges associated with current supply arrangements do not make an adequate contribution to the upkeep of the irrigation infrastructure used by environmental water holders. In the future, environmental water holders will be required to pay equivalent charges for access to the irrigation distribution system and be provided with the same level of service as the other customers.

Policy 8.8

Environmental water holders will be required to pay applicable charges for the costs incurred by storage/system operators to store and deliver environmental water.

Action 8.2: All environmental water holdings will be reviewed, to ensure that they incur applicable headworks, delivery and resource management charges. Ministerial guidance will be provided to clarify the nature of charges that are applicable for environmental water holdings. With regard to the costs incurred by the Victorian Environmental Water Holder, funding will be subject to standard budgetary processes.

Who: Department of Environment and Primary Industries, waterway corporations, Victorian Environmental Water Holder. **Timeframe:** 2014

Environmental water planning

The use of environmental water for TLM and CEWH is co-ordinated for use across northern Victoria by the VEWH and implemented by waterway managers on behalf of the entitlement holders (see Section 8.1.4). As more of the water available to TLM and the CEWH becomes increasingly available for use across northern Victoria, costs to the VEWH and waterway managers will increase.

As all costs incurred through environmental water management are based on full cost recovery, it is important that where the VEWH manages environmental water on behalf of other environmental entitlement holders, these costs are passed on to the relevant entitlement holders.

Similarly, where waterway managers are required to undertake intervention monitoring and report on the benefits of water for environmental waterholders, it is important that they are provided with the appropriate level of funding (from environmental water holders) to undertake these activities.

Action 8.3: The costs associated with environmental entitlements managed by the Victorian Environmental Water Holder and delivered by waterway managers on behalf of other entitlement holders will be identified to ensure these costs are passed on to the appropriate entitlement holders.

Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. **Timeframe:** 2014

8.5 Efficient and effective use of environmental water

Environmental water managers have learnt valuable lessons about managing limited water resources for maximum outcomes during periods of drought.

Management is now more targeted, efficient and effective with new tools that reduce the need to recover more water for the environment. Sometimes more cost-effective environmental benefits can be achieved through small scale changes to river management with reduced economic and regional impacts when compared with large scale water recovery programs.

8.5.1 Tools for achieving efficient and effective use of environmental water

Tools for achieving efficiencies and overcoming constraints for effective use of environmental water have been developed and implemented through the regional SWs. These management tools are set out in Table 8.2. Using available environmental water efficiently can reduce the need to recover water for the environment, thereby avoiding associated impacts on regional communities. Efficiency tools can also be used alongside water recovery to maximise environmental outcomes.

To achieve the most effective use of environmental water and maximise environmental outcomes, it is also necessary to consider how to overcome physical and operational constraints (such as flooding of private land).

In some instances, environmental works such as pumps and regulators can be used to deliver environmental water and achieve environmental outcomes with much less water. This is particularly true for wetlands and floodplains, that have become disconnected from the main river channels or where overbank flow frequency is inadequate to meet environmental objectives. This can be an effective alternative with less economic impact than recovering additional water to meet environmental objectives.

While environmental works for flooding high value floodplains and wetlands have benefits, they can also have negative effects (such as disconnection of the river and floodplain and acting as a barrier to fish movement and migration). This can reduce carbon and nutrient exchanges with the river, which are important to maintain ecological function. As such, the decision to use environmental works requires careful consideration and planning, as is the case for other types of public infrastructure in or around waterways (see Section 18.6).

Policy 8.9

Efficiency tools and environmental works to maximise the benefits of environmental water delivery will be explored to ensure available environmental water is used as effectively as possible.

Options to maximise the benefits of environmental water delivery will be assessed on a case by case basis; considering the potential benefits, risks, feasibility and cost effectiveness.

Table 8.2: Efficiency tools for managing environmental water

| Efficiency tools | Description | Benefits |
|----------------------------------|--|---|
| Carryover | Allows entitlement holders to hold unused water allocations for use in subsequent seasons. Carryover rights were historically provided to the environment to avoid greater water recovery being necessary. | Provide greater flexibility to manage water availability among seasons, for example, by trading water where better outcomes can be achieved from the funds generated by trade compared to outcomes that could be achieved from surplus water. |
| Trade | Environmental water entitlements and allocations can be bought and sold by the VEWH where consistent with the VEWHs objectives. | |
| Reuse of return flows | Return flows are the portion of water that 'returns' to the river (or water supply) system after a watering event. This water can be reused for floods and other environmental watering downstream. | Can significantly reduce the amount of environmental water required to meet environmental objectives. Can be an effective alternative with less economic impact than recovering additional water to meet environmental flow objectives. |
| Using consumptive water en route | Use of consumptive water or 'piggyback' environmental water on consumptive water on its way to being delivered to water users via rivers, creeks and wetlands. | |

8.5.2 Use of alternative sources of water for environmental purposes

Using alternative sources of water that are ‘fit for purpose’, that is, of an appropriate quality for its intended use, can help reduce reliance on water from our waterways. Examples of alternative water supplies include recycled water (treated wastewater from sewage treatment plants) and urban stormwater.

Treated recycled water is released into waterways for a range of reasons. In some cases, this may provide environmental benefits. There are two ways that recycled water can be used as environmental water in waterways:

- a proportion of existing releases from sewerage treatment plants, which can be shown to provide net benefits and can be maintained into the future
- sewerage treatment plant discharges can be diverted to new locations (that is, other waterways) that are in greater need of additional flow.

However, in some cases the negative effects resulting from recycled water discharges counteract or outweigh any benefits provided. Therefore proposals for using recycled water for environmental purposes must be carefully assessed on a ‘case by case’ basis and only supported where they provide overall net benefits to the community.

Case by case consideration will also allow assessment to take appropriate account of characteristics unique to particular sites. For example, increasing flows by discharging recycled water to a flow-stressed waterway may provide benefits. However, discharges from recycled water treatment plants may not contain the right level of nutrients or be so cold that organisms in the waterway cannot survive. Therefore the benefits of an increased flow may be reduced if those discharged flows are not the appropriate quality for that particular waterway, resulting in a small or negative net environmental benefit.

Stormwater is another alternative water source that could improve water supply reliability, broaden the supply base and improve local amenity and waterway health for communities (see Chapter 14). Approaches to use of stormwater will be considered as part of the Victorian Government’s *Living Victoria* initiative (see Section 14.2.3).

Policy 8.10

The use of recycled water for environmental purposes will be considered on a case by case basis and will only take place where:

- it is consistent with existing Government guidelines, regulation and policy (for example, streamflow management plans, environmental protection requirements and health requirements)
- there is a net benefit to the environment
- any impacts on existing water users such as licence holders are identified and managed.

The existence of a net benefit to the environment of the recycled water use will be assessed by identifying:

- existing water regime and water quality requirements of the site
- the values of the site likely to be affected by the changes in water regime and water quality from the recycled water discharge
- the consequences and likelihood of any changes due to recycled water discharge
- the ecological risks associated with the recycled water discharge
- the capital and ongoing costs of using the recycled water as an environmental water source
- the extent to which the use of the recycled water can be integrated with other activities for the improvement of environmental condition of waterways.

Where the use of recycled water as a source of environmental water is considered appropriate, the water may be used as such and potentially formalised as a right or entitlement.



Stormwater can be a valuable resource. Photographer: Rob Steel

8.6 Managing risks associated with environmental watering

Environmental watering can occasionally pose risks to communities, properties and the environment. Effective management of environmental watering activities requires identification and management of any risks that may be involved.

Several agencies have a role that can contribute to, or help manage, risks in environmental watering including; the VEWH, waterway managers, storage operators and occasionally land managers. As a result, a co-ordinated approach to risk management is necessary.

Policy 8.11

Risk strategies will be included in waterway managers' seasonal watering proposals and the Victorian Environmental Water Holder's seasonal watering plan.

Principles for managing risk associated with environmental watering

The management of risk associated with environmental watering in Victoria will be guided by the following principles:

- risks involved with environmental watering will be identified and managed commensurate with the level of risk and the environmental outcome sought
- risk management in environmental watering will consider the range of scenarios in which risks may arise
- the role of each relevant body involved in planning, delivery and facilitating delivery of environmental water will be clearly specified and verified to ensure due diligence and use of best available information to manage any risks to third parties.

Action 8.4: Clearly specify and verify the role of each relevant body involved in planning, delivery and facilitating the delivery of environmental water to manage any risks to third parties.

Who: Victorian Environmental Water Holder, waterway managers, Department of Environment and Primary Industries, water corporations.

Timeframe: 2014

8.6.1 Management of risks relating to delivery of large volumes of environmental water

Victorian and Australian Government investment in water recovery for the environment has enabled the delivery of large volumes of water to improve waterway condition. While this provides the opportunity for greater environmental benefit, it can also mean increased risk to communities and property from high flows in waterways and overbank flows on public or private property.

On floodplains, achieving an optimum water regime can mean delivering water in a way that simulates a flood event. This has environmental benefits and can also benefit surrounding landholders, for example, by increasing land fertility. In these circumstances, it is desirable to proactively plan for and create these flood events. However, where there is likely to be a flow of environmental water onto private land, the consent of the landholder needs to be obtained.

The MDBA will complete a constraints management strategy by November 2013, which will consider constraints that may affect delivery of environmental water and assess the options, risks and opportunities associated with addressing those constraints. Victoria will be involved in this process in addition to having its own risk management processes with Victorian environmental water delivery partners – the VEWH, water corporations and waterway managers.

Policy 8.12

Deliberate inundation of private property will only be undertaken with the landholder's consent (for example, in the form of an agreement or easement arrangement).

Action 8.5: Engage with the Murray-Darling Basin Authority for the development of its constraints management strategy for environmental watering.

Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, water corporations, waterway managers.

Timeframe: late 2013

8.6.2 Management of risks relating to water quality

In some cases, environmental return flows³ may cause water quality issues such as increased salinity, increased nutrients, blackwater events and acid sulfate conditions.

The volume of return flows from environmental entitlements will generally be small compared to return flows from natural floods. Nevertheless, it is important to manage the risks. Existing environmental water delivery programs analyse the potential for negative impacts and a risk mitigation program is then developed.

In the longer-term, water quality risks could be managed by reinstating a more natural flooding regime to improve the condition of floodplains and wetlands, reducing the occurrence of conditions that favour poor water quality (such as long-term build-up of organic matter of floodplains).

Policy 8.13

In relation to return flows, waterway managers will continue to:

- identify water quality risks associated with environmental watering
- identify risks to downstream drinking water supplies and determine mitigating actions
- identify and manage salinity risks of environmental watering
- ensure good communication of risks with potentially affected parties and water corporations.

Existing policies and regulatory requirements relating to return flows will continue to apply.

8.7 Maintaining environmental water availability

Maintaining environmental water availability is critical to ensure that current gains made through improved environmental water management are secured for the benefit of future generations.

8.7.1 Maintaining other types of environmental water

Under the Victorian water allocation framework there are several mechanisms (other than setting water aside in environmental entitlements) to ensure sustainable water use and to prevent unacceptable impacts to the availability of water for the environment that could otherwise result from river regulation and water extraction, including:

- Murray-Darling Basin limits on the taking of surface water and groundwater for consumptive use
- permissible consumptive volumes that set the total volume of water that may be taken for consumptive use in a system
- caps set in management plans

- licence management rules prohibiting summer diversions, setting rostering and restrictions to share summer low flows, restricting upstream and unregulated to regulated system trade
- Victorian policy-based diversion limits on consumptive use of water to limit extraction during periods of low flow and protect winter environmental flows
- rules in management plans and entitlements setting aside minimum or passing flows
- legislative requirements for consideration of impacts to the EWR as part of the allocation, amendment or transfer of entitlements.

The most secure form of water made available for the environment through the function of these mechanisms is in the form of passing flows. The rules for the provision of passing flows often require they must be provided for before other users. However, passing flows are small in volume.

By far the largest contributor (by volume) to environmental water is water left in the system due to the operation of the above mechanisms. However, this water may only be available in waterways in real terms in wet years where the water in the system is surplus to the water allocated to consumptive entitlements.

Action 8.6: Review and update subordinate instruments to the *Water Act 1989* as necessary to reflect policy for robust and transparent water allocation decision-making.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2015

For example, in regulated systems, a significant proportion of this water is made up of spills from storages available only in wet years. This means the available environmental water can vary widely from year to year and is particularly vulnerable to the potential impacts of climate change.

Additionally, water made available in these ways is not usually formally quantified and so is also vulnerable to pressure from non-environmental water-users for additional allocation of water for consumptive purposes. The review of the *Water Act 1989* (see Section 1.2.1) will investigate how the concept of the EWR has been implemented, including options to better clarify how the different components of the EWR are specified.

Efforts have been made to better track and understand expanding uses of water outside the entitlement framework that could affect the availability of water that contributes to the preservation of environmental values. For example, there are now requirements to register domestic and stock dams and efforts to estimate water intercepted by land use, such as plantation forestry.

Water resource decision-making processes relating to uses within the entitlement framework will continue to be sufficiently robust and transparent in considering the effect of these decisions on the availability of environmental water. As indicated above, the *Water Act 1989* and several policy-based instruments require that decision makers must have regard to the EWR when making water allocation decisions. However, the requirements are sometimes duplicated and the way in which this is applied and assessed is not clearly specified or consistent. The review of the *Water Act 1989* will also look at ways to streamline and clarify how impacts on the EWR will be considered in the future.

8.7.2 Management of unregulated systems

In unregulated rivers, the environmental water is provided primarily through management of existing diversions via licence conditions, rostering and restriction rules.

In systems that are not highly allocated, licences are only issued during the winter fill period (July to October). This is in response to the existing high number of annual licences which has led to over-extraction in many systems during the summer months when stream flows are typically low.

In priority unregulated systems that are flow-stressed in summer, formal management arrangements may be implemented. These arrangements provide for sustainably managing available water resources in an unregulated system to balance the needs of all users, including the environment. Types of existing management plans include:

- **Streamflow Management Plans** – statutory plans for managing water resources of priority unregulated waterways that are under stress, or where there is a demand for more development.
- **Integrated water management plans** – recognise the connections between groundwater and surface water in systems where these water resources are highly-connected.
- **Local management plans** – capture and formalise existing rules in unregulated systems where there is no statutory management plan.

Local management plans are an increasingly important instrument for capturing arrangements for management of unregulated systems and ensuring fair sharing of water resources in those systems between water users and the environment. Waterway managers have a critical role in contributing to the development of these plans and ensuring the needs of the environment are included.

Policy 8.14

Water resource management decisions will follow a robust and transparent process that considers effects on existing users and environmental water by:

- using the best available evidence about the effects
- considering alternative sources of water and alternative mechanisms for obtaining water (for example, trade) where there is a likely adverse effect on existing users
- consulting with existing entitlement holders about the proposed action including the ability to have input into how the action is implemented
- seeking submissions on the proposed action where no formal consultation has occurred.

Policy 8.15

In unregulated systems the focus is on maintaining and managing environmental water by strengthening existing processes relating to trade and allocation of water entitlements and conditions on water entitlements, to ensure the availability of environmental water is maintained.

Local management plans will be developed that consider environmental water requirements of waterways and surrounding land as appropriate.

Action 8.7: Develop guidelines to support the development of local management plans to ensure fair arrangements for water users and the environment.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2014

8.7.3 Better defining environmental water needs of groundwater-dependent ecosystems

Groundwater-dependent ecosystems (GDEs) are those that rely on groundwater for all or part of their water needs and may include rivers, estuaries, wetlands and terrestrial vegetation (see Figure 8.6). Historical management of groundwater has focused on the sustainability of the water resource, while ecosystems reliant on groundwater have been considered to a lesser extent.

Effective and sustainable management of GDEs in Victoria requires improved knowledge of the distribution, condition and environmental values of GDEs, including information about groundwater and surface water interactions.

The initial focus will be on GDEs of high environmental value and high risk and those that are most easily observed and monitored. Improved knowledge will enable managers to incorporate adequate consideration of those GDEs in groundwater management and allocation processes.

Policy 8.16

The groundwater allocation framework will adopt a risk-based approach to considering groundwater-dependent ecosystems. This approach will reflect the level of groundwater interaction and the level of risk posed by water use.

For groundwater-dependent ecosystems with high environmental values:

- those at risk of being affected by changes in groundwater levels will be considered in all groundwater management and allocation decisions, for example, by ensuring they are adequately considered when setting or adjusting permissible consumptive volumes
- those that rely on regional and intermediate scale groundwater systems will be considered in groundwater management planning
- those with high environmental values that rely on the surface expression of local scale groundwater systems will be assessed site by site in the licensing regime.

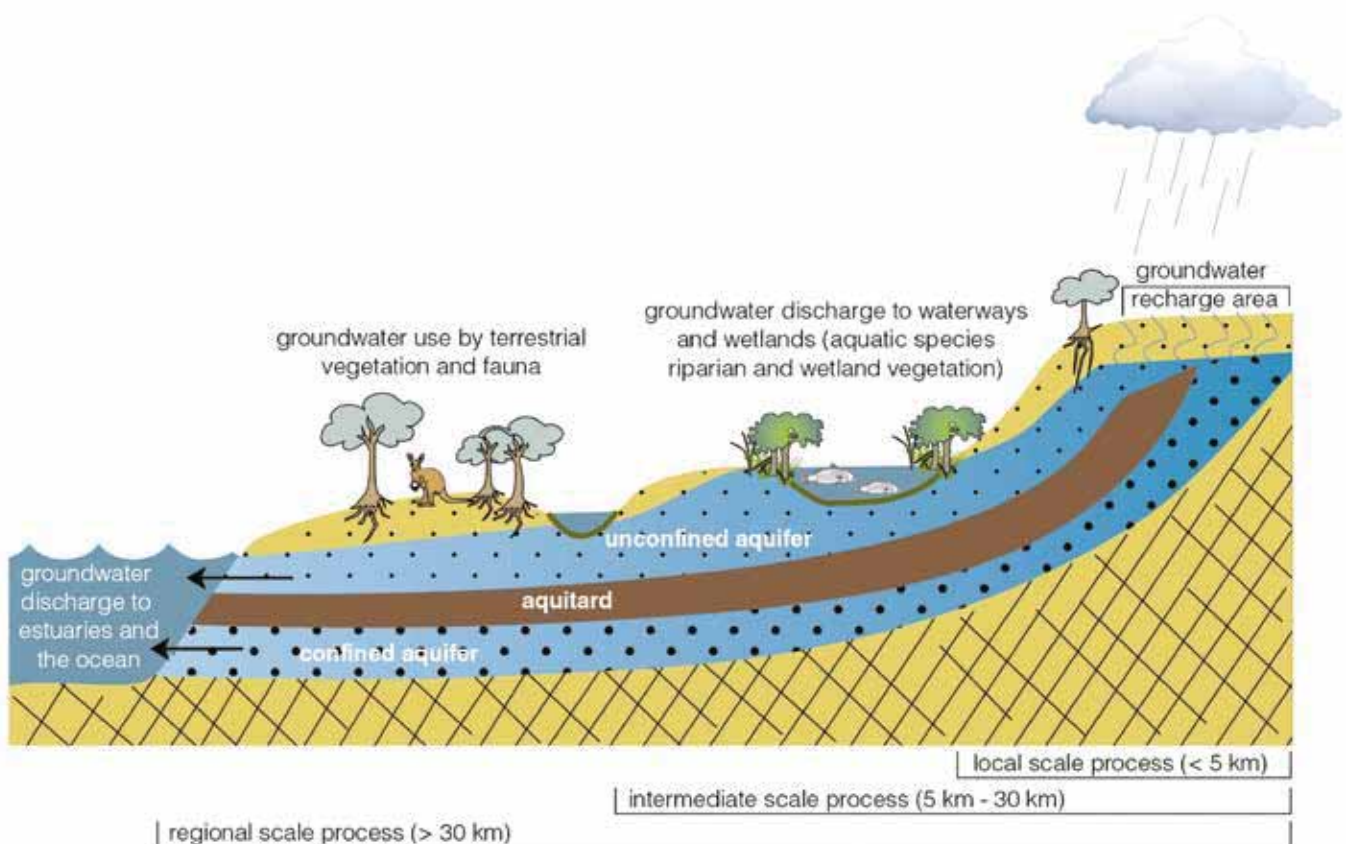


Figure 8.6: Locations of groundwater-dependent ecosystems in the landscape, and in relation to groundwater aquifers.

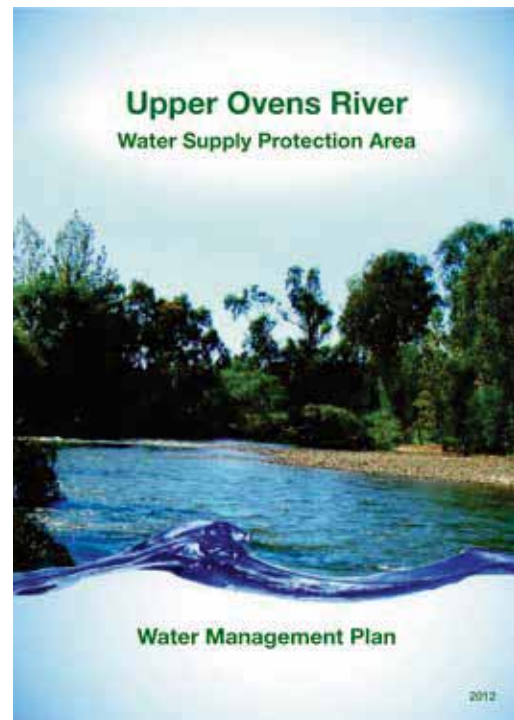
Some systems have a high level of interaction between surface water and groundwater. As a result, increased groundwater extraction can reduce streamflow and therefore affect GDEs and the reliability of water for existing surface water users.

Where a GDE relies on groundwater that is clearly connected to surface water, the management approach needs to be integrated, with recognition that an increased use of groundwater may reduce streamflow, and vice versa. An example of an integrated surface water-groundwater management plan is that created for the Upper Ovens River Water Supply Protection Area, the first such plan in Victoria.

Policy 8.17

Systems with high groundwater and surface water interaction will be:

- managed as an integrated resource
- considered as part of ongoing strategic groundwater resource assessments and local management plans or statutory management plans
- monitored to inform understanding of the condition of and impacts to high value and high risk groundwater-dependent ecosystems.



The first example of an integrated surface water-groundwater management plan.

Action 8.8: Identify and prioritise types of high value groundwater-dependent ecosystems to inform regional waterway planning processes and water allocation decisions.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2014

Action 8.9: Develop method(s) to assess the contribution of groundwater in supporting the priority types of groundwater-dependent ecosystems.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2015

Action 8.10: Develop guidelines to help licensing authorities consider the risk to groundwater-dependent ecosystems, including:

- management principles (for example, setting trigger levels)
- how to consider groundwater-dependent ecosystems in licensing decisions and groundwater-related management plans where appropriate.

Who: Department of Environment and Primary Industries, water corporations, waterway managers.

Timeframe: 2014

8.8 Continual improvement of environmental water management

Adaptive management of environmental water requires effective monitoring, reporting and evaluation, coupled with improved knowledge from targeted scientific research (see Chapter 17).

8.8.1 Research to support environmental water management

Effective environmental water policy and management needs to be supported by evidence, reflect current best practice and address priority knowledge gaps. The Department of Environment and Primary Industries currently supports research in several areas to support environmental watering activities and management approaches.

Focus areas for research to support environmental watering outcomes are:

- research to improve our understanding of ecological responses to environmental watering
- development of models to optimise the delivery of environmental water.

Further information on research and knowledge gaps in waterway management is outlined in Section 17.5.

8.8.2 Monitoring and reporting

Monitoring provides information about the linkages between environmental water delivery and ecological response and leads to continual improvement of environmental water management. Existing monitoring approaches address both long-term and short to medium term information needs and occur at different scales (see Table 8.3).

The Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) is the program through which longer-term ecological response monitoring is undertaken. Waterway managers monitor environmental indicators such as fish numbers, water quality and vegetation growth in response to different flows.

VEFMAP is used in nine priority regulated rivers across Victoria, including the Goulburn, Broken, Campaspe, Loddon, Wimmera-MacKenzie, Glenelg, Thomson, Macalister and Yarra rivers. These priority rivers are the subject of VEFMAP due to the significant environmental water recovery undertaken within those systems.

In some rivers, environmental water can also provide benefits to estuaries. Where this is the case, monitoring of environmental outcomes in those estuaries may be valuable. To do this, existing monitoring of rivers through VEFMAP can be extended to priority estuaries receiving environmental flows.

Currently there is no systematic monitoring undertaken for the response of wetlands to environmental watering. In the same way as for rivers, it is important to test hypotheses about the ecological response of wetlands to environmental water delivery through monitoring.

A statewide report on environmental watering outcomes is produced each year that captures the volume, timing and frequency of water delivered and the environmental outcomes achieved (see Section 17.4.1 on reporting). The annual environmental watering booklets can be found at www.vewh.vic.gov.au.

Monitoring and reporting requirements to evaluate effectiveness of the Basin Plan will be negotiated through the Basin Plan Implementation Agreement. Victoria will be seeking to use existing state statutory frameworks to meet all related requirements under the Basin Plan.



Monitoring fish numbers in response to environmental water delivery. Courtesy Arthur Rylah Institute

Table 8.3. Different types of environmental water monitoring programs.

| Monitoring | Purpose |
|--|---|
| Event-based compliance monitoring | Collects information about the volume and timing of environmental watering to assess if environmental water was delivered to specifications |
| Event-based ecological response monitoring | Collects information about short to medium-term ecological outcomes of specific environmental watering events |
| Ecological response monitoring | Collects information over the long-term to verify whether intended outcomes are being achieved by the program of environmental watering activities (for example, through the Victorian Environmental Flows Monitoring and Assessment Program) |
| Condition monitoring of rivers, estuaries and wetlands | Monitors long-term condition of waterways (for example, Index of Stream Condition, pilot Index of Estuary Condition and Index of Wetland Condition – see Section 17.3.4) |

Action 8.11: Develop a program to monitor the ecological response of priority estuaries to environmental watering.

Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. **Timeframe:** 2015

Action 8.12: Develop a program to monitor the ecological response of priority wetlands to environmental watering.

Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. **Timeframe:** 2015



Lake Meran before and after watering. Photographer: Bridie Velik-Lord North Central CMA



9

Riparian management



Vegetated riparian land along the Lower Franklin River. Courtesy West Gippsland CMA

Riparian management

Guide to the chapter

9.1 Context

- The value of riparian land
- Threats to riparian land
- Riparian land in Victoria
- The complexity of riparian land management
- Riparian land managers
- Riparian management activities

9.2 Improved approach to the management of riparian land

- Victorian Government investment in riparian management activities
- Landholder involvement in riparian management
 - Private land
 - Crown frontages
- Victorian Government role in the management of Crown frontages

9.3 Improved management of specific riparian issues

- Riparian land and bushfire
- Managing livestock grazing on riparian land
 - Controlled grazing
 - Stock access to waterways upstream of drinking water offtakes
- Management of fenced riparian land
- Access to water for stock when Crown frontages are fenced
- Carbon sequestration on riparian land
- Managing invasive species on riparian land
- Access to Crown frontages for recreational use

What are the issues with existing arrangements?

In Victoria, riparian land in cleared catchments has typically been used for agriculture, particularly grazing. However, the community is increasingly valuing the broader cultural, recreational and environmental values of riparian land. Consequently, there is a need to improve partnership arrangements, develop better onground management approaches and improve administrative, institutional and legislative arrangements to support broader management objectives for riparian land.

What improvements does the Strategy make?

For riparian management the Strategy will:

- establish a framework to progressively maintain and improve priority public and private riparian land through voluntary agreements for fencing, weed management, revegetation and long-term management of riparian land
- strengthen the partnership approach to managing riparian land, between private landholders, government and relevant agencies and clarify their roles in riparian management
- review and/or reform legislative and administrative arrangements to improve Crown frontage management
- provide clear management directions for difficult riparian management issues such as controlled grazing, long-term management of fences and fenced riparian land and access to water for stock.

9.1 Context

Land that adjoins rivers, creeks, estuaries, lakes and wetlands is known as riparian land (often called ‘frontage’). Riparian land can vary in width from a narrow strip to a wide corridor and is often the only remaining area of remnant vegetation in the landscape.

While much of the generic information in this chapter is relevant to all riparian land, most of the specific issues discussed and actions proposed relate to rivers and creeks in rural landscapes. Issues particularly relevant to wetlands, estuaries or rivers in urban areas are discussed in Chapters 12, 13 and 14 of the Strategy.

9.1.1 The value of riparian land

Riparian land has a range of important values. It is used by farmers for agriculture, particularly for grazing or providing access to water for stock. Riparian land is also valued for recreational use (for example, picnics, barbecues, walking and for access to waterways for swimming and fishing) and contributions to regional economies through tourism (for example, visitors to the River Red Gum forests along the Murray River). Riparian land also has cultural heritage values, especially sites of significance to Traditional Owners and other Aboriginal people. Finally, riparian land has many environmental values, such as providing habitat for rare or threatened species and as a network of habitat

that connects larger patches of remnant vegetation and provides a corridor for the movement of animals and native plants (known as a biolink). The key values, threats and management activities for riparian land are shown in Figure 9.1.

Healthy waterways depend on the condition of riparian land. Trees on riparian land provide a supply of organic matter to waterways, including large wood, which supports aquatic invertebrates and nutrient cycling. Vegetation on riparian land improves water quality in waterways. It filters out sediments, nutrients and pathogens from run-off from a range of land uses and catchment activities including agriculture, on-site domestic wastewater management and urban development. This protects public water supplies, improves water quality for fishing and recreation and helps reduce algal blooms downstream. Shade from riparian vegetation also helps regulate water temperature, which can be important to native fish species and helps reduce the likelihood of algal blooms. Riparian land is also important for the storage of carbon.

Riparian vegetation helps to stabilise stream banks and reduce erosion. High quality native riparian vegetation, in near natural waterways or established through revegetation programs such as those undertaken in Victoria over the last 10 to 20 years, reduces the occurrence and scale of flood related channel change¹. This channel change has led to nearly \$80 million of direct repair costs over 20 years and much larger costs to repair damaged assets such as bridges and roads.

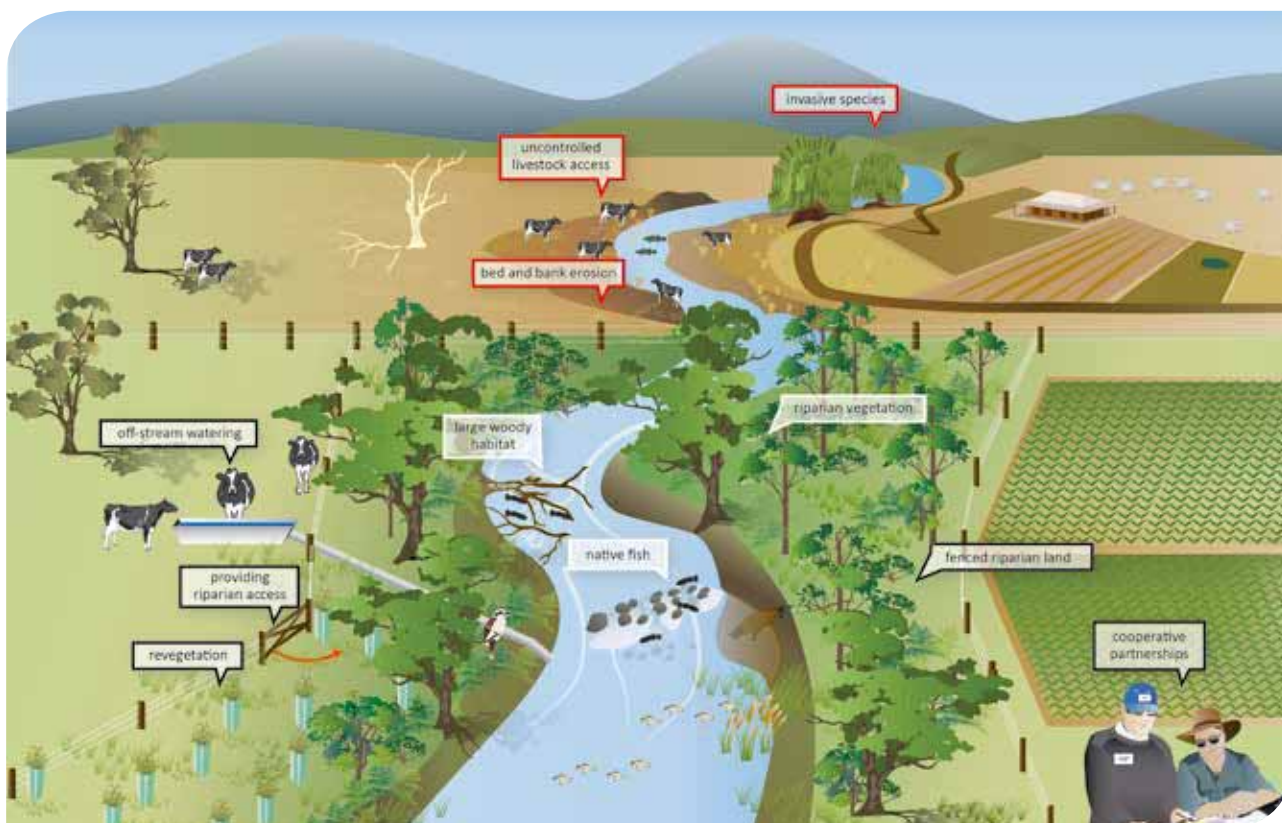


Figure 9.1: Values (white), threats (red) and management activities (black) for riparian land.

9.1.2 Threats to riparian land

The capacity of riparian land to provide a wide range of values relies upon its condition; particularly the width, connectivity and the quality, quantity and structure of the vegetation present. The major threats to riparian land are those that affect one or more of these key attributes.

One threat to the condition of riparian land is uncontrolled stock access to riparian land and the bed and banks of waterways². Stock can contaminate water and erode the banks by trampling. Other threats to the condition of riparian land include recreational pressure, weeds (especially willows), unmanaged vehicle access and stream crossings, rubbish dumping, urban development (see Chapter 14), the collection of firewood and some agricultural practices (such as cropping too close to riparian land).

These threats have all affected the condition of Victoria's riparian land.

The third statewide benchmarking of riparian land condition showed that 32 per cent was in good to excellent condition, around 40 per cent was in moderate condition and 28 per cent was in poor to very poor condition³.

9.1.3 Riparian land in Victoria

Victoria has a unique network of public riparian land known as Crown frontages (owned by the State), which were mostly established between the 1850s and the 1880s in recognition of their value as a public resource⁴. Crown frontages occur mostly on larger waterways. On smaller waterways in agricultural landscapes, riparian land is usually privately owned.

Of an estimated 85,000 km of rivers and creeks in Victoria⁵ (therefore about 170,000 km of frontage), there are about 30,000 km of Crown frontages. About 22,000 km of the Crown frontages are within cleared catchments (the other 8,000km are in larger public land blocks such as parks and State forests). Crown frontage can vary from a few metres wide to kilometres wide, with the average width being about 20 to 40 metres. The total area of Crown frontage in the state is about 100,000 ha, which is only 0.4% of the State and 1.1% of the total public land estate⁴.

At present, about 17,000 km of the 22,000 km of Crown frontages within cleared catchments are managed by the adjacent landholder under about 10,000 agricultural licences. Most of the licences are for grazing purposes, with a small and diminishing number for the cultivation of crops. These licences are typically renewed every five years, with the next renewal scheduled for October 2014. The average licence fee is \$85 for five years, calculated on productive value of the land but discounted based on weed management and other obligations on the licensee.



Uncontrolled stock access can be a threat to the condition of riparian land. Photographer: Rhonda Day

9.1.4 The complexity of riparian land management

The management of riparian land in Victoria is complicated by several factors including:

- the current administrative, management and licensing arrangements for riparian land are based on administrative definitions of a frontage, which do not recognise the wide range of values that riparian land can provide
- different types of riparian land are managed by differing statutory and management regimes, which can cause confusion about its management
- conflict between various uses and values of riparian land, particularly agricultural use and the broader recreational, cultural and environmental values of riparian land
- river movement, especially in flood, may make the location of Crown and private frontages difficult to determine without surveys.

9.1.5 Riparian land managers

Given the broad range of values and complex ownership and management of riparian land, there are many stakeholders with different roles in the management of riparian land.

The Department of Environment and Primary Industries (DEPI) has overall management responsibility for Crown frontages in Victoria. It is responsible for their administration, including their licensing for riparian management and for grazing and ensuring compliance with licence conditions. The DEPI also has a direct onground responsibility for unlicensed Crown frontages (see Section 9.2.2) and some other categories of frontage. Furthermore, the DEPI provides funding for riparian management programs through the catchment management authorities (see Section 9.2). Funding arrangements for Melbourne Water are outlined in Section 18.4.2.

Waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) are primarily responsible for the maintenance and improvement of most riparian land through partnerships with adjoining landholders. However, waterway managers typically do not have any direct land management responsibilities for either private or Crown riparian land.

Landholders play a major role in the management of both private riparian land and licensed Crown frontages. In partnership with waterway managers, landholders typically contribute resources to the initial riparian management activities and undertake long-term management of the fenced riparian land. Even on frontages where there is no input from waterway managers, many landholders expend considerable resources on pest animal and weed management as required by their legislative obligations and licence conditions.

Some Crown riparian land is also managed by committees of management, Parks Victoria and other agencies. The typical focus for this management is the protection of high environmental and recreational values. Also, much riparian land in urban settings is managed by local councils, as committees of management, with the principal focus being on enhancing recreational values.

'Friends of' and Landcare groups can also play a role assisting other agencies in riparian management, for example, through weed management and revegetation activities. Landcare groups often form the link between individual landholders and agencies and may be able to offer additional resources, such as volunteers to help with revegetation.

Traditional Owners may play a role in riparian management on Crown land, particularly through joint and co-operative management agreements (see Section 6.4.1).

Other agencies also play a role and have an interest in riparian management, such as rural water corporations through the authorisation of the use of water for stock, local government through enforcing various local laws (for example, about vegetation clearance and heritage controls) and urban water corporations, which must provide safe drinking water to their customers.



Fencing and revegetation of riparian land. Courtesy West Gippsland CMA

9.1.6 Riparian management activities

Over the last 15 years, waterway managers have worked in voluntary partnerships with landholders to undertake riparian management activities. Management activities typically include fencing, revegetation, maintenance or improvement of existing indigenous vegetation, controlled grazing, provision of offstream stock watering infrastructure and weed management. These management activities provide many benefits to the community and landholders through improved water quality (with significant benefits to public health due to improved drinking water quality), better stock management and improved waterway condition⁶. Within a catchment context, riparian management activities provide beneficial carbon, biodiversity and water quality outcomes⁷.

Using this partnership approach, about 9,000 management agreements between waterway managers and landholders were put in place between 2002 to mid 2012 to improve the condition of riparian land.

This included over 8,400 km of waterways being fenced and over 33,000 ha of riparian land being protected. The scale of riparian work has meant that some waterways in the state are now almost entirely fenced and protected. For example, the floodplain section of the Snowy River in East Gippsland is almost entirely fenced and over 1,000 km of waterways have been fenced in the Glenelg Hopkins region (see Box 9.1).

An evaluation of riparian works undertaken by waterway managers in partnership with landholders, including a survey of the landholders' attitudes to riparian management, showed that generally, the riparian works have been successful and continue to be well maintained by landholders. Also, landholders overwhelmingly support the works and would recommend similar work to other landholders (see Box 9.2)⁸.

Box 9.1: One thousand kilometres of fencing – A Glenelg Hopkins success story

In mid 2011, the 1,000th km of riparian fencing in the Glenelg Hopkins CMA region was erected – the distance between Hamilton and Sydney – protecting a significant number of waterways.

This included parts of the Glenelg River – the largest and most significant waterway in the Glenelg Hopkins region. In partnership with landholders and community groups, such as Landcare, the CMA protected 400 km of the Glenelg River and its tributaries. As well as fencing, the funding provided landholders with stock crossings for improved stock management and over 100 offstream watering points.

The funding also provided economic benefits to the regional economy. The project injected \$7.4 million of State funding into the regional economy by providing funds directly to landholders and by the use of local businesses such as fencing contractors, nurseries and fencing material suppliers.

Ian Sutherland and his family purchased a rundown property near Balmoral. He said they had a 10-year vision for the land, which was virtually a dust bowl. They were keen to fence off all the waterways to improve farm management and waterway condition but didn't have the financial capability to do it alone. "The CMA grants have helped a lot. It will improve our stock management and we can still pump water out of the creeks if we need to. Just saving one calf from tumbling down a bank and drowning in a waterway will justify all the work done".

Box 9.2: Evaluating onground riparian works

An investigation was undertaken in 2011 to evaluate a sample of riparian sites in Victoria where onground works had been completed over the last decade⁸. It determined the condition of riparian works and landholder attitude to the works. For example:

- where fencing was erected to prevent stock access to riparian land the fencing was still functional at 86 per cent of sites
- on average, landholders gave 'willing to recommend riparian work to others' a score of 9/10 and most considered they would do more riparian work themselves
- 76 per cent of landholders indicated that there had been no loss of productivity across the property as a result of the riparian works
- 74 per cent of landholders indicated that they considered that the condition of the waterway had improved as a result of riparian works
- landholders have been involved in long-term management at 93 per cent of sites.

Comments from landholders included "I can't understand why more farmers don't do it. In the past we would lose one or two animals in the stream each year, but we haven't lost any for years. Property looks better with healthier streams and surrounds, and has increased in value" and "Thanks to CMA for a job well done".

9.2 Improved approach to the management of riparian land

Improvements to the current riparian management program in Victoria need to build on the strengths of the existing partnership approach, develop better onground management practices and improve administrative, institutional and legislative arrangements to support broader management objectives for riparian land. These objectives apply to all riparian land, both private and public land.

This section builds on the general approach to the management of riparian land outlined in Section 9.1.6. The approach taken for specific riparian management issues is described in Section 9.3.

9.2.1 Victorian Government investment in riparian management activities

Victorian Government investment in riparian land management needs to be targeted to priority activities that are determined through a regional priority setting process. Regional Waterway Strategies (RWSs) will identify high value waterways and establish priority riparian management activities over the eight-year planning period (see Section 4.2).

Long-term management and improvement of riparian land will only succeed if there is a clear partnership between landholders and Government. Consequently, Government will build on the existing approach and continue to invest in riparian management by supporting voluntary partnerships with landholders on both private and Crown frontage land.

The process of identifying priority riparian management activities does not discriminate between private or public land, but the subsequent management approach for undertaking the riparian management will vary somewhat according to the tenure of the land.

Management objective

The objective for the management of riparian land, particularly Crown frontages, is to maintain or improve its condition to support environmental, social, cultural and economic values. On Crown frontages, private benefits (such as the economic value of grazing stock) will be supported where they achieve positive environmental outcomes or where they do not significantly compromise the environmental, cultural and social values.

Policy 9.1

The Victorian Government's approach to achieve its objective for riparian management on both public and private land is to assist landholders (and other public land managers) to maintain or improve the condition of the riparian land. It does this by providing both information on riparian management and investment which contributes towards the cost of onground riparian management activities. These activities typically include fencing, revegetation and vegetation enhancement, weed management and the provision of offstream stock watering infrastructure.

The approach to riparian management will be achieved through voluntary and co-operative partnerships between landholders and Government, typically through waterway managers. The partnerships will involve voluntary riparian management agreements with landholders (for Crown and private land) in addition to licensing arrangements with adjoining landholders (for Crown frontages). It will also involve other land managers where appropriate (for example, Parks Victoria, committees of management, Traditional Owner Land Management Boards and local government).

Wherever possible, riparian management will deliver multiple benefits, including the provision of:

- agricultural values such as:
 - controlled grazing
 - access to water for stock
- environmental values such as:
 - the protection of biodiversity, especially significant plants and animals
 - providing biolinks of continuous and connected riparian vegetation, particularly along entire high value waterways and as lateral connections between riparian land and the surrounding landscape
- water quality benefits, particularly by considering areas upstream of drinking water offtakes or reservoirs
- public access and recreational use
- cultural heritage values
- carbon sequestration.

9.2.2 Landholder involvement in riparian management

Landholders are the key custodians of much riparian land in Victoria. As the occupier of the property or frontage, they generally have good local knowledge of their riparian land. They often undertake pest plant and animal management on riparian land. Voluntary partnerships between waterway managers and landholders form the key element of the Victorian Government's approach to riparian land management. In these partnerships, landholders typically invest at least as much as Government in riparian management.

The long-term management responsibilities of landholders and waterway managers for riparian land where works have been undertaken are not always adequately described in agreements or on the licence for Crown frontages. Therefore, there is a need for the management obligations of both the waterway manager and the landholder to be clearly articulated in formal binding management agreements between both parties. Further discussion of landholder roles in the management of fenced riparian land is included in Section 9.3.3. Many of the approaches to the management of riparian land apply equally to private and public land. However, there are some differences.

Private land

The benefits of onground riparian works and the defined role of the landholder in managing the works may be lost upon change of ownership of private riparian land or once a fixed-term agreement with the current landholder expires. An on-title agreement may be able to assist in securing the benefits of the riparian work in perpetuity by ensuring the long-term management obligations apply to current and new landholders and to the agency party to the agreement. On-title agreements, such as Trust for Nature covenants and Land Management Conservation Agreements, are not 'set and forget' but require all parties involved to commit to long-term management. Often, higher incentives are made available to landholders for riparian management activities if they are prepared to enter into on-title agreements.

Crown frontages

Licensed frontages

There are almost 10,000 agricultural licences on Crown frontage across the state. In 2010, the Victorian Government introduced 'riparian management licences'. By mid-2013 there were over 730 riparian management licences (and 152 conservation licences) covering over 7,000 ha of Crown frontage, of which over 5,600 ha is fenced and protected⁹.



Landholder shows riparian fencing achieved in partnership with North Central CMA on Tullaroop Creek. Photographer: Johanna Slijkerman

Landholders with either traditional agricultural licences or riparian management licences are responsible for managing weeds and pests and other issues related to the condition of the licensed frontage. However, there is a lack of clarity about what standards are expected of a landholder to comply with these obligations. Therefore, it is critical that these standards be defined for licensees.

The true costs and benefits to both landholders and to Government of the current framework, whereby landholders manage Crown frontages under licence (both traditional agricultural licences and riparian management licences), are not well understood. An improved understanding of these costs and benefits will help inform improved management, including both cost-sharing guidelines for undertaking and managing riparian management works and examining options for resourcing long-term management of fenced riparian land. These issues are further explored in Section 9.3.3.

Compliance by licensees with licence conditions and other statutory requirements on Crown frontages is also critical. Further information on this issue is provided in Section 9.2.3.

Unlicensed frontages

Many parcels of Crown frontage are unlicensed but still used by the adjoining landholder, typically for grazing (known as ‘unlicensed occupations’ or ‘unauthorised occupations’). Often this occurs because the landholder is simply unaware that the riparian land is Crown frontage or the licence has not been transferred for a change in ownership. Appropriate management activities, such as fencing and revegetation, need to be undertaken for some of these occupied unlicensed frontages, particularly in priority areas. In other cases, it may be appropriate to issue an agricultural licence.

Policy 9.2

Minimum standards for management of riparian land are required by the conditions of an agricultural licence on Crown frontages and are a legislative requirement on private land.

When work is undertaken on private or Crown riparian land, partnerships between landholders and waterway managers will be documented in clear and effective, legally binding agreements that:

- articulate the responsibilities of each party to the agreement
- will be negotiated with landholders on a voluntary basis.

On private land, on-title agreements will be an option to secure the benefits of the riparian work in perpetuity.

When entering agreements with waterway managers involving currently licensed Crown frontages, landholders will need to convert their existing licences into riparian management licences issued by the Department of Environment and Primary Industries that:

- specify the landholder’s long-term management responsibilities in the licence conditions
- waive the licence fee (for the managed area)

- provide for controlled grazing in certain circumstances
- provide for the issue of a take and use licence to water stock
- ensure long-term management responsibilities will pass to a new licensee when properties adjoining Crown frontages are sold and licences are transferred.

Where Crown frontages are in unauthorised occupation on a priority reach, and it is deemed appropriate to issue a licence by the public land manager (for example, DEPI or Parks Victoria), the landholder will be given the choice of:

- taking up a riparian management licence (which provides for the issue of a licence to take and use water for stock) and typically being eligible for fencing and offstream stock watering incentives or
- not taking up a licence which will require fencing the frontage off at the landholder’s cost.

Where Crown frontages are in unauthorised occupation on a non-priority waterway, the landholder may be offered a standard agricultural licence. However, in circumstances where the unauthorised occupation is on a low priority waterway but the site-specific riparian values are high, a riparian management licence may be offered.

Action 9.1: Develop minimum standards for the management of licensed Crown frontages.

Who: Department of Environment and Primary Industries, waterway managers. **Timeframe:** 2014

Action 9.2: Investigate the costs and benefits to landholders and the Victorian Government of managing Crown frontages under licence.

Who: Department of Environment and Primary Industries. **Timeframe:** 2015

9.2.3 Victorian Government role in the management of Crown frontages

There is a need to improve communication and formal processes between waterway managers, the DEPI and landholders regarding Crown frontages and their administration and management. In part, this will be achieved by reviewing the current roles and responsibilities of the DEPI and waterway managers for the management of Crown frontages.

Current legislation governing the management of Crown frontages, especially the *Land Act 1958*, is outdated and inflexible in its approach to licensing and administration and does not support the current approach to land management.

While collaboration and partnerships between landholders and agencies are the cornerstone of the riparian management program, compliance action may sometimes be required. This is particularly important given the new licensing regime for frontages (including riparian management licences) and the commitment to better defined minimum standards for Crown frontage licences. In 2012, the (then) Department of Sustainability and Environment commenced building capacity for riparian compliance activities on priority riparian land, which will be reflected in the current revision of the DEPI's Statewide Compliance Strategy and Regional Compliance Plans. The focus is on education and negotiation with landholders and licensees and using enforcement only when necessary as a 'last resort'. The DEPI's compliance role for Crown frontages needs to continue to be supported.

If private property adjoining a Crown frontage is sold, prospective purchasers need to be aware that the frontage is not private land. Real estate agents and others in the industry may also be unaware of the adjoining Crown land. Current legal mechanisms do not adequately inform prospective buyers about the status of the adjoining frontage, so they may assume it is private land.

Therefore, when properties adjoining Crown frontages are being sold, systems are required to articulate to the prospective purchaser that the land adjacent to the river is Crown and not part of the private land, that it is subject to a licence and that the landholder may be contacted by the waterway manager to discuss the priority of the frontage for riparian management activities.

When a riparian property with adjoining licensed Crown frontage has been sold or transferred, there are no systems in place to alert the DEPI about this change. The sale of property with an adjoining Crown frontage and the impending transfer of the frontage licence provide an important opportunity to communicate with the new owner, inspect the condition of the frontage being transferred and negotiate new management objectives to improve the management of that riparian land, if required.

Therefore, systems need to be developed to alert the DEPI, and waterway managers, about the sale or transfer of a property adjoining a Crown frontage.

The next Crown frontage licence renewal is scheduled for 2014. This presents an opportunity to introduce the minimum standards (referred to in Section 9.2.2) as part of guidelines explaining to licensees what is expected of them in the management of their frontage and to provide additional information to licensees about riparian land management. These will ensure greater clarity for landholders in meeting their responsibilities for managing their licensed Crown frontages.

Policy 9.3

Administrative, institutional and legislative arrangements relating to the management of Crown frontages will be reviewed and amended (if required) to:

- streamline and improve their administration, particularly the relationship between the Department of Environment and Primary Industries, waterway managers and Crown licensees
- ensure they align with the Victorian Government's objective for the reduction of 'red tape' and the management objective for riparian land.

The Department of Environment and Primary Industries will continue to foster improved understanding by Crown frontage licensees of their obligations for the management of frontages.

The Department of Environment and Primary Industries will continue to support and implement improved compliance approaches for Crown frontages, including stronger action against serious breaches of licence conditions and unauthorised occupations.

| | |
|--|------------------------|
| Action 9.3: Review the roles and responsibilities of the Department of Environment and Primary Industries and waterway managers for the management of Crown frontages. | |
| Who: Department of Environment and Primary Industries, waterway managers. | Timeframe: 2015 |
| Action 9.4: Review and reform the legislation relating to the management of riparian land, particularly Crown land (focussing on the <i>Land Act 1958</i>), to streamline the administration and management of Crown frontages and to enable it to support the Victorian Government's objective for the management of riparian land. | |
| Who: Department of Environment and Primary Industries, waterway managers. | Timeframe: 2018 |
| Action 9.5: Develop and distribute information to Crown frontage licensees (as part of the next Crown frontage licence renewal) explaining what is required to meet licence obligations and provide further information about riparian management. | |
| Who: Department of Environment and Primary Industries. | Timeframe: 2014 |
| Action 9.6: Develop and implement improved compliance approaches for Crown frontages, including stronger action against serious breaches of licence conditions and unauthorised occupations. | |
| Who: Department of Environment and Primary Industries, waterway managers. | Timeframe: 2016 |
| Action 9.7: Develop information for the real estate and legal industries to inform prospective riparian property buyers that land along rivers is often public land. | |
| Who: Department of Environment and Primary Industries. | Timeframe: 2016 |
| Action 9.8: Develop systems at the point of sale to alert prospective buyers of riparian property abutting Crown frontage that the land adjacent to the river is Crown and subject to a licence. | |
| Who: Department of Environment and Primary Industries. | Timeframe: 2016 |
| Action 9.9: Develop systems to alert the Department of Environment and Primary Industries and waterway managers when property adjoining a Crown frontage is sold or the title transferred. | |
| Who: Department of Environment and Primary Industries. | Timeframe: 2014 |

9.3 Improved management of specific riparian issues

9.3.1 Riparian land and bushfire¹⁰

Many landholders are concerned that vegetated riparian land, including land revegetated through riparian management programs, poses a fire risk to their property. However, riparian land poses a lower fire threat to a landholder's property, including to crops, livestock and built assets (such as houses and farm buildings), than the threat posed by other parts of the landscape.

Any significant patch of vegetation situated close to assets may pose a fire threat. However, under low to moderate fire danger conditions, well-managed riparian vegetation, with limited grass and weed growth, is less likely than pasture or crops to contribute to the spread of fire across a property or the wider landscape. This is largely because:

- fire will spread more quickly in cured grass or crops compared with forest (provided there is only limited spotting)
- trees generally reduce wind speed and the rate and intensity of fire
- riparian land occupies a relatively small proportion of the broader landscape.

Fire is also much less likely to start in riparian land than other parts of the landscape, typically because it is not as prone to lightning strikes, is remote from access for arsonists, has fuel too moist to burn and is sheltered from the wind and sun.

Built assets would typically be under greater threat from cured pasture and nearby unmanaged wind breaks than from riparian land, which is often further away from farm assets. In addition, riparian land does not act as a 'wick' or 'fuse'. Fires will burn most rapidly in the direction of the wind. Consequently, riparian land poses a lower fire threat to a landholder's property, including to crops, livestock and built assets, than other parts of the landscape.

Extreme fire events, such as the February 2009 bushfires in Victoria, are rare. In such conditions of protracted drought and extreme fire weather all vegetation can burn.

In these situations, riparian land will have less influence on fire spread and impacts than the landscape level grass and forest fuels.

Increased communication between the DEPI, Country Fire Authority, waterway managers and landholders about fire behaviour in riparian land will assist all stakeholders to understand the relative contribution of riparian vegetation to fire risk compared with other aspects of landholders' properties and how best to manage any risk.

Fire management and planning need to be considered in riparian management activities including:

- weed and pasture grass management
- setbacks from the riparian land to built assets (such as houses and sheds)
- the establishment of access points at strategic locations within the riparian land for fire suppression agencies, particularly to access reliable watering supplies for fire fighting tankers.

Ongoing management of riparian land from a fire management perspective is the responsibility of landholders on both private land and licensed Crown frontage.

Policy 9.4

The Country Fire Authority, Department of Environment and Primary Industries and waterway managers will work to increase landholder and broader community understanding of the fire risks associated with riparian land.

Fire risk, especially to built assets, will be considered in riparian management planning through collaboration between waterway managers and fire agencies.

Action 9.10: Develop information for fire suppression agencies, waterway managers and landholders about fire behaviour in riparian land.

Who: Country Fire Authority, Department of Environment and Primary Industries, waterway managers.

Timeframe: 2014

9.3.2 Managing livestock grazing on riparian land

Controlled grazing

Grazing of stock is a major use of riparian land and can be a commercial benefit to farming enterprises. Complete exclusion of grazing can be a disincentive for landholders to be involved in improved management of riparian land, particularly due to concerns about the build up of weeds. Controlled grazing limits stocking rates and restricts the timing, duration and conditions under which grazing takes place. It can be a useful management tool in some circumstances, typically in:

- controlling palatable weeds, particularly pasture grasses
- maintaining or improving the vegetation condition of certain vegetation types, such as native grasses
- promoting natural regeneration of indigenous woody species.

A decision support tool and guidelines have been developed to determine the acceptability of grazing in different types of riparian land¹¹. The decisions about grazing management based on these guidelines will be included in riparian management agreements and in riparian management licence conditions on Crown frontages.

Management agreements and licence conditions allowing for controlled grazing need to be monitored by waterway managers and the DEPI to ensure landholder compliance.

The decision support tool is based on the best available science and management knowledge. However, there is very limited applied environmental research in south-eastern Australian on the interactions between grazing in riparian land and environmental condition and recovery. Research on the use of controlled grazing in riparian ecosystems and the circumstances where it is appropriate, is required for it to be improved as a management tool.

Policy 9.5

In general, controlled grazing will be allowed on Crown frontages and private riparian land subject to riparian management agreements if it:

- is environmentally beneficial
- is acceptable as a management tool and/or
- does not compromise:
 - environmental, social, cultural or economic values of the riparian land
 - downstream environmental, social, cultural or economic values.

A decision support tool and guidelines will be used to assist implementation of the policy on controlled grazing.

Grazing will continue to be permitted on lower priority Crown frontages that are not the subject of riparian management agreements, subject to licence conditions that minimise the adverse impacts of grazing on the value of the riparian land and the waterway.

Stock access to waterways upstream of drinking water offtakes

Grazing stock need access to water. Similarly, Victoria's waterways provide water for human use. One of the catchment-based risks that water corporations need to take into account is the potential risk from pathogens due to stock accessing waterways upstream of drinking water offtakes, especially juvenile and sick stock. Risk needs to be managed with a range of options including upgrading water treatment facilities, fencing streams to manage stock and educating landholders about the risk and how they can manage it (especially encouraging and educating landholders to separate juvenile stock from waterways)¹².

Currently, water corporations are legally obliged to consider health risks to their water supplies by identifying, documenting and assessing how they will be managed in their risk management plans. However, there is a need to provide water corporations with further guidance in determining the level of risk from stock upstream of their offtakes.

Also, in many cases, water corporations are working with waterway managers to fence off frontages where water corporations have identified that there is a risk to water supplies. For Crown frontages, this includes the practice of conversion from traditional agricultural licences to riparian management licences, with accompanying fencing and other management activities. However, the riparian work priorities of waterway managers and water corporations have not always been aligned.

Policy 9.6

Stock will not be banned catchment-wide from drinking water catchments. However, reducing stock access, especially juvenile stock, to priority waterways upstream of drinking water offtakes by fencing riparian land will be undertaken by agencies (including waterway managers and water corporations) as part of their onground management programs. For Crown frontages, this will be assisted by the conversion of traditional agricultural licences to riparian management licences.

Action 9.11: Prepare guidance material for water corporations for the management of risks to drinking water quality arising from stock in waterways upstream of drinking water offtakes.

Who: Department of Health, Department of Environment and Primary Industries, water corporations

Timeframe: 2014



Reducing stock access to priority waterways upstream of drinking water offtakes will be encouraged as part of riparian management programs. Courtesy DEPI

9.3.3 Management of fenced riparian land

Fencing to manage stock access is the major tool in riparian management programs. There are many practical issues faced by Government, waterway managers and landholders concerning riparian fencing and managing the fenced riparian land, including consideration of:

- when fences are and are not the appropriate management tool
- cost-sharing between landholders and Government to pay for the initial riparian management works and management of the fenced land, particularly taking account of the level of benefit received by each party
- long-term management responsibilities for fences and fenced riparian land, which must be clearly articulated and understood by all parties, including issues such as weed management, fence maintenance and ongoing access to the fenced land
- landholder capacity to resource long-term management of fenced riparian land^{8,13,14}
- the need for existing and future riparian work sites on both Crown and private riparian land to be inspected to ensure that the sites are being managed according to the obligations specified in riparian management agreements^{8,15,16}
- the width of the fenced riparian land, which must be sufficient to meet its management objectives
- the most appropriate alignment of the fence, including consideration of the location of the Crown-private land boundary, the alignment of the fence relative to river flow, and the ability to reduce potential flood damage
- funding the replacement of fences damaged or destroyed in extreme events such as floods and bushfires
- standards of fence design and construction, considering issues such as the type of stock and the location of the fence in the floodplain
- the need for ongoing engagement between waterway managers and landholders who have riparian management agreements.

Principles

Fences are an important tool to manage the impacts of livestock on waterways and riparian land.

Riparian fences need to be on the appropriate alignment for the best riparian management outcome, giving due regard to the position of the fence with regard to flood flow, the location of the Crown frontage boundary (where applicable), impacts on access (for recreation, for fire management and to cultural heritage sites) and negative effects on native animal movements.

Fences must be built to an appropriate standard depending upon the purpose and location of the fence, giving regard to factors such as the location in the floodplain, the stock involved and the topography of the riparian land.

Once the initial riparian management works have been undertaken, the works and the fenced riparian land must be managed over the long-term.

Long-term management obligations and responsibilities for fencing and the fenced riparian land must be clearly understood by all stakeholders.



Fences are important tools in managing impacts of livestock on waterways and riparian land. Fenced riparian land on the left is contrasted with uncontrolled stock access on the right. Photographer: Terry McCormack

Policy 9.7

The following policy statements apply when the Victorian Government contributes to the costs of management activities on riparian land, particularly fencing.

The proportion of the costs for management activities on riparian land, particularly fencing, that is paid for by the Victorian Government will depend upon:

- its priority for riparian management activities
- the level of public benefit of the work
- the level of security of the agreement.

When entering voluntary partnerships with waterway managers for riparian management activities, landholders, including licensees on Crown frontages, will generally be responsible for the long-term management of the riparian fence and fenced riparian land, with the landholders' requirements specified in riparian management agreements and/or riparian management licences (when on Crown frontages).

Construction of fences and management of riparian land will be undertaken to a high quality following specified guidelines or standards (where required).

Riparian land fenced for riparian management purposes will aim to be at least 20 m wide on average from the top of the bank and must not be narrower than 10 m in any one place.

Waterway managers will maintain long-term contact with landholders who have agreements, including site visits as appropriate. Maintaining long-term relationships with landholders will help to ensure that the sites are being managed and works are being maintained according to the obligations in riparian management agreements.

The Victorian Government will be responsible for funding the replacement of riparian fences in declared natural disasters (bushfires and floods), depending upon:

- regional priorities at the time
- the level of disaster assistance and other funding available
- the extent of the disaster and the damage involved.

On temporary streams, where stock can cross the stream for part of the year, the Government will generally not invest in fencing and revegetation on only one side of the stream.

Compliance with long-term management responsibilities for fences and fenced riparian land specified in licences and riparian management agreements will be monitored.

Action 9.12: Develop cost-sharing guidelines for riparian management activities that detail a sliding scale of public investment based on the level of public benefit.

Who: Department of Environment and Primary Industries, waterway managers

Timeframe: 2016

Action 9.13: Develop guidelines for riparian fence construction in flood prone areas.

Who: Department of Environment and Primary Industries, waterway managers

Timeframe: 2014

Action 9.14: Develop options for resourcing ongoing management of fenced riparian land.

Who: Department of Environment and Primary Industries, waterway managers

Timeframe: 2016

Action 9.15: Develop a toolkit of approaches waterway managers can employ for long-term engagement of landholders with riparian management agreements.

Who: Department of Environment and Primary Industries, waterway managers

Timeframe: 2014

9.3.4 Access to water for stock when Crown frontages are fenced

Access to water for stock is a critical issue for landholders when considering their involvement in riparian management programs. Currently, an agricultural licence permitting stock to graze a Crown frontage provides direct access to water for stock at no cost and without the need for a separate water entitlement. When a landholder fences a Crown frontage they lose direct access and are required to obtain a take and use licence (TUL).

However, landholders will still incur licensing costs (for the licence application, annual fees and for renewal of the licence), which is the case for all other TUL holders. This can be an impediment to landholders agreeing to take part in riparian management works. Therefore, it is necessary to minimise the administrative burden and costs to landholders associated with obtaining and renewing the necessary TULs.

Currently, landholders in unlicensed occupation of Crown frontages may be required to vacate the land, which would require them to erect a fence at their own cost and they would lose direct access to water for stock. Such landholders will be required to take out either a traditional agricultural or riparian management licence (assuming the issue of a licence is appropriate). A riparian management licence will ensure they have continued access to water.

On private frontages, landholders have a statutory right to water for stock (in most circumstances) whether they have direct access to the waterway or have erected a fence. Therefore, they are not required to obtain a TUL.

Policy 9.8

Access to water for stock will continue to be available for landholders with riparian management licences for the adjoining Crown frontage when riparian fencing excludes stock from direct access to a waterway, through the issue of take and use licences.

Regarding take and use licence fees for landholders participating in riparian management programs and taking out a riparian management licence:

- The application fee will be paid for by the waterway manager as part of the cost of a riparian management project.
- The annual fee will be waived by rural water corporations for the first three years.
- Licences will be issued for 15 years by rural water corporations (the current legislative maximum).

Landholders occupying Crown frontages without a licence will need to take out an appropriate frontage licence to ensure they have continued access to water.



Fenced riparian land showing regeneration of vegetation and offstream watering for stock. Photographer Johanna Slijkerman

9.3.5 Carbon sequestration on riparian land

Carbon biosequestration is the storage of carbon in vegetation and soils. There is growing evidence that riparian forests have particularly high capacity to store carbon. Therefore, improved management of riparian land presents a major opportunity for carbon sequestration. Riparian land is a key location in the landscape to establish biodiverse vegetation funded through programs seeking to invest in carbon sequestration, such as through the Australian Government's Carbon Farming Initiative (CFI).

Given Victoria's extensive network of Crown and private river frontages, waterway managers and landholders are well placed to capitalise on investment made available for biodiverse plantings for carbon biosequestration.

Policy 9.9

Consistent with its *Environmental Partnerships* statement, the Victorian Government will undertake actions to better understand the amount of carbon stored in Victoria's public land and ecosystems, including riparian land and investigate opportunities for industry, waterway managers and landholders to use programs investing in permanent carbon sequestration as a mechanism to encourage biodiverse riparian plantings on Crown and private riparian land.



Improved management of riparian land presents opportunity for carbon sequestration. Photographer: Alison Pouliot

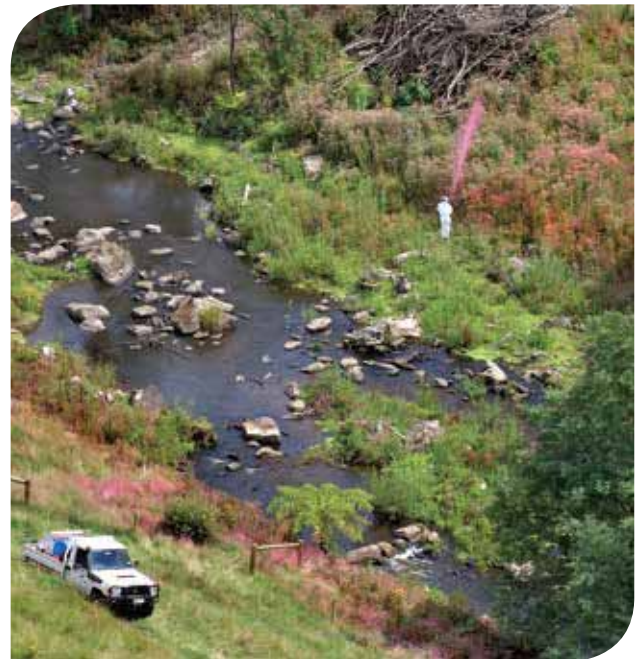
9.3.6 Managing invasive species on riparian land

Invasive species, especially weeds, are a key threat to the condition of riparian land. Riparian land is particularly prone to weed infestations spread by water and from stock access. Unless properly managed, high risk agricultural and environmental weeds (such as willows, bridal creeper and blackberry) will progressively physically transform and degrade riparian land and spread to and contaminate downstream land, as well as spreading to and from neighbouring farmland (see Box 9.3).

The deliberate planting of exotic species (including ash, elm, poplar and particularly willows) for erosion control and aesthetic purposes has led to degradation of riparian environments. Planting exotic species on riparian land has been actively discouraged for the last decade or more and activities to contain or remove weed infestations will continue to be implemented through regional waterway management programs. However, there may be some exceptions. For example, it is recognised practice that in certain circumstances, sterile non-native grasses are used as a rehabilitation tool on riparian land.

Pest animals, such as rabbits, can also be a threat to the condition of riparian land. Both pest plants and animals generally need to be managed as part of broader catchment or waterway management programs. The management of both riparian and aquatic invasive species is discussed in Chapter 16.

Landholders are currently required to manage certain pest plants and animals, under the *Catchment and Land Protection Act 1994* for private riparian land and through licence conditions for Crown frontages.



Spraying blackberries. Courtesy West Gippsland CMA

Box 9.3: Willows and willow management in Victoria

In the past, the use of willows was considered to be beneficial for preventing bank erosion and stabilising river banks. Government funding was used to plant willows in many areas. It is now recognised that:

- Willows often initiate erosion and channel widening. The extensive willow root mats extend into the channel bed and trap sediment, which raises the bed level and diverts flows into and over the bank. This results in bank erosion causing the river to widen out around the willow.
- Willows degrade the condition of rivers. Willows crowd out native plants, hence reducing native biodiversity. They also disrupt environmental processes in rivers (for example, their massed autumn leaf fall can affect water quality and deplete oxygen levels).
- Healthy fish populations require rivers to be in good condition. Willows can affect fish by reducing habitat and food. For example, willow root mats create uniform stream channels with reduced diversity of habitat for fish. Also, willows support fewer terrestrial bugs than native plants, reducing the number of bugs that fall into rivers as a source of food for fish.
- Dense stands of willows can result in reduced access for recreational use such as for fishing and can be dangerous for canoeists who can become trapped under them.
- Willows are highly invasive, with many varieties producing very large quantities of seeds. Most willow varieties are able to propagate vegetatively from broken twigs and branches.

Consequently, willows are recognised as one of the worst riparian weeds in temperate Australia and they are listed as a Weed of National Significance (WoNS) (with the exception of weeping willow, pussy willow and sterile pussy willow). Willows have currently invaded thousands of kilometres of riparian environments in south eastern Australia.

Within Victoria, most species of willows (with some exceptions, for example, cricket bat willow) were declared as “restricted” noxious weeds in 2005, meaning they cannot be bought or sold within Victoria. However, there is no legal obligation upon landholders to manage willows on their properties.

Willow removal and replacement with indigenous vegetation is now a major river management activity in many areas of Victoria. The highest priority for willow management is the control of seeding willows. The control of infestations of crack willow (a sterile species spread by vegetative propagation) is of lower priority.

While in the short-term willow removal can be aesthetically unattractive, this short-term impact is far outweighed by the long-term benefits for river condition and recreational fishing of re-establishing native vegetation along Victoria’s waterways.

More information about willows can be found on the WoNS website at:

www.weeds.org.au/WoNS/willows/



Willow removal works on Fish Creek. Courtesy West Gippsland CMA

Policy 9.10

Planting of non-indigenous species on riparian land will be actively discouraged by the Victorian Government and relevant agencies involved in riparian management*.

Victorian Government funding will not be provided for planting any non-indigenous species on riparian land*.

Any invasive plant and animal management requirements expected of landholders on Crown frontages or private riparian land above their current legal obligations will be described on the frontage licence and/or riparian management agreement.

Management of invasive species, particularly weeds, will be co-ordinated at the scale of whole river systems, across catchments and/or across investment programs, to maintain or improve the condition of priority waterways.

The Victorian Government will contribute to the management of invasive plants and animals, particularly weed infestations, as part of larger riparian management works programs. Crown frontage licensees and landholders with riparian management agreements will then generally be responsible for long-term management. Other agencies and community groups, such as Landcare groups, also play a role in long-term weed management.

*NB the use of sterile non-native grasses may be required as a rehabilitation tool in some circumstances on riparian land.

The importance of access for Victorian Traditional Owners is outlined in Section 6.6.

Access to Crown frontages through unused road reserves is also often a source of conflict between farmers holding an agricultural licence for the reserve and those requiring access to the waterway for recreation. All users of Crown frontages need to be aware of their rights and obligations regarding recreational use of Crown frontages. Under certain circumstances, access to riparian land may be limited or closed to ensure the integrity of riparian management activities, such as revegetation, or for public safety or other risk management purposes (for example, water corporations maintain rights to close access to public land around water storages in line with the risk management approach outlined in their governing legislation).

Principles

The community has the right to access public riparian land.

Recreational users and Crown frontage licensees need to be aware of their rights and responsibilities regarding recreational use of riparian land and must show mutual respect and understanding for each other's rights and responsibilities.

9.3.7 Access to Crown frontages for recreational use

Much of the 30,000 km of Crown frontage in Victoria is highly valued as a means of access to Victorian waterways for recreation (see Chapter 7 for more information on the recreational use of waterways). As Crown frontages are also highly valued for agricultural use, there is potential for conflict between recreational users and farmers, particularly closer to urban areas. For example, recreational users may find access blocked, while farmers sometimes face issues with gates left open, theft or vandalism of farm property, camp fires escaping and concern about public liability issues. The values of riparian land can, in turn, be affected by inappropriate recreational use.

Policy 9.11

The Victorian Government will support community access to and along waterways and Crown frontages, where appropriate and in accordance with the existing statutory regime.

Recreational access to Crown frontages must be considered in riparian management programs, including provision of access (such as gates and stiles) and appropriate signage, especially in areas of known high public use. Special conditions regarding public access will be included in riparian management agreements where required.

Action 9.16: Develop and strengthen existing programs aimed at developing awareness by landholders and recreational users of their rights and responsibilities regarding access to and recreational use of Crown frontages.

Who: Department of Environment and Primary Industries, waterway managers

Timeframe: 2015



10

Water quality



*Water quality impacting on the Murray Cray.
Photographer: Keith Ward*

Water quality

Guide to the chapter

10.1 Context

- Importance of water quality
- Threats to water quality
- Water quality in Victoria
- Management issues

10.2 Framework for managing water quality

- National policy context
- State statutory framework
- Regional water quality planning arrangements

10.3 Water quality monitoring

10.4 Roles and responsibilities

10.5 Prevention and mitigation of water quality incidents

10.6 Water quality incident management: preparedness, response and recovery

10.7 Managing impacts from water storages on water quality

10.8 Managing the impacts of acid sulfate soils and soil acidification

10.9 Knowledge gaps

What are the issues with existing arrangements?

Future regional planning arrangements for water quality management need to be clearly outlined. The focus on catchment-wide water quality planning or regional water quality hotspots needs to be determined. Managing water quality requires supporting information from monitoring programs. Existing water quality monitoring programs need to be improved so they better inform planning and management decisions.

Agencies involved in water quality management do not always actively implement their different roles and responsibilities, particularly for managing water quality incidents. Improved frameworks for regional co-operation are required. Further work is needed to effectively manage diffuse source water quality pollution and address knowledge gaps for emerging water quality threats.

What improvements does the Strategy make?

For water quality the Strategy will:

- update the regional planning arrangements for water quality management
- set objectives for water quality monitoring across Victoria
- outline agency roles and responsibilities for water quality management
- commit to clarifying and strengthening roles and responsibilities for managing water quality incidents.

10.1 Context

10.1.1 Importance of water quality

Water quality (the physical, chemical and biological attributes of water) is a key measure of waterway condition. It determines the suitability of water for a particular purpose, with better quality water able to support a wider range of uses than poor quality water. For example, drinking water for towns and communities requires very high water quality, but water for irrigation or stock does not require the same level of quality. There are also water quality standards for recreational activities such as swimming or boating and these activities can be affected by degraded water quality. Adopting preventative measures to protect water quality, to appropriate levels, can significantly reduce the need for expensive water treatment options.

Good water quality is vital for supporting many types of plants and animals. For example, some native fish species require particular water temperatures to trigger breeding. Other waterway species may only be able to survive where water has relatively low levels of nutrients, sediment and pollution. The key values, threats and management activities for water quality are shown in Figure 10.1.

Water quality also affects the health of receiving waters, including coastal and marine environments. Many key marine species (for example, seagrass) are sensitive to changes in nutrient loads and sediment and are adversely affected by declining water quality inputs from upstream catchments.

Water quality is a major management issue for waterways in urban areas (see Chapter 14). For example, the lower reaches of the Yarra River often have poor water quality (particularly after heavy rainfall) as a consequence of urban development, stormwater, litter, licensed discharges of point source pollution and other factors. The water quality in large catchments such as the Yarra can have significant impacts on the health of receiving environments, in this case Port Phillip Bay. Improving water quality in these systems is vital to support waterway values and enhance the liveability of urban areas. Recent reforms to better integrate urban and water planning and to improve the health of the Yarra River and Port Phillip Bay are described in more detail in Chapter 14.

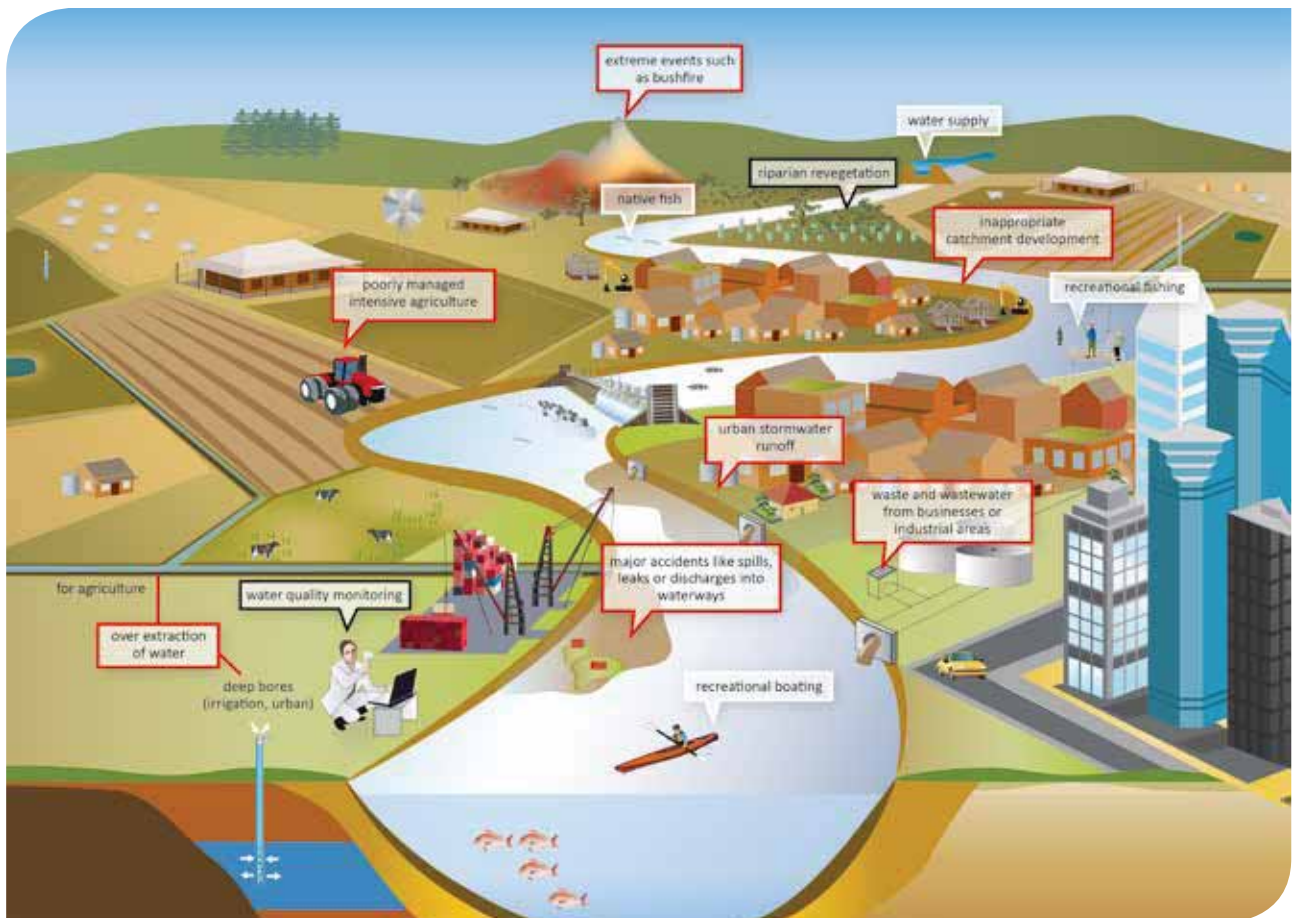


Figure 10.1. Values (white), threats (red) and management activities (black) for water quality.

10.1.2 Threats to water quality

Water quality can be affected when the physical, chemical or biological attributes of water change outside their usual range. These changes may include:

- increased nutrients (for example, phosphorus and nitrogen)
- increased sediment and turbidity
- increased salinity
- presence of toxicants (for example, heavy metals, pesticides, organic pollutants, algal toxins, pharmaceuticals from wastewater discharges, veterinary products used in agriculture and endocrine disrupting chemicals)
- pathogen and microbial contamination
- reduced dissolved oxygen levels
- altered acidity (pH)
- altered water temperatures or water regimes.

The types of activities that can cause these changes include:

- urban stormwater runoff
- over extraction of water
- poorly managed intensive agriculture
- inappropriate catchment development
- forestry
- extreme events such as bushfire and flood
- drought
- major accidents such as spills, leaks or discharges into waterways
- waste and wastewater management from homes, businesses or industrial areas
- port, marina and boating operations.

10.1.3 Water quality in Victoria

Water quality data are collected through the Victorian Water Quality Monitoring Network and the Regional Water Monitoring Partnerships (see Section 10.3). A report on long-term water quality trends from the mid 1970s up to, in some cases, 2005¹ showed that there was a small increase in total nitrogen across all regions of the state. The central and southern parts of the state also showed a small increase in total phosphorus. Increased conductivity (a measure of salinity) was evident in the western parts of Victoria. There were no clear trends for turbidity or pH.

A statewide assessment of data up to 2010² showed that since 2005 there have been no consistent, statewide trends for total nitrogen or total phosphorus, electrical conductivity generally increased and pH either did not change or slightly increased at most sites across Victoria. The assessment used detailed analysis at particular sites to provide information to help evaluate the efficiency and effectiveness of existing management activities and programs. Figure 10.2 illustrates data for total nitrogen in the Barwon River at Pollocksford between 1991 and 2010. The graph shows that nutrients levels started to improve (that is, total nitrogen decreased) around the time that the Corangamite Catchment Management Authority started actively working with dairy farmers to reduce agricultural runoff and the nearby water treatment plant was upgraded. Although there are still occasional instances where total nitrogen is outside the acceptable upper limit, it is clear that the management activities undertaken in the area have improved water quality at this site.

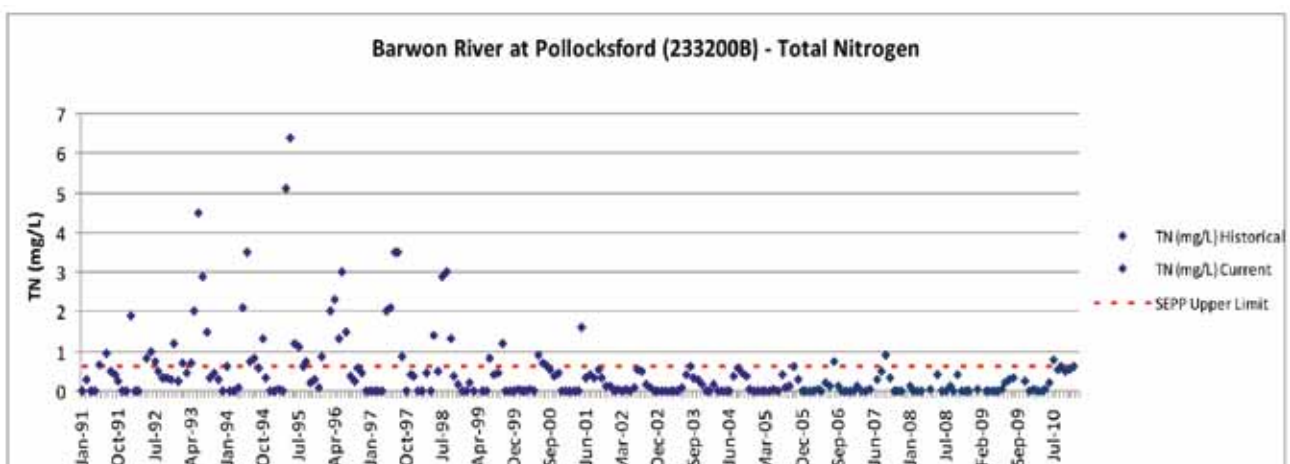


Figure 10.2. Trends in total nitrogen for the Barwon River at Pollocksford between 1991 and 2010.

10.1.4 Management issues

Diffuse and point sources of pollutants

Pollutants broadly fall into two different categories and each requires different management approaches. Point sources are direct inputs of pollutants into waterways, such as sewage outfalls and industrial wastewater. Non-point sources (or diffuse sources) are indirect inputs of pollutants into waterways that occur when pollutants are carried in surface water runoff or groundwater into waterways (for example, catchment runoff, stormwater runoff in urban areas, irrigation drainage and rising groundwater tables).

The control of point source pollutants is managed using a range of regulatory mechanisms. The Environment Protection Authority (EPA) Victoria uses tools provided under the *Environment Protection Act 1970* to prevent direct discharges of pollutants to waterways or limit discharges to levels that will ensure the environment is protected. The EPA Victoria uses a combination of works approvals, licences, issuing of notices and formal enforcement, in accordance with the levels of protection required by the *State Environment Protection Policies* (SEPPs). The EPA Victoria and the Department of Environment and Primary Industries (DEPI) undertook a joint review of the framework for statutory policies in 2013.

By contrast, the control of diffuse sources of pollutants is more difficult because there is a wide range of activities that contribute pollutants and it is difficult to track where they come from and how much can be attributed to each activity. High nutrient levels in a river might be caused by excess fertilizer running off farm properties, but since this may occur

over large expanses of land with multiple landholders it is very difficult to monitor and regulate. In urban environments, high levels of toxicants such as zinc are a common source of diffuse pollutants in rivers. Zinc particles come from galvanised tin roofs and car tyres and are washed into waterways when it rains. Stormwater runoff into waterways is a major source of pollutants and has significant impacts on water quality in urban areas (see Chapter 14).

The control of diffuse sources of pollutants requires collective effort. While the impact of any individual may be small, the cumulative impacts of many individuals may be substantial. Management of water quality can therefore only be successfully undertaken within a framework of integrated catchment management and integrated water cycle management that involves all of the land users and land managers within a catchment. Education is equally important to ensure that individuals are aware of their impacts on water quality and waterway condition and are committed to reducing these impacts.

Other influencing factors

Even when management activities are in place to improve water quality, the success of these measures can be affected by:

- time lags between a management activity being implemented and the response
- the amount of water in waterways (droughts or floods can affect water quality)
- unintended consequences of other management activities.



Protecting Melbourne's drinking water. Photographer: Amber Clarke

10.2 Framework for managing water quality

The existing management framework for water quality addresses both point and diffuse sources. This framework continues to provide the direction for water quality management in Victoria. The key aspects of the framework are:

- a national policy context
- a statewide, statutory framework that recognises regional catchment management arrangements as the main mechanism for the management of water quality
- regional planning arrangements for water quality that are developed in the broader context of waterway management and integrated catchment management
- regulatory controls and standards to minimise the impact of various land uses and other diffuse sources on water quality
- information or research on current and emerging water quality issues.

10.2.1 National policy context

The *National Water Quality Management Strategy* (NWQMS) provides the framework for improving water quality in Australian and New Zealand waterways. The main objective of the NWQMS is to achieve sustainable use of water resources, by protecting and enhancing their quality, while maintaining economic and social development. The policy framework is supported by the *Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC guidelines). The Australian Government also works in collaboration with states and territories to tackle major water quality issues in identified national water quality ‘hotspots’, by funding development of Water Quality Improvement Plans. In Victoria, this has included plans for Port Phillip Bay and Western Port, Corner Inlet and the Gippsland Lakes.

More recently, the National Water Initiative set out a framework for the health of water dependent ecosystems (such as those in rivers and wetlands) through environmental water management measures. As part of this framework, it also set intergovernmental obligations for water quality.

In those parts of the Murray-Darling Basin within Victoria, the management of water quality should remain consistent with arrangements under the Murray-Darling Basin Agreement, the NWQMS, the ANZECC guidelines and Victoria’s statutory framework for managing water quality (see Section 10.2.2).

Victoria has negotiated a Basin Plan Implementation Agreement that clarifies obligations, including those related to water quality. Consistent with this, Victoria will be seeking to use existing state statutory frameworks to meet Basin Plan water quality requirements.

10.2.2 State statutory framework

The *State Environment Protection Policy (Waters of Victoria)* was developed in 1988 (and revised in 2003) to address water quality issues. It is a whole of government policy that identifies protection of waterways as a responsibility shared by all levels of government and industry, business, communities and the people of Victoria.

The SEPP(WoV) provides a statutory framework for the protection of the uses and values (‘beneficial uses’) of Victoria’s fresh and marine water environments and remains the primary mechanism for managing water quality in Victoria (see Box 10.1). The SEPP(WoV) also provides other tools to manage water quality including licences on discharges, standards and encouraging best water quality management practice by industry.

The review of the framework for statutory policies (see Section 10.1.4) highlighted the need to review the SEPP(WoV) to ensure it is simple, relevant and focused on outcomes and risk.

Box 10.1: The role of the *State Environment Protection Policy (Waters of Victoria)* in managing water quality in Victoria

The SEPP(WoV) provides a statutory framework for the protection of the uses and values of Victoria’s fresh and marine water environments. It provides statewide water quality objectives to protect the agreed uses and values, some of which refer to international and national guidelines, particularly for toxicant values. Specific schedules in the SEPP(WoV) deal with individual catchments and contain more detailed information on region specific objectives (for example, Waters of the Yarra Catchment, 1999).

The SEPP(WoV) also includes guidance for waterway managers, coastal boards, water corporations, communities, businesses, local government and State government agencies to protect and rehabilitate water environments to a level where environmental objectives are met and beneficial uses are protected – this is known as the attainment program. The attainment program identifies clear roles and responsibilities for environment protection and rehabilitation and identifies strategic actions and tools to address activities that pose a risk to Victoria’s existing environmental management arrangements.

The purpose of the SEPP(WoV) is not to provide detailed management activities for water quality or wastewater management, but to provide a benchmark for the protection of water environments and strategic guidance on how this can be achieved. More detailed management frameworks and tools are provided through statewide strategies (such as this Strategy) and more detailed management activities are provided in regional plans developed by catchment, coastal and water management bodies (such as the regional Waterway Strategies). The SEPP(WoV) supports these important processes by providing a set of agreed uses and values to be protected, objectives needed to protect them and some strategic guidance on how this can be achieved.

The Victorian Government established the Office of Living Victoria to drive generational change in how Victoria uses and plans urban water systems to achieve better outcomes for the community. The Office of Living Victoria will oversee co-ordination of urban and water planning (see Section 14.2.3).

Further state policy relevant to the management of water quality includes discharge management (including new Memorandums of Understanding), groundwater management and the SEPP (Groundwaters of Victoria). In addition, there are several other plans where the primary objective is not the management of a water quality issue, but where the management activities will have water quality impacts (for example, the *Victorian Litter Strategy*).

Policy 10.1

The *State Environment Protection Policy (Waters of Victoria)* is the key statutory framework for managing surface water quality in Victoria and provides long-term, region-specific water quality objectives for rivers.

The *Environmental Water Quality Guidelines for Victorian Riverine Estuaries* provide specific guidance for managing water quality in estuaries.

Action 10.1: Review and update the *State Environment Protection Policy (Waters of Victoria)*.

Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria.

Timeframe: TBD following review of the framework for statutory policies

10.2.3 Regional water quality planning arrangements

Existing regional water quality plans focused on areas with the poorest water quality, rather than areas of high value where poor water quality is a key threat. The regional priority setting process (see Section 4.2.3) that underpins development of the regional Waterway Strategies (RWSs) provides a mechanism to identify where poor water quality poses a threat to high value waterways and determine priority management activities. The development of the RWSs also provides a process to determine the beneficial uses in each waterway, in consultation with regional communities (the beneficial uses broadly align with the values outlined in Appendix 4.1). This is a more targeted and integrated approach to managing water quality than developing stand-alone water quality plans for each region.

Waterways with good environmental condition may be threatened by poor water quality from upstream areas or adjacent waterways. Management of water quality can require works to be undertaken outside priority areas, or require co-operation across catchment boundaries. Water quality management in estuaries and coastal wetlands needs to consider groundwater and coastal and marine influences.

Other regional policy relevant to water quality management includes the regional Sustainable Water Strategies, policies for environmental water management, water corporation standards for water re-use, municipal stormwater management plans, reviews of local government planning schemes and regional water cycle plans (see Section 14.2.3). Irrigation regions also have land and water management plans.

The DEPI is the State co-ordinator for blue-green algae management under the Blue-Green Algae Coordination Framework. The objectives of this framework are for parties to work co-operatively for effective management of blue-green algae events. The framework is broadly based on emergency management principles described in the *Emergency Management Manual Victoria*³.

Policy 10.2

Regional Waterway Strategies will identify priority waterways where environmental, social, cultural or economic values are threatened by poor water quality, resulting in high or very high risk to values ('regional hotspots').

If the sources of water quality issues for regional hotspots are known, high level management activities (aligned with the broad actions in the *State Environment Protection Policy (Waters of Victoria)*) to address these risks should be included in the regional Waterway Strategies. If the sources are unknown or uncertain, risk assessments or other investigations should be undertaken to help guide further action planning.

Catchment-scale water quality plans will only be developed in special cases when risk assessments or other investigations indicate they are required. Where relevant, these plans should also consider impacts of poor water quality on marine receiving waters.

Management activities may require partnership and negotiation between agencies (such as waterway managers, Department of Environment and Primary Industries, Environment Protection Authority Victoria, public land managers and local government) and should be negotiated during development of the regional Waterway Strategies.

Decisions on the type and quantity of water quality management activities will consider the scale of the problem and the resources available to remedy the issue. Realistic, short-term output targets that outline progress towards long-term resource condition outcomes will be required.

10.3 Water quality monitoring

Water quality reflects the environmental condition of waterways, but can also provide an integrated indicator of the health of whole catchments.

Analysis of long-term water quality trends and comparisons of changes in trends over time, can help to assess the effectiveness of water resource and catchment management activities (see Figure 10.2) and highlight areas where further management activities or investigations are required.

Water quality is measured regularly across much of Victoria through the Victorian Water Quality Monitoring Network and the Regional Water Monitoring Partnerships (consisting of 44 public and private organisations), which has historical and ongoing data from over 200 sites. In 2013 there were approximately 770 surface water monitoring sites covered under the partnerships. Melbourne Water also monitors water quality at more than 100 additional sites and water corporations conduct additional water quality monitoring (for example, at drinking water offtakes). Aquatic invertebrates are also monitored at hundreds of sites per year across the state (with an additional set of sites regularly monitored by Melbourne Water) and used as an indicator of water quality and environmental condition. Other sources of water quality data include intervention monitoring (see Section 17.3.3) and community monitoring programs (Waterwatch and EstuaryWatch). Community monitors undergo regular quality assurance and control tests to ensure that their data is of a level suitable for particular uses. Community members can also participate in water quality monitoring less formally through visual monitoring of their local waterways. They can report pollution or any activity potentially harmful to the environment to the 24-hour EPA Victoria Pollution Hotline.

Sediment quality monitoring can also help identify point source pollution in catchments and is increasingly being used to complement existing water quality and macroinvertebrate monitoring. For example, recent sediment monitoring of silver in waterways across Melbourne provided evidence that point sources of pollution were occurring in the catchment. When this data was coupled with a targeted drain monitoring program, the industry responsible for these discharges was identified and management measures were put in place.

Reporting on water quality every five years is a requirement under the *Water Act 1989* and this information can also be used to inform the future development or refinement of water quality policy and management activities.

The fourth assessment report is scheduled to be completed by 2017.

There are several issues with the current water quality monitoring and reporting framework. These include:

- lack of agreed and comprehensive objectives
- problems with accessibility and usability of data
- monitoring locations, coverage or parameters may not be sufficient to assess particular water quality issues, particularly for wetlands and estuaries
- there can be a time lag between data collection and data being available for use
- not all data is currently used to inform planning and management decisions
- current cost-share arrangements may not be equitable.

This Strategy includes a first step towards improving the usefulness and usability of the data from the Victorian Water Quality Monitoring Network with the development of a clear set of objectives for the program. Further work is also being undertaken to improve the accessibility of the data by developing the Water Management Information System (see Section 17.3.7).

Community-based water quality monitoring programs (such as Waterwatch and EstuaryWatch, see Chapter 5) can also provide an important source of information to inform regional decision-making if the appropriate quality assurance mechanisms are in place.

Policy 10.3

The objectives of the Victorian Water Quality Monitoring Network are to provide data that will:

- inform water resource management, catchment management and waterway management (including flood warning and information)
- inform assessments of catchment or waterway management programs and progress against regional targets over the long-term
- provide warning of any significant changes and detrimental environmental impacts
- inform short-term operational management
- inform long-term assessments of compliance with the *State Environment Protection Policy (Waters of Victoria)*
- contribute to public reporting requirements (including State of the Environment and catchment condition reporting).

Policy 10.4

Water quality monitoring programs will:

- Provide fit-for-purpose, high quality data that is the basis of informed decision-making and reporting.
- Be undertaken by organisations that manage for and report progress against regional or national water quality targets. Currently, these are the Department of Environment and Primary Industries, waterway managers, water corporations and the Environment Protection Authority Victoria.
- Be largely funded under a co-operative monitoring partnership that shares costs appropriately among those organisations that benefit from the data collection. The appropriateness and sustainability of the cost-share arrangement will be reviewed on an as-needs basis. Current partners include, the Department of Environment and Primary Industries, waterway managers, water corporations, Gippsland Lakes Ministerial Advisory Committee, Environment Protection Authority Victoria, Bureau of Meteorology, some local governments and the Murray-Darling Basin Authority. Additional water quality monitoring may be undertaken by individual organisations to complement data from the monitoring partnership.
- Take place at sites and frequencies as necessary to meet the objectives of the Victorian Water Quality Monitoring Network. The appropriateness of monitoring sites, the quality and the type of the information collected will be reviewed every eight years by the organisations in the co-operative monitoring partnership.
- Include ongoing development of high quality community monitoring programs that provide information that can be used to inform regional decision-making and waterway management.

Action 10.2: Publish the fourth Victorian water quality assessment for Victoria's rivers.

Who: Department of Environment and Primary Industries.

Timeframe: 2017

Action 10.3: Review the appropriateness of the location, information collected and cost-share arrangements for sites in the Victorian Water Quality Monitoring Network.

Who: Department of Environment and Primary Industries, waterway managers, water corporations, Environment Protection Authority Victoria.

Timeframe: 2016



Water quality monitoring through the Waterwatch community monitoring program. Courtesy DEPI

10.4 Roles and responsibilities

Ensuring the protection and management of Victoria's water quality requires collective effort.

Roles and responsibilities for agencies involved in water quality management and incident response (see Table 10.1 for an overview) are outlined in existing government legislation and policy. In particular, the SEPP(WoV) describes the statutory responsibilities for all key agencies. Although these roles are clearly documented, there is a need for improved co-ordination and accountability.

Water quality incidents can be broadly categorised into pollution events and 'natural' events (which may or may not be triggered by human activities).

Pollution events – include chemical spills, oil spills, discharges from industry, dead stock in waterways etc.

'Natural' events – include algal blooms, blackwater events, large scale fish death events and water quality impacts from acid sulfate soils. Bushfires, floods or extreme droughts can all increase the risk of 'natural' water quality incidents (for example, heavy rainfall after bushfire often delivers high loads of sediment and pollutants to waterways which can cause fish deaths).

Although there are currently some response plan protocols for waterway incidents (for example, fish deaths and algal blooms) these need to be further developed to provide increased capacity to deal with water quality incidents at a regional level (see Case study 10.1).

Table 10.1: Roles and responsibilities of key agencies in water quality management and incident response.

| Who | Role | Responsibilities |
|--|--|--|
| Department of Environment and Primary Industries | <p>Develop State legislation and policy for water quality management</p> <p>Facilitate sustainable development of primary industries</p> <p>Control agency for water and sewerage disruption</p> | <ul style="list-style-type: none"> • Ensure a continuous water resources assessment program that provides for the collection, collation, analysis and publication of information about water quality (including salinity) • Develop Victorian policy on water quality management • Provide inter-governmental, statewide and regional liaison for water quality issues • Co-ordinate and maintain the statewide water quality database • Co-ordinate blue-green algae management across Victoria • Manage public lands for water quality benefits • Provide input to national water quality management policy • Invest in regional management activities to improve water quality • Work with primary industries (dairy, beef, vegetable, horticulture, intensive livestock) to recognise and reduce impacts on water quality |
| Parks Victoria | <p>Manage parks on behalf of Department of Environment and Primary Industries</p> | <ul style="list-style-type: none"> • Manage public lands to reduce risk to waterways from poor water quality • Ensure messages are communicated about marine and coastal values protected within parks and reserves (for example, Marine National Parks and Marine Sanctuaries) at risk from poor water quality • Manage litter in the Yarra and Maribyrnong rivers |
| Waterway managers | <p>Regional waterway management</p> | <ul style="list-style-type: none"> • Develop and implement programs and activities that protect or improve water quality • Support and facilitate the implementation of regional land use planning measures to improve water quality • Provide water quality advice for emergency water quality management (for example, spills and fish deaths) • Undertake community stewardship and awareness programs with a focus on protecting water quality through changes in personal behaviours • Contribute to water quality monitoring |

| Who | Role | Responsibilities |
|---|---|---|
| Environment Protection Authority Victoria | <p>Independent regulator to protect and improve water quality</p> <p>Control agency for pollution of inland waters</p> | <ul style="list-style-type: none"> • Work with industry (rural, industrial, building, commercial) sectors, government agencies and resource managers to assess and understand key drivers for and stressors on water quality • Work with government to develop legal frameworks (statutory policy and regulatory tools) to manage and protect water quality • Set statutory standards for acceptable water quality and indicators for healthy waterways • Support industry and water quality management agencies to comply with the law through guidance and advice • Monitor compliance with the law through the use of data and investigations to protect and manage water quality • Investigate water quality incidents classified as 'pollution' • Enforce the law through legal actions where required in accordance with compliance and enforcement policy • Encourage higher performance of industry and water quality management agencies through partnership approaches and strategic industry improvement program |
| Water corporations | <p>Provide water supply and wastewater treatment services (urban)</p> <p>Provide water supply, drainage and salinity mitigation services for irrigation and domestic and stock purposes (rural)</p> <p>Manage water quality incidents in storages</p> | <ul style="list-style-type: none"> • Provide of high quality drinking water in compliance with the <i>Safe Drinking Water Act (2003)</i> - urban only • Ensure appropriate contingency planning and water quality incident response and notification capabilities (including for blue-green algae in storages and for sewer spills and releases) • Develop and implement water quality incident management plans that include provisions for water quality issues resulting from water releases from water treatment plants - urban only • Assess planning permit applications to ensure that the use and development of land do not pose a significant risk to water quality • Support and facilitate the implementation of regional land use planning measures to improve water quality • Support appropriate research and development, ensuring continual improvement of the industry's performance and understanding of water quality issues from the source to the customer |
| Office of Living Victoria | Drive integration of water and urban planning | <ul style="list-style-type: none"> • Co-ordinate and facilitate the development of Integrated Water Cycle Plans for Melbourne's four growth areas and inner Melbourne • Prepare a Regulatory Impact Statement for building controls to improve the water performance of new buildings • Work with the Department of Planning and Community Development to amend the Victoria Planning Provisions to more broadly apply current performance requirements for the management of stormwater |

| Who | Role | Responsibilities |
|--|--|---|
| Local government | Develop and implement local and state planning policy | <ul style="list-style-type: none"> Consider waterway management objectives in the statutory planning processes and maintenance of stormwater drainage systems Develop municipal stormwater management plans (or contribute to Integrated Water Cycle Plans) that consider land use change and land management practices under local Planning Schemes Ensure that subdivision designs comply with the Water Sensitive Urban Design requirements of the planning scheme and industry guidelines for best practice management Undertake actions to improve stormwater quality Manage public lands for water quality benefits Manage septic tanks (including preparation and implementation of Domestic Wastewater Management Plans) and stormwater drainage services for water quality benefits Facilitate the implementation of regional land use planning measures to improve water quality |
| Department of Health | Protect and enhance public health Regulate drinking water Planning and policy development Control agency for drinking water contamination | <ul style="list-style-type: none"> Administer the <i>Safe Drinking Water Act (2003)</i> Provide advice on potential public health effects of hazards in water (including chemical and microbial hazards in drinking water as well as recreational waters) Provide advice on managing public health risk |
| Department of Planning and Community Development | Manage Victoria's planning system to create liveable, sustainable communities | <ul style="list-style-type: none"> Manage environmental assessments of projects with potentially significant environmental effects, including water quality impacts Ensure planning policy and urban design minimises the impact of land use change on water quality |
| Department of Transport | Control Agency for marine pollution incidents in Victorian waters | <ul style="list-style-type: none"> Ensure Victoria is adequately prepared for and effectively responds to any marine pollution incident in State coastal waters up to three nautical miles offshore |
| Alpine Resort Management Boards | Manage five Alpine Resorts in Victoria | <ul style="list-style-type: none"> Provide or arrange required basic services and utilities, including water supply and sewerage |
| Murray-Darling Basin Authority | Strategic planning for integrated and sustainable management of water resources in the Murray-Darling Basin | <ul style="list-style-type: none"> Develop the Murray-Darling Basin Water Quality and Salinity Management Plan Water quality monitoring |
| Industry | Produce goods and services | <ul style="list-style-type: none"> Minimise impacts on water quality by the implementation of best management practices in accordance with 'duty of care' responsibilities and good corporate citizenship |
| Individuals and communities | Personal behaviour and participation in programs | <ul style="list-style-type: none"> Avoid and report pollution Reduce individual water consumption Participate in community monitoring programs such as Waterwatch |

10.5 Prevention and mitigation of water quality incidents

In addition to the chronic nature of most water quality issues, there are also more acute water quality incidents (such as fish deaths, algal blooms and chemical spills) that can present very high and immediate risks to waterways.

Some acute water quality incidents could potentially be prevented or moderated through improved management of diffuse pollution sources. Limiting nutrient inputs to waterways can help reduce the frequency and severity of algal blooms. However, management activities for preventing or mitigating water quality incidents are not always well integrated into broader catchment and waterway management planning. For some other water quality incidents, further research is required to understand the risk factors or 'warning signs'.

Policy 10.5

The Department of Environment and Primary Industries and the Environment Protection Authority Victoria will encourage best management practices and specific management activities to reduce both diffuse and point sources of pollution to waterways.

Regional agencies will pursue a stronger integrated approach to management of factors contributing to water quality incidents in relevant catchment, land use, resource management and emergency management policies.



Taking samples from the Gippsland Lakes to monitor water quality. Courtesy DEPI



Blue-green algae bloom, Gippsland Lakes, contrasted with ocean water. Courtesy DEPI

10.6 Water quality incident management: preparedness, response and recovery

There are already established processes for the management of water quality incidents at both State and national levels, including the:

- *Emergency Management Manual Victoria* that sets out high level roles and responsibilities for agencies in responding to water quality 'emergencies'
- *Waterway Incident (Fish Death) Response Guideline 2006* and associated regional response plans
- Blue-Green Algae Coordination Framework
- National Oil Spill Response Atlas and Management Guidelines
- *Victorian Marine Pollution Contingency Plan*⁴.

These existing documents and processes outline roles and responsibilities for managing and responding to water quality incidents. However, apart from the *Emergency Management Manual Victoria* there is no over-arching framework for preparedness, response to and recovery from water quality incidents in Victoria. Currently, agency roles and responsibilities are better implemented for pollution events than 'natural' incidents. Regional approaches to management and response to 'natural' water quality incidents vary.

There is a need for greater integration at the State and regional level and improved regional frameworks for planning and responding to water quality incidents. In some regions, partnership agreements already exist and this may provide a useful model for other regions across the state (see Case study 10.1).

There is currently limited planning for longer-term recovery activities following water quality incidents in Victoria. There is a need for clear policy and protocols to guide management of waterway health and fisheries resources following an incident to minimise risk of the event re-occurring and maximise chances for recovery.

Policy 10.6

Statewide approaches to management of water quality incidents will be improved through review and clarification of agency roles.

Regional approaches to water quality incident response will be improved through development of regional 'waterway incident' partnership agreements between relevant agencies, where appropriate.

Action 10.4: Clarify and strengthen roles, responsibilities and accountability for agencies involved in managing water quality incidents.

Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria, waterway managers, Marine Safety Act waterway managers water corporations, Parks Victoria and other relevant government departments.

Timeframe: 2015

Case study 10.1: Regional partnership agreement for managing water quality incidents in the Goulburn Broken region

A partnership agreement for managing water quality incidents was established in 2007 by key agencies with regulatory or functional responsibilities for waterways in the Goulburn Broken region. The *'Partnership Agreement for Preparedness and Response to Waterway Incidents in the Goulburn Broken Catchment'* clearly outlines roles and responsibilities for responding to regional waterway incidents and was signed by the (then) Department of Sustainability and Environment, the Environment Protection Authority Victoria, the Goulburn Broken Catchment Management Authority, Goulburn-Murray Water, Goulburn Valley Region Water Authority, North East Region Water Authority and Department of Human Services.

The agreement provides a regional framework for response and recovery from waterway incidents that are not covered by existing arrangements. The intent of the agreement was to clearly establish the framework for leadership and provide guidance on operations, communications and investigation of waterway incidents. This was considered essential for a co-ordinated approach and to maintain the confidence of the community while all agencies carry out their respective roles in protecting, restoring and maintaining water quality of waterways.

In support of the agreement, a Water and River Contingency Planning Group was also established for the region that considers a range of waterway and water quality issues, including fish death incidents. This group meets on a regular basis throughout the year and more frequently when risks to waterways increase (for example, periods of drought, floods and low streamflow).

The agreement has provided useful guidance during the dry conditions that were experienced during the drought and for managing water quality incidents such as low dissolved oxygen, blackwater and fish deaths that were caused by regional flooding.

A review of the current agreement is scheduled on a regular basis, with annual incident de-briefs and scenario planning also undertaken.

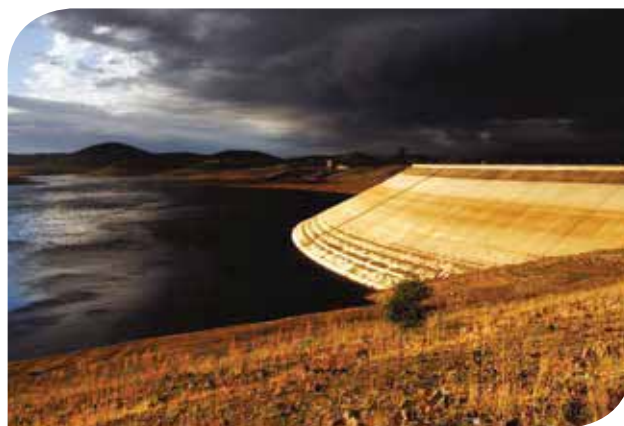
This approach provides one potential model for improved regional co-operation and leadership on managing water quality incidents that could be adopted more widely across the state. Key lessons from implementing the Goulburn Broken agreement could be used to develop and design other regional models.

10.7 Managing the impacts from water storages on water quality

The storage of water in large dams can affect water quality both within the storage and downstream of the storage when it is released. For example, holding water in storages can change the natural levels of sediment, metals, dissolved oxygen and growth rates of algae. Work is currently being undertaken by some water corporations using models to understand these impacts and test alternative operating regimes that aim to reduce negative effects on water quality while meeting water supply obligations.

There are also impacts that arise in most large storages as a result of a cold and low oxygen layer of water forming at the bottom of the storage. This can be problematic when storages have their outlets at the bottom of the dam wall (usually older storages) because this very cold and low oxygen water is transported into the downstream waterways. Conversely, in upland areas water released from storages may be too warm (for example, the upper Snowy River).

Alteration of the natural temperature regime of waterways is listed as a threatening process under the *Flora and Fauna Guarantee Act 1988*. Altered temperature regimes (or thermal water pollution) can affect on water quality (by changing levels of dissolved oxygen) and directly impacts native species. For example, thermal water pollution can interfere with natural temperature cues that trigger spawning in many native fish species. Impacts of dams and storages on waterway condition (including thermal water pollution) are addressed in Chapter 11.



Sugarloaf Reservoir. Photographer: Alison Pouliot

10.8 Managing the impacts of acid sulfate soils and soil acidification

Acid sulfate soils are soils or sediments that contain (or once contained) high levels of reduced inorganic sulfur. When exposed to oxygen, the soils or sediments undergo a chemical reaction (called oxidation) that produces acid.

If the amount of acid produced is greater than the system's ability to absorb that acid, the pH of the system falls (that is, it becomes acidic). The oxidation of acid sulfate soils consumes oxygen. In extreme cases this can remove all the oxygen from a waterway, resulting in the death of aquatic plants and animals. Oxidation of acid sulfate soils can also lead to the release of metals (such as cadmium and lead) and metalloids (such as arsenic) into the environment. Disturbance of acid sulfate soils can occur as a result of drainage, dredging, drilling for bores, drought that induces drying of soil profiles, extractive industries, infrastructure works, land use changes that alter water tables, urban and tourism development and water extraction.

Disturbance of acid sulfate soils can result in fish deaths or other negative effects on waterways. Noxious odours may result, reducing social amenity. Acid drainage water can also corrode concrete and steel in underground pipes and building foundations. The processes through which acid sulfate soils affect waterways are not all well understood and their location and level of risk is often uncertain.

Acid sulfate soils occur naturally in both coastal and inland settings. It had been assumed that acid sulfate soils in Australia were largely restricted to the coastal regions. However, they have recently been identified in inland wetlands and rivers in Victoria, including in the Corangamite region, on the Dundas Tablelands (associated with permanently flowing springs), waterways in Mildura and in waterways affected by dryland salinity. The prevalence of acid sulfate soils in inland settings is thought to have increased because of human-induced changes to surface water and groundwater flows and levels, changes to natural wetting and drying regimes and an increase of sulfate in surface waters. In inland waterways, exposure of sediments (for example, during drought) can trigger acidification events.

Coastal land in Victoria with the potential to contain acid sulfate soils has been mapped. More detail is needed in some areas, particularly those where disturbance and impacts are evident and the management of risk would be improved by more site-specific characterisation. Knowledge gaps remain regarding the occurrence of potential acid sulfate soils in most inland parts of Victoria.

Management of coastal acid sulfate soils is guided by the *Victorian Coastal Acid Sulfate Soil Strategy* and the *Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils*. The *Victorian Coastal Acid Sulfate Soil Strategy* outlines the relevant legislative and approval processes that relate to coastal acid sulfate soil issues. In inland aquatic systems, national guidance is in place.

The Industrial Waste Management Policy (Waste Acid Sulfate Soils) provides a policy and management framework with specific requirements to ensure appropriate waste management and protect human health and the environment.

Policy 10.7

Management of waterways will take into account the threats posed by acid producing soils, rocks and sub-surface materials, their in situ properties, potential disturbance and the principles of best practice management.

Environmental watering plans for individual waterways will take into account any risks associated with acid sulfate soils.

Action 10.5: Identify and document current knowledge about how acid sulfate soils threaten environmental, social, cultural and economic values of waterways and identify those factors that pose the greatest risk.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

10.9 Knowledge gaps

Diffuse sources of water quality pollution are a major threat to waterways but further information and tools are required for their effective management.

Effective management requires the development of detailed water quality models and improved strategies for ensuring all stakeholders carry out their responsibilities. Further research is required to investigate the effectiveness of different management options and strategies for selecting and implementing the most appropriate suite of tools in different situations.

There are also emerging water quality threats that are currently not being monitored or managed comprehensively and are not fully understood. These emerging threats (such as endocrine disrupting compounds from pharmaceuticals in recycled waste water, pesticide use and pathogens) are a concern for their potential impact on waterway condition and public health.

Government is investing in research to improve knowledge in these areas. This is most often through effective research partnerships involving government departments and those with waterway and catchment management responsibilities.

Action 10.6: Support research to address priority knowledge gaps in water quality management.

Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria, waterway managers.

Timeframe: 2016



11

The river channel



*Fish ladder at Cowwarr Weir, Thomson River.
Courtesy West Gippsland CMA*

The river channel

Guide to the chapter

11.1 Context

- Values of the river channel
- Threats to the river channel
- Risks to public infrastructure from waterway processes

11.2 Framework for managing the river channel

- Roles, responsibilities and statutory requirements
- Approach for managing the river channel

11.3 Preventing degradation of the river channel

- Undertaking works on waterways
- Managing instream habitat
- Existing regulation for dams in waterways
- Existing regulation for mining and sand and gravel extraction

11.4 Maintaining and improving river channel condition

- Maintenance, operation and design alteration of existing structures
- Removal of instream barriers
- Maintaining and restoring lateral connectivity
- Improving passage for native fish

What are the issues with existing arrangements?

The existing framework for managing the river channel has proved to be a solid foundation for future management. New knowledge, particularly in relation to managing structures and instream habitat in the river channel need to be incorporated into the existing framework. Investment in previous fish passage works has not always been secured through effective operation, maintenance and monitoring.

What improvements does the Strategy make?

For managing the river channel the Strategy will:

- promote a partnership approach between land and water managers, local government and the community
- identify opportunities to maintain or improve river channel condition by reducing risks associated with existing instream structures
- commit to developing best practice standards for construction and maintenance works in waterways
- improve connectivity to support native fish populations and monitor effectiveness of fish passage works.

11.1 Context

11.1.1 Values of the river channel

The river channel (see Box 11.1) supports a range of important values such as water supply to industry, agriculture and urban centres, fishing, swimming and boating, as well as important habitat for native plants and animals.

Many of these waterway values depend on the environmental condition of the river channel. For example, boat ramps rely on the stability and composition of the bed and banks, while the best swimming spots are often within deep, natural pools. Stable bed and banks of the river channel help to improve the quality of water that flows to downstream users. Fishing success depends on healthy populations of fish species which, in turn, rely on the availability and condition of habitat in the river channel. Some native fish species, such as Murray Cod, are important cultural values for Traditional Owners and Aboriginal people. It is estimated that native fish populations in the Murray-Darling Basin have fallen to 10 per cent of pre-European settlement levels and more than 60 per cent of species are threatened¹. The key values, threats and management activities for the river channel are shown in Figure 11.1.

High quality instream habitat is essential to support healthy populations of aquatic plants and animals. The key components of the river channel that determine the quality of instream habitat are:

- substrate type and diversity, such as the presence of pools and riffles
- channel shape, which influences aspects such as water depth, velocity and the presence of backwaters and undercut banks
- large woody habitat (snags) and instream vegetation, which provide protection from erosion, feeding and spawning sites for fish and increase the diversity of physical habitat types
- native riparian vegetation
- connectivity, which allows animals, organic material and sediments to move both along the river and laterally into floodplains and associated wetlands.

Changes to the presence or amount of any of these components of physical habitat will influence the plants and animals that live there.

Box 11.1: The river channel

The river channel is the bankfull channel (including the bed and banks). The physical characteristics of a river channel vary considerably among rivers and along the course of a river. The river channel usually becomes wider and deeper as a river travels downstream from its headwaters and the catchment area and water volumes increase.

There is great variation across Victoria in stream channel types and channel processes, which reflect both the landscape setting and the history of catchment, riparian and channel management. Rivers are dynamic systems that flood and change course through the natural processes of erosion, sedimentation and avulsion (a sudden change in a river's course) that are driven by changes in inflow and sediment input from the catchment. These geomorphic processes, which can operate over both short and long time scales, determine the shape of the river channel and influence floodplain evolution, habitat formation, nutrient and carbon exchange with the floodplain and downstream environments.

11.1.2 Threats to the river channel

Some processes and activities, including some management activities (see Sections 11.3 and 11.4), can degrade the condition of the river channel. In urban areas these activities are often intensified (see Chapter 14).

Erosion and sedimentation

The natural processes of erosion, avulsion and sedimentation, which are most active during floods, can be accelerated by activities within the river catchment such as the large scale clearing of catchment vegetation, poor soil management practices and bushfire. These activities can result in the delivery of excessive amounts of sediment, nutrients and ash (in the case of bushfires) to the river, especially following heavy rainfall.

Stock access and the removal of riparian vegetation can, in some cases, cause damage to the stability of the bed and banks and may also contribute to increased nutrients in the stream. The mobilisation and deposition of sediment alters the channel form, smothers habitat, reduces instream productivity and threatens native fish species that use deep pool habitats or clean gravel patches. Increased turbidity reduces visibility for native predators like Murray Cod and can affect other native fish species.

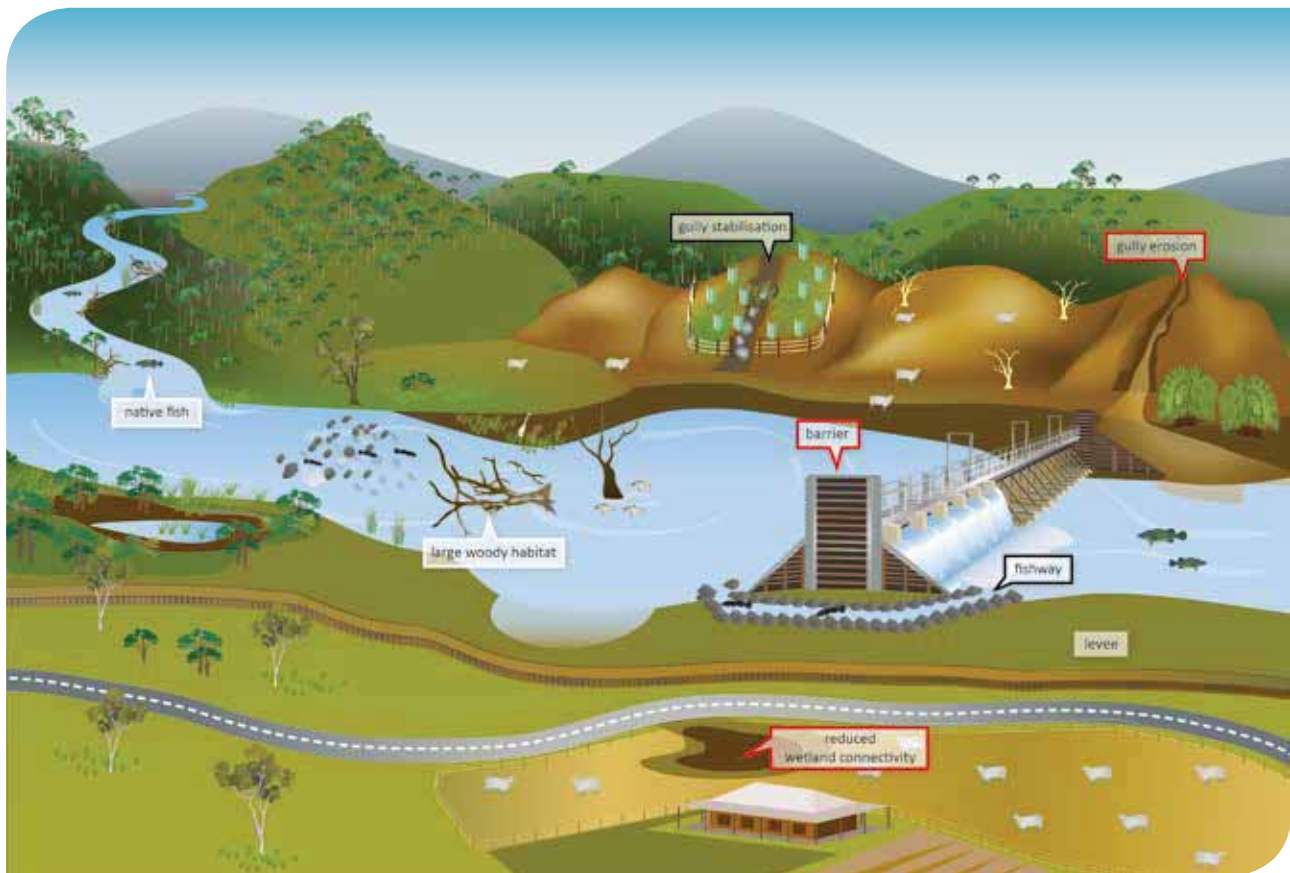


Figure 11.1: Values (white), threats (red) and management activities (black) for river channel management.

Damage to instream habitat

Activities such as channelisation, the removal of large woody habitat and instream vegetation, undertaking works on waterways, building of dams and dredging or mining can negatively affect the physical habitat in the river and disturb the substrate making the river more prone to erosion and avulsion. These activities also potentially remobilise pollutants, such as metals, that are buried in the sediments. Changes to water regimes can leave banks exposed, causing slumping that releases large amounts of sediment into the river. Downstream of water storages, scouring of the bed and banks can occur if there are large and rapid releases of water. If cold water is released from the bottom of a dam it can have detrimental impacts on native fish and aquatic invertebrates.

Loss of connectivity

Dams, weirs, culverts and road crossings are important public infrastructure, but may act as barriers preventing upstream and downstream movement of native fish and other animals and can also interrupt the transport of organic material and sediment. Barriers such as flood levees and erosion control structures can prevent lateral movement of water onto the floodplain and to its associated wetlands. This may reduce available habitat, prevent the exchange of carbon, nutrients and sediments between the river and the floodplain and limit breeding opportunities for certain fish species.

Extremes of climate

Australia's climate is naturally variable and Victoria's rivers have adapted to droughts and floods. The potential impacts of climate change may include longer periods of low flow and more frequent extreme events (see Chapter 15). River channels may experience additional impacts under these extremes causing increased destabilisation of the bed and banks. An increase in the intensity and frequency of bushfires may damage bank vegetation, instream habitat and river bank structures (such as pile fields). More extreme rainfall events with increased flood peaks will put additional pressure on the stability of the bed and banks and increase sediment loads entering rivers.

11.1.3 Risks to public infrastructure from waterway processes

The dynamic nature of waterway processes and the accelerated changes caused by human activities mean that public infrastructure in river channels may be subjected to greater loss or damage in the future, especially during floods. In settled areas, the impact of these dynamic waterway processes on regional communities can be significant. Risks to public infrastructure from waterway processes is addressed in Section 4.2.3.

11.2 Framework for managing the river channel

Successful management of the river channel requires an approach that:

- clearly identifies roles and responsibilities
- promotes partnerships with land and water managers, local government and the community
- sets out the management approach
- defines best practice standards for maintenance and improvement works.

The framework outlined in this Chapter builds on the existing approach to the management of the river channel in Victoria, taking account of statutory requirements, new knowledge and recent management experience.

11.2.1 Roles, responsibilities and statutory requirements

In Victoria, the bed and banks of most large rivers and the associated riparian land (see Section 9.1.3) are in public ownership.

Under the *Water Act 1989*, water corporations are delegated to licence works on the river channel associated with taking and using water (for example, the construction of dams and weirs). They must take into consideration all possible impacts, including native fish passage. The Act also provides for waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) to regulate works in waterways. The responsibilities of waterway managers and water corporations are further described in the Statement of Obligations, issued under provisions of the *Water Act 1989* by the Minister of Water. For example, water corporations are required to manage the environmental impact of their activities on the waterway in accordance with the Statement of Obligations issued to them.

Following the review of the *Water Act 1989* (see Section 1.2.1), the Statements of Obligations for water corporations (including Melbourne Water) and catchment management authorities will also need to be reviewed.

In addition to the responsibilities assigned to water corporations and waterway managers, other agencies and public authorities have responsibilities under a range of legislation for land management. This includes issuing licenses or permits for certain activities (the Department of Environment and Primary Industries (DEPI) and Parks Victoria), undertaking certain functions such as water supply and regulation (water corporations) and managing recreation in certain waterways (Parks Victoria). Local government has an important role in regulating activities that may affect the river channel through administering planning schemes. Under the *Marine Safety Act 2010*, port authorities or appointed Marine Safety Act (MSA) waterway managers are responsible for altering or dredging channels for navigation in the waters under their control and regulating vessel operations and on water activities by waterway users on Victorian State Waters.

The *Conservation, Forest and Lands Act 1987* requires public authorities to submit plans of works to the Secretary of the DEPI for comment where works involve ‘*construction of dams, weirs or other structures in or across watercourses which potentially interfere with the movement of fish, or the quality of aquatic habitat*’.

Threatened aquatic species are listed under the *Flora and Fauna Guarantee Act 1988*. The Act also lists three potentially threatening processes: the removal of woody debris from Victorian rivers and streams; the prevention of passage of aquatic biota as a result of the presence of instream structures; and changes to natural temperature regimes in waterways. Maintenance or restoration of native fish passage is also supported by the *Murray-Darling Basin Native Fish Strategy 2003–2013*¹. The *Fisheries Act 1995* regulates fishing in waterways and promotes the ecologically sustainable development, use and management of fisheries.

Action 11.1: Review and update the Statement of Obligations issued by the Minister for Water to catchment management authorities.

Who: Department Environment and Primary Industries, catchment management authorities. **Timeframe:** 2014

11.2.2 Approach for managing the river channel

Management of the river channel needs to be based on an understanding of the geomorphological processes that are at work in catchments. Where catchments and water regimes are largely unaltered and processes such as erosion and sedimentation are relatively balanced, the focus of management is on maintaining natural processes, managing invasive species (see Chapter 16) and managing waterway-related bushfire risks and impacts (see Sections 9.3, 15.2.3 and 15.3).

Where natural river channel processes have been accelerated or changed by land use in the catchment (for example, land clearing and agriculture), by outdated river management activities (for example, channelisation and removal of large woody habitat) or by changes to the water regimes, the channel may become unstable and affect channel form, resulting in lower resistance to flood damage.

Improving channel stability and the condition of river channels in degraded areas requires a long-term approach that focuses on riparian management programs (see Chapter 9) and integrated catchment management to reduce erosion and improve soil health. Where the water regime is regulated, improvements to river channel

conditions may also require changes to river operations (where this can be done without compromising water supply and delivery) or environmental watering (see Chapter 8). In the shorter-term, management activities such as structural engineering works or reinstatement of large woody habitat may also be needed to address local erosion, sedimentation or habitat loss. In heavily urbanised areas, where options for sustainable catchment management and riparian restoration are limited, a greater emphasis on managing stormwater runoff or instream rehabilitation works may be necessary.

Priority management activities for the river channel outlined in the regional Waterway Strategies (RWSs) may include hard engineering works (for example, rock chutes, reinstatement of pool-riffles and fishways) or broader catchment management activities. Works standards and technical guidelines for waterway management define best practice standards for maintenance and improvement works in waterways, as outlined in Section 17.3.2. Supplementary expert advice may be required to implement best practice standards for engineered works, based on the characteristics of the site of the proposed works.

Policy 11.1

Waterways will be managed to achieve appropriate rates of erosion, sedimentation and avulsion over the long-term, consistent with natural processes.

Management of the river channel will focus on maintaining and improving the bed, banks, instream habitat, riparian land and integrated catchment management to improve resistance and resilience to the adverse impacts of waterway processes on river channel condition and public infrastructure.

Options for changing river operations to improve the water regime in priority regulated rivers will be investigated as part of the regional Waterway Strategies.

11.3 Preventing degradation of the river channel

Some works and activities that are undertaken within the river channel have the potential to degrade the physical form of waterways and affect the environmental values of the channel and associated habitats. It is important that controls, standards and guidelines are in place to manage the risks posed by such works and activities.

11.3.1 Undertaking works on waterways

Works and activities in waterways include construction of bridges and access crossings, bed and bank erosion control works, stormwater drainage outlets, removal of invasive instream vegetation, installation of pipelines and stream deviations. Controls on dams are addressed in Section 11.3.3.

Where works and activities in waterways are not undertaken in accordance with best-practice standards, they may pose a risk to waterway values, landholders or public infrastructure owners. In addition to the regulatory provisions under the *Water Act 1989* (see Section 11.2.1) the *Technical Guidelines for Waterway Management*² and the *Guidelines for Assessment of Applications for Permits and Licences for Works on Waterways* provide guidance to waterway managers on best management practice for engineering works in waterways.

Experience in recent floods indicates that to minimise the risk of flood damage to works and activities, they need to be designed to take account of the river processes of erosion and sedimentation and need to be regularly maintained.

Policy 11.2

Waterway managers will work with proponents of works and activities in waterways to:

- ensure compliance with regulatory requirements
- promote best-practice standards of design to:
 - maintain or improve the environmental condition of the site and surrounds
 - avoid causing instability or adverse site impacts or increased flood impacts
 - minimise the risk of damage to the works from future flooding and waterway processes
- reduce the likelihood of affecting other parties and infrastructure
- encourage adequate operation and maintenance of works into the future.

Action 11.2: Develop guidelines on best-practice standards for minimising risks to works and activities in waterways from flood damage.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

11.3.2 Managing instream habitat

Large wood and native instream vegetation are important habitat in rivers. They provide shelter, food sources and breeding sites for a variety of instream animals, including threatened fish species, as well as contributing to biological processes within the river channel. Large woody habitat is an important structural component of rivers, assisting in the formation of features such as scour pools and channel bars and in stabilising the river channel. In large lowland rivers, large woody habitat may be the only stable substrate and an important instream source of nutrients.

Extensive removal of large woody habitat and instream vegetation clearing occurred in Victoria from the late 1800s to late 1990s with a view of increasing conveyance of flood water. However, extensive research has shown that large woody habitat has negligible impact on channel capacity and removal does little to improve flood conveyance. In addition, instream vegetation and large woody habitat have been found to reduce bed erosion. The removal of large woody habitat and instream vegetation increases flow velocity, bed degradation, channel enlargement and loss of important instream habitat.

There may be instances where the removal of large woody habitat or instream vegetation is warranted to maintain the social or economic values of a waterway, reduce an immediate threat to public infrastructure or reduce public risk. In such cases, waterway managers will need to balance the habitat benefits against the level of risk. Alternatives to the removal of large woody habitat may exist, such as anchoring or realignment.

Re-establishment of large woody habitat and native instream vegetation may be needed to improve the condition of the river channel and support environmental values in priority rivers. The current guidance for managing large woody habitat is limited and requires updating based on new knowledge.

The management of instream vegetation and large woody habitat in relation to reducing flood impacts is addressed further in Section 15.3.3. The Environment and Natural Resources Committee (ENRC) conducted an inquiry into matters relating to flood mitigation infrastructure in Victoria in 2012, including clearing of vegetation in waterways to mitigate flood risk. The Victorian Government's response to recommendations of the ENRC may result in changes to the management of instream vegetation and large woody habitat.

Policy 11.3

Large woody habitat or native instream vegetation will not be removed from river channels unless it is demonstrated to pose a serious risk to public safety or public infrastructure. Realignment or anchoring of large woody habitat will be undertaken where feasible, rather than removal.

The management of large woody habitat and native instream vegetation in waterways to reduce flood risk will be conducted in accordance with the Victorian Government's response to any recommendations of the Environment and Natural Resources Committee inquiry into matters relating to flood mitigation infrastructure in Victoria.

Where programs to reinstate large woody habitat or instream vegetation are planned to improve the condition of the river channel, the benefits and risks will be assessed in consultation with the community.



*Re-establishment of large woody habitat.
Photographer: Sean Phillipson*

Action 11.3: Develop guidelines on the assessment of flood risk posed by large woody habitat and instream vegetation.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

Action 11.4: Prepare updated guidance for managing large woody habitat, including information for the community.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

11.3.3 Existing regulation for dams in waterways

Dams have many social and economic values. They provide water for drinking, irrigation, industry and offer recreational activities such as fishing and boating. Although dams may provide refuge habitat for animals during dry periods, they also cause negative impacts on aquatic environments. These impacts (such as altering natural water and temperature regimes, trapping sediment and impeding the movement of native fish) need to be appropriately managed.

Private dams

Under the *Water Act 1989*, water corporations are delegated to carry out the licensing for private dams. In considering a licence application to construct a private dam on a waterway with high environmental value, the water corporation must be satisfied that the applicant has thoroughly investigated alternative sites for the dam and must ensure that requirements relating to native fish passage and environmental water are addressed. Owners of existing private dams also require an operating licence if there is a need to pass water downstream for the environment.

Water corporations must refer applications for a new private dam to the DEPI, local government and waterway managers for comment before it is approved. The RWSs provide guidance to assist water corporations and referral authorities in identifying waterways of high environmental value. Planning permits may also be required for construction of a new private dam, depending on its location.

Construction or refurbishment of dams by water corporations

The *Gippsland Region Sustainable Water Strategy*³ outlined the Victorian Government's policy on proposals for new large public storages. The policy provides for a thorough investigation into the economic, environmental and social benefits of any such proposal. Water corporations are required to ensure that works are undertaken in accordance with current environmental practice, including requirements for environmental watering, native fish passage and managing risks to downstream water quality (including thermal pollution) when constructing or refurbishing their assets (for example, weirs) on waterways.

11.3.4 Existing regulation for mining and sand and gravel extraction

Sand, gravel and mineral extraction needs to be managed to ensure minimal impact on waterway condition and river channel stability. Potential types of damage include removing substrate, changing the bedform of the river and triggering significant erosion events. Eductor dredging has

been banned in Victoria since 1990. However, there are some cases where the extraction of sand or gravel from a river can provide benefits to the river, such as in the management of sand slugs caused by catchment erosion.

The extraction of sand, gravel, rock or minerals from a waterway requires approval under various legislation such as the *Mineral Resources (Sustainable Development) Act 1990*, *Environmental Protection Regulations 2007*, *Environmental Effects Act 1978*, *Planning and Environment Act 1987* and the *Water Act 1989*. A local government planning permit is required (and, for reserved land, a licence is also required under the *Land Act 1958*) to enter reserved public land to remove materials from the bed or banks of a waterway or to seek and remove gemstones. Specific approvals may apply as outlined below:

- A work authority under the *Mineral Resources (Sustainable Development) Act 1990* is not required for sand or gravel extraction but is required for mineral extraction.
- For extraction of sand, gravel, rock or minerals up to a depth of two metres below the natural surface, and for an area of more than 2000 square metres, or for extraction to a depth greater than two metres below the natural surface, a work authority under the *Mineral Resources (Sustainable Development) Act 1990* is required.
- Extractive industry and mining activities require a Works Approval and may require an ongoing licence from the Environment Protection Authority Victoria under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007*.
- Approval under the *Water Act 1989* is required from the waterway manager where the extractive works will interfere with the bed or banks of a waterway.
- A referral to a catchment management authority made under the *Planning and Environment Act 1987* for works within a flood zone or overlay.

Proposals to mine in a waterway may also require an environmental effects statement under the *Environmental Effects Act 1978*.

Policy 11.4

Mining and sand and gravel extraction must be conducted in accordance with current regulatory controls.

Sand and gravel extraction in the river channel may be undertaken by waterway managers as a management tool for the protection of waterway assets.

Action 11.5: Develop guidelines to assist waterway managers in determining appropriate environmental requirements when assessing proposals for new private dams.

Who: Department of Environment and Primary Industries, waterway managers, water corporations, local government.

Timeframe: 2016

11.4 Maintaining and improving river channel condition

There are opportunities to mitigate the risks to river channel condition posed by instream structures and to improve longitudinal and lateral connectivity to enhance the viability of native fish (and other animals) and support instream processes.

11.4.1 Maintenance, operation and design alteration of existing structures

The maintenance and operation of structures in waterways (such as storages or weirs) can affect the condition of the river channel. For example, desilting of weirs can adversely affect water quality. Most significant structures on waterways are operated by water corporations. Water corporations are required to manage the environmental impact of their activities on the waterway as outlined in Section 11.2.1. Water corporations holding a bulk entitlement may be required, as a condition of the bulk entitlement, to develop an environmental management program to minimise the impact of storage operation on the downstream environment. However, some such bulk entitlement holders have not yet initiated environmental management programs and limited guidance has been provided on the required content of these programs.

Structures on waterways can adversely affect the river channel by creating barriers to native fish passage, changing water regimes, causing sudden changes to downstream flow rates and affecting water quality, including downstream water temperature. Native fish can inadvertently be directed into artificial supply channels through structures that divert or pump water from the river. This reduces their chances of survival. Altering the operation or design of structures can often reduce these threats and improve river channel condition. Activities or programs to improve the operation of structures should aim to identify and minimise the impacts on aquatic plants and animals and the nearby bed and banks, manage risks to downstream water quality and, where relevant, prevent native fish from being redirected out of waterways. Alteration to the design of structures may include works to provide passage for native fish and other animals (see Section 11.4.4), increase flow variability downstream, address water quality issues, including thermal water pollution, or improve options for the delivery of environmental water (see Chapter 8).

Many large storages in Victoria were designed to release water from near the bottom of the dam wall, so that water can be provided from dams even when storage levels are low. Those that have outlets near the bottom of the dam wall may release very cold water which is low in oxygen and can substantially change the downstream water temperature and affect native species such as fish and aquatic invertebrates (see Section 10.7). In addressing thermal water pollution downstream of storages, the improvement of environmental values (such as enhancing native threatened species habitat) needs to be weighed against social values such as the value of the downstream reach for recreational fishing of species that favour cold water (for example, trout).

When water corporations upgrade their structures they are required to do so in line with Government guidelines. If upgrades are not imminent, but design alterations of a structure are a priority to reduce the threats to river channel condition, the cost of design alterations can be met from other sources (see Section 18.4). Any proposed design alterations need to be feasible and cost-effective, with the benefits outweighing costs. It is essential that, where such works are undertaken to alter structure design, ownership of the works are clear and agreements are established for their ongoing operation, maintenance and improvement, if required. This issue is addressed in Section 18.6.

Policy 11.5

Regional Waterway Strategies will identify structures where a change to operation or design is a priority to maintain or improve river channel condition. This will be done in consultation with water corporations and based on an assessment of the feasibility and cost-effectiveness of required works.

Where design alterations are required at priority structures owned by water corporations, these will be undertaken by the water corporations when upgrading their structures.

If upgrades are not imminent but planned within 10 years, a cost-sharing arrangement may be agreed between the catchment management authority and the water corporation to bring the required works forward. If upgrades are not planned, funds will be sought from other sources.

Where cost-sharing is undertaken between waterway managers and water corporations for structure upgrades, operating agreements should be developed to ensure structures are operated in a way that provide benefits to both parties.

In assessing management options for addressing thermal pollution downstream of storages, storage owners and waterway managers will consider fisheries management plans, the presence of populations of significant or endangered wildlife and the feasibility and cost-effectiveness of design alterations.

11.4.2 Removal of instream barriers

There are thousands of artificial structural barriers (see Chapter 18, Box 18.1) in Victoria's waterways and many of these structures were built long ago. Some are no longer used for their original purpose and many have fallen into disrepair or have been replaced by more modern structures. Ownership for these structures is often unclear (see Section 18.6). The removal of such structures may be a priority to improve native fish passage, water regimes and other natural waterway processes. Other reasons to remove such barriers may include avoiding any future costs associated with their maintenance or addressing issues of public risk. However, the benefits of removing a structure need to be balanced against

other values that the structure provides to local communities and possible environmental risks associated with its removal.

A structure that is no longer used for its original purpose may provide other values. For example, the permanent water in a weir no longer used for irrigation purposes may be used by the community for recreation. Some structures may be recognised for their heritage value. Potential environmental risks associated with removing a structure are the loss of refuge habitat, the potential spread of aquatic invasive species, the unwanted transport of sediment or water quality issues such as the mobilisation of heavy metals that may have accumulated behind the barrier.

Water corporations manage many instream structures. When such structures are due for major maintenance, there is an opportunity to consider if they are still required. There may be alternative means of providing a similar level of service with lower environmental impacts.

Costs for the removal of structures need to be negotiated between the structure owner and other beneficiaries.



A previous barrier, this road has been adapted to allow fish passage. Courtesy Corangamite CMA

Policy 11.6

Waterway managers will assess and identify priority structures for removal in the regional Waterway Strategies. This will be done in consultation with the structure owner, where the owner can be identified. The cost-sharing arrangements for removal will be agreed with the owner of the structure and other beneficiaries in accordance with the cost-sharing principles outlined in Section 18.5.

In assessing if an instream structure should be removed, waterway managers and the structure owner will take the following factors into account:

- environmental benefits and risks associated with its removal
- if the structure is redundant to the owner and to the community
- if the service provided by the structure is still required
- if the service is required, whether it can be provided in an alternative way with lower environmental impacts
- environmental, social, cultural and economic values associated with the structure
- the cost of maintenance of the present structure, the cost of removal and the cost of any alternative means of providing the service
- the level of public risk posed by the structure.

When water regulating structures owned by water corporations are due for major maintenance work, consideration will first be given to the need for the structure. Water corporations will conduct a community process to determine if the structure is required. If there is no ongoing need, options will be assessed for the removal of the structure.

11.4.3 Maintaining and restoring lateral connectivity

An important aspect of river channel condition is connectivity to the floodplain. The condition of floodplain wetlands also depends on lateral connectivity between the river and the wetland. The policies and actions outlined in Section 12.8 are designed to maintain or restore linkages between the river, floodplain wetlands and the floodplain generally.

11.4.4 Improving passage for native fish

Preventing further loss of connectivity and restoring passage for native fish are critical aspects of maintaining and improving their population viability. Longitudinal connectivity within the river channel is essential for many species of native fish to spawn and recolonise. If fish passage is blocked, critical spawning sites may be inaccessible. The provision of fish passage also facilitates the movement of other aquatic native plants and animals.

Barriers to the passage of native fish range from large dams and weirs to smaller structures such as culverts and road crossings. It is important to ensure that new structures required within the river channel are designed to include fish passage so that existing connectivity is not further reduced. Strategies to improve fish passage include:

- removing redundant structures within the river channel (see Section 11.4.2)
- constructing fishways or undertaking fish passage works at existing structures
- considering fish passage in the delivery of environmental water.

Policy 11.7

Passage for native fish in waterways will be maintained or improved by:

- minimising further loss of connectivity
- improving fish passage at priority sites.

Encouraging native fish passage in works on waterways

A recent review of fishways in Victoria found that there is a lack of consistency by organisations in obtaining approvals and implementing fish passage in works on waterways⁴. Apart from some dam safety improvement works, few fish passage referrals were made to waterway managers. Some new stream gauges, forest road crossings and flow regulators may have been constructed without sufficient consideration of the impacts on fish passage.

Waterway managers have a role in ensuring that proponents, including public authorities, are aware of the importance of native fish passage, design standards and regulatory requirements.

Policy 11.8

Waterway managers will advise key stakeholders involved in undertaking works and activities in waterways of the importance of, and priorities for, maintaining or improving native fish passage.

Priorities for constructing fishways or undertaking fish passage works

By 2010, 167 fishways or fish passage works had been completed in Victoria to improve connectivity for native fish. These include rock ramps at low level weirs (61 per cent) in coastal catchments, designed to cater for smaller migratory fish species and vertical-slot fishways (10 per cent) that cater for large migratory fish species. Other fish passage activities include the removal of redundant weirs, installation of 'fish friendly' road culverts and erosion control works⁴.

There are still sites where the restoration of fish passage is a high priority. In Victoria, the priorities for providing fish passage are identified using criteria adopted in 2002. A recent statewide assessment applying these criteria has identified the highest State priority sites for restoring fish passage when new funding opportunities arise (see Policy 11.9). Further priority sites may be identified at the regional level, also based on these criteria and the regional priority setting process (see Section 4.2.3). Recent mapping of Victoria's rivers and streams using light detection and ranging technology provides high quality data to improve identification and assessment of instream barriers (see Chapter 17, Case Study 17.3).

Criteria for establishing priorities for native fish passage

Statewide priorities for native fish passage are determined on consideration of:

- native fish species likely to benefit (high conservation status or migratory species will be given the highest priority)
- length of river and area of habitat made accessible to fish
- quality of habitat made accessible to fish
- proximity to the sea or Murray River (the number and diversity of native fish that would benefit is highest at the lower end of catchments)
- complementary restoration programs being undertaken within the river basin
- an assessment of adverse effects such as spread of invasive species
- a feasibility analysis that accounts for issues such as total cost of works, availability of independent financial support, enhancement of recreational/commercial fisheries, drown-out weir frequency, and other management options such as modification or removal of a structure.

Policy 11.9

The Victorian Government will give priority to improving native fish passage at the following instream barriers when new funding opportunities arise:

- Broken River (Gowangardie Weir)
- Barwon River (various barriers)
- Ovens River (Tea Garden Weir)
- Thomson River (Horseshoe Bend)
- Campaspe River (Campaspe syphon & weir)
- Broken River (Rupertsdale Crossing)
- Gunbower Creek (various barriers)
- Avon River (Avon fords)
- Loddon River (various barriers)
- Gulf Creek (Barmah Forest - Gulf Creek regulators).

Regional priorities for providing native fish passage will be identified in the regional Waterway Strategies and will be assessed using the *Criteria for establishing priorities for fish passage* and the regional priority setting process outlined in Section 4.2.3.

Guidance for fishway design and construction

While guidelines such as the *Technical Guidelines for Waterway Management*² provide some fishway design information, there are currently no standard fishway design criteria for use in Victoria. Quality of fishway design is highly variable. There is an opportunity to set better design standards based on recent examples of design best practice in south-eastern Australia. There is a need for a contemporary and comprehensive suite of fish passage design guidelines for small scale structures such as stream gauging weirs, culverts and causeways. Fishways designed in consultation with engineers, fish biologists and appropriate government agencies have been found to be the highest performing and most successful fishways².



Constructing Tarwin River Fishway. Courtesy West Gippsland CMA

Action 11.6: Develop best practice guidelines for the appropriate design, approval and construction of fishways and other fish passage works.

Who: Department of Environment and Primary Industries, waterway managers, water corporations. **Timeframe:** 2016

Action 11.7: Develop a suite of fish passage design guidelines for use at small scale structures.

Who: Department of Environment and Primary Industries, waterway managers. **Timeframe:** 2015

Fishway performance and maintenance

There is currently no statewide program for monitoring the performance of fishways and fish passage works across Victoria to ensure they meet the objectives for which they were designed. A review published in 2010⁴ found that only 7 per cent of fishways were highly efficient, 22 per cent were relatively efficient and about 25 per cent had fallen into disrepair or had limited functionality. The remainder could not be assessed due to a lack of information.

Maintenance and operation plans to ensure sustained efficiency of fishways and fish passage works are generally not in place. Performance, operation and maintenance guidelines are needed. Some fishways are not operated within their optimal range, resulting in reduced efficiency. There appears to be little routine fishway maintenance.

Ownership has not been determined for 39 per cent of fishways and some managers of instream structures with fishways in Victoria were unfamiliar with their responsibilities. The ownership and responsibility for ongoing operation, maintenance and improvement of built assets in waterways, including fishways, are addressed in Section 18.6.

Policy 11.10

Programs will be put in place to ensure the operation, performance and maintenance of fishways and other fish passage works are monitored and continue to meet best practice standards.

Action 11.8: Develop and implement a statewide program for monitoring the performance of fishways and fish passage works.

Who: Department of Environment and Primary Industries, waterway managers, water corporations. **Timeframe:** 2016

Action 11.9: Develop performance, operation and maintenance guidelines for fishways and fish passage works.

Who: Department of Environment and Primary Industries, waterway managers, water corporations. **Timeframe:** 2014



12

Wetlands

*Kinnairds shallow freshwater wetlands.
Photographer: Yvette Baker*

Wetlands

Guide to the chapter

12.1 Context

- The extent, nature and distribution of Victoria's wetlands
- Threats to Victoria's wetlands

12.2 Framework for managing wetlands

12.3 Protecting the values of Ramsar sites

- Meeting obligations for Ramsar sites
- Management of Ramsar sites
- Approvals for actions affecting Ramsar sites
- Addressing changes in ecological character
- Listing new Ramsar sites or extending the boundaries of existing sites

12.4 Managing water regimes for wetlands

12.5 Managing wetlands in natural landscapes

12.6 Improving wetland management in fragmented landscapes

- Managing catchment-based threats to wetlands
- Managing public wetlands in fragmented landscapes
- Supporting conservation and sustainable use of wetlands on private land

12.7 Maintaining and improving wetland connectivity

- Maintaining and improving floodplain connectivity

12.8 Managing the impacts of drainage on wetlands in rural areas

- Reducing impacts of rural drainage
- Reducing impacts of irrigation drainage

12.9 Managing coastal wetlands

12.10 Information to improve wetland management

What are the issues with existing arrangements?

The wetland management framework in Victoria is outdated, lacks detail on policy and action and requires integration with the framework for managing with rivers and estuaries (and other land management frameworks).

A stronger onground works program is needed for the management of Ramsar sites and other high value wetlands. Information and advice on wetland values, threats and management activities need to be improved and periodically updated to support natural resource managers, public land managers and landholders to maintain and improve wetland condition. Landholders require continued support to further improve their capacity to manage wetlands sustainably on private land. The emerging risks for wetlands and the effectiveness of current management tools and approaches needs to be evaluated.

What improvements does the Strategy make?

For wetlands the Strategy will:

- comprehensively integrate the management of wetlands with the management of rivers and estuaries
- commit to maintaining the values of Ramsar sites (incorporating site management plans into the regional Waterway Strategies), monitoring their ecological character and providing clarity regarding the listing of new Ramsar sites
- commit to environmental watering of high value wetlands on the floodplains of regulated rivers, on a priority basis
- ensure public land managers and waterway managers work together more closely to manage wetlands in parks and reserves
- ensure that wetland biodiversity is integrated into landscape connectivity planning
- outline approaches for maintaining and improving connectivity between rivers and floodplain wetlands
- outline arrangements for improving the long-term security of wetlands on public land reserves in fragmented landscapes
- commit to providing assistance for landholders to improve the conservation and sustainable use of wetlands on private land
- outline the existing arrangements for mitigating risks to wetlands from irrigation drainage and provide for better protection of wetlands from rural drainage.

12.1 Context

Victoria's wetlands support a wide range of public and private values. They are an important part of the agricultural landscape, providing services to landholders such as sustainable grazing, water for stock and amenity.

Wetlands provide recreational opportunities such as boating, camping, bird watching, fishing and duck hunting and help to support tourism and local economies. The cultural values associated with Traditional Owner and Aboriginal use of wetlands over many tens of thousands of years have great significance and are an important part of Victoria's cultural heritage.

Wetlands act as sediment traps and filter nutrients from catchments; helping to protect the water quality of rivers, estuaries and marine areas. They help reduce the impacts of flooding by holding and slowing floodwater. Many new wetlands have been constructed in urban areas to treat sewage or reduce the adverse effects of urban runoff and stormwater (see Chapter 14). Other types of human-made wetlands include farm dams, salt works, sewage ponds and water storages. In addition to the services they were constructed to provide, they often support social and environmental values.

Victoria's wetlands are important in sustaining biodiversity at a regional, national and international scale. They provide habitat for threatened species and communities. Of the threatened native species in Victoria, 499 (24%) depend on wetlands for their survival. Over 85% of the 145 wetland ecological vegetation communities are endangered or vulnerable in at least one of the bioregions in Victoria in which they occur. Some wetland ecological communities are formally listed as threatened at a State or national level. These include shallow freshwater seasonal herbaceous wetlands, which are listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

Wetlands also help to support waterbird populations that range across Australia and to provide feeding areas for the thousands of shorebirds that migrate to Victoria each summer from the northern hemisphere. Mangrove and seagrass communities provide important nursery habitat for fish, helping to sustain fish populations, many of which provide the basis for Victoria's recreational and commercial fisheries.

The key values, threats and management activities for wetlands are shown in Figure 12.1.

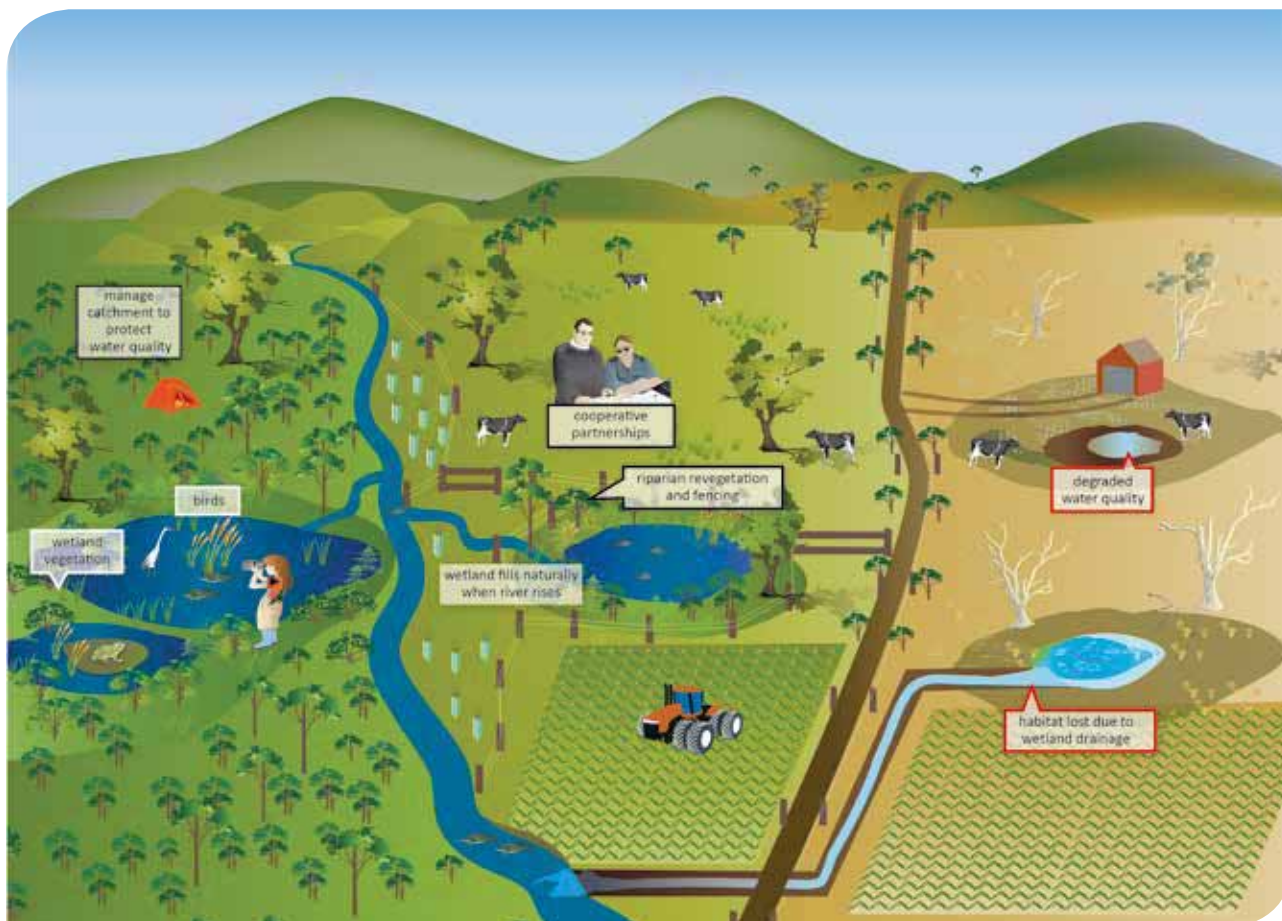


Figure 12.1: Values (white), threats (red) and management activities (black) for wetlands.

12.1.1 The extent, nature and distribution of Victoria's wetlands

Victoria's natural wetlands are diverse and include billabongs, marshes, lakes, swamps, alpine peatlands, intertidal saltmarshes, mangroves, mudflats and seagrass areas. The inventory of Victoria's wetlands was updated in 2013 and recorded 23,739 natural wetlands covering 604,322 hectares. This is greater than the number and area of natural wetlands recorded in the previous 1994 statewide inventory (12,800 wetlands covering 530,000 hectares). This difference represents more accurate and finer scale mapping, rather than an increase in the actual number or area of natural wetlands. Thirty one per cent of natural wetlands in Victoria are on public land, with an average area of 54 hectares. The remaining 69% are on private land but average only 13 hectares in area. In addition, there are 11,060 artificial wetlands that cover 170,613 hectares. Wetlands of unknown origin number 321 and cover 2,702 ha.

In 1994, it was estimated that 26% of the area of Victoria's wetlands had been lost since the time of European settlement. The loss was mainly due to drainage of wetlands and was much greater for freshwater than for saline wetlands. It has not been possible to estimate further loss across Victoria since 1994. The development of a suitable, cost-effective method to monitor changes in wetland extent and water regime is needed (see Section 12.10).

Wetlands in Victoria are concentrated in low lying areas in the south west, south east and north central parts of Victoria, on river floodplains and in settled coastal areas (Figure 12.2). Wetlands in these fragmented, largely agricultural landscapes are on private land or in small public land reserves. Wetlands are less common in more natural landscapes (such as large parks, reserves or forests) and they are often under less threat because land is in public ownership and primarily managed for conservation and native forestry. The main wetlands in these areas are alpine peatlands, coastal wetlands, the large floodplain wetlands of the Murray River and terminal wetlands of the Wimmera River. In urban areas, some natural wetlands remain on floodplains and in intertidal areas.

Box 12.1 Definition of wetlands

Wetlands are areas of permanent, periodic or intermittent inundation that hold still or very slow moving water. They support ecosystems adapted to flooding. Wetlands may be formed by natural processes or be human-made.

Several coastal wetlands are also classed as estuaries. The policy and actions in Chapter 13 are also relevant to their management.



Lake Wallawalla in the Murray Sunset National Park. Photographer: Shar Ramamurthy

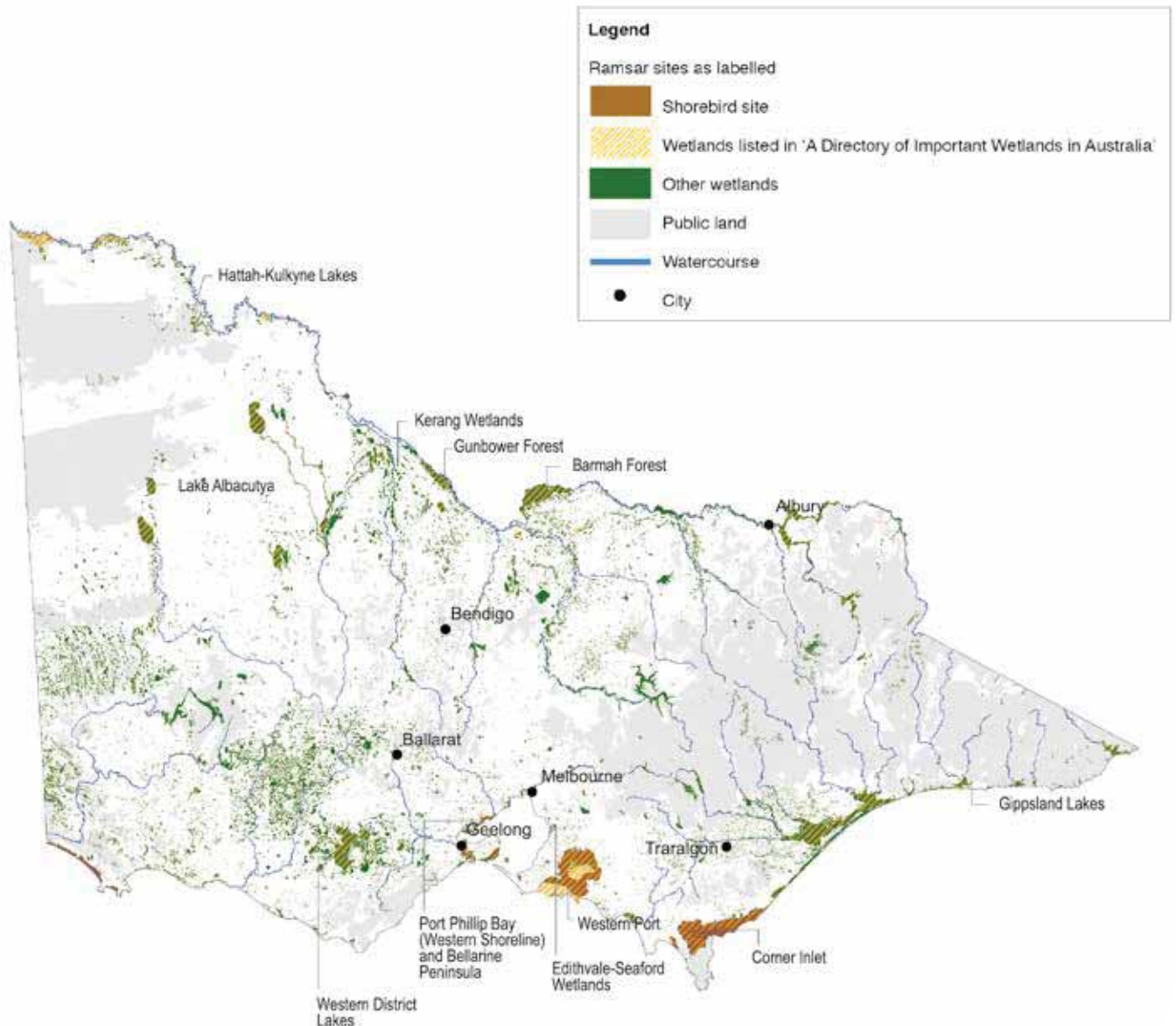


Figure 12.2: The distribution of wetlands in Victoria, including Ramsar sites and other high value wetlands.

12.1.2 Threats to Victoria's wetlands

An assessment of the condition of high value wetlands and a selection of wetland types across Victoria found that over half the wetlands assessed were subject to at least one of a range of threats (Table 12.1). Key threatening processes to wetlands include water extraction and regulation, stock grazing, nutrient runoff and wetland excavation¹.

The key threats to Victoria's wetlands vary according to the landscapes in which they occur (Table 12.2). Policies and actions to address the threats from altered water regimes, degraded water quality (including acid sulfate soil disturbance) and invasive species are addressed in Chapters 8, 10 and 16 respectively.

Some key threats to wetlands are predicted to increase given the potential impacts of climate and land use change. A recent report into the predicted impacts on wetlands found that under a high climate change scenario, wetlands in the north and west of Victoria would be more greatly affected than those in the far east of Victoria². They would be filled less often and undergo longer dry periods than under historical climate conditions. It is also predicted that coastal wetlands will be affected by sea level rise².

Table 12.1: Threats recorded in 587 high value wetlands assessed in 2009/10 and 240 representative wetlands in 2010/11¹ (wetlands can be affected by more than one threat).

| Threat | High value wetlands (% affected) | Representative wetlands (% affected) |
|------------------------|-------------------------------------|---|
| Altered water regime | 46 | 32 |
| Soil disturbance | 19 | 38 |
| Degraded water quality | 15 | 28 |
| Reduced wetland area | 14 | 26 |
| Altered wetland form | 6 | 12 |

Table 12.2: Key threats to wetlands in different landscape settings.

| Landscape | Wetlands | Threatening processes | Key threats | | | | | | |
|----------------------------|--|---|------------------|------------------|------------------------|-------------------------------|----------------------|----------------------|-----------------|
| | | | Soil disturbance | Invasive species | Degraded water quality | Acid-sulfate soil disturbance | Altered water regime | Altered wetland form | Loss of wetland |
| Natural landscapes | Alpine peatlands | Bushfire, stock grazing in State forests, pest invasion, drainage for hydro power generation, potential impacts of climate change. | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| | Floodplain wetlands | Water extraction and regulation, stock grazing in State forests, pest invasion, potential impacts of climate change. | | ✓ | | | ✓ | | |
| | Coastal wetlands | Sea level rise, marine pest invasion. | | ✓ | | | ✓ | | |
| Fragmented landscapes | Wetlands in reserves and on private land in dryland areas and on lowland river floodplains | Wetland loss, drainage, stock grazing, cropping, plantation forestry, nutrients, groundwater use, salinity, changed runoff patterns, pest invasion. On floodplains, water extraction and regulation, floodplain barriers, water regulating structures. Potential impacts of climate change, changes in land use and agricultural practices. | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Settled coastal landscapes | Coastal wetlands | Sea level rise, coastal development, nutrient runoff, drainage, marine pest invasion. | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Urban landscapes | Urban wetlands | Intensive development, nutrients and pollutants, drainage, high levels of human disturbance, pest invasion, changed runoff patterns. | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

12.2 Framework for managing wetlands

The management of wetlands in Victoria is based on an integrated approach at international, national, state and regional levels. It requires collaboration between states and territories, and among wetland managers, natural resource managers and policy makers.

In 1974, Australia became a contracting party to the Convention on Wetlands of International Importance (the Ramsar Convention). The Convention provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources.

It obliges contracting parties to:

- list wetlands of international importance (Ramsar sites)
- maintain the ecological character of Ramsar sites (see Box 12.2)
- establish nature reserves on wetlands
- formulate and implement planning to promote conservation and sustainable use of all wetlands.

The Australian Government is the Australian Administrative Authority to the Ramsar Convention. The Australian and state government agencies and land and water managers have collective responsibility for the wise use of wetlands, each having clearly defined roles and responsibilities³. The Victorian Government is responsible for implementing Ramsar matters in Victoria through State legislation, policy and programs.

Ramsar sites are a matter of national environmental significance under the EPBC Act. The EPBC Act and associated regulations require that Ramsar sites are managed in accordance with Australian Ramsar Management Principles to maintain their ecological character from the time they were listed. It also requires assessment and approval of actions with the potential to affect the ecological character of a Ramsar site.

Other matters of national environmental significance are relevant to wetlands, such as nationally threatened species and communities and listed migratory species. Actions affecting these matters also require approval under the EPBC Act.

In Victoria, nature reserves or protected areas are established under the *National Parks Act 1975* and the *Crown Land (Reserves) Act 1978*. They protect 55 per cent of the area of wetlands in Victoria (13 per cent of wetlands by number) and are managed by Parks Victoria. Plans are in place to guide the management of many wetlands, particularly those of high value. These include Ramsar site strategic management plans, park and forest management plans and environmental watering plans.

In Victoria, the legislation, regulatory and policy controls for wetlands are derived from a number of different tools that promote the protection of the environment and sustainable use of natural resources. The *Water Act 1989* contains specific provisions to assess and manage impacts on waterways (including wetlands). The *State Planning Policy Framework* of the *Victorian Planning Provisions*, the *Environmental Effects Act 1978* and the water entitlement and allocation framework include mechanisms to protect wetlands. This Strategy co-ordinates these regulatory mechanisms within a strategic management framework, addressing gaps and uncertainties in management direction, accountability and onground management activities for wetlands.

Policy 12.1

The *Victorian Waterway Management Strategy* will provide the leading statewide strategic direction on the management of the environmental condition of wetlands.

Regional management of wetland condition will be integrated with that for rivers and estuaries through the regional Waterway Strategies.

12.3 Protecting the values of Ramsar sites

The sound management of Victoria's 11 Ramsar sites (Figure 12.2) is of vital importance to protect the environmental values for which they are listed as well as their significant social and economic values such as tourism, recreation, fishing and forestry.

Ten of Victoria's Ramsar sites were listed in 1982. The Edithvale-Seafood Wetlands Ramsar Site was listed in 2001. Ramsar site managers are responsible for onground management. Nearly all land in Victoria's Ramsar sites is public land managed by Parks Victoria, Melbourne Water or the Department of Environment and Primary Industries (DEPI). These agencies take the lead role as site managers, although small areas within some Ramsar sites are managed by other public agencies or are privately owned. The DEPI is responsible for co-ordinating Ramsar site management in Victoria, while a range of other agencies, including waterway managers are responsible for catchment management and other aspects of natural resource management that is important for protecting Ramsar site values. The Australian Government works with the states to promote the conservation of Ramsar sites and to review their condition. The obligations and responsibilities for managing Ramsar sites are set out in National Guidelines for Ramsar Wetlands⁴.

12.3.1 Meeting obligations for Ramsar sites

In managing its Ramsar sites, Victoria's role is to undertake actions that address the Ramsar Convention obligations and Australian Government requirements to maintain the ecological character of Ramsar sites (see Box 12.2) and to maintain the currency of the Ramsar site documentation. This requires a co-ordinated approach within Victoria between the DEPI (lead agency), site managers and other natural resource management agencies and a partnership with the Australian Government to:

- adhere to the Australian Ramsar Management Principles, national Ramsar site guidance and direction for describing ecological character, mapping site boundaries, notifying change in ecological character and preparing management plans

- monitor and report on the ecological character of Ramsar sites, including any change in ecological character at individual sites every three years (see Box 12.2)
- maintain up-to-date documentation for Ramsar sites, including Ramsar information sheets, ecological character descriptions, management plans, site descriptions and maps.

Most land in Victoria's Ramsar sites is covered by Victorian legislation relating to the use and management of the land for conservation or for utilisation purposes such as, water storage, disposal of saline drainage water, duck hunting or forestry. To avoid adverse impacts on the ecological character of the Ramsar site, these uses need to be sustainable. If they lead to a change in ecological character, the policies in Section 12.3.4 apply.

Box 12.2: Ramsar Convention definition of ecological character and change in ecological character

Ecological character is the combination of ecosystem components, processes and benefits and services that characterise a wetland at a given point in time. For Ramsar sites this is the time of Ramsar listing. A change in ecological character is a human-induced adverse alteration of any ecosystem component, process and/or ecosystem benefit/service.

Policy 12.2

The Department of Environment and Primary Industries will work in partnership with Ramsar site managers and the Australian Government to maintain and report on the ecological character of Ramsar sites and the status of Ramsar site documentation.

Ramsar sites in Victoria will be monitored to detect change in ecological character.

Action 12.1: Endorse the ecological character descriptions and updated Ramsar information sheets for Victoria's Ramsar sites that are being developed by the Australian Government.

Who: Department of Environment and Primary Industries, Ramsar site managers, waterway managers.

Timeframe: 2014

Action 12.2: Monitor the ecological character of Ramsar sites and provide information to the Australian Government on the status of ecological character and Ramsar site documentation for inclusion in three-yearly national reports to the Ramsar Convention.

Who: Department of Environment and Primary Industries, Ramsar site managers.

Timeframe: 2015, 2018

12.3.2 Management of Ramsar sites

Management of Victoria's Ramsar sites is currently covered by individual Ramsar site management strategies. In addition, there is a range of other management plans and strategies that relate to aspects of Ramsar site management (such as those for the management of waterways, catchments, parks, reserves and State forests and environmental water).

Periodic renewal of Ramsar site management planning is necessary to evaluate management effectiveness, reflect evolving management policies and programs (for example, those relating to environmental water – see Chapter 8) and to address emerging risks from processes such as land use change and the potential impacts of climate change. Ramsar site management planning needs to integrate relevant management activities from the range of complementary plans and strategies with the aim of achieving a co-ordinated approach to Ramsar site management. Regional Waterway Strategies (RWSs) are the appropriate mechanism for incorporating Ramsar site management planning for most sites. However, in some cases the complexity of the management issues may require preparation of an individual management plan for a Ramsar site. Ramsar site management plans need to be consistent with the management planning arrangements for Ramsar sites set out in the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth).

In addition to routine catchment and public land management, there are several significant programs, actions and management arrangements in Victoria with the potential to maintain and improve the values of particular Ramsar sites.

These include:

- the allocation and use of environmental water through State and national programs (see Chapter 8)
- changes in the management of the Woody Yaloak Diversion Scheme as outlined in the *Western Region Sustainable Water Strategy*⁵ to allow more water to flow to Lake Corangamite in the Western District Lakes Ramsar Site
- the establishment of the Gippsland Lakes Ministerial Advisory Committee covering the Gippsland Lakes Ramsar Site and the development and implementation of the *Gippsland Lakes Environmental Strategy*⁶.

Policy 12.3

Regional Waterway Strategies will incorporate Ramsar site management planning, unless the complexity of management arrangements for the site warrants an individual management plan.

Ramsar site management planning documents will set out the range of management activities required to maintain the ecological character of Ramsar sites and address emerging risks.

The maintenance of the ecological character of Ramsar sites will be given high priority in the management of environmental water.



Ramsar site, Hattah-Kulkyne Lakes. Source: Index of Wetland Condition database

12.3.3 Approvals for actions affecting Ramsar sites

Proposals for development or changes in land and water management have the potential to affect Ramsar site values. As outlined in Section 12.2, approvals for proposed actions with the potential to adversely affect Ramsar sites are required under the EPBC Act. In Victoria, approvals may also be required under the *Environmental Effects Act 1978*, other legislation or planning schemes. It is the responsibility of the proponent of the action to obtain the necessary approvals.

Policy 12.4

The Victorian Government will continue to require all necessary approvals for actions with the potential to cause long-term change to the ecological character of Ramsar sites.

12.3.4 Addressing changes in ecological character

Despite the best management efforts, it is possible that a change to the ecological character of a Ramsar site may occur. Threatening processes such as drought, floods, bushfires, invasive species outbreaks or significant widespread changes in land and water management sometimes occur at level of severity that limits the ability of managers to respond effectively. The *National guidance on notifying change in ecological character of Australia's Ramsar Wetlands (Article 3.2)* outlines the process to be followed if monitoring indicates that change in ecological character has occurred or is likely to occur at a particular Ramsar site. In such a case, Victoria must notify the Australian Government and prepare a response strategy. There may be circumstances under which there are limited feasible or cost-effective options to respond to persistent, major threats such as changes in climate and associated sea level rise. In this case, management objectives would need to be reassessed for the Ramsar site in accordance with the process outlined in Section 4.2.7 and taking account of relevant Ramsar Convention guidance.

Article 2.5 of the Ramsar Convention makes provision for deleting or restricting the boundaries of a Ramsar site, only in the urgent national interest. Resolution IX.6⁷ of the Ramsar Convention covers principles and procedures for other situations not foreseen in the Convention text concerning loss or deterioration of the ecological character of Ramsar sites. This guidance only applies where the loss of ecological character is unavoidable. The Resolution sets out a procedure that follows on from the notification of change in ecological character to the Ramsar Secretariat described previously. It involves assessing if the change is truly irreversible, such that all attempts at recovery and restoration have failed to the extent that the site fails to meet any of the Ramsar Convention criteria for identifying wetlands of international importance⁸.

Policy 12.5

If monitoring indicates the ecological character of a Ramsar site is likely to change or has changed, the Victorian Government will notify the Australian Government and develop a response strategy for the site and monitor the effectiveness of its implementation.

If there are no feasible or cost-effective management response options to maintain the site's ecological character, Victoria will engage the Australian Government to agree on a process to review management objectives for the site. This will be done in consultation with the community and will be aimed at facilitating adaptation to a new ecological regime that maximises existing and likely future values.

Deleting or restricting the boundary of a Ramsar site will only be investigated where irreversible change results in a loss of critical values to the extent that the Ramsar site fails to meet any of the Ramsar Convention criteria for identifying wetlands of international importance.

Action 12.3: Evaluate and renew management planning for Victoria's Ramsar sites.

Who: Department of Environment and Primary Industries, Ramsar site managers, waterway managers, other agencies involved in Ramsar site management.

Timeframe: 2015

Action 12.4: Develop, implement, monitor and evaluate management response strategies for any Ramsar sites where monitoring indicates that a change in ecological character has occurred or is likely to occur.

Who: Department of Environment and Primary Industries, Ramsar site managers, Australian Government.

Timeframe: as required

12.3.5 Listing new Ramsar sites or extending the boundaries of existing sites

Victorian Government agencies, the community, organisations, individuals or the manager of a wetland can propose a wetland in Victoria for listing as a Ramsar site. Proposals may also be made to extend the boundaries of an existing Ramsar site to incorporate additional wetland areas. The Australian Government makes the final decision regarding the listing of a new Ramsar site or extending the boundaries of an existing site and requires the endorsement of the Victorian Government. National guidance outlines the process for listing a new Ramsar site and the ongoing obligations and administrative requirements. The DEPI is responsible for assessing the evidence for any proposal to list a new Ramsar site or extending the boundaries of an existing site.

Ramsar site listing may have benefits such as raising the profile of a wetland, increasing the level of support for conservation and sustainable use and providing greater security for long-term management. Many Victorian wetlands potentially meet the Ramsar Convention criteria for identifying wetlands of international importance⁸. However, this does not mean that listing of all such wetlands is necessarily appropriate. Other mechanisms to protect wetlands in Victoria (see Section 12.2) may be more suitable. A range of factors are relevant in considering the suitability of a wetland for Ramsar listing. These relate to the eligibility of the wetland in relation to the Ramsar convention criteria, the actions needed to meet the obligations associated with listing, the support of the wetland manager and other stakeholders for listing, international and national strategic objectives of the list of Ramsar sites and the advantages that listing would have over other management alternatives.

Policy 12.6

Investigations to list a new Ramsar site or extend the boundaries of an existing site may be initiated in response to proposals by the community or other parties and will consider the following factors:

- the Ramsar Convention criteria for identifying wetlands of international importance met by the wetland
- the Ramsar Convention *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands* and any national strategic direction on priorities for Ramsar site listing
- agreement by the land manager and key stakeholders involved in the management of the wetland and the actions they propose to meet relevant Ramsar obligations
- the current degree of protection of the wetland and the opportunities for increasing the level of protection by listing the wetland as a new Ramsar site
- alternative legislative and management frameworks for management of the wetland
- the level of threat to the wetland, and the contribution that listing would make to improving the management of threats

- the feasibility and cost-effectiveness of maintaining the ecological character of the wetland in the long-term
- the contribution that listing would make to awareness raising and community education in relation to the values of the wetland and wetland conservation in general
- the level of community support for listing
- the national and international documentation and administrative requirements.

The Victorian Government will recommend listing of a new Ramsar site or extending the boundaries of an existing site to the Australian Government where:

- there is agreement by the owner or manager of the wetland
- there is compelling evidence that listing will provide clear benefits in:
 - protecting highly significant wetland values relating to the Ramsar criteria for listing
 - raising the wetland profile
 - increasing the level of support for conservation and wise use measures that cannot be achieved through other mechanisms.

12.4 Managing water regimes for wetlands

The extraction, regulation and use of water from rivers for consumptive purposes is essential to provide human drinking water and help support agricultural productivity.

However, such extraction must be managed to reduce the adverse impacts on the water regime of wetlands located on the lowland floodplains of regulated rivers. Such wetlands include Ramsar sites (Section 12.3.2) and other high value wetlands, as well as a large number of smaller billabongs.

Wetlands dependent on groundwater are vulnerable to lowered water tables where groundwater is licensed for consumptive use. Section 8.7.3 outlines the approach for better defining the groundwater needs of such wetlands.

The management framework for environmental water is outlined in detail in Chapter 8. Regional Waterway Strategies will identify priority wetlands where environmental values are at risk from altered water regimes and, if environmental watering is feasible and cost-effective, specify the management activities planned to address this risk. This may include development of environmental water management plans and environmental watering.

The water regime of a wetland is one of the critical processes for supporting wetland values. Many wetlands are adapted to a periodic cycle of wetting and drying. This needs to be taken into account when setting water regime management objectives for wetlands where the water regime is actively managed, either through environmental watering or through excluding artificial inflows. Artificial inflows, such as those derived from stormwater, disposal of drainage water or artificial water connections, can prolong inundation and may require management to ensure they do not adversely affect wetland condition.

Policy 12.7

Regional Waterway Strategies will identify priority wetlands where environmental water management plans and environmental watering is required to maintain or improve wetland values at risk from altered water regimes.

The groundwater allocation framework will take account of the water requirements of high value groundwater-dependent wetlands.

Appropriate wetting and drying regimes will be taken into account in managing artificial inflows to a wetland.

12.5 Managing wetlands in natural landscapes

In the parts of Victoria where large areas of native vegetation remain, the landscape is in a largely natural state. In these natural landscapes, most wetlands are on public land and are managed as part of largely intact ecosystems in extensive parks, reserves or forests.

The management of these wetlands involves managing threats within the park, reserve or forest (for example, invasive species or bushfire). It also involves the management of visitor access and permitted activities and uses, for example timber harvesting in State forests. Management is guided by legislation such as the *National Parks Act 1975*, *Crown Land (Reserves) Act 1978*, *Forests Act 1958* and the *Land Act 1958* and park and forest management plans. While public land managers are responsible for management of land within parks, reserves and forests, waterway managers also have a role in identifying priority management activities for wetlands and managing catchment and water related issues. These responsibilities need to be co-ordinated.

Management may also involve targeted programs, such as those to rehabilitate the alpine peatlands. Alpine peatlands are listed as a threatened community at the State and national level and are adversely affected by weeds, stock grazing and trampling, altered water regimes, increased fire frequency and intensity and the potential impacts of climate change. Where they occur within land set aside for alpine resorts, Alpine Resort Management Boards have a role in their management. The Alpine Resorts Planning Scheme regulates land use and development in alpine resorts.

Policy 12.8

The Victorian Government will ensure that threats to wetlands in natural areas on public land continue to be addressed through legislative controls and park and forest management planning.

Public land and waterway managers will work together to ensure that priorities and management activities for wetlands in regional Waterway Strategies and park and forest programs are aligned.

12.6 Improving wetland management in fragmented landscapes

Most wetlands in Victoria are in the north central, south west and south east of the State and the majority of these are located in fragmented landscapes (Figure 12.2).

Wetlands in these landscapes include most of Victoria's small, shallow, periodically inundated wetlands as well as larger wetlands such as those in the Western District Lakes Ramsar Site and many of the wetlands listed in *A Directory of Important Wetlands in Australia*⁹. Some shallow freshwater wetlands are classed as seasonal herbaceous wetlands and listed as nationally threatened under the EPBC Act.

Wetlands in fragmented landscapes occur on both public and private land and collectively support habitat for both threatened and non-threatened wetland species. A high proportion of wetland species, such as waterbirds, rely on the wetland habitat remaining in fragmented landscapes. Wetlands in fragmented landscapes are important for amenity, recreation and tourism but experience a range of threats (Table 12.2). In the Wimmera, for example, of 986 wetland features assessed in 2004 and 2011, a dam or drain had been constructed since 2004 in 7% of features and cropping initiated in almost 25%.

12.6.1 Managing catchment-based threats to wetlands

Wetlands in fragmented landscapes are surrounded by land that has been altered for agriculture (Figure 12.3), peri-urban and urban development. These changes adversely affect wetland water quality, habitat and water regimes. Integrated catchment management is an important aspect of wetland management. Maintaining or improving native vegetation around the wetland is a key management activity to minimise threats associated with adjacent land use.

Wetlands on public land are located in parks and reserves that are often relatively small and surrounded by private land. In many cases, the wetland catchment, riparian vegetation and sometimes part of the wetland itself are on private land (Figure 12.4).

Almost 70% of wetlands are on private land and they represent 35% of Victoria's wetland area. Wetlands on private land contribute significantly to the character of the landscape and the viability of wetland species and provide opportunities for recreation.

The actions of private landholders who manage land adjacent to wetlands and in the broader catchment are often critical to achieve management outcomes. Local government has a role in regulation of land use and development that may adversely affect wetlands. Wetland management involves collaboration between the public or private wetland manager and the waterway manager as well as between planners and landholders in the catchment.

Policy 12.9

Catchment-based threats to wetlands in fragmented landscapes will be addressed in Regional Catchment Strategies, regional Waterway Strategies and local government planning schemes, where appropriate.

The Victorian Government will provide assistance to private landholders to undertake voluntary measures on their own land that complement management activities by the wetland manager to protect and improve high value wetlands.



Figure 12.3: Aerial image showing the land use context of wetlands in a fragmented agricultural landscape. Wetlands surrounded by agricultural land are often affected by altered water regimes and excess nutrient and sediment runoff.

12.6.2 Managing public wetlands in fragmented landscapes

Wetlands on public land in fragmented landscapes are located in national, State or regional parks, conservation or other public reserves. The objectives of management for public land are established by the government-approved recommendations of the former Land Conservation Council (LCC), former Environment Conservation Council (ECC) and the Victorian Environment Assessment Council (VEAC). As with larger parks and reserves, the management of threats and activities within parks and reserves in fragmented landscapes is guided by legislation and management plans, where these exist.

Policy 12.10

On-site threats to wetlands within public parks and reserves in fragmented landscapes will continue to be managed in accordance with Government-approved recommendations of the Land Conservation Council, Environment Conservation Council and the Victorian Environment Assessment Council, relevant legislation and approved management plans.

12.6.3 Supporting conservation and sustainable use of wetlands on private land

Individual landholders, community groups (for example, Landcare) and non-government organisations (for example, Trust for Nature, Field and Game Australia and Greening Australia) make a significant contribution to maintaining and improving the condition of wetlands on private land. It is important to build on this effort to improve the level of conservation and sustainable use of privately owned wetlands.

Shallow, temporary wetlands may be dry for periods of time, especially during droughts and are often not recognised as wetlands by private landholders. They are often used for stock grazing, cropping, as a site for farm dams and for plantation forestry.

Stock grazing in wetlands can damage native vegetation, disturb soils and cause nutrient enrichment but can be managed sustainably in some circumstances. Crops and plantations may be established in shallow wetlands in extended dry periods and this sometimes involves draining the wetland (see Section 12.8.1). These uses generally have greater impacts than grazing because native vegetation is removed and soils are more highly disturbed. In addition, the crop or plantation may be adversely affected when the wetland fills, leading to a loss of investment by the land manager. Although the *Code of Practice for timber production*¹⁰ provides guidance for wetland protection in the establishment and management of plantation forests, shallow temporary wetlands are often not recognised as wetland habitat and can be affected by plantation forests.

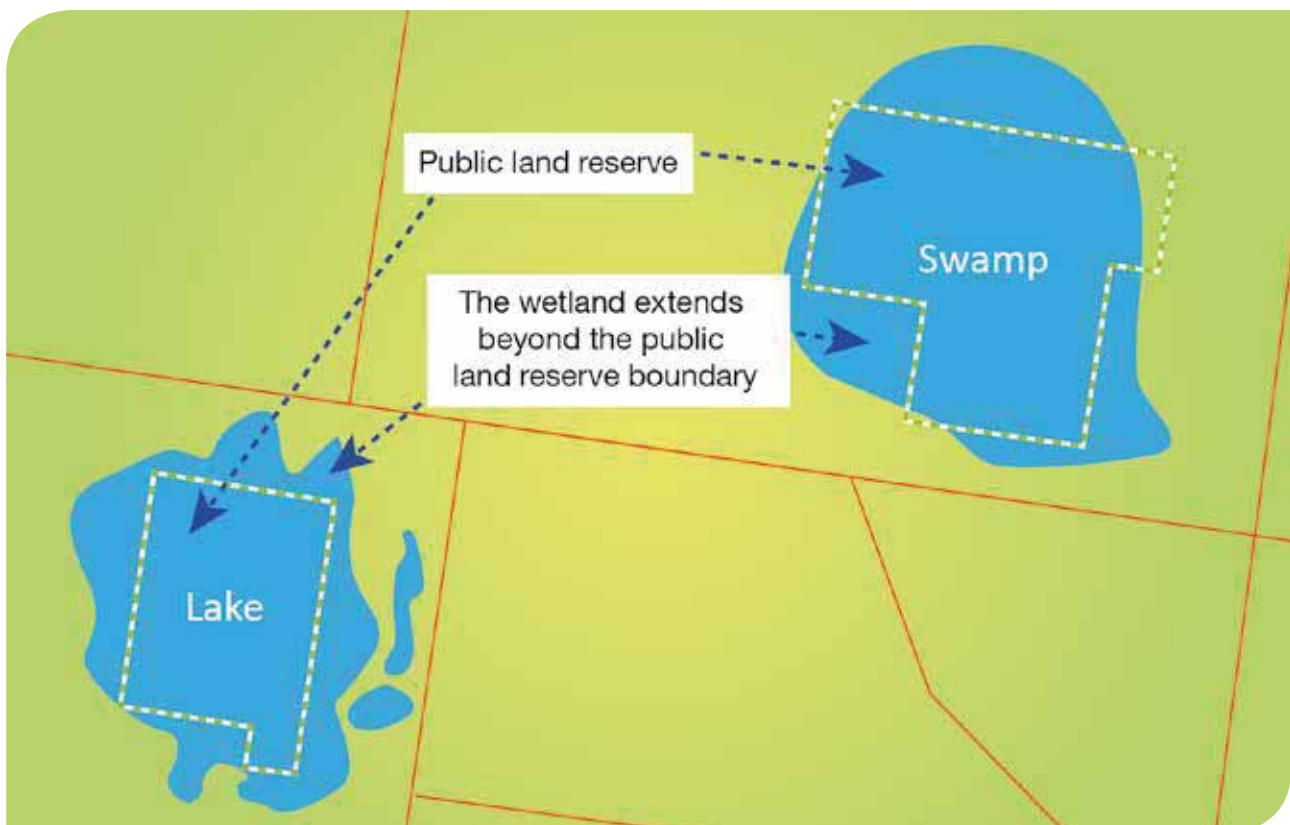


Figure 12.4: Stylised examples of the context of public reserve wetlands in a fragmented landscape where the wetland extends beyond the reserve boundary and is surrounded by private land.

Raised-bed cropping is an example of a practice that is becoming more widespread and can affect shallow freshwater wetlands by disturbing soil, altering water regimes and accelerating runoff, which may affect landholders downstream. The extent of the practice in wetlands and its impacts need further investigation.

Maintaining and improving wetland condition on private land involves a range of tools and approaches (see Section 4.2.4 for more detail). These include market-based incentive programs (for example, HabitatTender, EcoTender, BushTender, WetlandTender), other incentive and grant programs, whole farm planning programs and provisions under legislation such as the *Water Act 1989*. Permanent protection of wetlands can be effected under Trust for Nature covenants or agreements under Section 69 of the *Conservation, Forests and Lands Act 1987*. Another option to secure land in or adjacent to high value wetlands is the purchase and reservation of land when it is offered for sale. Local government regulates land use and development through planning schemes in line with the *State Planning Policy Framework*, which includes objectives for protection and conservation of Ramsar sites, other wetlands and native vegetation (including that in wetlands). The application of native vegetation planning controls can be difficult for wetlands due to seasonal variations in vegetation.

An important aspect of delivering programs and applying mechanisms to maintain and improve wetland condition on private land is increasing the level of knowledge about wetlands. Landholders, community-based natural resource management groups, natural resource managers and local government need access to the appropriate information and knowledge about wetland priorities, values, threats and management activities. Sound information on the location of wetlands, their characteristics and current condition is also important (see Section 12.10).

Policy 12.11

The Department of Environment and Primary Industries, in partnership with waterway managers and local government, will design and deliver regional programs for the maintenance or improvement of wetland condition and the sustainable use of wetlands. Actions by landholders to maintain and improve the condition of high value wetlands on their land will be encouraged through market-based instruments and other incentives.

The selection of the most appropriate management activity to maintain or improve wetland condition on private land will depend on program objectives, resources, regulatory requirements, cost-effectiveness, suitability and level of stakeholder support.

Information, advice and guidance on wetland priorities, values, threats and management will be provided to landholders, community-based natural resource management groups, natural resource managers and local government to enhance the effective design and delivery of wetland programs.

Action 12.5: Prepare guidance for landholders on sustainable use of wetlands, including guidance on sustainable stock grazing in appropriate circumstances.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

Action 12.6: Educate and train natural resource management professionals working with landholders about the importance of wetland conservation and prepare guidance to assist them in identifying management options to improve protection of high value wetlands on private land.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

Action 12.7: Investigate the extent and impact of different land use practices on high value wetlands.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

Action 12.8: Improve information about wetland vegetation and develop guidance to assist local government in the application of native vegetation planning controls for wetland vegetation.

Who: Department of Environment and Primary Industries, waterway managers, local government.

Timeframe: 2016

12.7 Maintaining and improving wetland connectivity

Connectivity between wetlands is important for the conservation of native wetland plants and animals.

Connectivity refers to the ability of plants and animals to move between habitats in the landscape that are necessary for their ongoing survival, for example allowing them to escape adverse conditions and recolonise habitat and breed in more favourable times. Plants and animals move between wetlands by flight (waterbirds), through suitable terrestrial habitat (frogs, reptiles and eels), in water (fish, plants and aquatic invertebrates), through dispersal by wind or in the gut or plumage of waterbirds (plant seeds and fragments and aquatic invertebrates). Short-term refuges and longer-term refugia play an important role in ensuring survival of wetland plants and animals.

Connectivity is also important for the wetland biological processes (for example, flooding, drying and cycling of nutrients and energy) that are necessary to provide the habitat to support wetland plants and animals. On floodplains, the high degree of lateral connectivity that occurs during overbank flooding is essential for the exchange of nutrients, sediments, carbon, organic matter and native plants and animals between the floodplain, floodplain wetlands and the river. An understanding of connectivity can help define groups of wetlands that can be managed together.

Threats to wetland connectivity include the obstruction of flow paths to wetlands and the loss and degradation of key wetlands or the terrestrial habitat that allows species to move between them. A recent project has identified the different levels of connectivity for wetland plants and animals based on their dispersal pathways¹¹. Further investigation is required to apply this knowledge at the regional level, to define wetland systems, integrate wetland connectivity into the regional priority setting process (Section 4.2.3) and into the design of biolinks.

Policy 12.12

Wetland connectivity will be incorporated into the regional priority setting framework for waterway management and into the design of biolinks.

12.7.1 Maintaining and improving floodplain connectivity

The river channel, its floodplain and the wetlands that occupy depressions on the floodplain form part of a larger ecological system. Lateral connectivity between these landscape elements is important to sustain habitat for native plants and animals, promote nutrient cycling and provide flood storage and conveyance.

Connectivity between a river, the floodplain and floodplain wetlands can be disrupted by obstructions to the natural flow paths of floodwaters, changes to water levels within the river channel or reductions in the frequency of overbank flows.

The *Victoria Flood Management Strategy* (currently scheduled for renewal) adopts the principle that rivers should, wherever possible, be allowed to flood naturally, maintaining connectivity to floodplains and their associated wetlands. Regional floodplain management needs to better integrate the management of flood risk with the protection of high value waterways identified in regional Waterway Strategies.

Connectivity between a river, its floodplain and wetlands can be disrupted by development on the floodplain. Zoning and overlay instruments in local government planning schemes (which apply throughout Victoria), assist in preventing further loss of connectivity between the river, its floodplain and the wetlands. These instruments include the Urban Floodway Zone, which applies in Melbourne, the Floodway Overlay (FO) and the Land Subject to Inundation Overlay (LSIO). One purpose of these instruments is to ensure that, based on flood studies and advice from the relevant floodplain manager, the responsible planning authority considers the potential effects of proposed developments on redirecting or obstructing floodwater, stormwater or drainage water and on reducing flood storage and increasing flood levels and flow velocities. The LSIO and FO also aim to ensure that development on the floodplain maintains or improves river and wetland health, waterway protection and floodplain health. Most rural floodplain wetlands are covered by LSIOs or FOs. The Environmental Significance Overlay is another planning instrument that can be tailored to protect specific environmental values of wetlands and floodplain habitat in local planning schemes.

In floods, levees on floodplains can obstruct flow paths to parts of the floodplain, including wetlands. In August 2012, the Environment and Natural Resources Committee (ENRC) reported to the Government on the management of levees in Victoria as part of the Inquiry into Flood Mitigation Infrastructure in Victoria. The Government's response will inform the policy for the management of levees to be set out in the updated *Victoria Flood Management Strategy*.

Action 12.9: Identify wetlands that have a high value for protecting or improving landscape connectivity.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2014

In some situations, works can be undertaken to reinstate hydrological connectivity to individual floodplain wetlands. One approach involves lowering the flooding threshold so the wetland floods at lower flood levels. Where individual wetlands have been isolated from overbank flows by infrastructure or past development, it may be possible to reinstate hydrological connectivity by removing or by-passing blockages in flow paths (for example, by installing a culvert under a road). Issues to be considered in seeking to reinstate connectivity in this way include the values of the wetland, any impacts on the community, feasibility and cost-effectiveness, integration with other management activities for waterways (such as environmental watering), riparian management and viability of the wetland under future river flow regimes.

Principles for restoring hydrological connectivity to floodplain wetlands

Works to reinstate hydrological connectivity to high value floodplain wetlands will be undertaken on a priority basis where:

- they are feasible, cost effective and have community support
- the wetland is viable under the predicted, future flooding regimes; taking account of available environmental water
- any impacts on community services and public and private assets can be mitigated
- they can be integrated with any other works or environmental watering programs required to protect or improve the values of the wetland.

Where river levels are kept artificially high by in-channel water storage structures such as weirs or by maintaining high river levels to deliver irrigation water downstream, this can result in adverse prolonged or unseasonal flooding of connected wetlands. Restoring the natural wetting and drying cycle of affected wetlands may involve building regulators on the effluent channel to the wetland so the water regime can be managed appropriately.

Connectivity can also be improved by reinstating a more natural water regime to priority floodplain wetlands affected by river regulation and water extraction through environmental watering (see Chapter 8). Deliberate inundation of private property will not be undertaken without the landholder's consent (see Section 8.6.1).

Policy 12.13

The updated Victoria Flood Management Strategy will take account of floodplain values in establishing policies for floodplain management.

The integration of flood risk management and the protection of floodplain wetlands and other high value floodplain areas will be improved at State and regional levels. The updated Victoria Flood Management Strategy will be aligned with the *Victorian Waterway Management Strategy* and regional floodplain management will be informed by regional Waterway Strategies.

Waterway managers will provide information and advice to local government to ensure wetland and floodplain values are taken into account in flood planning and the administration of the planning controls for floodplain management.

Connectivity for floodplain wetlands will continue to be protected, through the use of the Land Subject to Inundation Overlay and Floodway Overlay. Additional planning controls such as the Environmental Significance Overlay may be applied where environmental values require stronger protection.

Regional Waterway Strategies will identify priority floodplain wetlands where hydrological connectivity will be reinstated or works undertaken to prevent inappropriate permanent or unseasonal flooding.

12.8 Managing the impacts of drainage on wetlands in rural areas

12.8.1 Reducing impacts of rural drainage

There is a long history of rural drainage in Victoria and the extent of drainage in dryland agricultural areas is significant. For example, in the Glenelg Hopkins region, over 196,000 hectares has been drained. Drainage has been the main cause of the loss of freshwater wetlands in Victoria (Section 12.1.1). Drainage became less of an issue in the dry period between 1997 and 2009. However, there is renewed pressure for drainage following high rainfall and floods, as occurred in 2010 and 2011.

While drainage usually directs water away from wetlands, water may also be drained into wetlands. While this often negatively affects the water regime of the receiving wetland, in some cases, the additional water may assist in supporting waterway values, for example maintaining high water levels for recreation. The mitigation of adverse effects on water quality is also an issue in drainage management. Drainage may disturb and activate acid sulfate soils (see Section 10.8).

Planning controls provide the main mechanism to regulate local drainage. Local government can apply an Environmental Significance Overlay or use the schedule to the Farming Zone to specify that a permit is required for works that affect the flow of water across a property boundary. However, these controls are not universally applied in planning schemes. In some local government areas there is no requirement for approval to undertake smaller drainage works on individual farms.

Drainage is a complex issue and many aspects of its management are beyond the scope of this Strategy. The Environment and Natural Resources Committee (ENRC) initiated an inquiry into rural drainage in 2012 that addressed the impacts of rural drainage on landholders and waterways. In addition, the functions and powers of authorities in relation to regional drainage will be investigated as part of the review of the *Water Act 1989* (see Section 1.2.1).

At the State level, a framework is needed to manage the risks to waterways from drainage, taking into account the Government's response to the ENRC inquiry and any relevant *Water Act 1989* amendments. At the regional level, for high value waterways impacted by drainage, it may be possible to identify local solutions to mitigate these impacts, taking into account feasibility, cost-effectiveness and any effects on surrounding and downstream stakeholders. Where drainage water supports environmental and social values, it is important these values are considered when developing management options. A trade-off may be required between a wetland that is drained and a wetland that receives the drainage water. Water quality issues associated with drainage also need to be addressed.

Policy 12.14

The Victorian Government will ensure that any future reform of drainage management in Victoria includes measures to protect the environmental, social, cultural and economic values of waterways.

Regional Waterway Strategies will identify priority projects to mitigate the impacts of existing drainage on high value wetlands where this is feasible and cost-effective, has community support and does not affect other stakeholders. Rehabilitation of high value, privately-owned wetlands affected by drainage will be encouraged through market-based instruments and other incentives.

Waterway managers will provide advice to local government on threats to high value wetlands that are associated with drainage for land use and development.

12.8.2 Reducing impacts of irrigation drainage

Drainage associated with irrigation can change the water regime of wetlands and lead to salt accumulation, poor water quality and vegetation change. Irrigation areas can cause disruption of natural water regimes and the discharge of drainage water to wetlands. Some wetlands now depend on drainage where drainage water has replaced former natural runoff or where wetland habitat has adapted to the changed water regime. Reductions in drainage volumes associated with dry climatic conditions, improved irrigation practices and water saving projects often result in less flow of drainage water to wetlands. This may have positive or negative effects, depending on the individual site characteristics. The disposal of drainage water to wetlands often leads to progressive salinisation and high nutrient levels.

Irrigation drainage in Victoria's three major irrigation regions (the Goulburn-Murray, Sunraysia and Macalister irrigation districts) is managed under the Victorian Irrigation Drainage Program. The *Victorian Irrigation Drainage Program Strategic Direction 2010–2015*¹² aims to enhance the environmental services provided by water and natural environments in landscapes influenced by irrigation. It includes a project to manage environmental assets at risk from irrigation-induced shallow water tables, loss of drainage flows or residual drainage flows.

Action 12.10: Develop a framework to manage risks to waterways from rural drainage.

Who: Department of Environment and Primary Industries.

Timeframe: 2014

New irrigation developments outside established irrigation areas require a Water Use Licence (WUL) or Take and Use Licence (TUL) under the *Water Act 1989*. Rural water corporations, which have the power to grant licences, must consider the impacts of the proposed water use on the environment. Outside established irrigation areas, waterway managers are responsible for the development of regional Irrigation Development Guidelines (IDGs) which are designed to guide new irrigation developments to meet expected environmental and performance standards that avoid or minimise the offsite impacts of water use and irrigation. IDGs provide guidance, to both irrigation developers and government agencies, on the process, matters for consideration, conditions and approvals required to obtain

or modify a WUL or TUL. These requirements provide a sound basis for minimising the environmental impacts of irrigation drainage associated with new or expanded irrigation development outside the major irrigation regions.

Policy 12.15

The impacts of irrigation drainage on wetlands will be minimised through the incorporation of environmental risk assessment and mitigation in irrigation drainage management programs.

12.9 Managing coastal wetlands

Coastal wetlands are valued for tourism, recreational activities such as fishing and boating and their environmental values. The key threats to coastal wetlands are sea level rise, coastal development, invasive species and the disturbance of acid sulfate soils.

Climate change projections predict that sea levels will continue to rise and storms will be more frequent and intense. The lowest lying coastal areas are most at risk from inundation and it is in these areas that coastal wetlands occur. A report² found that sea level rise is likely to result in the permanent inundation of tidal wetlands. Saltmarshes, which are currently intermittently inundated during spring tides and storm surges, are predicted to become more frequently inundated. Permanent coastal and mangrove wetlands are likely to persist, although their distribution is expected to change as they move into intermittent coastal wetlands. Saltmarshes will be at most risk because of barriers to inland migration associated with topography and land use. They are likely to diminish significantly in area. In addition, coastal freshwater wetlands at low elevations may become inundated by seawater.

The most vulnerable coastal wetlands are those in low lying areas adjacent to embayments and estuaries and where inland migration is restricted. These include wetlands around Port Phillip Bay and Western Port (constrained by infrastructure) and along the Otway and far east coast (constrained by topography).

A range of tools and approaches is available to facilitate adaptation. The identification of vulnerable coastal wetlands and options for facilitating their adaptation to the salinity and water regimes that are predicted to occur in the future will assist in regional priority setting.

Population growth is occurring rapidly in Victoria's coastal areas. If not carefully managed, this could adversely affect water quality and environmental condition of coastal wetlands.

Policy 12.16

Regional Waterway Strategies will identify appropriate management activities to facilitate adaptation of high value coastal wetlands to sea level rise and to mitigate adverse effects associated with coastal land use and development.

Long-term strategic waterway and coastal planning will consider the impacts of potential future sea level changes on wetlands.

Action 12.11: Undertake research to identify high value coastal wetlands that are vulnerable to sea level rise and quantify risks and opportunities for adaptation to predicted future salinity and water regimes.

Who: Department of Environment and Primary Industries, waterway managers, regional coastal boards, Gippsland Lakes Ministerial Advisory Committee.

Timeframe: 2015

12.10 Information to improve wetland management

Sound, current information on the location and characteristics of wetlands, their extent, condition, threats and values is needed to provide the basis for continuous improvement in policy setting, strategic planning and management effectiveness.

Wetland managers need knowledge about the most appropriate management activities. Policy makers and planners need to better understand the extent and impact of current and future actions that cause or are likely to cause significant wetland loss and degradation. Measures and techniques to mitigate significant and common impacts need to be periodically assessed for their effectiveness and improved or changed, if necessary. Section 17.3 provides further information on intervention monitoring and resource condition assessment for waterways.

Action 12.12: Maintain the Victorian wetland inventory, allowing for updates of wetland attributes in response to new knowledge or changes to attributes and ensure wetland information is accessible to landholders, community networks and groups, local government and natural resource managers.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2020

Action 12.13: Develop and apply a method to routinely monitor changes in wetland extent and changes in wetland water regime.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

Action 12.14: Improve the framework for identifying high value wetlands and assessing risk.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016



Assessing the characteristics of wetlands on the Wimmera River from the air. Photographer: Andrea White



13

Estuaries



Powlett River. Courtesy West Gippsland CMA

Estuaries

Guide to the chapter

13.1 Context

- Values of estuaries
- Threats to estuaries

13.2 Framework for managing estuaries

13.3 Specific estuary management issues

- Management of estuary entrances
- Maintaining and improving environmental condition of estuaries
- Setting water quality objectives for estuaries
- Determining environmental water requirements for estuaries
- Managing coastal acid sulfate soils

13.4 Information to improve estuary management

13.5 Increasing community awareness and understanding of estuaries and their management

What are the issues with existing arrangements?

The management of estuaries in Victoria requires improved co-ordination with the coastal management framework and comprehensive integration with the management of rivers and wetlands. Roles and responsibilities for managing estuaries across government agencies and the community are currently unclear and there is a need for clear strategic direction for estuarine policy and management at State and regional levels. While our understanding about how threats to estuaries affect estuarine condition is improving, continued research is required to provide the evidence base for effective planning and management.

What improvements does the Strategy make?

For estuaries the Strategy will:

- comprehensively integrate the management of estuaries with the management of rivers and wetlands
- clarify and formalise organisational responsibility for estuary entrance management
- outline arrangements for strategic planning of management activities to maintain or improve the environmental condition of estuaries
- enhance knowledge to support improved estuary management
- strengthen programs to increase community awareness of and involvement in estuary management.

13.1 Context

Estuaries connect rivers to the sea. They are a transition zone where freshwater draining from the land mixes with the saltwater from the ocean to create unique and important ecosystems.

Estuaries are partially enclosed waterbodies that may be permanently or periodically open to the sea and have salinities that vary from almost fresh to very saline. Estuarine ecosystems are highly complex and dynamic environments. Since estuaries are at the bottom end of catchments, their condition can be affected by activities occurring within the upstream freshwater catchment. Where the condition of catchments, rivers or estuaries is poor there are likely to be additional impacts on the marine receiving waters and coastal areas.

The majority of Victoria's estuaries are brackish mouths of rivers and streams that flow directly into the ocean or into large marine bays (such as Port Phillip Bay, Western Port and Corner Inlet). There are more than 100 estuaries in Victoria; 83 of which exceed one kilometre in length. The definition of estuaries also includes coastal barrier lagoons (such as the Gippsland Lakes) and some coastal inlets (such as Anderson Inlet).

Many of Victoria's estuaries close intermittently as a result of sand bar formation at the estuary entrance. This usually occurs during periods of low freshwater inflow. Intermittently closed estuary entrances are a natural feature of the Victorian coastline and can be critical to the ecology and physical form of estuaries.

13.1.1 Values of estuaries

Victoria's estuaries have long been important to Victoria's Traditional Owners and many contain sites of cultural significance (see Chapter 6). Sheltered estuarine waters across Victoria were among the first areas to be settled by non-indigenous people. Many estuaries in the late 1800s and early 1900s supported important industries such as ports and commercial fishing and these early settlements have since developed into some of Victoria's most densely populated areas. Estuaries are valued for recreational use (for example camping, swimming and boating) and contributions to local and regional economies through tourism and commercial or recreational fishing. They also provide opportunities for connecting with wildlife or enjoying the scenery. The key values, threats and management activities for estuaries are shown in Figure 13.1.

Estuaries also have many environmental values. They support a range of distinctive aquatic and terrestrial plants and animals, including rare and threatened species and communities. Estuaries are important drought refuges, and provide significant breeding and feeding areas for birds and spawning and nursery areas for fish. Vegetation and saltwater marshes adjacent to estuaries maintain water quality, assist with nutrient cycling, and provide a buffer to catchment-derived sediments and pollutants entering the marine environment.

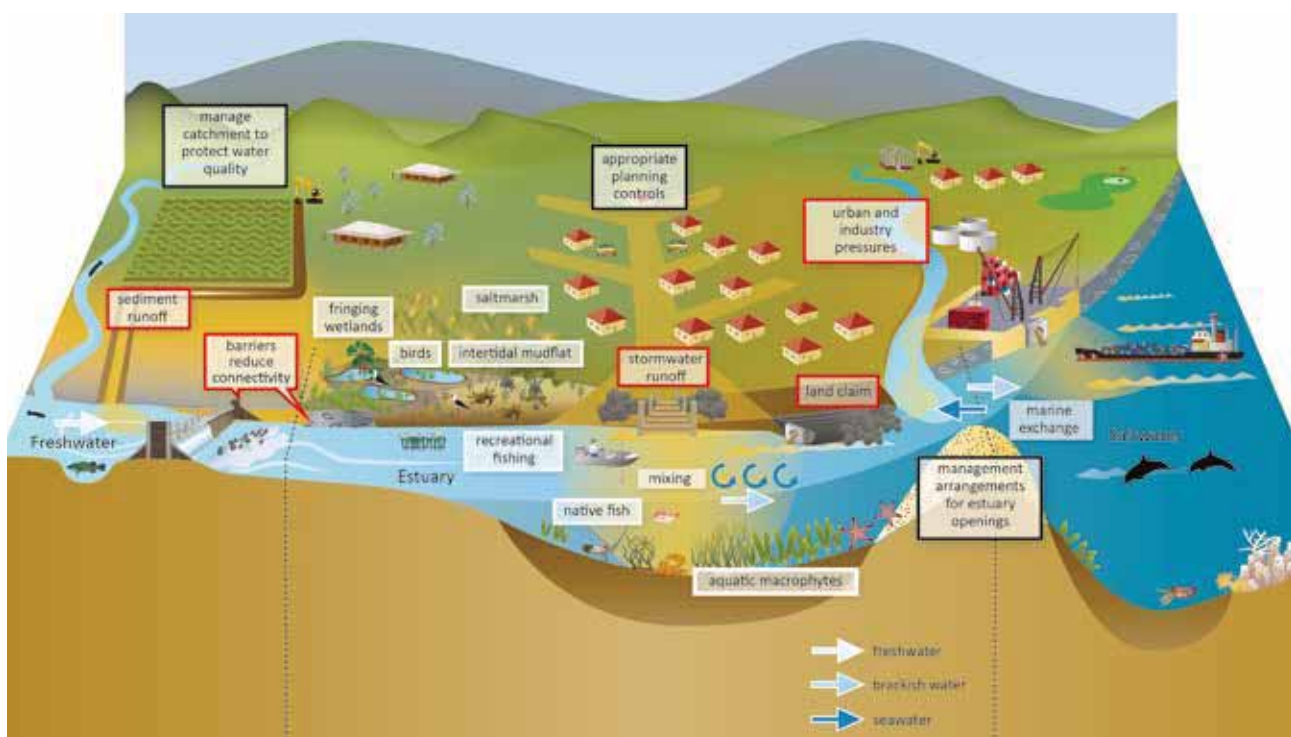


Figure 13.1: Values (white), threats (red) and management activities (black) for estuaries.

13.1.2 Threats to estuaries

A diverse range of threats can potentially degrade the condition of estuaries. Estuaries are often surrounded by dense coastal settlements and can be exposed to intensive levels of recreation and use. Other threats include:

- unpermitted estuary entrance openings (for example, people using machinery to remove sand from the mouth of an estuary so that it flows into the ocean)
- changes in water regimes
- high levels of sediment and nutrients
- pollution events (such as oil spills)
- habitat modification
- land-claim (creating new land from areas that were previously below high tide)
- invasion by weeds or pests
- salinisation and acidification.

Land use change, such as agriculture or residential development, may also have impacts on environmental condition that need to be managed.

Estuaries are particularly vulnerable to reduced freshwater inflows from rivers. While reduced inflow can lead to a reduction in sediment and nutrient inputs from upstream, it can also decrease the mixing and flushing of estuary water (increasing salinity), change sediment and nutrient dynamics, increase the frequency of algal blooms and reduce the number of entrance openings in some estuaries. Changes in water level and salinity regimes can also have serious impacts on existing plant and animal communities.

The potential impacts of climate change are another key challenge for estuary management. If the climate warms over the long-term it is predicted that sea levels will rise, storm surge intensity will increase and freshwater inflows will decrease. A rise in sea level will result in increased inundation of fringing vegetation and low lying land adjacent to existing estuaries. This can cause saltwater intrusion, where saltwater extends further up river channels into the freshwater sections, and potentially alter the dynamics of the estuary entrances to be open more frequently or permanently in some cases.

Dealing with natural climate variability is also a major challenge in the planning and management of Victoria's estuaries.



Aire River estuary. Photographer: Alison Pouliot

13.2 Framework for managing estuaries

The *Victorian Coastal Strategy*¹ (VCS) provides the current statewide direction for managing coastal, estuarine and marine environments.

The VCS is the statewide policy for coastal management and planning, prepared in accordance with the *Coastal Management Act 1995*. The Act also establishes regional Coastal Action Plans (CAPs) to implement the VCS directions at the regional level. Local coastal management plans then guide management of coastal public land consistent with both the VCS and CAPs.

The VCS, CAPs and coastal management plans are robust tools to address use and development issues related to estuaries in Victoria, particularly for issues that require planning responses. Coastal Action Plans specifically to address estuary issues have also been developed previously in Victoria's south-west and Gippsland regions. Together these plans are important tools to address use and development issues, but do not comprehensively include management of the environmental condition of estuaries. They also lack integration with the management of river and wetland condition.

The development of this Strategy provides a consistent, strategic direction for the management of the environmental condition of Victoria's estuaries that is integrated with rivers and wetlands.

In coastal catchments, waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) will lead the development of regional Waterway Strategies (RWSs) to provide regional direction for managing the environmental condition of estuaries.

Policy 13.1

The *Victorian Waterway Management Strategy* will provide the leading statewide strategic direction on the management of the environmental condition of estuaries. The *Victorian Coastal Strategy* will continue to provide strategic direction for coastal land use planning and sustainable development issues.

Regional management of estuary condition will be integrated with that for rivers and wetlands through regional Waterway Strategies.

The RWSs will identify high value estuaries and priority management activities over an eight-year period (see Section 4.2). In their development, outstanding actions and strategic directions related to estuaries from relevant CAPs will be considered (see Figure 13.2). The RWSs will also identify where Estuary Management Plans need to be developed (or updated) and will help provide a clear picture of the actions required to maintain or improve the health of priority estuaries.

Estuary Management Plans may also link to broader catchment management approaches to protect estuary condition, such as improved land management practices. These plans will need to consider and be considered in coastal management plans prepared by local land managers to ensure alignment of management activities.

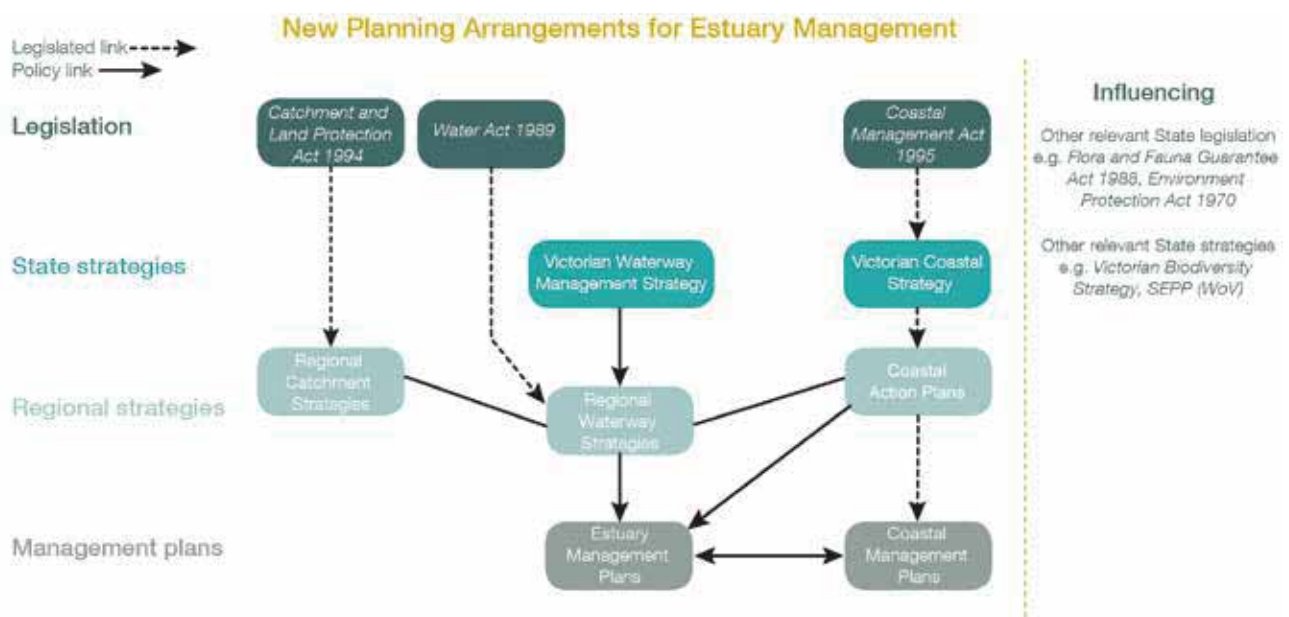


Figure 13.2: Key legislation and new planning arrangements for estuary management.

Policy 13.2

Regional coastal boards will continue to provide strategic direction, in partnership with local government, for coastal land use planning and sustainable development issues through implementation of the *Victorian Coastal Strategy* and Coastal Actions Plans.

At the regional level, waterway managers, regional coastal boards and public land managers (that is, the Department of Environment and Primary Industries, Parks Victoria, local government and coastal committees of management) will undertake a co-ordinated approach to estuary management.

Waterway managers are responsible for strategic planning for estuary condition management through the development of regional Waterway Strategies.

Regional Waterway Strategies will identify priority Estuary Management Plans for development (or updating) and nominate the organisation to develop and implement the plans (in conjunction with key stakeholders).

Coastal Action Plans may also provide guidance for Estuary Management Plan development (or updating) regarding land use planning for land use and development.

Estuary Management Plans have the capacity to deliver outcomes under the regional Waterway Strategies and Coastal Action Plans and will help provide a clear picture of the management activities required to maintain or improve the condition of priority estuaries.

Future Estuary Management Plans will also consider upstream catchment influences, influences on marine receiving waters and the potential impacts of climate change on the environmental condition of estuaries.



Surry River estuary entrance. Courtesy Glenelg Hopkins CMA

Action 13.1: Consider outstanding actions and strategic directions (related to estuaries) in Coastal Action Plans during development of the regional Waterway Strategies.

Who: Waterway managers, regional coastal boards.

Timeframe: 2014

Action 13.2: Review and update current Estuary Management Plans or develop new plans as required.

Who: Waterway managers, Parks Victoria, regional coastal boards, local government, committees of management, Department of Environment and Primary Industries, Department of Transport, Planning and Local Infrastructure.

Timeframe: 2018

13.3 Specific estuary management issues

13.3.1 Management of estuary entrances

The closure of an estuary entrance can result in an increase in water level and inundation of adjacent land. Inundation is a natural process and plays an important role in the life cycle of many species and the cycling of nutrients. Periodic inundation of adjacent wetlands and fringing vegetation is also necessary to ensure their ongoing health. For some estuaries, reduced freshwater inflows, as experienced in drought periods, reduce the frequency of flushing flows that open estuary entrances and result in increased periods of inundation.

However, high water levels and prolonged inundation can have social and economic impacts through flooding of adjacent agricultural or residential land, roads and structures (such as jetties and boat ramps).

Artificial estuary entrance openings

The social and economic costs associated with flooding from estuaries can be reduced through the provision of a drainage service, that is, artificially opening the estuary entrance to allow the excess water to flow out to sea. However, there are potential environmental impacts associated with this intervention if conducted under the wrong conditions. The detrimental effects of an artificial estuary entrance opening can include:

- disruption to the natural patterns of variation in water quality
- impacts on plant and animal species, including mass fish deaths (for example, the Surry River fish death event in 2005)
- disruption of animal migration and reproductive cycles.

Artificial estuary opening is regulated by waterway managers who are responsible for issuing approval under the *Water Act 1989*. Due to past management practices, there is a widespread community belief that an artificial estuary opening is automatically initiated when the water reaches a particular level. However, the decision process should commence when water level is considered to have a significant impact on the environmental, social and economic values of the estuary. The impact associated with a particular water level may vary at different times of the year.

A history of unpermitted estuary entrance openings and community concern about the lack of clear and consistent guidelines led the Victorian Government to develop the Estuary Entrance Management Support System (EEMSS). EEMSS provides estuary managers with a powerful tool for considering impacts on the environmental, social and economic values of an estuary and properly accounting for all of the likely risks involved with decisions to artificially open (or not to open) an estuary. In addition to its use as a decision support tool, the EEMSS also provides sound guidance for the ongoing management of estuaries by establishing important baseline data such as records of estuary entrance openings, water levels, water quality data, and species lists.

Principles

An artificial estuary entrance opening will only occur if:

- a risk-based assessment that considers impacts on the environmental, social and economic values of the estuary determines it is appropriate
- weather and physical conditions allow for a safe and effective opening as outlined in approval conditions.



Artificial estuary opening at Painkalac Creek.
Courtesy Corangamite CMA

Policy 13.3

Waterway managers will take the lead role in the regulation of estuary entrance opening using the process outlined below:

- a. A risk-based assessment considering the environmental, social and economic values of an estuary is conducted when making a decision whether or not to open an estuary. The Estuary Entrance Management Support System (EEMSS) should be used by waterway managers to inform decisions about artificial estuary entrance openings, where possible.
- b. Waterway managers will be primarily responsible for all decisions regarding requests to artificially open an estuary entrance. Approval under the *Water Act 1989* issued by the waterway manager will outline the conditions of estuary openings.
- c. Where required, waterway managers in conjunction with relevant agencies will develop a Memorandum of Understanding (MOU) for estuary openings. On a case by case basis MOUs will identify roles and responsibilities, the process and the beneficiaries of artificial openings, which will in turn guide funding arrangements for the works component and water quality monitoring requirements of the estuary opening. The MOU will be signed by all parties and reviewed as required.
- d. The land manager or delegated responsible entity (permit holder) identified in the relevant MOU will be responsible for carrying out the works component of all artificial estuary entrance openings.

Waterway managers in conjunction with relevant agencies will investigate alternative management options for agricultural or residential land and infrastructure (built) assets that are regularly threatened by inundation due to estuary closures.

Action 13.3: Implement a risk-based assessment process to help inform estuary entrance management decisions.

Who: Waterway managers.

Timeframe: late 2013

Action 13.4: Identify land or built assets that regularly are the subject of requests to open an estuary entrance and determine if any alternative actions can be undertaken to minimise the long-term threat of inundation.

Who: Waterway managers.

Timeframe: 2016

Managing estuary entrances for flooding impacts

While estuary entrance opening may be undertaken to reduce inundation impacts on current built assets, it is also important to manage future development in areas that may be inundated when the estuary entrance is closed. Flood planning controls (such as the Urban Floodway Zone, Land Subject to Inundation Overlay and Floodway Overlay) may be used to reflect the extent of potential inundation due to estuary entrance closures and provide a trigger for more detailed consideration of risks from development in these areas as well as riverine flooding. Riverine flooding results from heavy rainfall events in the catchment, whereas flooding from estuary entrance closures can occur in times of low inflow. These controls may need to be reviewed over time as information on the vulnerability of estuaries and other coastal assets to sea level rise and potential climate change impacts (as identified in the VCS) is better understood and mapped.



Thompson Creek estuary. Courtesy Corangamite CMA

Principles

To avoid inappropriate development in areas subject to inundation from estuary entrance closures, land use planning controls will reflect the extent of potential inundation based on the best available information about coastal processes, estuary entrance dynamics and riverine hydraulic considerations.

Flood provisions in planning schemes for estuarine areas will be reviewed by waterway or floodplain managers and local government as information about the vulnerability of estuaries and other coastal assets to sea level rise and potential climate change impacts is improved.



Benedore River estuary. Courtesy East Gippsland CMA

Action 13.5: Review and update planning controls in local planning schemes to include areas that are subject to inundation due to estuary entrance closure, which are not currently addressed.

Who: Waterway and floodplain managers, local government.

Timeframe: 2020

13.3.2 Maintaining and improving environmental condition of estuaries

The environmental condition of instream and riparian estuarine habitat, vegetation communities and animal species can be affected by threats from the surrounding catchment. Erosion and sedimentation can affect the water quality of estuaries. The maintenance and improvement of these habitats (and their associated values) is vital for improving estuary condition as they provide food, cover, migratory corridors and breeding/nursery areas for many species.

Connectivity between the river, fringing wetlands, floodplains and the ocean is important for some estuarine species (particularly fish) to complete their life cycles and for nutrient exchange between habitats. Barriers such as concrete banks (built to protect infrastructure), weirs, and sand banks can reduce connectivity of estuaries both longitudinally and laterally (with fringing ecosystems such as wetlands). Inappropriate timing of estuary entrance openings can also affect longitudinal and lateral connectivity of estuarine habitats. Such openings are often triggered by impacts on adjoining private land.

Sea level rise may result in wetland and estuarine habitats naturally migrating inland, but this adaptive process may be hindered by built assets and infrastructure. Management activities to enhance connectivity and condition, such as riparian management programs (see Chapter 9) and barrier removal (see Section 11.4), along both river and estuarine reaches are critical for waterway health.

Policy 13.4

Work programs will be developed and implemented through regional Waterway Strategies to maintain or improve environmental condition of priority estuaries. Enhancing latitudinal and longitudinal connectivity of estuaries will be a critical part of the work programs.

Regulation through legislation, statutory processes, works on waterways approvals and planning controls will continue to be used to protect the environmental condition of Victorian estuaries.

Long-term strategic waterway and coastal planning will consider potential future changes to coast lines, estuary structures (built), estuarine extent, sea level changes and other relevant factors to prepare for potential changes in the extent of estuary areas and their associated plants and animals.

Waterway managers will identify opportunities to mitigate the impact on estuarine condition caused by sea level rise, more frequent estuary closures expected from reduced flows in dry periods and regular artificial estuary openings.

Where private land interfaces with high value estuaries, arrangements may be sought with the landholders to maintain the condition of the estuary. This may include landholder agreements and/or covenants. In limited circumstances where land is offered for sale, the government may choose to purchase the land.

13.3.3 Setting water quality objectives for estuaries

Water quality objectives for estuaries in Victoria are included in the *State Environment Protection Policy (Waters of Victoria)* and are drawn from the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC guidelines) (see Section 10.2.1). However, these guidelines are based on data from estuaries that are not representative of many of Victoria's estuarine systems. In 2010, the Environment Protection Authority (EPA) Victoria developed *Environmental Water Quality Guidelines for Victorian Riverine Estuaries*² to support the sustainable management of Victoria's estuarine ecosystems (see Box 13.1). These guidelines provide a specific framework and tools for assessing the water quality of Victorian riverine estuaries.

Policy 13.5

Where sufficient monitoring data is available, the *Environmental Water Quality Guidelines for Victorian Riverine Estuaries* will be used to inform water quality targets for Victoria's riverine estuaries in the regional Waterway Strategies.

Box 13.1: Environmental Water Quality Guidelines for Victorian Riverine Estuaries

The *Environmental Water Quality Guidelines for Victorian Riverine Estuaries* support the sustainable management of Victoria's estuaries.

The guidelines were developed using water quality and estuary condition data collected from 31 reference estuaries across Victoria and provide preliminary water quality guideline values and a tool to allow estuary managers to improve their understanding of estuaries. The water quality guideline values represent a level at which there is a potential risk that adverse environmental effects may occur and a risk-based investigation may need to be conducted.

The guidelines use control charting to provide users with a graphical tool to detect patterns in the measurements of estuary environmental variables. Control charts allow the user to compare environmental measurements taken in an estuary of interest with what would be expected for an estuary in good condition. The use of control charts reflects a new approach to assessing condition in waterways. Control charting allows the natural causes of variability to be taken into consideration, removing their effect and reducing the overall variability of the data.

The guidelines can be refined as additional regular monitoring data becomes available. This will enhance understanding of estuaries and their processes and provide the basis for their sustainable management.

13.3.4 Determining environmental water requirements for estuaries

A key gap in the management of estuaries has been the lack of a consistent and systematic approach to determine the environmental water requirements of estuaries. The input of freshwater from rivers or groundwater is a major influence on estuary condition, but there is little knowledge regarding the extent of effects caused by altering freshwater flows to estuaries.

To fill this management gap, the Victorian Government developed the Estuary Environmental Flows Assessment Methodology (EEFAM) (see Section 8.3.1). EEFAM is a decision support tool to guide the delivery of environmental water to support estuarine condition.

13.3.5 Managing coastal acid sulfate soils

An emerging issue for estuary management is the disturbance of coastal acid sulfate soils in estuarine wetlands and marshes (see Section 10.8). The *Victorian Coastal Acid Sulfate Soils Strategy*³ aims to protect the environment, humans and infrastructure from the potentially harmful effects of disturbing coastal acid sulfate soils. The development of the *Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils*⁴ provides land managers with guidelines to address this problem.

A map of where coastal acid sulfate soils are a potential issue in Victoria is provided by the *Victorian Coastal Acid Sulfate Soils Strategy*. The map identifies locations where immediate action or protection or installation of detailed monitoring networks might be warranted.

13.4 Information to improve estuary management

Improved knowledge about estuaries is critical to inform policy and management.

It is vital to understand the links between the values of estuaries, threats to those values and how management activities can reduce threats and improve environmental condition of estuaries. Logic models can be used to predict the impact of management interventions on the values and condition of estuaries (see Section 17.2.1). A consistent method for assessing the environmental condition of Victorian estuaries has not previously been available. However, the Department of Environment and Primary Industries (DEPI) has now developed a pilot Index of Estuary Condition (IEC) program (see Sections 3.2.3 and 17.3.4). Victoria's estuaries are likely to become increasingly vulnerable to climate variability and land use changes. Potential sea level rise will increase areas of inundation in low lying land adjacent to current estuaries. Reductions in freshwater flow will allow marine waters to move further upstream. The combination of these physical factors will have serious implications on where critical habitats, such as saltmarsh, mangroves and seagrass will exist in the future. Changes in these habitats will also have impacts on a range of natural values, including those that support important

industries such as fishing and tourism. Models and maps of vulnerable estuaries affected by expected changes in climate are needed to inform management decisions.

The potential impacts of artificial estuary entrance openings on the environmental condition of estuaries are poorly understood. It is important to understand the impacts of artificial openings on the hydrological cycle within the estuary and impacts on the surrounding coastal environment. This information is vital to inform decisions on artificial estuary entrance openings.

Policy 13.6

The Victorian Government will increase knowledge that supports the management of estuaries, giving priority to research:

- into vulnerability of estuarine function to potential changes in climate and catchment threats
- that improves understanding of consequences of altered estuarine hydrology, including artificial estuary entrance opening and water harvesting activities within the catchment.

Action 13.6: Review vulnerability of estuaries from coastal sea level rise and other potential impacts of climate change to inform appropriate adaptation strategies.

Who: Department of Environment and Primary Industries, Department of Transport, Planning and Local Infrastructure, waterway managers, local government.

Timeframe: 2016



Sydenham Inlet. Photographer: Sean Phillipson

13.5 Increasing community awareness and understanding of estuaries and their management

Efforts to maintain or improve estuary condition require community support. Several initiatives that raise community awareness of waterway management issues already exist, such as Waterwatch, EstuaryWatch, Coastcare Victoria, Land for Wildlife, Fishcare and Landcare.

Of these, EstuaryWatch is the only program specific to estuaries. EstuaryWatch is a community-based estuary monitoring program that collects water quality and other estuary data. It aims to help local communities learn more about the unique characteristics and health of individual local estuaries and to provide information to inform estuary management. Community data collected by EstuaryWatch participants can also be used to inform decisions regarding artificial estuary entrance openings.

EstuaryWatch was established by the Corangamite CMA and the Western Coastal Board in 2006. The success of the Corangamite program led to an expansion of EstuaryWatch into the Glenelg Hopkins and West Gippsland CMA regions. EstuaryWatch allows community members to actively participate in estuary health monitoring and provides a pathway for community members to increase their knowledge about estuaries through regular seminars, information days and training.

Policy 13.7

The EstuaryWatch program will be supported to:

- provide opportunities for the community to participate in estuary monitoring activities that help inform decision-making
- increase community awareness of estuary management issues, particularly the management of estuary entrances.

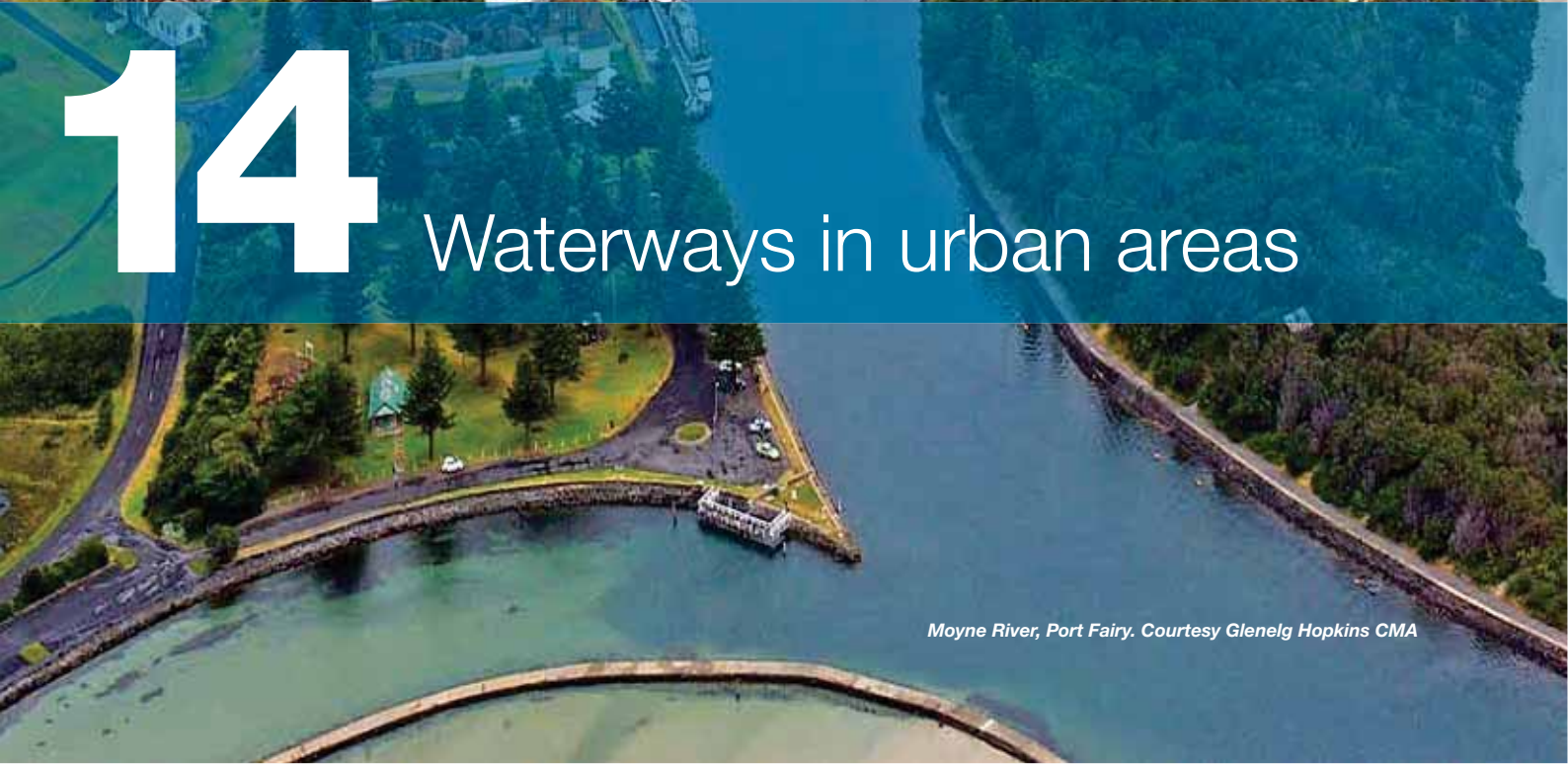


Water quality monitoring at Anglesea River. Courtesy Corangamite CMA



14

Waterways in urban areas



Waterways in urban areas

Guide to the chapter

14.1 Context

- Values of waterways in urban areas
- Threats to waterways in urban areas

14.2 Strategic waterway planning arrangements

- Roles and responsibilities for waterway management
- Current waterway management in urban areas
- Urban water reform: *Living Victoria*

14.3 Knowledge gaps

What are the issues with existing arrangements?

Waterways in urban areas are often in poor environmental condition, typically due to impacts from stormwater runoff. Research has shown that retaining stormwater in urban catchments for local use, or infiltrating stormwater into soils or vegetated areas could improve waterway condition. Better use of urban stormwater could also reduce reliance on drinking water supplies, provide water to green urban spaces, reduce the heat island effect in built environments and reduce the risk of flooding. Realising these multiple benefits will require greater integration of urban planning, water service planning and waterway management planning and improved co-ordination and collaboration between responsible agencies.

What improvements does the Strategy make?

Improved condition of waterways in urban areas will be a key outcome of the Government's *Living Victoria* initiative for urban water, which is a commitment to:

- support liveable and sustainable communities
- protect the environmental health of urban waterways and bays
- provide secure water supplies efficiently
- protect public health
- deliver affordable essential water services.

The above policy will:

- improve the condition of waterways in urban areas and achieve other benefits by adopting new whole-of-water-cycle management principles and approaches in planning and managing urban waterways.
- ensure co-ordination and common understanding of whole-of-water-cycle management across agencies and the community through the activities of the Office of Living Victoria, including the preparation of regional and local water cycle plans.

14.1 Context

Waterways are a focal point for many cities and towns throughout Victoria and most urban communities have a long history of interaction with their local waterways.

Historically, waterways in urban areas (such as the Yarra River in Melbourne throughout the 1800s) were treated as little more than pipelines to remove waste from rapidly expanding communities. Meat industry waste, factory waste, huge amounts of litter and raw sewage all ran directly into the Yarra River¹ and other rivers running through regional centres. The eventual development of sewerage systems to pipe waste directly to treatment plants was a major advance in waterway management. Waterways in urban areas were also historically managed with a strong engineering focus on flood conveyance and the provision of drainage services, which involved modification of many waterways into concrete drains and channels.

Major clean-up campaigns of the late 1970s and 1980s led to improved waterway health for many waterways in urban areas. For example, significant work in the Yarra River and surrounding catchment saw the return of animals such as platypus and a range of migratory native fish species. Despite the muddy appearance of the water, the Yarra River is probably one of the cleanest capital city rivers in the world². Currently, water quality in the Yarra River varies along its length, from good in the upper reaches to poor in some locations in the lower Yarra, particularly after heavy rain.

Generally though, water quality in the Yarra is suitable for many of the uses valued by the community.

The next stage in this transformation is to value waterways as an integral part of our cities and towns and work to improve the health of these waterways through better planning and use of water resources to make urban areas more liveable and sustainable.

The key values, threats and management activities for waterways in urban areas are shown in Figure 14.1

14.1.1 Values of waterways in urban areas

Although waterways in urban areas are often highly modified, they provide many important benefits for communities. The Yarra River supports considerable recreation and tourism; providing the setting for a range of sports, festivals and major events each year. In regional urban areas, waterways often run through the centre of towns and provide a meeting place and setting for recreational activities, as well as a focal point and sense of identity for the community. For example, many towns have weir pools that once had an historic water supply function, but now provide important recreation and amenity values.

Waterways in urban areas are often prized for their very high social values, due to their location near to large populations that access waterways on a daily basis for a range of beside water activities. Walking, running, cycling and barbecues are all popular activities along waterways in urban areas.



Figure 14.1: Values (white), threats (red) and management actions (black) for waterways in urban areas.

Recreational fishing is an important social and tourist activity in some regional centres. Access to waterways and associated public space, and the amenity that they provide, is an important consideration in improving liveability in urban and urbanising areas. Management of waterways is focused on maintaining or improving the environmental condition of waterways to support environmental, social, cultural and economic values (see Section 3.4). In urban areas, this may include planting native trees for shade (to support passive recreation), or improving water quality to a level that is safe for rowing or kayaking.

In addition to providing the setting for recreation, physical activity and tourism, waterways in urban areas also provide a valuable point of connection with nature in an ever intensifying urban environment. The *My Victorian Waterway* survey found that the Merri Creek in Melbourne's north is Victoria's most popular urban creek, despite the fact that it is heavily affected by urban development³. Waterways in urban areas provide critical services with significant economic value, including town water supplies, flood conveyance and disposal of wastewater and stormwater. They also help to sustain vegetation in the urban landscape and aid in natural cooling of urban areas. Urban waterways and their riparian corridors often provide the only opportunity for the movement of wildlife in developed areas and provide important habitat within the built landscape.



Relaxing by the Yarra River. Photographer: Melissa Clarke

14.1.2 Threats to waterways in urban areas

Waterways in urban areas are often adversely affected by urban development (new or infill) that increases impervious (hard) surfaces and changes the natural water cycle of catchments. Adverse impacts result from the increased runoff of polluted stormwater into waterways. That is because stormwater has traditionally been directly piped to the nearest waterway to help facilitate development. The subsequent increased frequency and intensity of flows can degrade waterway condition, while also reducing important base flows that were previously supplied by slow infiltration through catchment soil and vegetation. The health of waterways in urban areas has also been affected by the removal of riparian vegetation and channelisation of waterways, including the piping of their smaller tributaries.

Future population growth, increased urban infill and development, and the potential impacts of climate change will put increasing pressure on waterways in urban areas. A new approach to managing Victoria's urban water systems is therefore needed.

Scientific research has shown that retaining stormwater in urban catchments for local use, or assisting infiltration of water into soils and vegetation can improve waterway condition. Making better use of and retaining stormwater in our urban areas can also help to secure drinking water supplies, green our towns and cities, reduce the heat island effect present in developed areas, improve our natural environments and reduce the risk of localised flooding. This needs to be reflected in how we plan for and manage our urban environments and urban waterways in the future.

Planning for urban waterways, urban water resources and the built environment is currently managed across a number of agencies and planning processes. Better integration, collaboration and co-operation between these agencies is needed to deliver integrated water cycle management outcomes. The *A Cleaner Yarra River and Port Phillip Bay – A Plan of Action*⁴ (see Box 14.1) is an example of government agencies collaborating to deliver a range of improved water quality outcomes for the Yarra River and Port Phillip Bay.

Box 14.1 Water quality in the Yarra River and Port Phillip Bay

The Yarra River and Port Phillip Bay are iconic natural assets that are highly valued by Victorians, as well as visitors from interstate and overseas. They support a wide range of environmental, social, cultural and economic values; many of which are dependent on environmental condition. Water quality is particularly important for animals and plants (such as platypus, fish, birds, riparian vegetation and seagrass), as well as supporting opportunities for recreation and tourism. While the Yarra and the Bay are overall in good condition, water quality in the Yarra River can vary along its length, from good in the upper reaches to poor in some locations in the lower Yarra, particularly after heavy rain. Water quality in the Bay and along the beaches is highly valued for recreation and social events during summer but these are dependent upon the quality of water from rivers and catchments upstream.

Actions by a number of government agencies have been identified to improve water quality and ensure that current and future generations can have the confidence to use and enjoy the values provided by the Yarra River and Port Phillip Bay. These actions are specified in the *A Cleaner Yarra River and Port Phillip Bay – A Plan of Action*, released by The Hon. Ryan Smith MP in early 2012 which focuses on four priority tasks to improve water quality in the Yarra River and Port Phillip Bay:

- enable more effective co-ordination between government agencies in protecting water quality and providing timely information to communities about water quality events
- manage threats to water quality, including pollution, litter and stormwater inputs by identifying new priority actions to address them
- develop easier ways for the community to access information about water quality of the Yarra and the Bay
- support Victorians to take actions that care for and protect the Yarra and the Bay.



Litter and pollutants entering waterways through drains. Courtesy Melbourne Water

14.2 Strategic waterway planning arrangements

14.2.1 Roles and responsibilities for waterway management

Institutional arrangements, roles and responsibilities of key agencies in waterway management are outlined in Chapter 18. Regional planning processes for waterway management are outlined in Chapter 4. The differing institutional arrangements for the metropolitan Melbourne region compared to urban areas in other parts of Victoria are described in Section 18.2.2.

14.2.2 Current waterway management in urban areas

Waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) implement state policy for waterway management through various strategies and plans prepared for the waterways in their region.

In the metropolitan region, Melbourne Water also has responsibility for the regional drainage system. In undertaking this role Melbourne Water works closely with the 38 local governments, which have responsibility for local drains, road networks, streets and property drainage that feed into regional drains and urban waterways in the metropolitan region.

Catchment management authorities (CMAs) are the waterway managers for the sections of urban waterways outside of Melbourne Water's area of responsibility. In some areas, local governments may be appointed Marine Safety Act (MSA) waterway managers (see Ch 1, Box 1.2 and Section 18.2.2). As with the Melbourne region, local governments have responsibility for managing urban stormwater. CMAs also work collaboratively with local governments to manage the impacts of urban stormwater runoff on urban waterways.

There are currently several strategies, plans and approaches relevant to waterway management in urban areas.

For the Department of Environment and Primary Industries and other agencies and organisations these include:

- This *Victorian Waterway Management Strategy* – which describes the state policy framework for managing rivers, estuaries and wetlands from 2013–2020
- *A Cleaner Yarra River and Port Phillip Bay-A Plan of Action* – which outlines actions to improve water quality in the Yarra River and Port Phillip Bay (for the metropolitan region only).

For Melbourne Water these include:

- *Healthy Waterways Strategy* – which focuses on waterway management for the Port Phillip and Westernport region and proposes a range of targets and associated programs to be carried out by Melbourne Water from 2013/14 to 2017/18

- *Stormwater Strategy* – which focuses on the management of stormwater in metropolitan Melbourne and its surrounding peri-urban and rural areas
- *Development Planning Servicing Plan* – which focuses on providing drainage services for the developing urban areas of Melbourne for the period 2013/14 to 2017/18
- *Port Phillip and Westernport Region Flood Management and Drainage Strategy* – which focuses on addressing drainage and flooding issues across the Port Phillip and Westernport region.

For CMAs these include:

- regional Floodplain Management Strategies – which focus on floodplain management
- regional Waterway Strategies (see Chapter 4) – which identifies priority management activities for waterways in their region (replacing the regional River Health Strategies)
- reliance on strong partnerships, cost-sharing arrangements and good will from local governments and other partners to deliver improved waterway management outcomes.

For local governments these include:

- participating in the development and implementation of the range of waterway management initiatives of Melbourne Water and CMAs
- regulating land use and development through municipal planning schemes to meet a range urban stormwater management objectives
- developing and implementing urban stormwater management plans.

A significant challenge for managing urban waterways is stormwater runoff from impervious surfaces in existing and new urban areas. Despite some advances in water sensitive urban design and urban development projects, urban stormwater has largely been managed as a nuisance that needs to be removed from urban areas through drains and waterways as quickly as possible. This has been considered appropriate to enable stormwater and urban waterway managers to effectively manage inundation constraints of land in urban areas and reduce the risk of flooding. Stormwater is more recently being considered a valuable resource that can provide a range of benefits to towns, cities and communities. Future arrangements for planning and managing urban stormwater and its interactions with the built environment and impact on urban waterways will have to be adapted to reflect this.

14.2.3 Urban water reform: *Living Victoria*

As part of the *Living Victoria* initiative, the Government has created the Office of Living Victoria (OLV) to drive the integration of water and urban planning and the delivery of whole-of-water-cycle management in urban areas.

The OLV was established in May 2012 and has commenced work on a number of key initiatives relevant to urban waterways. These initiatives include:

- preparation of *Melbourne's Water Future*, a high level strategy listing all the initiatives that need to be undertaken to improve how we manage Melbourne's urban water cycle. The draft strategy was released 1 July 2013 for community consultation⁵.
- administration of the Living Victoria Fund, which will provide funding to a number of stormwater related projects
- co-ordinating and facilitating the development of regional water cycle plans for Melbourne's four growth areas and inner Melbourne
- preparing a Regulatory Impact Statement for building controls to improve the water performance of new buildings
- working with the Department of Transport, Planning and Local Infrastructure to amend the Victoria Planning Provisions to apply the current performance requirements for the management of stormwater more broadly.

These, and other initiatives by the OLV, will help deliver the Government's *Living Victoria* initiative by ensuring water is planned for using a whole-of-water-cycle management approach in ways that support and enhance Melbourne's liveability.

The adoption of whole-of-water-cycle management should reduce the impacts of urban development on waterway condition through increased retention, use and infiltration of stormwater at the local level. The benefits of such an approach are evident from the Little Stringybark Creek Project (see Box 14.2).

Further information on these and other initiatives relating to waterways in urban areas can be found at www.water.vic.gov.au/initiatives/livingvictoria/office-of-living-victoria

The introduction of the new whole-of-water-cycle management policy and approaches will have implications for the strategies and plans outlined in Section 14.2.2. In time, these strategies and plans may be incorporated into, or be further developed to incorporate, the new whole-of-water-cycle management policy and approaches. This may provide opportunities for integrating or rationalising the multiple plans and strategies currently guiding waterway management in urban areas of Victoria.

Box 14.2: Little Stringybark Creek Project

The Little Stringybark Creek Project is a research program co-ordinated by the University of Melbourne and Monash University. It is putting into practice new approaches to stormwater management to help improve the health of waterways in urban areas.

Little Stringybark Creek is in the Dandenong Ranges, east of Melbourne and has interactions with the urban township of Mount Evelyn. Extensive monitoring indicates that the environmental condition of Little Stringybark Creek is affected by stormwater runoff. However, the extent of stormwater drainage in the catchment is small enough that a relatively small investment in stormwater retention can achieve improvements in waterway health.

Intercepting stormwater drainage pipes with alternative drainage systems that allow capture of water from most rainfall events (for use or infiltration) is likely to be an effective means of reducing the impact of urban stormwater on receiving waterways. Private properties typically make up 50% of the impervious area of urban catchments and are therefore a large contributor to the poor environmental condition of many waterways in these areas. However, property owners can make a substantial contribution to improving waterway health by reducing the frequency and volume of stormwater entering local waterways through retention of stormwater on their properties.

The Little Stringybark Creek Project has worked with property owners in Mount Evelyn to install rainwater tanks, raingardens or a combination of both on their properties. By using auction processes for this program, the project has determined a market price for stormwater retention works. This price has been used to prioritise funding of larger stormwater harvesting and infiltration projects constructed by the Yarra Ranges Shire Council to manage the stormwater generated from roads and untreated properties of the catchment.

The project is continuing to monitor the environmental condition of the creek (and other nearby waterways) to demonstrate the effectiveness of dispersed stormwater retention and infiltration in improving waterway health.

For further information on this project visit www.urbanstreams.unimelb.edu.au

14.3 Knowledge gaps

Onsite wastewater systems aim to treat and manage domestic wastewater to an acceptable standard and contain it within the boundaries of the property (for example, septic tanks).

In 2007, the Municipal Association of Victoria estimated that there were around 300,000 domestic onsite wastewater systems across Victoria. On an appropriate site and when an appropriate system is in place that is maintained and managed properly, onsite systems can effectively manage wastewater. However, when the site is not suitable, the sites are further developed, or when the onsite systems are not managed and/or maintained correctly, they can be a source of pollution and diminished water quality.

In 2012, the Victorian Government released guidelines for *Planning permit applications in open, potable water supply catchment areas*⁶. The guidelines enable consideration of higher density of development if certain conditions are met, including the development and implementation by the relevant local council of a Domestic Wastewater Management Plan.

While considerable work has been undertaken to date, the extent and magnitude of potential impacts on waterways from onsite wastewater systems is complex and remains a current knowledge gap that requires further investigation.



Onsite wastewater systems are common for properties in rural Victoria. Courtesy DEPI



15

Extreme events of flood and bushfire

Extreme events of flood and bushfire

Guide to the chapter

15.1 Context

- Extreme events of flood and bushfire
- Impacts of floods on waterways
- Impacts of bushfires on waterways

15.2 Management arrangements for extreme events of flood and bushfire

- Emergency management arrangements
- Flood management arrangements
- Bushfire management arrangements

15.3 Reducing flood and bushfire impacts in waterways

- Establishing a strategic risk-based approach to disaster mitigation
- Management of levees
- Management of instream vegetation and debris
- Ensuring best practice standards for works on waterways in extreme events
- Reducing future flood risk through riparian management programs

15.4 Flood and bushfire response

15.5 Flood and bushfire recovery

- Natural disaster assistance
- Prioritising flood recovery activities
- Reprioritising actions for waterways affected by flood or bushfire

What are the issues with existing arrangements?

Land use change, development on floodplains and predicted changes in climate may increase the severity and frequency of floods and bushfires and reduce the resilience of waterways, limiting their ability to withstand or recover from extreme events. There is a need to describe how the existing arrangements for floods and bushfire management apply to waterway management, how flood and bushfire damage can be reduced and how flood and bushfire response and recovery can be improved. Studies of recent floods have demonstrated that public investment in riparian management programs between floods can reduce the amount of damage to private and public infrastructure during floods. This highlights areas where waterway management can better complement flood management.

What improvements does the Strategy make?

For extreme events of flood and bushfire the Strategy will:

- better integrate future flood management with waterway management
- improve consideration of waterways in bushfire planning and management
- ensure that waterway values and assets are included in bushfire and flood rapid risk assessment processes
- provide direction for reviewing and reprioritising resource allocation after an extreme event.

15.1 Context

This chapter outlines the policy for dealing with natural disasters that are of rapid onset, cause acute short-term stress to waterways, and require emergency management.

The two main such events are floods and bushfires. While drought can also affect waterways, the effects are chronic rather than acute and unlike floods and bushfires, droughts are not classified as natural disasters (see Box 15.3). Managing waterways through periods of drought is addressed as part of the seasonally adaptive approach, as outlined in Section 4.2.5. The management of water quality incidents is addressed in Sections 10.5 and 10.6.

15.1.1 Extreme events of flood and bushfire

In the last decade, Victoria experienced several severe bushfires and floods. Extensive bushfires occurred in 2003, summer 2005/2006, summer 2006/2007 and in 2009. In 2007, severe rainfall caused flooding in West Gippsland and parts of East Gippsland. Widespread flooding occurred across much of Victoria in 2010, 2011 and 2012.

This chapter outlines the management framework to reduce, respond to and recover from the impacts on waterways from the extreme events of flood and bushfire (see Box 15.1).

Floods and bushfires are a natural part of Victoria's environment. Waterways have evolved with natural flood and bushfire cycles and are adapted to benefit and recover from these periodic disturbances. Under natural conditions, floods and bushfires can be important for nutrient cycling. Floods drive many of the geomorphological and biological processes that sustain the health of rivers, estuaries and wetlands. They can scour sediment deposits from instream pools, provide inputs of large woody habitat to waterways, aid dispersal of native species and open estuary entrances. Many of Australia's plants and animals have evolved to survive bushfire events and many plants rely on bushfires to regenerate.

Changes in catchment and floodplain land use from human settlement have contributed to an increased frequency and severity of floods¹. Also, possible changes in climate may increase the intensity of future floods and bushfires in Victoria². Under these changed conditions, waterways may have a reduced ability to withstand or recover from these disturbances. In addition, the public infrastructure for transport, services and communication that crosses or is located near waterways is at the risk of damage in floods and bushfires.

Box 15.1: Extreme events of flood and bushfire

Flood or bushfire is regarded as an extreme event when it requires a response that is beyond the normal level of local resources, has complex and wide ranging impacts on communities and built and natural assets and overwhelms normal protective measures in waterways.



2012 flood in Nathalia. Courtesy DEPI

15.1.2 Impacts of floods on waterways

The adverse impacts of floods on waterway condition and values are primarily related to accelerated rates of river channel erosion, which have been exacerbated by past clearing of native vegetation in catchments and on riparian land. Impacts include avulsion (the abandonment of the main river channel in favour of a new course), channel widening, infilling of large pools by sediment, erosion of important habitat, damage to native riparian vegetation and loss of large wood for instream habitat. Fences protecting riparian vegetation may be lost or damaged. Floods can affect estuaries and wetlands, primarily through the delivery of large amounts of sediments and nutrients. Flood events can also accelerate the spread of invasive species. Debris (such as logs and branches) may accumulate above bridges or culverts and erosion of the channel may threaten infrastructure. Waste from sewage treatment facilities may enter waterways and stock may be killed during floods.

Over the past 25 years in Victoria, river restoration works to address flood impacts have required grants of approximately \$74 million, equivalent to approximately \$3 million per year³. A large proportion of the flood response and recovery cost relates to impacts from high energy flows in rivers and streams. Floods with the highest energy tend to occur in Gippsland and the north east of Victoria due to steep terrain, relatively steep river channels and the high intensity of rainfall in the Great Dividing Range.

Accelerated rates of erosion and channel change can also damage public infrastructure associated with waterways as well as agricultural land. The full cost of recovery, including bridge replacement, is estimated to be an order of magnitude higher than that for river restoration works³. Following the 2010 and 2011 floods in Victoria, the State Government budgeted \$141.5 million for repairs to roads, bridges and railways alone³.

15.1.3 Impacts of bushfires on waterways

Excessive runoff from recently burnt catchments into waterways can cause flooding and can carry high loads of sediments and nutrients into waterways, particularly if a bushfire is followed by heavy rains. Increased nutrients can lead to algal blooms in downstream water bodies. Sediments can reduce available instream habitat, cause low oxygen levels in the water and disrupt the natural breeding cycles of aquatic native animals or cause fish deaths. In wetlands, bushfires can change vegetation composition and structure, destroy native animal habitat, impair biological functions, increase soil erosion and increase the risk of weed invasion. Loss of riparian vegetation through bushfires can reduce shading, increasing the water temperature of rivers or wetlands. In rivers it also increases the risk of erosion in the next flood.

Bushfires in water supply catchments can have significant impacts through contamination of water storages and drinking water supplies with ash, sediment and fire retardants.

Medium-term impacts include decreased catchment runoff to waterways through increased uptake of water by immature trees as the forest regenerates. Bushfires can also damage public infrastructure and waterway assets, such as fences that protect riparian vegetation or pile fields that prevent erosion. Bushfires can also result in stock deaths in the vicinity of the waterway with the risk of water contamination if they are not promptly removed.



Ash in the Cowwarr Weir after the 2007 bushfires. Courtesy DEPI

15.2 Management arrangements for extreme events of flood and bushfire

15.2.1 Emergency management arrangements

Floods and bushfires can be classed as emergencies. The key legislation for emergency management is the *Emergency Management Act 1986*. The *Victorian Emergency Management Reform White Paper*⁴ sets out the strategic priorities and actions for emergency management in Victoria. Emergencies caused by the extreme events of flood and bushfire cause a range of social, economic and environmental impacts, of which the impact on waterways is just one. The *Emergency Management Manual Victoria*⁵ identifies high level roles and responsibilities for agencies involved in emergency management. The Manual also contains the *State Emergency Response Plan*, *State Relief and Recovery Plan* and outlines structures for emergency planning at State and regional levels.

The emergency management framework (Box 15.2) guides the approach to the management of extreme events of flood and bushfire in waterways.

Policy 15.1

Managing risks to waterways and associated public infrastructure from the extreme events of flood and bushfire will be guided by the framework for emergency management.

Box 15.2: Emergency management framework

Emergency management consists of three types of activities.

1. Prevention, mitigation and preparedness activities eliminate or reduce hazard impacts, increase community or environmental resilience, establish planning arrangements and increase community education and awareness.
2. Response activities take place during and immediately after an emergency event.
3. Recovery activities involve reconstruction of physical infrastructure and restoration of affected environments and communities.

15.2.2 Flood management arrangements

The *Victoria Flood Management Strategy*⁶ provides the policy framework for managing floods and guiding regional floodplain management. That strategy is in the process of being renewed. Catchment management authorities (CMAs) and Melbourne Water have floodplain management functions, prescribed in the *Water Act 1989*. They work with other agencies, particularly local government, to develop processes and plans for the implementation of floodplain management activities.

Regional Floodplain Management Strategies have been developed by the CMAs and Melbourne Water and are also scheduled for renewal. They set out the policy framework, the floodplain characteristics and the detailed programs for each region, focusing primarily on flood damage prevention or mitigation.

State and regional flood strategies need to take account of the aspects of flood management that affect waterway values and public infrastructure. In addition, management activities required to manage serious risks to public infrastructure from waterway processes (including flood related erosion or avulsion) should be negotiated by asset owners, waterway managers and relevant beneficiaries of the public infrastructure (see Section 4.2.3 and Section 15.3.1).

Many flood studies are being carried out, or are planned, following the 2010/2011 floods to assess the broader issues associated with the risk of flooding to vulnerable Victorian communities. Flood planners need to consider the condition of waterways as part of their evaluation of flood studies and cover issues such as the effect of instream vegetation on floods, the effects of upstream vegetation on flood levels through towns, blockages under bridges and damage to infrastructure. Ensuring that there is an appropriate setback of new developments from waterways is important for reducing future flood risk to communities and for minimising the cost of ongoing maintenance activities to alleviate flood risk. The updated Victoria Flood Management Strategy needs to complement the policy in this Chapter by addressing these issues and take into account any changes to floodplain management as a result of the Government's response to the Environment and Natural Resources Committee (ENRC) Inquiry into Flood Mitigation Infrastructure in Victoria (see Section 11.3.2) and the review of the *Water Act 1989* (see Section 1.2.1).

Policy 15.2

The integration of flood management and flood related aspects of waterway management will be improved by the alignment of:

- relevant policy between the updated Victoria Flood Management Strategy and the *Victorian Waterway Management Strategy*
- Regional Floodplain Management Strategies and regional Waterway Strategies.

15.2.3 Bushfire management arrangements

Management of waterway-related bushfire risks in Victoria is undertaken in the broader context of the bushfire policy framework. The *Code of Practice for Bushfire Management on Public Land*⁷ establishes the framework for bushfire management (including prevention, preparedness, fuel management, response and recovery) on Victoria's public land. The Code sets the primary objectives for bushfire management, as follows:

- to minimise the impact of major bushfires on human life, communities, essential and community infrastructure, industries, the economy and the environment. Human life will be afforded priority over all other considerations.
- to maintain or improve the resilience of natural ecosystems and their ability to deliver services such as biodiversity, water, carbon storage and forest products.

The Code sets out the risk-based framework for bushfire management planning that aims to reduce the risk to these objectives. The management planning framework is co-ordinated by the Department of Environment and Primary Industries and operates at three levels, as outlined below:

- 1. Strategic level** – Strategic bushfire management plans outline landscape and regional strategies for achieving the objectives of bushfire management and are prepared in collaboration with managers of public and private land, the community and interested stakeholders. They also inform the other levels of planning.
- 2. Operational level** – Consistent with strategic bushfire management plans, fire operations planning sets out a forward-looking program of works and prioritises the annual implementation of actions.
- 3. Tactical level** – Tactical plans (including burn plans, incident action plans and recovery plans) outline how specific actions are to be undertaken.

The Code outlines the intention to engage with stakeholders to identify State, regional and local needs that may be affected by bushfires or bushfire management strategies and actions, to understand the issues and impacts, to seek to mitigate any negative effects and bring about the best practicable bushfire planning outcomes, balancing community and stakeholder needs. In this context, bushfire management planning needs to take account of waterway values and management priorities as set out in regional Waterway Strategies and include actions to minimise the impacts of bushfires and bushfire management activities on waterways.

The *Emergency Management Manual Victoria*⁵ sets the framework for integrated planning by fire management agencies across public and private land at the State, regional and local levels. Under the *Emergency Management Act 1986*, local governments are required to develop Municipal Emergency Management Plans, which (for local governments wholly or partly in regional areas) must include a municipal fire management plan. Municipal fire management plans are reviewed every three years and must identify environmental values and address priority risks in the planning area.

Fire risk for riparian land is covered in more detail in Section 9.3.1.

Policy 15.3

Waterway managers will work with the Department of Environment and Primary Industries, other fire management agencies and local government to ensure that the impacts of bushfires and bushfire management activities on waterway condition and values are minimised, taking account of the priority to protect human life.

15.3 Reducing flood and bushfire impacts in waterways

It is certain that large floods and bushfires will occur in the future.

The scale and relatively unpredictable nature of such events limits the ability of waterway managers to fully protect waterways and associated public infrastructure from the adverse impacts of floods and bushfires. However, there are activities that can be undertaken to reduce impacts from future floods and bushfires.

15.3.1 Establishing a strategic risk-based approach to disaster mitigation

Waterway managers need to prepare for the impacts of floods and bushfires on waterways and public infrastructure. The high energy flows that occur during floods can cause avulsions, river breakaways and bed and bank erosion. Flow energy may be increased by the removal of vegetation after a bushfire. As resources are limited, waterway managers need to adopt a risk-based approach to disaster mitigation that identifies significant risks to waterway condition and public infrastructure in the event of floods or bushfires and prioritises cost-effective actions for risk reduction. Management activities to protect public infrastructure or reduce risks from extreme events are considered in the regional priority setting process (see Section 4.2.3 and Figure 4.2).

There is a range of possible management activities to reduce risk. These include works to prevent erosion when high energy flows occur, removal of debris that has piled up against bridges or culverts during a previous flood and contingency planning for the management of wastes that may enter waterways in floods or the removal of dead stock. Longer term management activities may also be required such as the management of levees and instream vegetation (Section 15.3.2 and 15.3.3) and the reduction of future flood risk through riparian management programs (Section 15.3.5). Section 4.2.3 outlines the policy for managing serious risks to public infrastructure from waterway processes (see Policy 4.3).

Policy 15.4

Waterway managers will adopt a risk-based approach to reduce the likely impacts of floods and bushfires on waterways and identify priority management activities in regional Waterway Strategies.

15.3.2 Management of levees

Levees have a role in protecting communities and landholders from flooding. However, they can affect flood behaviour by confining flow, or by directing flow into new paths. They can affect waterway condition by reducing the natural frequency of flooding on floodplains. Groundwater and nutrient balances are affected by levees, as are floodplain wetlands (see Section 12.7.1) and the native plants and animals dependent on the connectivity of river systems and their floodplains. In August 2012, the Environment and Natural Resources Committee (ENRC) reported to the Government on the management of levees in Victoria as part of the Inquiry into Flood Mitigation Infrastructure in Victoria. The Government's response will inform the policy for the management of levees, which will be set out in the updated Victoria Flood Management Strategy.

Policy 15.5

The updated Victoria Flood Management Strategy will take account of waterway condition in establishing policies for the future management of levees.



Piled up debris against a bridge on the Loddon River following the 2011 flood. Courtesy DEPI

15.3.3 Management of instream vegetation and debris

Vegetation in waterways may include native plants or weeds such as willows. Debris may include wood and other plant material from riparian land and the floodplain as well as rubbish and litter, particularly in urban areas.

Woody debris and native instream vegetation have many benefits for communities and the environment. They provide instream habitat for native animals and support underlying biological processes that maintain waterways in good condition, as outlined in Section 11.3.2. In floods, instream and riparian vegetation also reduce erosion, sedimentation and the movement of wood and other debris downstream. The management of weeds in waterways is addressed in Section 9.3.6 and Section 16.4.

Large-scale removal of vegetation or large wood from rural waterways to alleviate the impacts of flooding is seldom justified. Research has demonstrated that vegetation plays an important role in slowing floodwaters and lowering flood peaks, providing agencies and the community additional time to prepare for flooding³. However, there may be some situations in urban areas where actions to manage instream vegetation are warranted, such as where willows, weeds or woody debris impedes flow and a flood study has demonstrated that this contributes to increased flood risk.

The ENRC Inquiry into Flood Mitigation Infrastructure in Victoria addressed vegetation clearing in waterways and their general maintenance. The Government's response to the recommendations of the ENRC inquiry will guide the management of instream vegetation, as outlined in Section 11.3.2.

15.3.4 Ensuring best practice standards for works on waterways in extreme events

In extreme events, land managers or landholders may undertake works on waterways as an immediate response to perceived risks to their property or assets. However, these works may not always comply with accepted standards or licence requirements under the *Water Act 1989*. Where works are not constructed to the necessary standard, they are likely to pose an immediate or future risk to waterway condition or values and to other landholders, for example, by exacerbating downstream flooding.

Policy 15.6

Waterway managers will work with stakeholders to:

- improve awareness of the need to comply with licence provisions and best-practice standards in undertaking works on waterways in the extreme events of flood and bushfire
- ensure that any substandard works undertaken during extreme events are removed or brought up to standard to minimise future risk to waterway condition or values and to other stakeholders.

15.3.5 Reducing future flood risk through riparian management programs

River erosion during floods can result in the loss of valuable land or public infrastructure (for example, bridges and roads) and degrade habitat for native plants and animals. Improving the resilience of waterways to floods can be achieved through works (for example, erosion control works and small grade control structures) and through riparian management programs (for example, fencing, revegetation, native vegetation enhancement, weed management and provision of offstream stock watering infrastructure, as outlined in Chapter 9). These combined measures can reduce the impacts of floods, hence reducing the costs of flood recovery. Riparian management programs also have many other benefits (see Section 9.1.1).

A study³ on the impact of riparian revegetation on stream erosion during floods in Victoria found:

- the absence of native riparian vegetation increases the occurrence and scale of flood related channel change in streams in Victoria and associated flood related recovery costs in Victoria
- native riparian vegetation, including vegetation established through waterway management programs, is effective at reducing the occurrence, extent and scale of flood related channel change.

The study found that to increase resistance to flood related channel change, riparian vegetation needs to be structurally diverse, an appropriate width to ensure it is ecologically and physically functional and largely continuous along the waterway. The study also indicated that, while native riparian vegetation corridors will increase the resistance and resilience to flood related channel change, where there is significant public infrastructure located near waterways, additional structural works for river bed and bank stabilisation may also be required. This is addressed in Section 11.2.2.

Policy 15.7

The Government will continue to support large-scale riparian management programs and structural works for river bed and bank stabilisation as a means of reducing the longer term risk of flood damage to waterways and associated public infrastructure and property.

15.4 Flood and bushfire response

Urgent works may be required after extreme flood or bushfire events to address immediate risks.

These may include clearing of flood debris in waterways to protect public infrastructure, stabilising waterways affected by erosion, addressing threats to water quality (such as overflows from sewage works or dead stock in waterways), erecting temporary silt barriers after a bushfire or relocating threatened species that cannot survive in waterway habitats affected by bushfire.

A rapid risk assessment approach was initiated in Victoria to assess the immediate risk that resulted from the 2009 bushfires. This approach has now been incorporated as a standard approach for risk assessment after bushfires and floods. The approach was also used to assess the immediate risks of the 2010/11 floods. Assessments are carried out by Bushfire Rapid Risk Assessment Teams with a range of specialist skills including those related to waterway management, biodiversity, flooding, erosion and built assets. The teams prepare a report that identifies priority risks and risk treatment strategies that include an estimate of costs.

Scoping the scale and nature of necessary emergency stabilisation, rehabilitation and recovery works in a waterway as soon as possible after a bushfire or flood event provides timely information to waterway managers, local government, other government agencies and public infrastructure owners to enable them to rapidly prioritise and manage the immediate risks in their areas of responsibility. It also assists government to determine the likely cost implications. Long-term waterway management program priorities may need to be adjusted to enable urgent works to be undertaken after a bushfire or flood.

Policy 15.8

After floods and bushfires, the Department of Environment and Primary Industries may undertake rapid risk assessments that will assess the risks to waterway condition and values, water quality and public infrastructure associated with waterways.

Waterway managers, in consultation with local government, other government agencies and public infrastructure owners, will respond to the findings of the rapid risk assessments by identifying and implementing priority management activities to address immediate threats to waterway condition and values affected by floods or bushfires.



*Bridge on Guys Forest Road, Burrowye (before flood).
Courtesy Towong Shire Council*



*Bridge on Guys Forest Road, Burrowye (after flood, 2012).
Courtesy Towong Shire Council*



Impacts of bushfire on waterway condition. Photographer: Jarod Lyon

15.5 Flood and bushfire recovery

There are two main aspects to flood and bushfire recovery in relation to waterway management. These are the funding and prioritisation of recovery activities and the reassessment of waterway values that have been affected.

15.5.1 Natural disaster assistance

The Natural Disaster Funding Assistance Program administered by the Victorian Department of Treasury and Finance provides funding assistance to local governments, State government departments and CMAs for recovery from natural disasters. When the estimated costs of a disaster exceed an agreed threshold, the Australian Government also contributes funding. The National *Natural Disaster Relief and Recovery Arrangements Determination 2011*⁸ (NDRRA determination) defines a natural disaster (Box 15.3) and sets out the terms and conditions for Commonwealth financial assistance to the states and territories in line with agreed funding thresholds.

Box 15.3: Definition of a disaster

In the National *Natural Disaster Relief and Recovery Arrangements Determination 2011* a natural disaster means a serious disruption to a community or region caused by the impact of a naturally occurring rapid onset event that threatens or causes death, injury or damage to property or the environment and which requires significant and co-ordinated multiagency and community response.

Natural disasters include bushfires and floods but not drought.

Under the natural disaster assistance arrangements, the cost of eligible emergency and recovery works by CMAs are met. No financial co-contribution from CMAs for works is required. However, CMAs meet the costs of co-ordinating, managing and supervising eligible works. Eligible actions include the restoration or replacement of essential public assets (such as bridges and roads) to a pre-disaster standard or to a more disaster resilient standard (if it is considered that the proposal is cost-effective and will mitigate the impact of future natural disasters).

The policy for the replacement of fencing destroyed in floods and bushfires is set out in Section 9.3.3.

The process for developing, assessing and reporting on the implementation of flood claims under the Victorian Government Natural Disaster Funding Assistance Program requires review. There are opportunities to streamline the current process for assessing and approving flood claims and reporting on the implementation of approved works.

Policy 15.9

For natural flood and bushfire disasters, waterway managers will prepare and submit to the Department of Treasury and Finance, applications for funding in accordance with the National *Natural Disaster Relief and Recovery Arrangements Determination 2011*.

Action 15.1: Review and improve the process for developing, assessing and reporting on the implementation of flood claims under the Victorian Government Natural Disaster Funding Assistance Program.

Who: Department of Environment and Primary Industries, Department of Treasury and Finance, waterway managers.

Timeframe: 2014

15.5.2 Prioritising flood recovery activities

Prioritisation of flood recovery activities in waterways is undertaken by waterway managers. Prioritisation of proposed recovery works is essential as the amount of natural disaster funding allocated may not cover the cost of all eligible works, additional activities to those eligible for funding may be required and the initial cost estimate for an action may be exceeded. In addition, prioritisation assists in scheduling the implementation of recovery works. Waterway managers require guidance to ensure a consistent statewide approach.

15.5.3 Reprioritising actions for waterways affected by flood or bushfire

There are several circumstances in which the management activities outlined in regional Waterway Strategies may need to be reprioritised following a flood or bushfire.

Allocated disaster relief and recovery funding may not cover all priority waterway response and recovery activities following a flood or bushfire event. Also, the event may not be of a type or scale that triggers natural disaster funding arrangements. In these cases, waterway managers need to fund priority response and recovery activities for flood and bushfire events in their region from the funds which have been allocated to implement their regional Waterway Strategy.

Flood events may provide opportunities for enhancing some waterway values. Examples include relocation of large wood for instream habitat conservation projects and use of fallen timber from damaged riparian and other vegetation to stabilise and protect banks. After bushfires, there is often greater access to waterways, allowing for easy access to control or eradicate weed species.

Weeds often germinate aggressively after a flood or bushfire event and may need to be controlled as a priority in line with the policy in Section 16.3. Replacing fencing that has been destroyed or damaged in flood and bushfire events can provide an opportunity for better placement of fence lines. Burnt timber from bushfires can be stockpiled for later use as large wood in streams.

Damage from bushfires and floods may be so severe that the former values of a waterway will be changed or potentially lost. The habitat may be damaged to the extent that it can no longer support local populations of key aquatic native plants or animals. It may not be feasible or cost-effective to return particular values to a site in the short-term. The focus may need to change to facilitating a long-term process of recovery.

In the reprioritisation of management activities, waterway managers need to consider both the immediate response that is required as well as the longer term recovery needs. They must also consider the costs and benefits of redirecting funds to other activities and identify opportunities that might arise to improve waterway values following a flood or bushfire.

Principles for prioritising flood recovery actions

In undertaking flood recovery actions, waterway managers will give priority to actions that are required to:

- assess flood damage
- reduce the threat to critical waterway works, public works or public infrastructure
- treat or prevent river avulsions and maintain physical river stability
- protect the environmental, social, cultural and economic values of priority waterways.

Principles for reprioritising activities following a flood or bushfire

In reprioritising activities following a flood or bushfire, waterway managers will consider:

- both the immediate flood and bushfire response and the longer term recovery of waterways from flood and bushfire events
- the costs and benefits of redirecting resources from other management activities
- changes in the environmental, social, cultural and economic values of waterways affected by the flood or bushfire
- changes to the level of threat to waterway condition following floods or bushfire
- opportunities to enhance waterway condition or values as a result of the flood or bushfire.



Restoration works on the Macalister River following 2007 flood. Courtesy West Gippsland CMA



16

Invasive species management in waterways

*Holding a carp caught in the Murray River at the Mallee CMA
Catch A Carp Day 2009. Courtesy Mallee CMA*

Invasive species management in waterways

Guide to the chapter

16.1 Context

16.2 Framework for managing invasive species

- International agreements
- National agreements and strategies
- Victorian strategies
- Role of the *Victorian Waterway Management Strategy*

16.3 Using a risk-based approach for invasive species management in waterways

16.4 An holistic and integrated approach to invasive species management in waterways

16.5 Improved support mechanisms

- Improved knowledge and information systems
- Better surveillance
- Greater community and industry awareness

What are the issues with existing arrangements?

Management of invasive species is complex and requires a high degree of co-operation between international, national, state and regional agencies. A shift towards a more risk-based approach would help focus management efforts and use limited resources more efficiently. Knowledge gaps about the threats, pathways of spread and options for invasive species management in waterways can reduce the effectiveness of management activities. Greater capacity and awareness by community and industry about their role in the management of invasive species that affect waterways is required.

What improvements does the Strategy make?

For invasive species management in waterways the Strategy will:

- establish a risk-based approach, which takes into account both current and future risk for invasive species management in waterways
- outline an holistic and integrated approach to invasive species management
- identify priorities for improved knowledge, surveillance and community and industry awareness.

16.1 Context

Invasive species (see Box 16.1) in waterways and along riparian land are an increasing threat to the health of rivers, estuaries and wetlands in Victoria. The establishment and spread of invasive species is often a symptom of broader land use change and disturbance. It is very difficult to eradicate invasive species and therefore management activities to prevent their establishment are critical.

Past management of invasive species in Victoria has been focused on land-based primary industries, with less consideration of waterways. However, compared to most land, waterways (including riparian land) appear to be especially vulnerable to invasive species. Riparian land is prone to invasion due to high productivity and frequent disturbances¹. The spread of invasive species through waterways and riparian land is assisted by high connectivity as a result of water flowing downstream, or laterally to the floodplain and associated wetlands. It is common for significant movement of invasive species to occur during flood events.

Invasive species affect waterway condition and also have the potential to threaten environmental, social, cultural and economic values. Examples of economic costs are outlined in Box 16.2. Environmental impacts may include predation on, or competition with, native species, loss of habitat and changes to water quality or sediment and nutrient levels. The impacts associated with invasive species are often underestimated as there may be a time lag between their introduction and their effects being noticed, or it may be difficult to calculate the costs associated with the damage caused.

Some invasive species (for example, trout) can pose a risk to environmental values, but at the same time support social and economic values, such as recreational fishing (see Section 7.2.3). A balanced management approach is therefore required to reduce the impacts of invasive species that cause substantial harm, while continuing to acknowledge that in some limited cases invasive species may provide other benefits that are valued by the community. The key values, threats and management activities for invasive species management are shown in Figure 16.1.

Box 16.1: Definition of invasive species

What are invasive species?

An invasive species is a species occurring, as a result of human activities, beyond its original range and that threatens valued environmental, agricultural or other social resources by the damage it causes. This can include organisms endemic to a country other than Australia, or translocated native species.

Which invasive species are considered in the Victorian Waterway Management Strategy?

Invasive pathogens and diseases can pose a significant threat to Victorian waterways, but they are not addressed in this Strategy. The current *Biosecurity Strategy for Victoria*² and other biosecurity policies and tools, including those at a Commonwealth level (for example, the Australian Quarantine and Inspection Service), are the appropriate approaches to address these threats.

Whilst terrestrial invasive species can have impacts on the health of waterways, this Strategy focuses on those invasive species dependent on inland aquatic and riparian habitats. These invasive species may live in natural freshwater or brackish environments (such as rivers, wetlands and estuaries), man-made environments (such as channels or reservoirs) or along riparian land. Invasive species that affect waterways may include vertebrates (such as fish, turtles and frogs), plants (aquatic and riparian species), invertebrates (such as snails, leeches and crayfish) and algae. Marine and coastal invasive species are considered only where they have the potential for significant impacts on coastal wetlands and estuarine areas. Invasive species that affect riparian land are further discussed in Section 9.3.6.

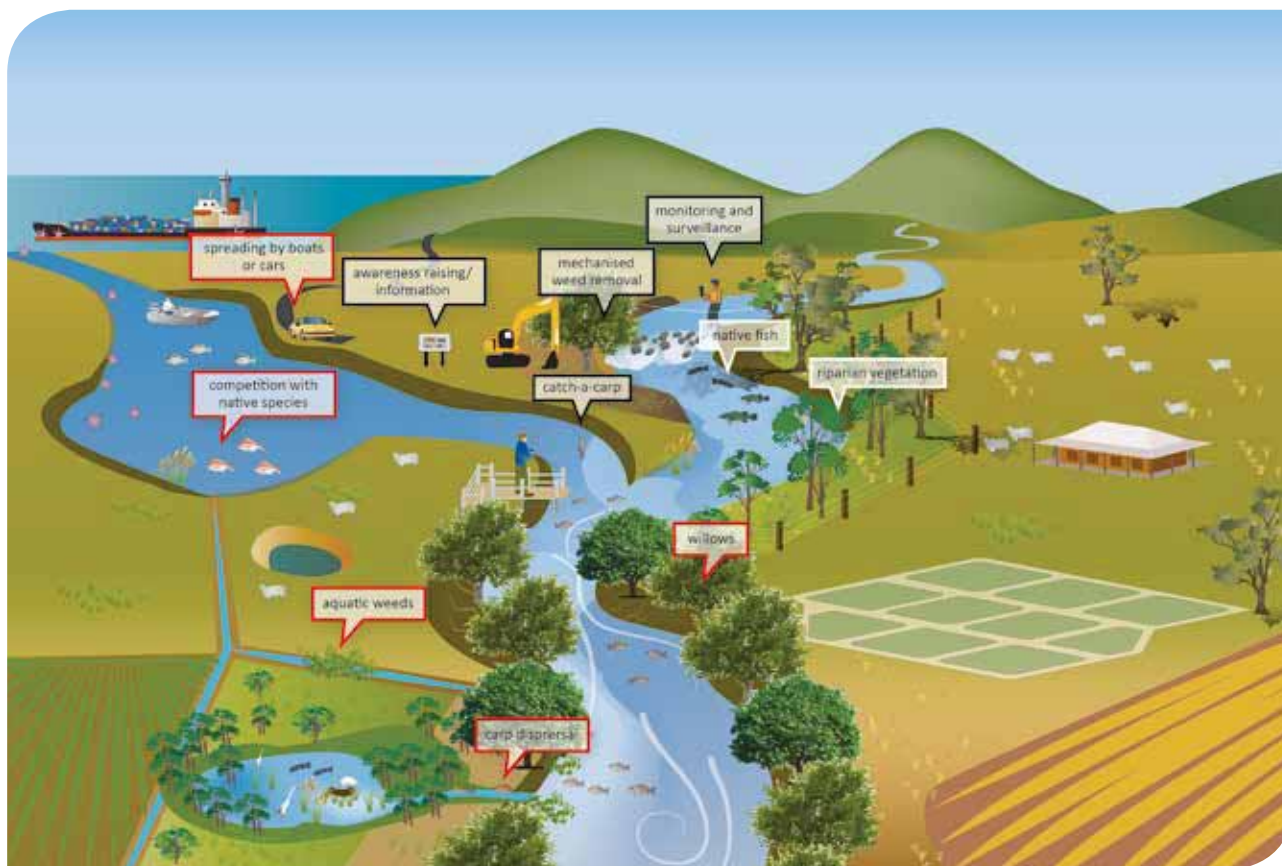


Figure 16.1: Values (white), threats (red) and management activities (black) for invasive species management.

Box 16.2: Economic costs of invasive species management

Economic costs of invasive species management include the funds spent on prevention, preparedness, containment, eradication, control and research activities, as well as costs of reducing impacts and recovery. Indirect economic costs may also occur through reduced business and tourism opportunities.

Substantial investment has been made to control and prevent the spread of invasive species that affect waterways. For example:

- Around \$6–10 million per annum is spent on willow control by Victorian waterway managers³.
- At least \$15.8 million per annum is spent on carp control in Australia⁴.

- In 2006, the Victorian Government spent \$1.8 million on installing screens at Rocklands Reservoir to restrict the spread of carp in the Glenelg River.
- Goulburn-Murray Water and Murray Irrigation Ltd spend around \$250,000 per annum to control arrowhead (an inland aquatic weed) in irrigation channels and natural waterways in northern Victoria.
- Since 2008, \$890,000 has been spent controlling *Spartina* (a saltmarsh grass) in tidal wetlands and estuaries in West Gippsland.

In addition to the direct costs of management, invasive species can undermine the outcomes of previous investment into waterway management activities. The costs of the impacts on waterways from invasive species in Victoria have not been fully estimated.

Case study 16.1: Didymo – Beware the rock snot!

Didymo (*Didymosphenia geminata*), commonly called rock snot, is a fresh water algae from the cool temperate regions of the Northern hemisphere that is causing major ecological, social and economic issues around the world. Didymo is a serious pest that is not currently present in Australia, but is a problem in its native range and has recently spread to New Zealand, choking its waterways. Victoria's high value upland streams in the Great Dividing Range have been identified as suitable habitat for Didymo.

Didymo is made up of millions of microscopic cells that can't be seen until a large colony has formed – by which stage it's almost impossible to eradicate. A single live cell is all that is required for Didymo to establish and spread. The cells attach to rocks and submerged plants, multiplying quickly to form massive algal blooms that can completely smother riverbeds or lake edges. These algal blooms adversely affect water quality, aquatic invertebrates and fish stocks and are a hazard for hydro power generation, irrigation and recreation.

On the South Island of New Zealand, Didymo is causing major concern for fisheries managers and recreational fishers. Didymo is likely to cost New Zealand between \$58 million and \$285 million over an eight-year period⁴. There is a significant risk that Didymo could establish and spread in Australia through transmission on watercraft, sporting or fishing equipment (such as fishing rods and nets, waders, kayaks, paddles, life jackets, water skis, wakeboards, wetsuits and hiking boots) from New Zealand. All such equipment must be thoroughly cleaned and dried and be presented to an Australian Quarantine and Inspection Service officer on arrival into Australia.

Border security and awareness raising activities are critical to prevent the establishment of Didymo in Australia as eradication will be impossible.



Didymo infestation smothering the bottom of a New Zealand river. Courtesy NZ Fish and Game

16.2 Framework for managing invasive species

Management of invasive species is complex and requires a high degree of co-operation between international, national, state and regional agencies.

16.2.1 International agreements

There are various international agreements that relate to the management of inland aquatic and riparian invasive species. For example, Australia is party to the Convention on Biological Diversity, which requires parties to prevent the introduction of, to control or to eradicate invasive species. Other relevant international agreements include the Convention on Wetlands of International Importance and the International Convention for the Control and Management of Ships' Ballast Water and Sediments.

16.2.2 National agreements and strategies

Intergovernmental agreements establish an agreed set of deliverables that enable all Australian states and territories to co-operate in managing invasive species. The National Intergovernmental Agreement on the Environment recognises that invasive species threaten the natural environment as well as agricultural and aquacultural production and acknowledges the need for a co-operative national approach to the management of invasive species. A new Intergovernmental Agreement on Biosecurity has been designed to strengthen the biosecurity system at a national level. It has been signed by all states and territories except Tasmania.

One of the Australian Government's key approaches to reduce the risk of invasive species incursions at the international border (that is, border security) is strict regulation of the importation of live organisms. This is regulated through the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the *Quarantine Act 1908* (Cth).

While border security reduces the potential of entry of invasive species into Australia, preventing the spread of invasive species within the country is a significant challenge. The National Environmental Biosecurity Response Agreement (NEBRA) establishes national emergency response arrangements to address the impacts of new incursions of invasive species and diseases. The NEBRA is applicable to waterway-dependent species and is likely to influence invasive freshwater fish and freshwater aquatic invertebrate management in Victoria in the future. Other opportunities for establishing national cost-sharing arrangements for other elements of biosecurity, such as containment, may arise in the future.

National strategies, such as the *Australian Pest Animal Strategy*⁵ and *A Strategic Approach to the Management of Ornamental Fish in Australia*⁶, outline management frameworks to address the impacts of invasive vertebrate animals that may adversely affect waterways.

16.2.3 Victorian strategies

The Victorian Government's *Environmental Partnerships*⁷ provides the overarching strategic framework for maintaining and improving Victoria's most important environmental assets and functions. It recognises the need for coordinating action across government agencies and working with the community to integrate environmental programs and achieve multiple outcomes for land, water and biodiversity.

The *Biosecurity Strategy for Victoria* outlines actions to ensure Victoria is well positioned to meet future biosecurity challenges. It recognises freshwater habitats are a key area where biosecurity arrangements need to be strengthened.

The *Invasive Plants and Animals Policy Framework* (IPAPF)⁸ represents the Victorian Government's approach to managing existing and potential invasive species across the whole of Victoria. There are four modules to the framework that will outline specific actions for each invasive plant and animal group – weeds and vertebrate pests, marine pests, freshwater fish and invertebrates, and invertebrate pests.

Both the *Biosecurity Strategy for Victoria* and IPAPF state that invasive species management needs to be guided by risk assessment. To date, management has focused mainly on established species rather than minimising the risk of new species invasions or rapid response to new incursions and/or containment. However, prevention provides a higher return for investment than eradication, eradication is better than containment and containment is generally better than managing the impacts of invasive species across widespread areas (see Appendix 16.1). Prevention is a particular priority for invasive species in waterways, as water flow and the connectivity of aquatic environments means that invasive species are often impossible to eradicate once established.

16.2.4 Role of the Victorian Waterway Management Strategy

This Strategy sets out policy direction for issues affecting waterway health, including the threat from invasive species. Waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) have an important role in undertaking regional management activities to contain high risk established invasive species and in protecting high value rivers, estuaries and wetlands from the threats posed by invasive species. A framework for the management of invasive species in waterways is outlined in Table 16.1.

Table 16.1: Framework for managing invasive species in Victorian waterways.

| Action | Goal | Strategic approach | Lead Victorian policy | Australian/State Government actions | Regional actions |
|------------------------------------|--|--|---|---|---|
| Prevention and preparedness | Prevent new, high risk invasive species from establishing in Victoria or spreading to uninhabited Victorian catchments | Species (threat) based | <i>Biosecurity Strategy for Victoria</i> <i>Invasive Plants and Animals Policy Framework</i> | <ul style="list-style-type: none"> – Undertake pre-border and border security – Undertake risk assessments – Develop and implement reporting framework | <ul style="list-style-type: none"> – Support national and statewide programs aimed at preventing the introduction and establishment of new high risk invasive species in waterways – Support informed community effort in invasive species management in waterways – Surveillance monitoring in waterways |
| Eradication | Eradicate high risk invasive species in the early stage of establishment | Species (threat) based | <i>Biosecurity Strategy for Victoria</i> <i>Invasive Plants and Animals Policy Framework</i> | <ul style="list-style-type: none"> – Clearly identify agency roles and responsibilities for participating in emergency eradication responses – Develop and implement emergency preparedness and rapid response plans – Co-ordinate eradication activities at a national/state scales | <ul style="list-style-type: none"> – Eradicate all newly establishing populations of Regionally Prohibited Weeds and other identified high risk invasive species in waterways – Support national and statewide programs aimed at eradicating high risk invasive species in waterways – Support informed community effort in invasive species management in waterways – Surveillance monitoring in waterways |
| Containment | Contain high risk invasive species | Species (threat) based | <i>Victorian Waterway Management Strategy</i> | Department of Environment and Primary Industries engages with waterway managers, water corporations and communities on containment programs | <ul style="list-style-type: none"> – Prevent identified high risk established invasive species in waterways from spreading outside core infestation boundaries – Eradicate outlier infestations – Protect assets within core infestation – Support informed community effort in invasive species management in waterways – Surveillance monitoring in waterways |
| Asset based protection | Reduce the impact of established invasive species on assets | Asset (value) based and Species (threat) based | <i>Victorian Waterway Management Strategy</i> | Department of Environment and Primary Industries engages with waterway managers, water corporations and communities on community education, asset management planning, implementation, monitoring and reporting | <ul style="list-style-type: none"> – Assess the threat of invasive species on the values of waterways – Undertake appropriate management activities to reduce the impacts of invasive species on waterway condition – Support informed community effort in invasive species management in waterways – Surveillance monitoring in waterways |

16.3 Using a risk-based approach for invasive species management in waterways

Risk assessments are required to identify which invasive species pose the greatest risk to waterways. The high risk species can then be targeted for management. Currently there are several national and Victorian lists of high risk invasive species (see Appendix 16.2) that can be used as guides.

Policy 16.1

A risk-based approach to prevention, eradication, containment and asset-protection will be used to manage invasive species in waterways.

Regional Waterway Strategies will consider both current and potential future risks, where known, of invasive species that affect the environmental condition of waterways.

Government intervention is only warranted to address high risk species that threaten significant environmental, social, cultural and economic values of waterways where benefit is expected to exceed cost. Generally, priority will be given to programs that prevent introduction or eradicate newly establishing invasive species over containment and programs to reduce the impact of established invasive species.



Thousands of juvenile carp at Dimboola Weir. Courtesy Greg Fletcher, Wimmera CMA

16.4 An holistic and integrated approach to invasive species management in waterways

The management of invasive species in waterways needs to be holistic and integrated with other waterway management activities, other pest plant and animal control work and fisheries management activities.

The Department of Environment and Primary Industries works in partnership with industry and the community to protect agriculture, the environment, the economy, health and the lifestyle of the community by stopping pests and diseases from entering, establishing and spreading within Victoria.

There are tens of thousands of invasive plants and animals that have the potential for negative impacts in Victoria. The Victorian Government manages the threat of invasive plants and animals by assessing the risk of each species entering and becoming established, then acting appropriately to manage those risks (those presenting the highest risk become the highest priority for management).

Stocking of both native and introduced fish species takes place in Victoria to improve recreational fishing opportunities. At the State level, the Translocation Evaluation Panel advises Fisheries Victoria on issues related to the translocation of live inland aquatic organisms (for example, fish) in accordance with protocols and guidelines. Regionally, stocking is dealt with through a consultative process involving regional input from land and waterway managers and recreational fishers. Policy regarding the stocking of recreational fish species can be found in Section 7.2.3.

There is currently limited understanding of how waterway management activities affect the establishment and spread of invasive species, including how activities designed to eradicate or reduce the impact of one invasive species can affect the establishment and spread of other invasive species. There is some evidence that control of invasive species can have unintended secondary consequences. For example, the removal of willows and the exclusion of stock from waterways may inadvertently promote the occurrence and rapid spread of other aquatic and riparian invasive plant species⁹. Additionally, the use of chemicals to control invasive species in waterways may adversely affect native plants and animals. Holistic management plans that consider the unintended consequences of waterway management activities at both a site and catchment scale are required.

Policy 16.2

An holistic and integrated approach to managing inland aquatic invasive species will be implemented through the regional Waterway Strategies. The approach will consider the:

- unintended consequences of waterway management activities, including environmental watering, on invasive species establishment and spread at both a site and catchment scale
- landscape-scale dynamics of the spread of invasive species
- where known, the predicted changes in distribution of invasive species affecting waterways.

Invasive species management in waterways will be linked to existing regional pest plant and animal strategic planning processes and other catchment and waterway management activities.

Effective invasive species management in waterways will be supported by strong community partnerships and co-ordination between agencies at federal, state and regional levels.

Victoria's water grid (the network of infrastructure used to store, transport and deliver water) poses new challenges for managing the spread and dispersal of invasive species. Regulated rivers provide suitable habitats for species to establish (such as dams, weir pools and irrigation channels). Increases in inter-basin water transfers also provide the potential for movement of species to new areas. Additionally, the effectiveness of environmental water delivery (see Chapter 8) is dependent on complementary onground management activities, including the management of invasive species.

Action 16.1: Assess the risks of inland aquatic invasive species spread through the Victorian water grid.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2016

16.5 Improved support mechanisms

For invasive species management in waterways to be effective, improved knowledge, better surveillance of key invasion pathways and broader industry and community awareness of the issues are required.

16.5.1 Improved knowledge and information systems

Knowledge about invasive species that affect waterways has increased in recent years. However, additional information on the risks and appropriate control techniques is needed. Better understanding of the pathways and mechanisms by which high risk species could be introduced to, or spread within, Victoria would help target activities to the regions most at risk. There is also a need for improved understanding of the potential impacts of climate change on the distribution of invasive species.

Better information management systems are required to plan, deliver and capture data on invasive species management activities and to enable streamlined performance and investment reporting.

Policy 16.3

The Victorian Government will support research that informs invasive species management in waterways. Priority will be given to research into:

- impacts, current extent and potential distributions of high risk invasive species
- estimates of the economic costs of these impacts
- main pathways and mechanisms of spread of invasive species and methods for managing them
- options for eradication, control and containment of invasive species
- the potential impacts of climate change on the distribution of invasive species that affect waterways.

Action 16.2: Develop an information system for planning, delivering and recording invasive species management activities, results and outcomes that provides consistent data for performance and investment reporting.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

16.5.2 Better surveillance

Adequate surveillance is critical for early detection of invasive species populations. Successful eradication or containment is most likely when the population is still small. If a population goes undetected until it is of such a large size that containment is impossible, the costs of managing the incursion will be greatly increased. However, surveillance is expensive and needs to be targeted to high risk pathways.

Policy 16.4

Surveillance of high risk invasive species in waterways will be targeted to high risk pathways. Procedures and systems for reporting invasive species surveillance information will be strengthened.

Action 16.3: High risk pathways for the spread of invasive species in waterways will be identified.

Who: Department of Environment and Primary Industries, waterway managers, water corporations.

Timeframe: 2016

16.5.3 Greater community and industry awareness

An increased level of awareness by the community and industry of the invasive species that affect waterways is important to:

- prevent new incursions (for example, to reduce accidental introductions through aquarium releases or transporting invasive species on fishing gear and/or boats)
- increase the capacity for surveillance of new invasive species
- assist in control of invasive species.

Commercial industry and the community may have limited awareness of the threats posed by invasive species in waterways. They may also have poor knowledge of their roles in biosecurity protection, particularly in preventing the introduction of new species and limiting further spread. Awareness of aquatic invasive species is relatively low compared to widespread and clearly visible terrestrial pests (such as foxes, rabbits and blackberries), resulting in less community pressure to deal with aquatic invasive species.

However, some community groups (such as recreational fishing bodies, Fishcare Victoria, Waterwatch, EstuaryWatch, Landcare networks and approved hunting organisations) may be involved in invasive species management in waterways or have a strong interest in the issue.

Recreational fishers and fishing groups acknowledge that new invasive freshwater fish introductions may affect fisheries and other valued assets. Fishcare Victoria performs a range of activities and events, including awareness raising of invasive freshwater fish issues primarily focusing on carp. 'Catch-a-Carp' days and 'Carp Musters' occasionally take place in regional areas, with the support of waterway managers. The Waterwatch program trains its co-ordinators to identify aquatic weed species and has initiated aquatic invasive species awareness raising activities

for communities. The Landcare network plans and actively undertakes projects to improve riparian vegetation, including invasive species management.

The participation and support of community groups in the management of invasive species is very important. Increasing community awareness of the importance of managing invasive species in waterways, particularly in preventing their release and minimising their spread, will have considerable benefits. The community can play a role in early detection and reporting of incursions, enforcement and monitoring, and support rehabilitation efforts. These groups also play a significant role in reducing the risk of spread through recreational activities (such as boating and fishing), by promoting good hygiene practices. There is a need to increase community awareness of the importance of managing freshwater invasive species particularly in preventing their release and minimising their spread.

Strong partnerships with industry are needed to foster a sense of shared issue ownership and encourage participation in management. Key industries include aquaculture, the aquarium trade, shipping and ports, plant nurseries, recreational and commercial fishing sectors, irrigators and agricultural industries. There may also be opportunities for commercial removal of some invasive species, for example carp are commercially harvested and used as garden fertiliser.

Policy 16.5

The Victorian Government will improve community and industry understanding and awareness of invasive species affecting waterways, and their management, through effective cross-agency and industry partnerships and programs aligned with broader biosecurity approaches.

Action 16.4: Develop education and awareness raising material on community and industry roles for invasive species management in waterways.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016



Mallee CMA raise community awareness of the impacts of carp at Catch a Carp Day. Courtesy Mallee CMA



17

Adaptive management

*Logging water depth in the Gunbower Forest.
Courtesy North Central CMA*

Adaptive management

Guide to the chapter

17.1 Adaptive management in the Victorian Waterway Management Program

17.2 Strategy and planning

- Program logic and specific logic models
- Key evaluation questions
- Objectives and targets

17.3 Implementation and monitoring

- Delivering management activities
- Work standards
- Intervention monitoring to test and improve logic models
- Resource condition assessment: the Indices of Condition
- Regional Water Monitoring Partnerships
- Long-term monitoring
- Improved data management

17.4 Reporting and evaluation

- Annual management reporting
- Resource condition reporting
- Reporting on Strategy targets
- Evaluation and program improvement

17.5 Research and capacity building

- Research priorities
- Ensuring knowledge exchange and capacity building

What are the issues with existing arrangements?

The Victorian Waterway Management Program operates within an adaptive management cycle, but more effective monitoring, reporting and evaluation processes are required to clearly demonstrate the outcomes achieved from investment in management activities. The approach to monitoring and research should be more strategic. Further capacity building is required in the waterway management sector to ensure that staff are able to update and improve their skills. Knowledge exchange between scientists, policy makers, managers and the community is also vital to continuously improve waterway management.

What improvements does the Strategy make?

For adaptive management the Strategy will:

- adopt logic models to predict outcomes from management activities and test predictions through monitoring and research
- improve resource condition assessment for Victoria's rivers, estuaries and wetlands
- improve data management standards and data accessibility relating to waterway management
- use logic models to identify knowledge gaps and prioritise waterway management research
- improve knowledge exchange and capacity building.

17.1 Adaptive management in the Victorian Waterway Management Program

Adaptive management is a systematic process for improving management by ‘learning from doing’.

The approach uses real-life actions (such as projects, management activities or policy) to test and improve understanding of how these actions contribute to achieving desired outcomes or objectives. The knowledge gained then provides the basis for continuing with, or adapting, actions in response to what has been learnt. Adaptive management is commonly practised by implementing and then reviewing policy (passive), or by predicting the outcomes of management activities and then strategically monitoring the actual outcomes to gather information to improve future management (active).

The adaptive management cycle of the Victorian Waterway Management Program (see Section 3.6 and Figure 3.5) can be broadly defined as having three stages; strategy and planning, implementation and monitoring, and evaluation and reporting.

Learning occurs at all stages and knowledge is used to improve the program in subsequent cycles (every eight years). Effective monitoring, reporting, evaluation and strategic research are key elements of this adaptive management cycle. Used together they provide the tools to improve management and to determine if the Victorian Waterway Management Program is meeting its targets and achieving long-term improvements in waterway condition. The approach outlined in this chapter aligns with the *Monitoring, Evaluation and Reporting Framework for land, water and biodiversity* developed by the (then) Department of Sustainability and Environment¹.

An evaluation of the *Victorian River Health Strategy*² and of the previous regional River Health Strategies identified elements of the adaptive management approach that could be improved. As part of the adaptive management cycle, that knowledge and experience was used to inform the development of this Strategy.



Water quality monitoring at Turners Lagoon. Photographer: A. Chatfield

17.2 Strategy and planning

The state policy framework and targets outlined in this Strategy mark the beginning of the strategy and planning phase of the adaptive management cycle.

The Strategy also provides direction for regional waterway planning processes that will identify priority waterways and management activities for an eight-year period and set regional targets (see Chapter 4). The objectives, priorities and targets in this phase are then used to inform development of monitoring, evaluation and reporting activities.

17.2.1 Program logic and specific logic models

Defining a clear program logic is an important part of the strategy and planning phase. The objective of the Victorian Waterway Management Program is to maintain or improve the environmental condition of waterways so that they can support environmental, social, cultural and economic values. The underlying program logic was outlined in Section 3.8.1 (see Figure 3.6), with a more detailed program logic and additional explanatory information in Appendix 3.2.

Figure 17.1 illustrates how this program logic structure can be used to develop more specific logic models to describe the known (or assumed) relationships between particular management activities and their expected outcomes. These logic models provide the foundation for active adaptive management and can be used to predict the outcomes of particular activities, target monitoring efforts once activities are implemented, and validate or alter management approaches based on the information gathered. The logic models can also be used to help identify research priorities by highlighting knowledge gaps or relationships with uncertain evidence (low confidence).

Policy 17.1

Logic models, based on best available knowledge, will be used to define the relationships (known or assumed) between outputs, management outcomes and long-term resource condition outcomes and will support an active approach to adaptive management.

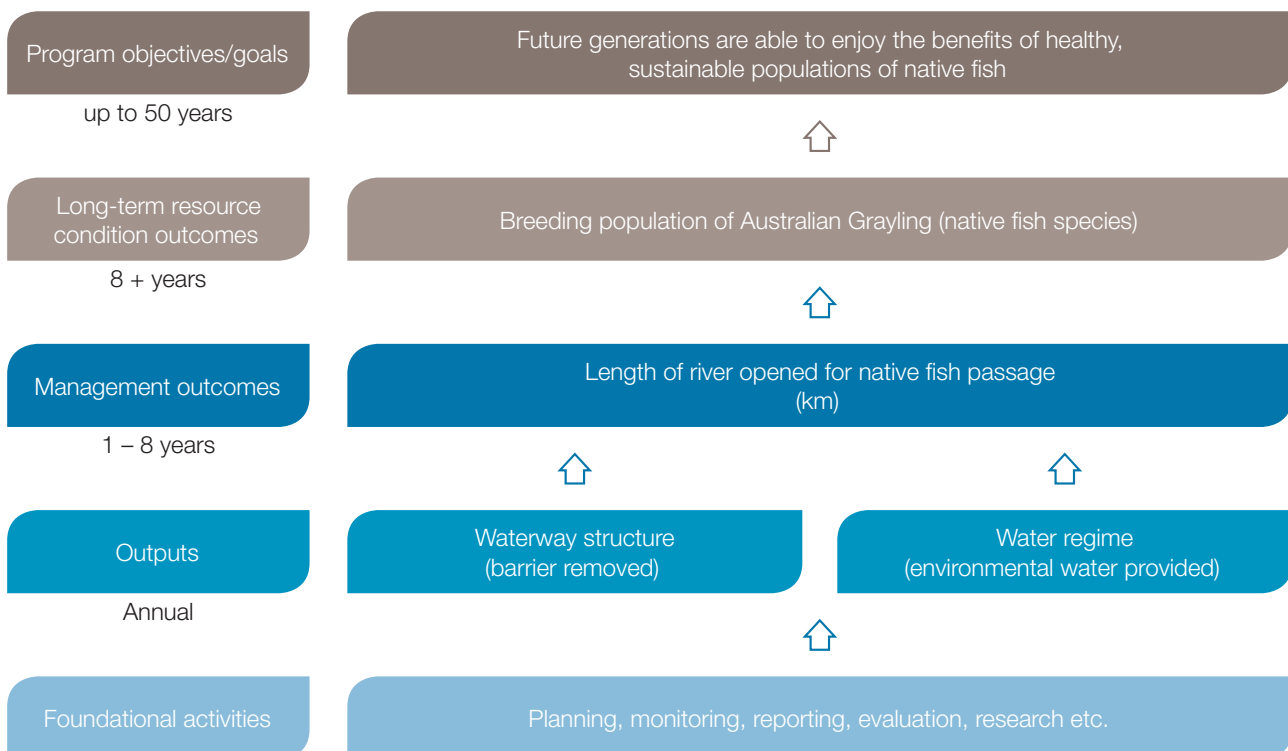


Figure 17.1: An example of a specific logic model showing the possible management activities (outputs) to increase habitat available for native fish movement (management outcome) and support breeding of native fish species (long-term resource condition outcome).

17.2.2 Key evaluation questions

The strategy and planning phase of the adaptive management cycle includes development of pre-determined key evaluation questions (KEQs) by which to assess the Victorian Waterway Management Program. These KEQs cover five categories including; impact, appropriateness, effectiveness, efficiency and legacy.

The KEQs address assumptions in the program logic and their evaluation provides direction and improved knowledge for subsequent planning cycles (see Section 17.4.4).

The following are examples of KEQs for the Victorian Waterway Management Program:

Impact – to what extent has waterway condition been maintained or improved?

Appropriateness – to what extent were management activities (outputs) aligned with priorities?

Effectiveness – to what extent did management activities (outputs) deliver the expected management outcomes?

Efficiency – to what extent were management activities (outputs) delivered in line with industry standards for cost and within expected timeframes?

Legacy – to what extent did the Victorian Waterway Management Program support the environmental, social, cultural and economic values of waterways and minimise future costs to Government and communities?

17.2.3 Objectives and targets

Objectives and targets are developed in accordance with the program logic. At the State level, two categories of targets have been developed to assess progress of the Victorian Waterway Management Program against the vision; management outcomes and long-term resource condition outcomes (see Section 3.8.2 and Figure 3.7). Targets for outputs are included in the regional Waterway Strategies (RWSs) (see Section 4.2.6 and Figure 3.7). Effective regional target setting requires knowledge (or assumptions) about the links between different outputs, management outcomes and long-term resource condition outcomes. Scientific studies, expert opinion and local knowledge have all been used to help guide these decisions in the past. The use of logic models in this planning cycle will provide a more consistent and transparent approach to selecting management activities and setting targets for the RWSs (see Section 4.2.6).

Policy 17.2

Logic models will be used to identify the management activities required to maintain or improve waterway condition and will also inform target setting in the regional Waterway Strategies.



Scientific research vessel. Courtesy Arthur Rylah Institute

17.3 Implementation and monitoring

17.3.1 Delivering management activities

Priority management activities in the RWSs form the basis of annual investment in onground works (such as fencing and revegetation) and environmental water management by the Victorian Government. The RWSs also help direct other funding sources (for example, local government and Australian Government) to priority projects in each region. Management activities are then implemented regionally by the waterway managers (that is, catchment management authorities and Melbourne Water in the metropolitan region) and other regional agencies or partners.

17.3.2 Work standards

Effective investment in waterway management requires a process to ensure that management activities (outputs) are being delivered to a suitable standard. For example, riparian fences should use specific types of materials and design features to ensure that they are able to withstand certain levels of flooding. Work standards define the requirements for completion of management activities that are funded by the Victorian Government. Existing work standards are currently being updated and refined and new work standards are being developed (as required) for a range of standard outputs that the Victorian Government invests in. Work standards, combined with periodic auditing, give investors confidence that their funding is being invested effectively and that reporting is consistent and comparable. Having consistent standards for outputs also means that data collected to inform logic models come from management activities that have been undertaken in a similar way. Work standards should be developed at a sufficiently high level to ensure that there is enough flexibility for regional or site specific variation.

Although the existing *Technical Guidelines for Waterway Management*³ provide information about a range of onground works specific to waterway management, they do not provide definitive work standards. Also, the guidelines do not reflect technical advances over the past decade and changes in the types of works commonly undertaken.

Policy 17.3

Management activities (outputs) funded by the Victorian Government will be completed to a defined standard.

Periodic technical audits of management activities (outputs) will be conducted to assess whether work standards are being met.

Periodic financial audits of regional expenditure will be conducted against program defined standards.

17.3.3 Intervention monitoring to test and improve logic models

Intervention monitoring focuses on collecting data about the short and long-term effects of management activities. Knowledge about the relationships between outputs, management outcomes and long-term resource condition outcomes can be incomplete, or uncertain. For some relationships there may be several scientific studies that demonstrate a clear link between an output and a management outcome (for example, removing an instream barrier will increase the length of river opened for native fish passage). This type of evidence supports a high confidence in the relationship between that output and management outcome (Figure 17.1). For other relationships there are few or no scientific studies and we rely on assumptions or expert opinion to determine the links between outputs, management outcomes and long-term resource condition outcomes. This type of evidence can be described as having low confidence. As part of the adaptive management approach, more evidence can be gathered to improve our understanding of relationships that have a low confidence by delivering outputs and strategically monitoring the predicted management outcomes at a selection of sites.

Management interventions on waterways take place at many sites across Victoria each year. It is not practical or cost-effective to measure the management outcomes at all these locations. Therefore, a program of targeted monitoring is needed that considers information requirements across the state and co-ordinates monitoring efforts accordingly. It is important to note that the existing statewide monitoring program (the Indices of Condition, see Chapter 17.3.4)

Action 17.1: Develop and refine work standards for management activities (outputs) to ensure effective and consistent implementation of onground works across the state.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2014

Action 17.2: Review the content and purpose of the *Technical Guidelines for Waterway Management* following development of the work standards.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

was established to assess the broad condition of rivers (at the reach-scale) across the state over the long-term and not to evaluate this type of shorter-term, site-scale change. However, these two monitoring approaches are complementary and together will provide vital information to support the adaptive management approach.

Regional and state agencies have begun to undertake site-scale monitoring at targeted locations across the state to assess and better understand the relationships between outputs, management outcomes and long-term resource

condition outcomes. However, a more co-ordinated approach is required to ensure that priority knowledge gaps are being addressed and that monitoring is undertaken in a consistent and appropriate way. This information will then be used to update and improve the logic models. Two multi-region case studies are described below that use logic models and targeted monitoring to assess and quantify the management outcomes of stock exclusion and revegetation (see Case study 17.1) and provision of environmental water (see Case study 17.2).

Case study 17.1: Riparian Restoration Experiment

The health of waterways is dependent on the condition of riparian land. However, the effects of management activities undertaken on riparian land (for example, revegetation and fencing) had not previously been quantified in Australia.

The Riparian Restoration Experiment has been monitoring ecological responses (for example, of fish populations, aquatic invertebrate populations and water quality) to riparian revegetation and stock exclusion activities carried out by catchment management authorities since 2003. The studies are taking place on several tributaries of the Murray River in Victoria and New South Wales.

The project has found that many of the short-term ecological responses expected to result from fencing and revegetation were significantly constrained and/or altered by the prolonged dry period experienced from 1997-2009. Nevertheless, some positive ecological responses to management activities were detected. For example, natural recruitment of River Red Gums was much higher in fenced sites than those that had not been fenced.

The project has also identified the best short, medium and long-term indicators of environmental condition change following management activities. This knowledge will help to make future monitoring programs more targeted and efficient. The Riparian Restoration Experiment is being delivered in Victoria through a collaborative research partnership between Monash University, the Department of Environment and Primary Industries, the Murray-Darling Basin Authority and the Goulburn Broken and North Central catchment management authorities.

Case study 17.2: Assessing ecological outcomes from delivering environmental water

In several of Victoria's large regulated rivers (Wimmera, Glenelg, Goulburn, Broken, Thomson, Macalister, Campaspe and Loddon river systems) the Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) has been established to demonstrate if the delivery of environmental water is achieving the predicted management outcomes.

The program is supported by a set of logic models that predict the effects of environmental flow components on key variables. The monitoring program collects data on variables such as fish, water quality, vegetation and physical habitat to assess and refine (where necessary) the accuracy of the models.

VEFMAP is being delivered through a collaborative research partnership between the Department of Environment and Primary Industries, the eWater Cooperative Research Centre and the waterway managers.

Policy 17.4

State and regional agencies will collaborate to undertake strategic monitoring at a selection of sites to improve knowledge and confidence about the effectiveness of management interventions. This information will be used to validate or update the associated logic models over time.

Action 17.3: Develop a program for intervention monitoring that targets priority locations and relationships for investigation over the short to medium-term (5 - 10 years).

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2014

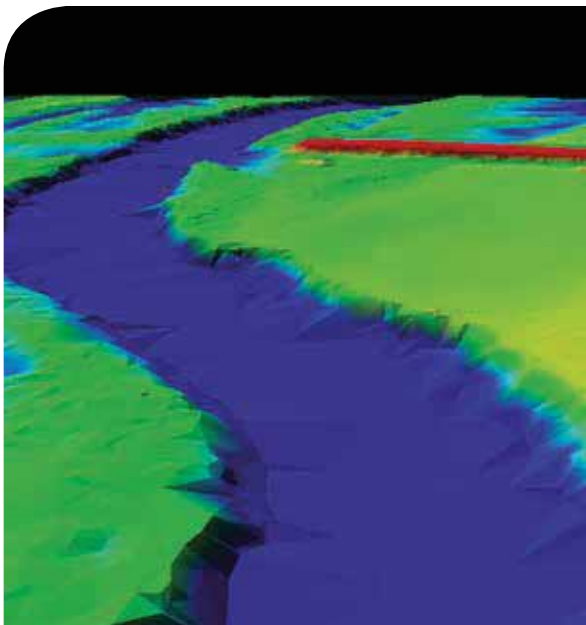
17.3.4 Resource condition assessment: the Indices of Condition

Resource condition assessment across Victoria is vital to understand the broader patterns and changes in the condition of waterways and provide information to help assess the success of the Victorian Waterway Management Program. Statewide monitoring of resource condition is undertaken using three specifically developed Indices of Condition: the Index of Stream Condition (ISC) the Index of Wetland Condition (IWC) and the pilot Index of Estuary Condition (IEC). The current condition of Victoria's waterways is described in Section 3.2.

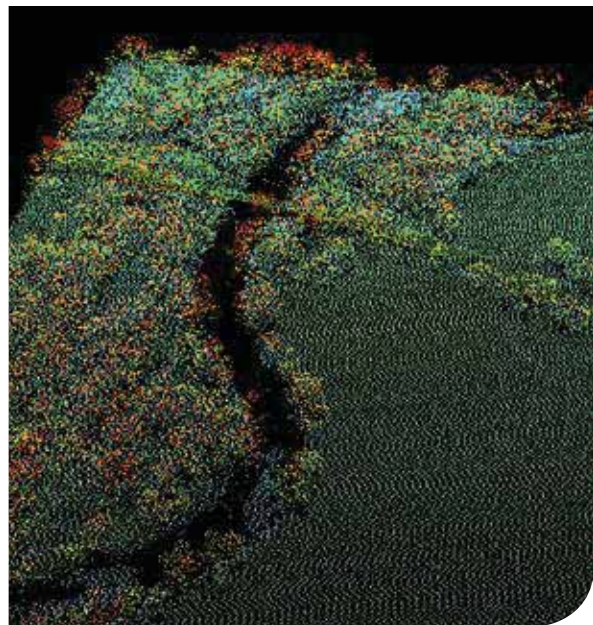
Case study 17.3: Using new technology to assess the environmental condition of waterways

Prior to each assessment, the Index of Stream Condition (ISC) has been reviewed to incorporate advances in science and monitoring. For the 2010 assessment, the major advance was to move from field based sampling for the streamside zone and physical form components to remote sensing (aerial photography coupled with light direction and ranging, known as LiDAR). LiDAR uses

laser pulses to produce a three dimensional image of the ground surface and vegetation structure. This allows types of analysis to be undertaken that are impossible when only aerial photography or field based assessments are used. This approach has allowed a continuous assessment of physical form and the streamside zone along both banks of the entire ISC stream network of 26,000 km. Previously the ISC had used approximately 2,500 random location to assess condition. The LiDAR mapping will also provide critical data in establishing links between short-term intervention monitoring and the longer-term resource condition monitoring.



3D LiDAR image which has had the vegetation removed to show only the bare ground surface. Courtesy DEPI



3D LiDAR point cloud image showing vegetation height and structure and a road and bridge in the top section of the image. Courtesy DEPI

Index of Stream Condition (ISC)

The ISC was the first statewide, integrated measure of river health to be developed in Australia. The ISC was first used to benchmark the condition of Victoria's rivers in 1999 and it provided a broad classification of the condition of Victorian rivers. Now that three assessments of river condition have been undertaken, and the methodology refined, it is appropriate to establish the third ISC results as the baseline against which future condition of rivers in Victoria should be assessed.

Subject to available funding, a fourth ISC assessment would have a dual purpose and move away from only reporting on statewide river condition. The majority of sampling would be focused on assessing environmental condition within priority river reaches (as defined in regional Waterway Strategies) to help determine the effectiveness of management interventions and help build the knowledge base to inform better target setting. The remaining sampling would continue to assess river condition outside these priority river reaches. It would more closely align with the location of Victoria's long-term water quality and water quantity stations (see Section 17.3.5).

Index of Wetland Condition (IWC)

The IWC was initially developed in 2005 to assess the condition of naturally-occurring wetlands in Victoria. In the period 2009-2011, the IWC was used to benchmark the condition of almost 600 high value wetlands and 240 additional wetlands selected to represent a range of different wetland types. This was the first time a systematic, statewide assessment of wetland condition had been undertaken in Victoria.

Subject to available funding, a second IWC would be undertaken following a review of the methods used in the first assessment.

Pilot Index of Estuary Condition (IEC)

A pilot IEC program was developed in 2009 and is currently being trialled and refined based on data collection in 40 of Victoria's estuaries. Data has initially been collected for six sub-indices including: physical form, hydrology, water quality, sediment, flora and fauna (see Section 13.2.1).

The results of this pilot study must now be assessed to inform the potential development of a formal IEC program (implementation of which would be subject to available funding).

The Indices of Condition integrate data about the key components of rivers, wetlands and estuaries that are important from an ecological perspective (hydrology, water quality, aquatic life, physical form and streamside zone (riparian vegetation), see Appendix 17.1). They have been designed to assess environmental condition and successive assessments should begin to broadly demonstrate the cumulative effect of management interventions across Victoria.

As previously stated, the Indices were not designed to measure the local-scale effects of particular management activities at specific sites (see Section 17.3.3). The Indices of Condition provide information at a larger scale (such as river reaches and individual wetlands).

The Indices of Condition do not currently measure change in condition over time (that is, trend), because this requires consistency in the methodology between assessments. To date, the emphasis has been on improving the assessment methods and increasing confidence in the results. Therefore, the Indices of Condition are currently used to provide a spatial 'snapshot' of condition across the state at a single point in time. However, once the methods are refined the Indices could be used consistently across multiple assessments to report on trend (if the monitoring intensity is also increased). Increased monitoring intensity is required because the design of condition assessment programs to measure trend require very intensive data collection over long periods of time to ensure that, statistically, there is sufficient data to be able to accurately identify a directional change (or absence of a directional change) in condition and to be confident that this directional change is outside the natural range of variability.

Policy 17.5

Statewide resource condition assessment will occur through the Indices of Condition programs every eight years, subject to available funding.

The Indices of Condition will be used to:

- provide statewide information on the condition of Victoria's rivers, estuaries and wetlands
- provide high quality baseline information on environmental values and threats to values to inform regional planning and priority setting
- help assess the overall, long-term effectiveness of the Victorian Waterway Management Program.

The Indices of Condition will be reviewed prior to each assessment to ensure the information collected is relevant for regional planning whilst ensuring long-term integrity of the data.

Action 17.4: Review the pilot Index of Estuary Condition program and assess the feasibility of conducting a statewide assessment of estuary condition.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2016

17.3.5 Regional Water Monitoring Partnerships

The DEPI has a responsibility to deliver long-term and continuous assessment of water quantity and water quality (see Section 10.3). This surface water resource monitoring is ongoing, with some data sets going back over 100 years to the mid 1880s. In 2013, the Regional Water Monitoring Partnerships consisted of 44 organisations that share the cost of collecting surface water data through the Victorian Water Quality Monitoring Network. The monitoring partnership is adaptable and capable of responding to emerging issues. The network was used to monitor the impact of recent bushfires on water quality by rapidly mobilising instream water quality probes and loggers and to measure flood peaks. Section 10.3 outlines clear objectives of the Victorian Water Quality Monitoring Network and a review of the location of monitoring sites and data collected to ensure information can better inform management decisions.

17.3.6 Long-term monitoring

One of the difficulties in improving knowledge about waterways and the impact of management activities on waterway condition, is that ecological responses occur across a wide range of spatial and temporal scales. Some ecological responses do not occur within the timeframe of short-term projects and funding cycles (typically 1–4 years). One approach to addressing this problem is to set up a small number of long-term ecological monitoring sites that can be used to monitor long-term responses to management activities or to support research on the processes that support healthy waterways. This approach has been highly successful in many other countries. For example, the Hubbard Brook Experimental Forest in the United States has been set aside for continuous research and monitoring since 1955.

Policy 17.6

The Victorian Government and regional agencies will continue to support Victoria's Regional Water Monitoring Partnerships.

Policy 17.7

The Victorian Waterway Management Program will align a proportion of monitoring projects and programs to a network of long-term waterway monitoring sites.

Action 17.5: Identify, establish, monitor and maintain a network of long-term waterway monitoring sites (including both work and non-work sites).

Who: Department of Environment and Primary Industries, Environment Protection Authority **Timeframe:** 2016 Victoria, waterway managers.



Regional partners monitor condition of the Snowy River.
Photographer: Sarina Loo

17.3.7 Improved data management

The quality and reliability of monitoring data are not only critical to understanding waterway condition, but also to enable effective management. Data, and the information generated from its interpretation, are key aspects of an effective adaptive management framework.

Data and information must be fit-for-purpose, easily accessible and in a readily usable format. The data need to be analysed, interpreted and organised into information that is appropriate for supporting management decisions.

While there have been advances in data collection and information management, challenges still remain. For example:

- data collection is not always linked to a clear objective and therefore may not be fit-for-purpose
- generally there are poor data quality standards and not all long-term data sets have a data custodian (that is, to appropriately store and manage data for future use)
- there is a need to strengthen the commitment to maintaining and funding long-term data sets
- existing data are not being used to their full potential.

Policy 17.8

Monitoring and assessment programs for rivers, wetlands and estuaries will be designed to maximise the ability of the information to inform policy, planning, investment and decision-making.

The Victorian Waterway Management Program will collect and utilise monitoring data to:

- understand the values and threats of rivers, wetlands and estuaries
- measure the resource condition of rivers, estuaries and wetlands and inform the community
- provide information for reporting and evaluation activities
- measure the outcomes from management activities
- understand the effects of extreme events such as bushfire and floods and variable climatic conditions
- enable effective adaptive management.

Waterway data and information collected by the Victorian Government will be required to meet a set of agreed industry based standards that:

- support the collection of high quality information associated with all river, wetland and estuarine works undertaken across Victoria
- improve reporting, with particular focus on increasing capacity to report spatially
- support the information requirements of agencies and Government
- increase the transparency of priority setting, investment and outcomes achieved.

Improving data accessibility

Waterway-related data collected by the Victorian Government is not always easily accessible or up to date. The Victorian Water Resources Data Warehouse had previously been the central repository for water-related data and information in Victoria. The data warehouse has been replaced an updated website for Victorian water data, the Water Management Information System (WMIS).

The Data Warehouse was based on out-dated technology that was difficult to use. It was unable to be easily adapted to accommodate the demand for more timely provision of water measurement information. The new WMIS website will house up-to-date water quality and quantity data, all the Indices of Condition data and groundwater data, in a much more user friendly format. For more information go to: www.depi.vic.gov.au/water/water-resource-reporting.

To improve public access to data collected by the Waterwatch monitoring program, the Waterwatch Victoria Data Management System has been established (see Box 17.1), and will also be linked to the WMIS website.

Other important databases with information on waterways include the Victorian Biodiversity Atlas. It holds over one million species records, including freshwater dependent species.

Box 17.1: Waterwatch Victoria Data Management System

The aim of the Waterwatch Victoria Data Management System is to better record, manage and make available Waterwatch data. The database supports Waterwatch volunteers, Waterwatch co-ordinators and the DEPI staff and for the first time makes the data collected by the program over the last 20 years accessible to the public via the web.

Data can be interrogated and reports can be generated, allowing Waterwatch volunteers and co-ordinators to better manage their equipment and support the Waterwatch program in their region.

For access to the Waterwatch Victoria Data Management System go to: www.vic.waterwatch.org.au/

Policy 17.9

Water resource and waterway-related data will be publicly available through the Water Management Information System (WMIS).

Waterwatch and EstuaryWatch volunteers and co-ordinators will be supported to better manage their data and information. Data and information collected by these programs will be targeted to priority waterways and associated management activities to help inform decision-making processes.

17.4 Reporting and evaluation

Reporting is an important tool to ensure accountability for the investment of government funds into waterway management activities and provide information for stakeholders and the community.

Over the long-term, consistent reporting can also provide evidence to evaluate the effectiveness of the Victorian Waterway Management Program. Several types of reporting are required to meet these different needs.

Melbourne Water have different reporting and evaluation requirements that reflect their separate accountability to the Essential Services Commission (see Section 18.2.2 and 18.4.2). These requirements are not discussed in the sections below and therefore references are to catchment management authorities (CMAs) rather than waterway managers.

17.4.1 Annual management reporting

Annual management reporting focuses on the outputs achieved in each region for the financial year. However, reporting on the delivery of outputs alone may not always be representative and comparable across the regions. To make management reporting more useful it must be supported by clearly defined work standards (see Section 17.3.2). Standards are also required to define how information for reporting should be collected, particularly spatial data associated with outputs. Financial audits are also required to ensure that reported expenditure is accurate and accountable. Standards and audits help to provide assurance for any third party or external observers that investment in delivering outputs has been implemented in a manner that is strategic, cost-effective and consistent. Finally, effective data management systems for storing and analysing output data are also necessary to support effective reporting and evaluation.

17.4.2 Resource condition reporting

The DEPI will continue to lead the collection, analysis and reporting of information on the condition of Victoria's waterways every eight years through the ISC, IWC and IEC, subject to available funding (see Section 17.3.4). These reports will then provide the collective data (over subsequent assessments) to assess the condition of waterways over the long-term and the effectiveness of the Victorian Waterway Management Program. The Victorian Catchment Management Council is responsible for reporting on condition of Victoria's catchments every five years. State of the Environment reporting is also undertaken in Victoria by the Commissioner for Environmental Sustainability (see Section 3.2). However, these organisations rely on data from the Indices of Condition.

17.4.3 Reporting on Strategy targets

Data from annual management reporting processes will be used to publicly communicate statewide progress in meeting the targets in this Strategy (Section 3.8.2). Progress will continue to be reported through the 'Report Card' series. Previous Report Cards have been released by the Victorian Government in 2005 and 2010⁴.

Action 17.6: Develop standards for spatial reporting of output data.

Who: Department of Environment and Primary Industries, catchment management authorities.

Timeframe: 2014

Action 17.7: Report on outputs and financials each year through the following reports:

- Annual investment reports
- Catchment Management Authority Annual Reports
- Catchment Management Authority Corporate Plans
- Annual environmental watering booklet
- Victorian Environmental Water Holder Annual Report.

Who: Catchment management authorities, Victorian Environmental Water Holder.

Timeframe: annually

Action 17.8: Report statewide progress against the targets outlined in the *Victorian Waterway Management Strategy* through the 'Report Card' series.

Who: Department of Environment and Primary Industries, catchment management authorities.

Timeframe: 2016 and 2020

17.4.4 Evaluation and program improvement

Periodic assessment of management activities, regional programs and statewide policy is required to determine their effectiveness and of the broader Victorian Waterway Management Program. Assessment should be undertaken in accordance with the pre-determined key evaluation questions (see Section 17.2.2). This information will then be used to adapt management if required and achieve continuous improvement.

Management activities

Evaluation of the effectiveness of management activities will occur through the regional land intervention monitoring programs implemented by CMAs or through statewide intervention monitoring programs (for example, the Victorian Environmental Flows Monitoring and Assessment Program and the Riparian Restoration Experiment – see Section 17.3.3). These programs will provide the knowledge to validate or update the logic models and improve the effectiveness of management activities over time. Information from long-term monitoring sites and strategic research will supplement this knowledge and improve our general understanding of waterways and longer-term ecological responses.

Regional programs

An internal review by each CMA will assess interim progress of implementing management activities outlined in each of the RWSs. This information, combined with any new information about values and threats and consideration of extreme events or climatic conditions, may lead to CMAs choosing to change or update the management activities to be undertaken during the final years of implementing their RWSs (see Section 15.5.3).

It is also vital to independently review the RWSs at the end of their lifespan to capture all of the knowledge gained during implementation of the strategy and progress against all of the targets. This will ensure that there is a clear record of lessons learned and an evidence base for updating or changing regional programs and management approaches in the future.

Statewide policy

The previous statewide policy framework (the *Victorian River Health Strategy*) was reviewed to assess progress against the policy directions and actions outlined in the strategy and to capture knowledge gained during implementation. The review provided valuable information to inform the development of this Strategy. It will be vital to independently review the implementation of the policy directions and actions in this Strategy at the end of the eight-year planning period.

Action 17.9: Review interim progress of implementing management activities in the regional Waterway Strategies.

Who: Catchment management authorities.

Timeframe: 2017

Action 17.10: Undertake an independent review of the regional Waterway Strategies (management activities and targets) to inform the development of the next regional Waterway Strategies.

Who: Independent reviewers, Department of Environment and Primary Industries, catchment management authorities.

Timeframe: 2021

Action 17.11: Complete an independent review of the *Victorian Waterway Management Strategy* to inform development of the next strategy.

Who: Independent reviewer, Department of Environment and Primary Industries, waterway managers.

Timeframe: 2020

17.5 Research and capacity building

17.5.1 Research priorities

During the development of this Strategy, several key areas were identified as a focus for future research. These include:

- inventory and assessment of waterways, including condition, threats and values
- improving our understanding of the relationships between outputs, management outcomes and long-term resource condition outcomes
- demonstrating the benefits from management activities
- development of best management practice standards and techniques.

In addition to these overarching research priorities, knowledge gaps for specific waterway management issues are identified in several chapters of this Strategy (see Chapters 10, 12, 13, 14 and 16).

The logic models will document where knowledge about the relationships between outputs and management outcomes is limited or there is low confidence in these relationships. The logic models therefore provide a transparent process for describing and documenting research priorities. Future research by State and regional agencies should be directed to investigating those priority relationships where there is little scientific evidence, or the confidence in the evidence is low. This targeted approach to research also provides an increased focus on making and testing predictions, rather than more general, descriptive research. It is vital that research is targeted to better understand the effectiveness of management activities in which the Victorian Government heavily invests (for example, riparian revegetation).

Better research outcomes are more likely if there are close collaborative partnerships between the research partners. There are existing examples of where this already successfully occurs, such as the Parks Victoria research partnerships and the annual Goulburn Broken CMA research forum. These programs deliver mutual benefit to both the researchers and the sponsoring body and achieve more focused and policy relevant outcomes.

Principles for research to inform waterway management

All key planning and investment decisions will be based on best available knowledge.

The knowledge base will be continually expanded and the Victorian Government will proactively share information.

The Victorian Government will establish collaborative partnerships and strengthen relationships with research providers to address research priorities.

The Victorian Government will proactively engage with research providers to increase focus on making and testing predictions rather than just descriptive research.

Policy 17.10

The Victorian Waterway Management Program will support research that:

- provides essential knowledge to address critical short-term and/or strategic long-term knowledge gaps. The resulting research findings will be incorporated into policy and management.
- targets knowledge gaps or areas of low confidence in the relationships between outputs, management outcomes and long-term resource condition outcomes (if significant for waterway management and investment).

Action 17.12: Use key knowledge gaps or relationships in which there are low confidence in the logic models to inform the prioritisation of research projects at both the state and regional levels.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2014

17.5.2 Ensuring knowledge exchange and capacity building

Knowledge exchange must be actively managed to maximise uptake and sharing of information. Clear processes are required to ensure knowledge is shared with those who are likely to adopt and benefit from it. Knowledge exchange plans are an effective tool for identifying ways to ensure new knowledge reaches those who will benefit most.

It is recognised that:

- it is important to consider not only formal, conventional sources of knowledge, but also knowledge that rests with people and communities
- waterway management agencies have different processes for knowledge and information exchange
- for knowledge exchange to be most effective it must be a two-way process.

Network development between scientists, social scientists, environmental economists, policy makers, managers and stakeholders (including the community) is an important element of knowledge exchange. True interdisciplinary connections between different areas of science, management and policy are crucial to providing information to inform decision-making. Although the Victorian Waterway Management Program undertakes a wide variety of research and investigations, very rarely is this information effectively exchanged within the program, or more broadly with the community and other interstate colleagues. This will be addressed as part of the new knowledge exchange plan.

Waterway managers have a crucial role to play in helping communities to understand, track, anticipate and respond to changes in the natural environment. Knowledge exchange to and from the community will raise awareness and capacity and is a core component of successful natural resource management (see Chapter 5).

To increase the effectiveness of the waterway management industry, staff need the appropriate skills and knowledge. Staff require continual training and capacity building opportunities to keep informed about new knowledge and changes in technology. This can be achieved through undertaking training courses, presenting at and attending conferences and research forums or undertaking further tertiary-level education.

For example, the *Science to Policy Leadership Program* (run by the Peter Cullen Trust) builds leadership and communication skills specifically geared to bringing about positive change in water and catchment management in Australia.

The Wise Water Ways Program is a one week course held annually in Victoria since 1999 that has trained 750 staff within the waterway management industry. The aim of the course is to provide an introduction for those working in the CMAs, local councils, water corporations and consultancies on the theory and practice of waterway management.

Technology is also likely to play an increased role, especially in data capture and analysis. Staff require appropriate skills to take advantage of this new technology.

In 2005, the (then) Department of Sustainability and Environment established the Graduate Certificate in River Health. Since 2005, the one-year course has run four times with over 80 graduates. The aim of the course is to increase the depth and diversity of the skills and knowledge of professionals practicing in the Victorian Waterway Management Program and to improve the capacity of organisations to deliver better outcomes for waterways. Commencing in 2012, scholarships are being provided to support Traditional Owners and Aboriginal people to undertake the Graduate Certificate in River Health and increase the capacity of Aboriginal Victorians to be involved in waterway management (see Section 6.5 and Action 6.5).

Policy 17.11

The sharing of knowledge is recognised as a crucial element of successful policy development and better decision-making. Improved methods will be put in place to enhance knowledge sharing between scientists, social scientists, environmental economists, policy makers, managers, stakeholders and the community.

Waterway managers will play a leadership role in the exchange of knowledge. They will act as a facilitator of knowledge exchange within the community (both to and from the community) and as a repository, source and distributor of knowledge.

Staff in the waterway management industry will be encouraged to continually update and improve their skills and capacity.

Action 17.13: Develop a knowledge exchange plan that maximises the exchange of information across the Victorian Waterway Management Program and to the broader community.

Who: Department of Environment and Primary Industries, waterway managers.

Timeframe: 2015

Action 17.14: Review the content of the Graduate Certificate in River Health course to improve links with the Victorian Waterway Management Program.

Who: Department of Environment and Primary Industries, The University of Melbourne, waterway managers.

Timeframe: 2014

Action 17.15: Provide one scholarship for a Department of Environment and Primary Industries staff member to participate in the Science to Policy Leadership Program run by the Peter Cullen Trust.

Who: Department of Environment and Primary Industries.

Timeframe: 2014 and 2016

Action 17.16: Provide scholarships for staff in the Department of Environment and Primary Industries and catchment management authorities to participate in the fifth Graduate Certificate of River Health course.

Who: Department of Environment and Primary Industries, catchment management authorities.

Timeframe: 2015



Students of the Graduate Certificate in River Health course on a Landcare site visit. Photographer: Ian Rutherford



18

Management arrangements

*Structural works for environmental
benefits. Hattah Lakes National Park.
Photographer: John Riddiford*

Management arrangements

Guide to the chapter

18.1 Context

18.2 Institutional arrangements

- State arrangements
- Regional arrangements
- Changes to State arrangements for emergencies and flood risk
- National and interstate arrangements

18.3 Partnerships

18.4 Funding for waterway management

- Victorian Government funding
- Waterways charge in the Port Phillip and Westernport region
- Regional funding
- Australian Government funding
- Murray-Darling Basin Authority funding

18.5 Cost-sharing for waterway management

18.6 Management arrangements for structures in waterways

- Management arrangements for new structures
- Management arrangements for existing structures

What are the issues with existing arrangements?

Roles, institutional arrangements and funding for waterway management in Victoria may change over time. Clarification of management arrangements is required to reduce uncertainty regarding aspects of the management of rivers, estuaries and wetlands. Experience in river health management over the last decade has shown that management arrangements for structures in waterways need to be strengthened to ensure accountability and reduce impacts on waterway condition.

What improvements does the Strategy make?

For management arrangements the Strategy will:

- provide an updated overview of the institutional arrangements for key State and regional agencies and their roles and responsibilities in waterway management
- provide direction for how Victorian Government funds will be allocated for regional waterway management
- strengthen arrangements for managing new and existing structures that are built in Victoria's waterways and floodplain areas.

18.1 Context

There are several government agencies and many other organisations that contribute to waterway management in Victoria.

For effective waterway management it is vital to clearly outline:

- institutional arrangements and the roles, responsibilities and partnerships for waterway management
- funding arrangements for waterway management activities
- accountability for complex management issues, such as new and existing structures in waterways.

See Chapter 10 for management of water quality incidents and Chapter 15 for managing through extreme events such as bushfires and floods.



Courtesy DEPI



Monitoring activities as part of waterway research. Courtesy Arthur Rylah Institute

18.2 Institutional arrangements

Institutional arrangements for waterway management in Victoria exist at both the State and regional levels. These arrangements, often supported by legislation, help define the roles and responsibilities for key agencies involved in waterway management.

18.2.1 State arrangements

State agencies and statutory bodies

There are several State agencies that have a major role in waterway management (Table 18.1). In addition to these, the Victorian Government receives advice from several independent statutory bodies on issues that relate to the management of waterways (Table 18.2).

Table 18.1: Roles and responsibilities for key Victorian State agencies in waterway management.

| Agency and purpose | Roles and responsibilities for waterway management |
|---|--|
| <p>The Department of Environment and Primary Industries is responsible for agriculture, fisheries, forestry, public land and the environment.</p> | <p>The Department of Environment and Primary Industries (DEPI) is responsible for the efficient and practical management of land, water and agricultural services. The DEPI is the lead agency for the development of policy regarding water resource management and waterway management. The DEPI is also responsible for other aspects of natural resource management that are relevant to waterways, including:</p> <ul style="list-style-type: none"> • delivery of services at a regional level, including some services that relate to waterway management • management of fisheries and recreational fishing in waterways to optimise economic and social value while ensuring the sustainability of resources • management of biosecurity, including aquatic invasive species • oversight of the catchment planning framework to promote integrated catchment management throughout Victoria • management of biodiversity • management of public land, including waterways and bushfire management on public land • improvement of agricultural productivity. |
| <p>The Environment Protection Authority Victoria is an environmental regulator and authority on environmental impacts.</p> | <p>The Environment Protection Authority (EPA) Victoria:</p> <ul style="list-style-type: none"> • identifies the beneficial uses of water environments and the level of environmental quality needed to protect them through the <i>State Environmental Protection Policy (Waters of Victoria)</i> • provides specific direction on the management of various activities that affect water quality • uses mandatory and regulatory processes, such as licensing and other discretionary tools to assist in the achievement of water quality objectives • acts in partnership with the DEPI and regional bodies to monitor water quality and waterway condition and enables problem solving approaches and independent audits of impacts on the environment and the protection of beneficial uses. |
| <p>Parks Victoria manages national, wilderness, state and regional parks, Melbourne's metropolitan parks and open space network as well as selected ports and waterways.</p> | <p>Parks Victoria:</p> <ul style="list-style-type: none"> • manages parks and conservation reserves in which many waterways are located, including national, State, wilderness, metropolitan and regional parks, marine national parks and sanctuaries and conservation and natural features reserves • creates, manages and maintains visitor sites and manages a range of assets, including visitor facilities and access points, piers and jetties, sporting facilities and navigation aids, many of which are associated with waterways. |
| <p>Transport Safety Victoria is responsible for determining standards and procedures for navigation and maritime safety on state waters.</p> | <p>Transport Safety Victoria:</p> <ul style="list-style-type: none"> • determines standards and procedures for navigation and maritime safety on all inland waters, rivers, creeks, canals, lakes and reservoirs, as well as coastal waters up to three nautical miles offshore • assists <i>Marine Safety Act</i> (MSA) waterway managers in their duties, who are appointed by the Minister for Ports and are responsible for regulating vessel operations and on water activities by waterway users on selected waterways under their control. |

Table 18.2: Institutional arrangements, roles and responsibilities for independent statutory bodies that advise the Victorian Government on matters related to waterway management.

| Statutory body | Institutional arrangements, roles and responsibilities |
|--|--|
| Victorian Environmental Water Holder | The Victorian Environmental Water Holder is appointed under the <i>Water Act 1989</i> to manage Victoria's environmental water entitlements. The Victorian Environmental Water Holder works with the waterway managers and the Commonwealth Environmental Water Holder, to ensure environmental water entitlements are used to achieve the most efficient and effective environmental outcomes. |
| Victorian Catchment Management Council | The Victorian Catchment Management Council is appointed under the <i>Catchment and Land Protection Act 1994</i> and advises the Minister for Environment and Climate Change and the Minister for Water on land and water management issues. The Council reports annually on the operation of the <i>Catchment and Land Protection Act 1994</i> and, every five years, on the environmental condition and management of Victoria's land and water resources, through the Victorian Catchment Management Council Catchment Condition Report. |
| Office of Living Victoria | <p>The Office of Living Victoria is leading the transformation of the way our water cycle is managed and how water cycle services are provided in Victoria.</p> <p>A key initial focus for the Office of Living Victoria is the transformation of Melbourne's water cycle in order to support delivery of the Victorian Government's vision for the water sector for metropolitan Melbourne.</p> |
| Victorian Coastal Council | The Victorian Coastal Council is appointed under the <i>Coastal Management Act 1995</i> to undertake strategic coastal planning and develop and oversee implementation of the <i>Victorian Coastal Strategy</i> . The Council provides advice to the Minister for Environment and Climate Change on coastal matters, facilitates the operation of regional coastal boards, monitors the development of regional plans and prepares guidelines for planning and management of the coast. |
| Victorian Environment Assessment Council | The Victorian Environment Assessment Council is appointed under the <i>Victorian Environmental Assessment Council Act 2001</i> . The Council conducts investigations that are requested by the Government relating to the protection and ecologically sustainable management of the environment and natural resources on public land. |
| Essential Services Commission | The Essential Services Commission is the economic regulator of the Victorian water sector appointed under the <i>Essential Services Commission Act 2001</i> . The Commission regulates prices and monitors service standards and market conduct of the Victorian water sector. The sector is comprised of water corporations, established under the <i>Water Act 1989</i> , providing bulk and retail water and waste water services to all of Victoria's urban and rural irrigation customers. |
| Commissioner for Environmental Sustainability | The Commissioner for Environmental Sustainability is appointed under the <i>Commissioner for Environmental Sustainability Act 2003</i> to report on Victoria's environment. The Commissioner's objectives are to report on the condition of the natural environment, encourage decision-making that facilitates ecologically sustainable development, enhance knowledge in these areas and encourage sound environmental practice by the Victorian Government and local government. |

18.2.2 Regional arrangements

Waterway managers: catchment management authorities and Melbourne Water

Under the *Catchment and Land Protection Act 1994*, Victoria is divided into 10 catchment management regions and each has a catchment management authority (CMA) responsible for the integrated planning and co-ordination of land, water and biodiversity management in their region. Management of waterways is a key part of this integrated catchment management. Under the *Water Act 1989*, authorities are designated with specific responsibility for the management of waterways, drainage and floodplains. The designated waterway management authorities are the CMAs, except in the Port Phillip and Westernport catchment region where it is Melbourne Water (who are regulated by the Essential Services Commission – see Section 18.4.2 and www.esc.vic.gov.au/Water for more information). These ten waterway managers (nine CMAs and Melbourne Water) have the lead role in developing and delivering regional programs for waterway management.

The *Water Act 1989* outlines the functions and powers of waterway managers in relation to waterway management, floodplain management and regional drainage. The Minister for Water may issue statements of obligations under the Act that provide more detail about how these functions and powers should be used.

The range of functions that waterway managers undertake include:

- developing a regional Waterway Strategy
- developing and implementing regional work programs to maintain or improve the environmental condition of waterways
- authorising works on waterways and acting as a referral body for planning applications, licences to take and use water and construct dams, for water use and other waterway management issues
- identifying regional priorities for environmental watering and facilitating environmental water delivery
- providing input into water allocation processes
- developing and co-ordinating regional floodplain management plans
- providing advice and undertaking investigations regarding flood events
- managing regional drainage in some areas
- assisting response to natural disasters and extreme events (such as bushfires and floods) where they affect waterways
- providing water quality advice for emergency water quality management
- undertaking community participation and awareness programs.

While the role of waterway managers in regional floodplain management is separate to that of waterway management, there is scope for improved integration of the two functions (as outlined in Section 15.2.2).

Waterway managers are also responsible for liaising with regional coastal boards to ensure there is integration between the management of rivers, estuaries and wetlands and coastal planning and management. This is covered in more detail in Chapter 13 in relation to the management of estuaries.

Water corporations

Water corporations in Victoria are established under the *Water Act 1989* and provide a range of water services to customers within their service areas. Melbourne Water provides bulk water and bulk sewerage services in the Melbourne metropolitan area and manages waterways and major drainage systems in the Port Phillip and Westernport region. Gippsland Water and Southern Rural Water and Goulburn Murray Water provide a combination of irrigation services, domestic and stock services and some bulk water supply services in regional Victoria. Grampians Wimmera Mallee Water and Lower Murray Urban and Rural Water provide a combination of water, sewerage, irrigation and domestic and stock services to customers in their respective service areas. Eleven of the water corporations provide water and sewerage services throughout regional Victoria. These are Barwon Water, Central Highlands Water, Coliban Water, East Gippsland Water, Gippsland Water, Goulburn Valley Water, North East Water, South Gippsland Water, Western Water, Westernport Water and Wannon Water. Amendments to the *Water Act 1989* in 2012 established three new water corporations (City West Water Corporation, South East Water Corporation and Yarra Valley Water Corporation) to replace the old water and sewerage licensees in the metropolitan Melbourne area under the *Water Industry Act 1994*.

MSA waterway managers

Marine Safety Act (MSA) waterway managers are bodies appointed by the Minister for Ports as waterway managers under the *Marine Safety Act 2010*. MSA waterway managers are responsible for regulating vessel operations and on water activities by waterway users on selected waterways under their control. Government departments, CMAs, water corporations, Parks Victoria, local governments, committees of management and others all have a role as designated MSA waterway managers for certain waterways.

MSA waterway managers oversee:

- management of vessel activities on waters under their control
- allocation and management of moorings and berths
- provision and maintenance of navigation aids, appropriate signage of water levels, hazards and rules applying to the waters
- control of navigation and vessel movement
- designation of areas in which anchorage of vessels is, or is not permitted
- altering or dredging of channels for navigation
- removal or marking of obstructions.

Gippsland Lakes Ministerial Advisory Committee

In 2012, the Victorian Government established the Gippsland Lakes Ministerial Advisory Committee. The Committee has developed the *Gippsland Lakes Environmental Strategy* and will advise the responsible Ministers on the progress of its implementation. At the same time, the Gippsland Lakes Environmental Fund was established to contribute to implementation of the strategy.

Regional Services – Department of Environment and Primary Industries

The DEPI has a strong focus on regional service delivery and staff in six regions across Victoria provide integrated services for land, water and agriculture. The DEPI Regional Services are also public land managers, with responsibilities for managing the environment, invasive species and bushfire on public land.

Parks Victoria

Parks Victoria is established under the *Parks Victoria Act 1998* and is responsible for managing an expanding public land estate that covers more than 4 million hectares (about 18 per cent) of Victoria. Parks Victoria delivers on-ground services across the state to ensure that Victoria's parks and waterways remain healthy and resilient. Management is focused on conserving park and waterway ecosystems, protecting cultural heritage, continuously developing opportunities for community involvement in parks and preparing for, responding to and recovering from fire, floods and other emergencies. Parks Victoria are also MSA waterway managers for several waterways.

Local government

In Victoria, local government is established under the *Local Government Act 1989* and is made up of 79 local councils, who manage local issues and plan for community needs. Local government has direct responsibility for managing drainage in many areas and for management of stormwater. They are also often appointed MSA waterway managers.

Local government contributes to waterway management by regulating land use and development through municipal planning schemes, developing and implementing urban stormwater plans, facilitating local industry involvement in waterway activities and providing support for local action groups.

Regional Coastal Boards

Regional coastal boards are established under the *Coastal Management Act 1995* to implement the *Victorian Coastal Strategy*, provide advice to the Minister for Environment and Climate Change and the Victorian Coastal Council and prepare and implement regional coastal plans. There are three regional coastal boards (Western, Central and Gippsland) to ensure co-ordination, planning and management of the coast and marine environment in each region.

Traditional Owner Land Management Boards

Traditional Owners are important partners with Government in land and water management (see Chapter 6). The Victorian Government is progressively strengthening partnerships with Traditional Owners through joint and co-operative management agreements over Crown land. These agreements recognise Traditional Owners' relationship to land, provide for certain rights on Crown land and for the establishment of Traditional Owner boards or councils whose purpose it is to prepare management plans and/or provide advice about the management of land and waterways within the agreement areas (see Section 6.4.1). For example, under the settlement agreement with the Gunaikurnai people, the State entered into a Traditional Owner Land Management Agreement to establish a Gunaikurnai Traditional Owner Land Management Board to jointly manage ten national parks and reserves in the agreement area.

Committees of management

Crown land reserves (public land set aside for the Victorian community) have historically been managed by committees of management (CoMs). CoMs can consist of locally elected or appointed citizens, local government, statutory bodies or trustees and are appointed by the Minister for Environment and Climate Change under the *Crown Land (Reserves) Act 1978*. CoMs have the responsibility and authority to manage, improve, maintain and control their reserve. They can also be appointed as MSA waterway managers.

18.2.3 Changes to State arrangements for emergencies and flood risk

The Victorian Government is reforming the State's crisis and emergency management arrangements in response to the findings of the *Review of the 2010–11 Flood Warnings and Response*¹ and the *2009 Victorian Bushfires Royal Commission*², which show that Victoria's framework for crisis and emergency management need to be modified and upgraded to meet future challenges. The Government outlined key reforms in the *Victorian Emergency Management Reform White Paper*³.

18.2.4 National and interstate arrangements

The Australian Government is responsible for establishing and overseeing the national legislative frameworks for water sharing, salinity and water quality in the Murray-Darling Basin. It also oversees national water reform programs and administers the Commonwealth Environmental Water Holder. The Commonwealth Environmental Water Holder manages water entitlements to protect or restore the environmental assets of the Murray-Darling Basin. The Commonwealth Environmental Water Office has been established to support the Commonwealth Environmental Water Holder to make decisions on the use of Commonwealth environmental water (see Chapter 8).

The Australian Government manages the national legislative frameworks for matters of national environmental significance, such as Ramsar wetlands and nationally listed threatened and migratory species. The Australian Government works with states and territories to ensure that Australia's Ramsar Convention obligations (see Chapter 12) are met and provides funding for natural resource management in the states.

Caring for our Country is the Australian Government's major natural resource management initiative. Funding for the period 2013 – 2018 totals \$2 billion and will support regional natural resource management groups, local, state and territory governments, Indigenous groups, industry bodies, land managers, farmers, Landcare groups and communities.

The Murray-Darling Basin Authority co-ordinates planning and management for the equitable, efficient and sustainable use of the water and other natural resources of the Murray-Darling Basin, which includes river basins in northern Victoria.

It is also responsible for developing and overseeing implementation of the Basin Plan and implementation of The Living Murray program (see Chapter 8).

In addition to waterways in the Murray-Darling Basin, there are several other waterways that require co-ordination between Victoria and other States. These include the Snowy River, where the river source is situated in New South Wales, as well as the Glenelg River and Mosquito Creek in western Victoria, where part of the catchments of these waterways are located in South Australia.

Arrangements for the Snowy River have been put in place by formal agreements between Victoria, New South Wales and the Australian Government. Other rivers in eastern Victoria are covered through an arrangement between the East Gippsland CMA and its counterpart in New South Wales. There is an agreement with South Australia that covers the Mosquito Creek and Glenelg River catchment. There is also a Cross Borders Groundwater Agreement with South Australia.

18.3 Partnerships

In addition to the formal institutional arrangements for waterways, successful program delivery also relies on the ongoing commitment and input from the community, non-government organisations, industry and research institutions.

The Victorian Government's *Environmental Partnerships*⁴ outlines a pathway for action and partnership by government, communities and businesses in Victoria to maintain a healthy environment.

Non-government organisations (such as Environment Victoria) advocate the importance of healthy rivers, estuaries and wetlands, provide input on waterway policies and strategies and contribute to the implementation of waterway programs.

Trust for Nature, a not-for-profit organisation, facilitate the permanent protection of waterways on private land through covenanting.

Industry can assist in the maintenance and improvement of waterway condition by managing its activities in accordance with the principles of ecologically sustainable development and minimising impact on the environment by the implementation of best management practices, in accordance with 'duty of care' responsibilities and good corporate citizenship.

Community groups and individuals participate in regional planning, priority setting, implementation of regional work programs, monitoring waterway condition and undertake projects in priority areas (see Chapter 5).

Individuals contribute to maintaining healthy waterways by managing their own enterprises and property in ways that acknowledge their 'duty of care' and their role in the stewardship of natural resources and may also enter into land management agreements.

Research institutions further the knowledge of waterways, develop tools and systems for effective waterway management and undertake targeted research on key waterway management issues. Educational institutions raise awareness and increase general understanding of waterways and train resource management professionals in waterway management.



Photographer: Brigid Hussey

18.4 Funding for waterway management

18.4.1 Victorian Government funding

The Victorian Government provides funding to the DEPI and CMAs specifically for river, estuary and wetland management from two major sources:

- core funding to undertake statutory functions (required by legislation) and waterway management activities as part of the Victorian Waterway Management Program
- funding from the Environmental Contribution (EC), which is a legally required contribution from water corporations for the purposes of funding initiatives that seek to promote the sustainable management of water or to address adverse environmental impacts of water consumption and extraction.

Funds provided from these sources support CMAs to undertake the range of waterway management functions outlined in Section 18.2.2. In some cases, actions are undertaken at the State level by the DEPI, as indicated throughout this Strategy.

Allocation of State funding to CMAs

CMAs were historically funded through waterway management tariffs that were largely based on population numbers and the level of industry in each region. The core funding provided to CMAs by the Victorian Government was established as a replacement to the waterway management tariffs. Its allocation (and previous allocation of the Environmental Contribution) across the CMAs generally mirrors the ongoing tariff propositions.

The *Victorian River Health Strategy*⁵ outlined 'Criteria for the Allocation of Healthy Waterways Program Funds' to determine the distribution of core funding between the CMAs. However, the criteria were not fully applied due to lack of information. This criteria will be reviewed and updated to reflect improved waterway knowledge (including new environmental condition data); changing circumstances and pressures and the need for flexibility (including the frequency and intensity of floods, bushfire and continued settlement growth); the inclusion of wetlands and estuaries in the Victorian Waterway Management Program and more effective and efficient use of public funds.

Equity in the allocation of core funds across each catchment management region needs to be considered to ensure there is an appropriate level of funding available to each CMA to carry out critical statutory functions (such as responding to land use and development planning referrals on floodplains) and to plan and deliver key priorities for waterway management, including the development of a regional Waterway Strategies and associated community engagement and partnership building activities.

Each CMA must consider the most effective and flexible approach to deliver program activities to ensure that State funding is achieving the greatest possible outcomes for the funds available. For example, securing previous investment and onground works by undertaking maintenance activities and re-connecting with participating landholders to foster relationships is vital for maximising the outcomes from investment.

Other options to support equity, effectiveness and efficiency include allocating some funds in a competitive manner, whereby a portion of State funds are provided to project proposals that can demonstrate a level of certainty of positive returns or outcomes in priority areas. It may also be used to leverage other program investments or in-kind contributions from landholders or business.

While it may be desirable that there is a level of competition for funding to CMAs, a totally competitive model is not appropriate. Current levels of resourcing, knowledge and capacity differ between CMAs. A fully competitive approach may lead to better-resourced CMAs being inappropriately advantaged over those that are less well resourced. The allocation model may therefore need to include elements of both base and competitive funding.

Greater accountability standards and processes such as auditing, works monitoring evaluation and reporting can also support equity and effectiveness objectives.

Further consideration and development of principles and criteria for future State funding allocation, together with supporting data will be developed for the four-year funding period between 2016/17– 2019/20. This may also require a program of transition to ensure that changes in funding do not cause sudden changes in regional staffing levels, skills and capacity for CMAs.



Photographer: Phil Ashton

Other State funding

In addition to the State funds provided directly for waterway management, there are other funds provided by the Victorian Government that can benefit the environmental condition of waterways. For example, funds are provided:

- to public land managers to manage the land assigned to them in accordance with statutory requirements, which may include activities related to waterway health on their land
- to regional organisations such as rural water corporations to undertake statutory functions
- for other catchment management programs and through State initiatives
- for natural disaster relief funding assistance which may be complemented by Australian Government funding in line with agreed funding thresholds and eligibility requirements, as set out in the national *Natural Disaster Relief and Recovery Arrangements Determination 2011* (see Section 15.5.1).

State funding for priority management activities to reduce risk to public infrastructure

Section 4.2.3 outlines the policy on managing serious risks to public infrastructure from waterway processes. State funding may be required to contribute to priority management activities to address these risks. For priority management activities associated with extreme events (see Chapter 15) funding is provided for eligible actions through natural disaster relief funding assistance as outlined in Section 15.5.1. In other cases, the usual funding source is the core funding outlined in Section 18.4.1. However, in exceptional circumstances the cost of a priority management activity may be so high relative to the core funding allocation that a business case may be required and alternative funding sources may need to be identified by the DEPI.

Policy 18.1

If the cost of the priority management activities to reduce risk to public infrastructure is so high that it cannot reasonably be met without significantly affecting other priority management activities requiring core funding, a business case will be developed by the waterway manager and agreed to by the owner or manager of the infrastructure asset. The Department of Environment and Primary Industries review the business case and advise on the appropriate source of funding.

Action 18.1: Develop principles and criteria to guide future funding allocation to catchment management authorities for waterway management and collect the necessary data to apply the principles and criteria in the period 2016/17 - 2019/20.

Who: Department of Environment and Primary Industries, catchment management authorities.

Timeframe: 2016

18.4.2 Waterways charge in the Port Phillip and Westernport region

The waterways charge collected by metropolitan retail water corporations on behalf of Melbourne Water is used in the Port Phillip and Westernport region to:

- manage and improve the health of rivers, creeks, estuaries, wetlands and floodplains
- manage urban development planning and approvals to ensure sustainable growth
- provide grants to landholders and community groups to improve waterways
- deliver drainage maintenance and improvements
- provide appropriate levels of flood protection and warning systems for communities.

The Essential Services Commission reviews this charge every five years based on a plan submitted by Melbourne Water to ensure that the program meets community expectations and is efficient.

18.4.3 Regional funding

There are some significant regional contributions for implementation of natural resource management activities that provide waterway health benefits. They include:

- funding and in-kind contributions from landholders, community organisations and individuals for priority management activities identified in regional Waterway Strategies and Regional Catchment Strategies
- government endorsed and community agreed action plans that include landholder contributions because of the private benefits generated by various implementation activities, such as maintenance of community drainage systems
- floodplain management or regional drainage schemes that provide clear benefits to all landholders within a specific region.

18.4.4 Australian Government funding

The Australian Government provides funds for river, estuary and wetland management through several national natural resource management programs (such as Caring for our Country). The Australian Government funds water recovery for the environment in accordance with national priorities. The national *Natural Disaster Relief and Recovery Arrangements Determination 2011* sets out the terms and conditions for financial assistance from the Australian Government to the states and territories for the purposes of natural disaster relief and recovery in line with agreed funding thresholds (see Section 15.5.1).

While the funding priorities for different national programs are set by the Australian Government, the regional Waterway Strategies are an important source of information regarding the priorities for waterway management in Victoria.

Policy 18.2

Waterway managers will seek funding from Australian Government programs to enhance management outcomes for waterways in Victoria.

18.4.5 Murray-Darling Basin Authority funding

The Murray-Darling Basin Authority provides funds for a range of natural resource management programs in the Murray-Darling Basin that cover monitoring, research and the implementation of basin-wide natural resource management strategies. Examples include:

- The Living Murray program for improving the health of Barmah Forest, Gunbower Forest, Hattah Lakes and Lindsay-Walpolla Islands, which are identified as icon sites under the program
- Channel Capacity Program to undertake waterway activities to control erosion in the Murray River downstream of the Hume Dam and the Mitta Mitta River downstream of Dartmouth Dam.

18.5 Cost-sharing for waterway management

While the framework for waterway management outlined in this Strategy will ensure that resources are directed to the areas of highest priority, the achievement of the vision for waterways is a significant task requiring considerable resources and long-term commitment. Cost-sharing with beneficiaries (those which benefit from a management activity) can be an effective way to more efficiently achieve outcomes with available government resources.

Beneficiaries that need to be considered in waterway management activities include:

- water corporations, given their dependence on a healthy water resource base and their potential impacts on healthy waterways

- direct beneficiaries (for example, recreational groups, private landholders)
- local government representing regional economic benefits (for example, increased tourism from healthy waterways)
- the broader Victorian community
- owners and managers of public infrastructure.

Policy 18.3

The cost-sharing principles for waterway management programs will be applied in the implementation of the regional Waterway Strategies.

Contributions from beneficiaries for activities that are part of the implementation of regional Waterway Strategies will be negotiated during the planning process.

Cost-sharing principles for waterway management programs

Duty of care

All natural resource users and managers have a duty of care to ensure that they do not damage the natural resource base, as outlined in the *Catchment and Land Protect Act 1994*. They are responsible for making good any damage incurred as a result of their actions.

Beneficiary pays

When it is not possible to attribute damage, then primary beneficiaries should pay. Users, both existing and future, are expected to pay for activities that provide private benefits. Contributions from secondary beneficiaries will, where appropriate, be negotiated with the primary beneficiaries.

Government contributions to private beneficiaries

Government contributes primarily for activities which produce public benefits. Government may agree to contribute to land and water management activities that provide private benefits, where the cumulative uptake of these activities provides significant public benefit and government support is required to facilitate this uptake.

Positive benefit-cost

Before Government will contribute to any land or water management activity, the activity must be technically sound, the benefits must outweigh the costs and it must be considered a priority management activity.

Private cost-share contributions

Management activities will be prioritised on the basis of the most public benefit for the least public cost. Where the public cost of a management activity is reduced by financial and in-kind contributions by private or corporate stakeholders, this will influence the level of priority for the action.

Upfront and maintenance costs

Waterway managers may collaborate with private landholders and with other government agencies, to bring a built asset up to a declared standard, after which time (in general), the maintenance of the built asset will be the responsibility of the beneficiary.

Disasters

The cost of repair and recovery of essential public assets following natural disasters will be in accordance with the nationally agreed natural disaster relief and recovery arrangements.

Statewide policy and monitoring

Government will contribute to the cost of statewide planning, statewide resource monitoring and assessment, and research and investigations where they are crucial to sustainable land and water management.

18.6 Management arrangements for structures in waterways

Thousands of structures (see Box 18.1) have been built in or adjacent to Victoria's waterways over the last 150 years and new structures continue to be built. In order to maintain or improve the environmental condition of a waterway, the regional Waterway Strategy may identify priority management activities that require:

- a new structure in a waterway
- maintenance or change to the design or operation of an existing structure (see Section 11.4.1)
- removal of a structure (see Section 11.4.2).

Box 18.1: Structures associated with waterways

Structures associated with waterways are built assets that can influence waterway condition and include:

- public infrastructure (structures that provide public or community services such as weirs, dams, bridges, roads etc. (see Chapter 4, Box 4.2)
- structures for the maintenance or improvement of waterway condition, such as fishways, carp screens, regulators to enable delivery of environmental water, multi-level offtakes in storages, bank stabilisation works, access points and fishing platforms
- private infrastructure such as dams, bridges and causeways on private property
- redundant structures, that is, those that are not used for a current purpose.

Clear management arrangements for both new and existing structures are required. This is to ensure that the structure owner and other stakeholders agree on their responsibilities and that the structure is appropriately managed to ensure its future successful ongoing operation and maintenance for waterway management purposes. Flood levees fall within the definition of a structure under the public infrastructure category. Management of flood levees was considered as part of the Environment and Natural Resources Committee Inquiry into Flood Mitigation Infrastructure in Victoria (see Section 15.3.2).

18.6.1 Management arrangements for new structures

It is important that the allocation of responsibilities across the life-cycle of any new structure associated with waterways is clear before it is built. The life-cycle of a structure includes:

- construction to the required standards
- operation and maintenance to ensure it is effective for its designated purpose
- refurbishment, replacement or removal if the structure is no longer required.

The proponent is responsible for the future management of a structure which is built in accordance with the regulatory requirements (unless otherwise agreed). For structures built for waterway management purposes, regardless of the source of funding, it is often appropriate that the waterway manager assumes responsibility for the management of the structure.

Policy 18.4

All new structures in waterways are the responsibility of the proponent. The proponent is:

- the entity that has built the structure in accordance with regulatory requirements, or
- the catchment management authority or Melbourne Water in the case of structures built for waterway management by, or for, the waterway manager (unless otherwise agreed).

The proponent is responsible for managing the structure throughout its life-cycle and must maintain an inventory of structures for which they have agreed ownership. The proponent may, by agreement, establish an arrangement with another entity to undertake activities for the management of the structure.



Structure allowing fish movement past a weir. Courtesy DEPI

18.6.2 Management arrangements for existing structures

Unless a structure on a waterway is on the asset register of a public infrastructure owner or some other arrangement is in place for its management (such as a water corporation), the owner of the land on which the structure is located is responsible for the structure. However, there may be uncertainty about the management of the structure where:

- the structure is redundant and the owner may not be actively operating or maintaining the structure
- changes have been made to a structure for waterway management purposes, for example, the installation of a fishway, but future operation and maintenance of the structure has not been negotiated and agreed.

Statutory authorities (such as CMAS and water corporations) are empowered, but not obliged, to maintain structures in waterways unless they are compelled to do so by an agreement, or by formal requirements (such as a statement of obligations). However, where structures are important for waterway management, CMAs will need to undertake a lead role in negotiating management agreements with the structure owner.

Policy 18.5

When a priority management activity in the regional Waterway Strategy involves works at an existing structure associated with a waterway, waterway managers will take a lead role in negotiating an agreement for future management responsibility for the structure. This will be done in consultation with:

- the structure owner
- stakeholders that benefit from or are affected by the structure.

Where management responsibility is agreed, this will be documented in the form of a legally binding agreement between the responsible parties.

The agreement will specify:

- responsibility for the various aspects of structure management
- any cost-sharing arrangements
- a process for setting priorities to manage the structure in relation to the functions and objectives of the parties to the agreement.



Carp screens and structure to release environmental water to the Glenelg River. Courtesy Glenelg Hopkins CMA

List of appendices

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Terms of Reference for Stakeholder Reference Committee
- Appendix 1.2** IAP2 Public Participation Spectrum
- Appendix 3.1** Legislation relevant to waterway management
- Appendix 3.2** Full program logic for the Victorian Waterway Management Program
and Explaining the program logic
- Appendix 4.1** The values of rivers, estuaries and wetlands considered in the regional
priority setting process
- Appendix 4.2** The threats to rivers, estuaries and wetlands considered in the regional
priority setting process
- Appendix 16.1** Types of management actions to manage risks from invasive species
- Appendix 16.2** Examples of existing invasive species lists (National and Victorian)
- Appendix 17.1** Sub-components of the Indices of Condition

Appendix 1.1: Terms of Reference for Expert Scientific Panel

Victorian Waterway Management Strategy Expert Scientific Panel

Terms of Reference

Members of the Expert Scientific Panel will be expected to provide advice on the science underpinning the policies being developed for the Victorian Waterway Management Strategy (VWMS). The advice should be specifically aimed at ensuring that the ecological concepts, management approach and objectives are based on the best scientific knowledge available.

Membership

Independent Chair – Emeritus Professor Barry Hart

| Expertise | Representative | Organisation |
|----------------------------|---------------------------------------|-----------------------------|
| Water quality | Emeritus Professor Barry Hart (Chair) | Monash University |
| River ecology | Emeritus Professor Sam Lake | Monash University |
| Aquatic biota | Leon Metzling | EPA Victoria |
| Hydrogeomorphology | Associate Professor Mike Stewardson | The University of Melbourne |
| River ecology | Dr Nick Bond | Griffith University |
| Wetland ecology | Dr Terry Hillman | La Trobe University |
| Urban aquatic environments | Associate Professor Chris Walsh | The University of Melbourne |
| Estuarine ecology | Professor Gerry Quinn | Deakin University |

Appendix 1.1: Terms of Reference for Stakeholder Reference Committee

Victorian Waterway Management Strategy Stakeholder Reference Committee

Terms of Reference

Members of the Stakeholder Reference Committee will be expected to provide advice and direction on key policies being developed for the Victorian Waterway Management Strategy (VWMS), particularly in relation to the implications for stakeholder groups. Note that two people are listed if there was a change in membership over the life of the committee.

Membership

Independent Chair – Mick Murphy, Chair, Victorian Catchment Management Council.

| Stakeholder | Representative | Position |
|--|---------------------------------------|--|
| Victorian Catchment Management Council | Mick Murphy | Chair |
| Catchment Management Authority CEO's forum | Geoff Hocking / Martin Fuller | CEO, West Gippsland CMA |
| Vic Water | Peter Field | Co-ordinator, Land Management, Sustainability Unit, Central Highlands Water |
| Victorian Farmers Federation (VFF) | Gerald Leach | Chairman, VFF Land Management Committee |
| Environment Victoria | Juliet LeFeuvre | Healthy Rivers Community Campaigner |
| Parks Victoria | Tamara Boyd | Statewide Ecological Water Manager |
| VRFish | Jean-Michel Benier / Chris Collins | VRFish Representative |
| Municipal Association of Victoria | Simone Stuckey / Ben Morris | Policy Advisor – Environment |
| Victorian Coastal Council | Rob Gell | Council member |
| Victorian Catchment Management Council | Dr Sandra Brizga | Former Council member |
| River Basin Management Society | James Rennie / Dr Geoff Vietz | Council President |
| Field and Game Australia (FGA) | Tom Chick | FGA Representative |

Appendix 1.2: IAP2 Public Participation Spectrum



International Association
for Public Participation
Australasia

IAP2 Public Participation Spectrum

Developed by the International Association for Public Participation

INCREASING LEVEL OF PUBLIC IMPACT

| INFORM | CONSULT | INVOLVE | COLLABORATE | EMPOWER |
|---|--|---|--|--|
| Public Participation Goal: | Public Participation Goal: | Public Participation Goal: | Public Participation Goal: | Public Participation Goal: |
| To provide the public with balanced and objective information to assist them in understanding the problems, alternatives, opportunities and/or solutions. | To obtain public feedback on analysis, alternatives and/or decisions. | To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered. | To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution. | To place final decision-making in the hands of the public. |
| Promise to the Public: | Promise to the Public: | Promise to the Public: | Promise to the Public: | Promise to the Public: |
| We will keep You informed. | We will keep you informed, listen to and acknowledge concerns and provide feedback on how public input influenced the decision. | We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision. | We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible. | We will implement what you decide. |
| Example Techniques to Consider: | Example Techniques to Consider: | Example Techniques to Consider: | Example Techniques to Consider: | Example Techniques to Consider: |
| <ul style="list-style-type: none"> • Fact sheets • Web Sites • Open houses | <ul style="list-style-type: none"> • Public comment • Focus groups • Surveys • Public meetings | <ul style="list-style-type: none"> • Workshops • Deliberate polling | <ul style="list-style-type: none"> • Citizen Advisory • Committees • Consensus building • Participatory decision-making | <ul style="list-style-type: none"> • Citizen juries • Ballots • Delegated decisions |

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Appendix 3.1: Legislation relevant to waterway management

Victorian

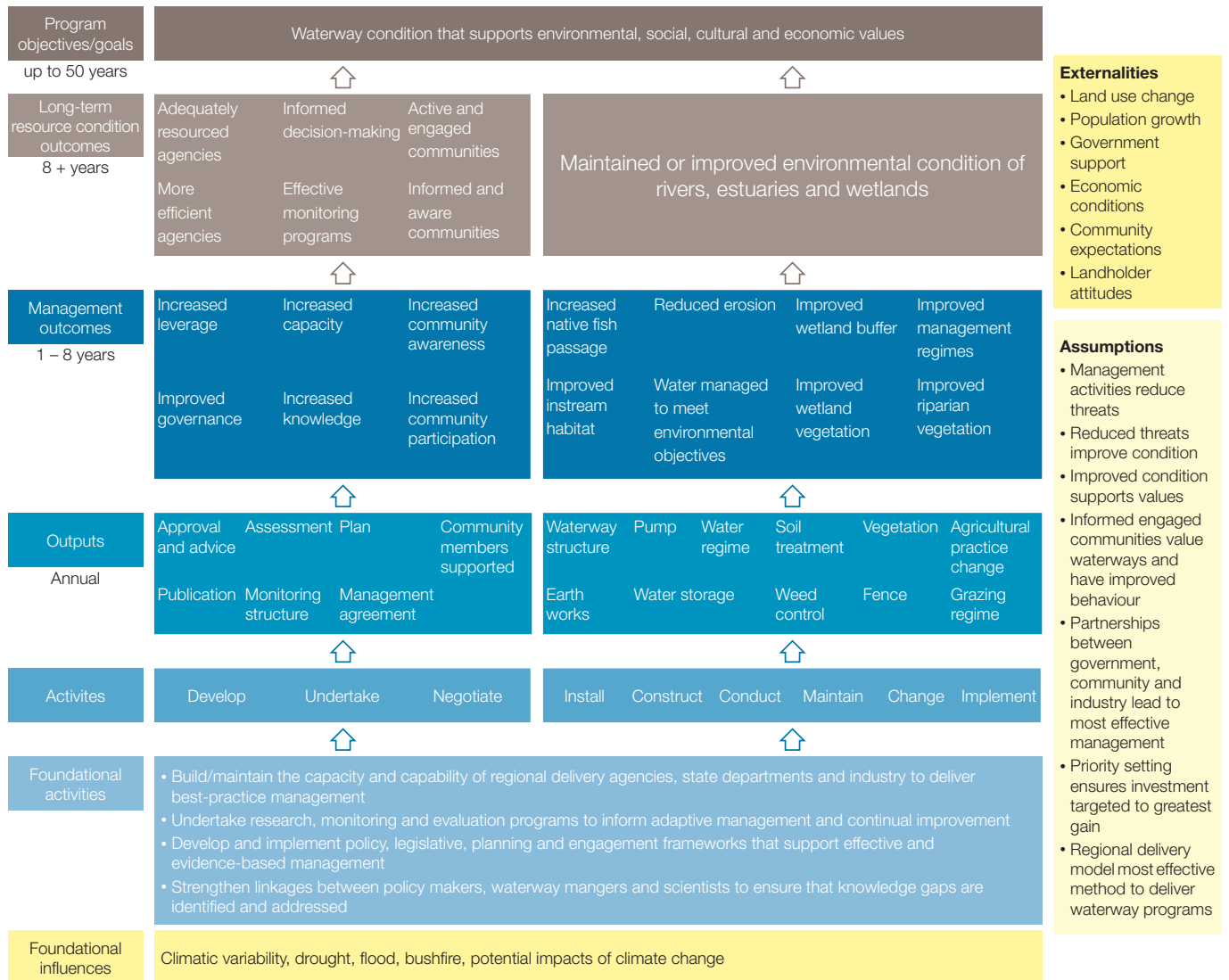
Water Act 1989
Catchment and Land Protection Act 1994
Heritage Rivers Act 1992
Environment Protection Act 1970
Crown Land (Reserves) Act 1978
Flora and Fauna Guarantee Act 1988
Land Act 1958
Climate Change Act 2010
Traditional Owner Settlement Act 2010
Aboriginal Heritage Act 2006
Sustainable Forests (Timber) Act 2004
Victorian Environmental Assessment Council Act 2001
Parks Victoria Act 1998
Alpine Resorts (Management) Act 1997
Coastal Management Act 1995
Fisheries Act 1995
Conservation, Forests and Lands Act 1987
Planning and Environment Act 1987
Reference Areas Act 1978
National Parks Act 1975
Wildlife Act 1975
Victorian Conservation Trust Act 1972
Forests Act 1958
Marine Safety Act 2010
Environmental Effects Act 1978
Mineral Resources (Sustainable Development) Act 1990
Emergency Management Act 1986
Safe Drinking Water Act 2003
Essential Services Commission Act 2001

Commonwealth

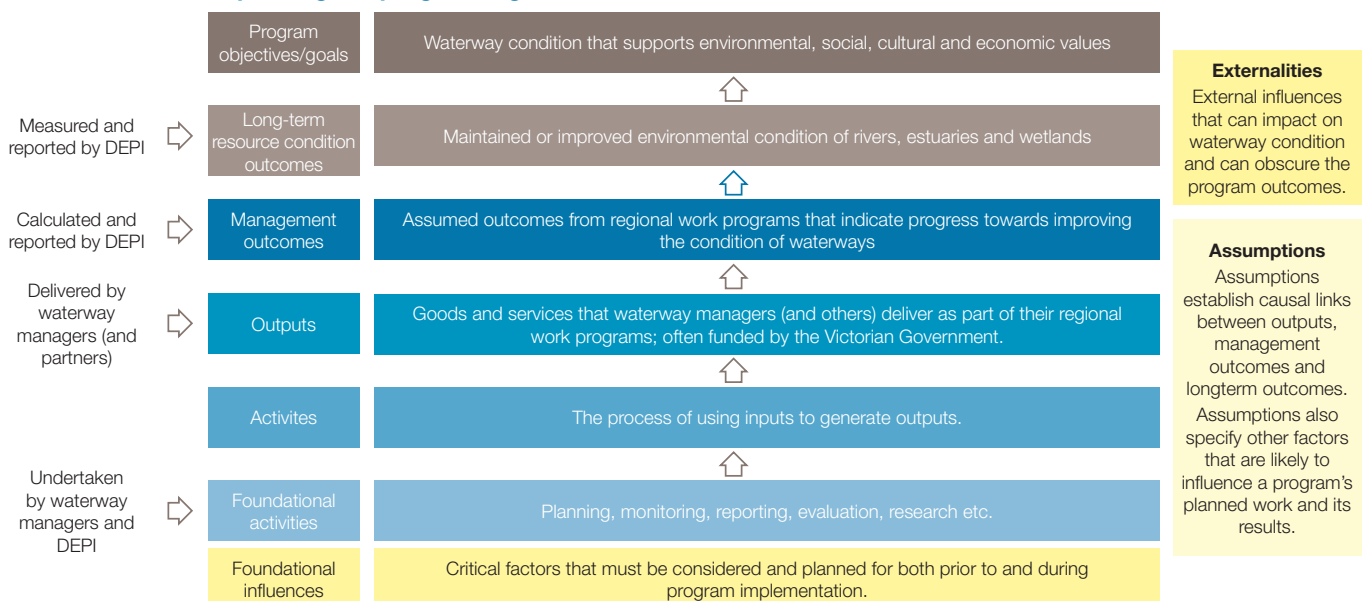
Water Act 2007
Water Amendment Act 2008
Environment Protection and Biodiversity Conservation Act 1999
Native Title Act 1993
Fisheries Management Act 1991
Quarantine Act 1908

Appendix 3.2: Full program logic for the Victorian Waterway Management Program

Full program logic for the Victorian Waterway Management Program



Explaining the program logic



Appendix 4.1: The values of rivers, estuaries and wetlands considered in the regional priority setting process.

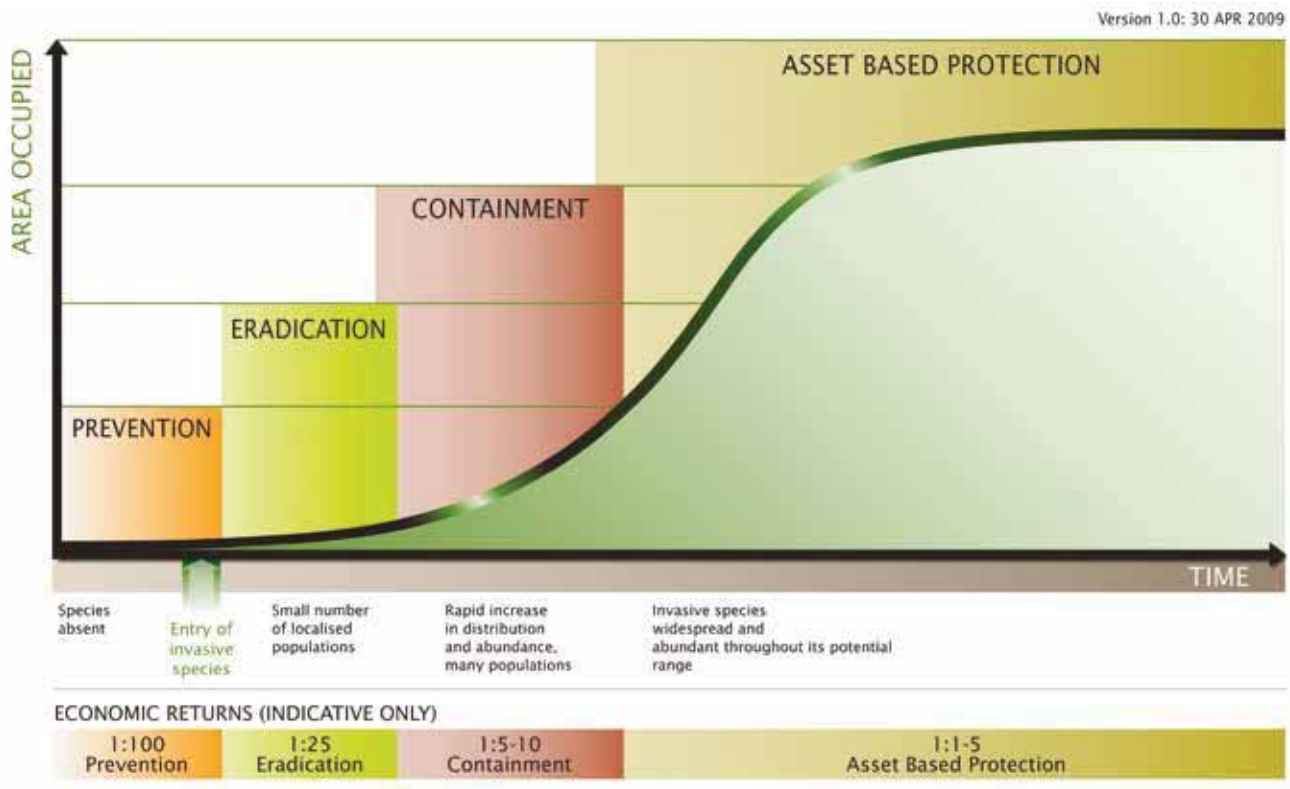
| ENVIRONMENTAL VALUES | | |
|---|---|---|
| Rivers | Wetlands | Estuaries |
| <p>FORMALLY RECOGNISED SIGNIFICANCE</p> <ul style="list-style-type: none"> National Significance <ul style="list-style-type: none"> Living Murray Icon Sites National Heritage Sites State Significance <ul style="list-style-type: none"> Heritage Rivers Icon Rivers Essentially Natural Catchments Victorian Parks and Reserves Victorian Heritage Sites | <p>FORMALLY RECOGNISED SIGNIFICANCE</p> <ul style="list-style-type: none"> International Significance <ul style="list-style-type: none"> Ramsar Sites East Asian-Australasian Flyway Sites National Significance <ul style="list-style-type: none"> Nationally Important Wetlands Living Murray Icon Sites National Heritage Sites State Significance <ul style="list-style-type: none"> Heritage Rivers Essentially Natural Catchments Victorian Parks and Reserves Victorian Heritage Sites | <p>FORMALLY RECOGNISED SIGNIFICANCE</p> <ul style="list-style-type: none"> International Significance <ul style="list-style-type: none"> Ramsar Sites East Asian-Australasian Flyway Sites National Significance <ul style="list-style-type: none"> Nationally Important Wetlands National Heritage Sites State Significance <ul style="list-style-type: none"> Heritage Rivers Essentially Natural Catchments Victorian Parks and Reserves Victorian Heritage Sites |
| <p>REPRESENTATIVENESS</p> <ul style="list-style-type: none"> Representative Rivers | <p>REPRESENTATIVENESS</p> <ul style="list-style-type: none"> Representative Wetlands (TBD) | <p>REPRESENTATIVENESS</p> <ul style="list-style-type: none"> Representative Estuaries (TBD) |
| <p>RARE OR THREATENED SPECIES/COMMUNITIES</p> <ul style="list-style-type: none"> Significant fish (migratory) Significant fish (non-migratory) Significant birds (riparian) Significant birds (waterway) Significant amphibians Significant invertebrates (aquatic) Significant invertebrates (terrestrial) Significant reptiles (aquatic) Significant reptiles (riparian) Significant mammals Significant flora (aquatic) Significant flora (terrestrial) Significant riparian Ecological Vegetation Communities | <p>RARE OR THREATENED SPECIES/COMMUNITIES</p> <ul style="list-style-type: none"> Significant fish Significant birds Significant amphibians Significant invertebrates Significant reptiles (aquatic) Significant reptiles (riparian) Significant mammals Significant flora Significant wetland Ecological Vegetation Communities | <p>RARE OR THREATENED SPECIES/COMMUNITIES</p> <ul style="list-style-type: none"> Significant fish (resident) Significant fish (dependent) Significant birds Significant reptiles Significant flora Significant estuarine Ecological Vegetation Classes |
| <p>NATURALNESS</p> <ul style="list-style-type: none"> Aquatic invertebrate community condition Native fish Riparian vegetation condition | <p>NATURALNESS</p> <ul style="list-style-type: none"> Aquatic invertebrate community condition (TBD) Native fish (TBD) Wetland vegetation condition | <p>NATURALNESS</p> <ul style="list-style-type: none"> Native fish (TBD) Estuary vegetation condition (TBD) |
| <p>LANDSCAPE FEATURES</p> <ul style="list-style-type: none"> Drought refuges Important bird habitats Biosphere reserves | <p>LANDSCAPE FEATURES</p> <ul style="list-style-type: none"> Drought refuges Important bird habitats Biosphere reserves | <p>LANDSCAPE FEATURES</p> <ul style="list-style-type: none"> Drought refuges Important bird habitats Biosphere reserves |

| SOCIAL VALUES | | |
|--|--|--|
| Rivers | Wetlands | Estuaries |
| ACTIVITY <ul style="list-style-type: none"> Recreational fishing Non-motor boating Motor boating Camping Swimming Beside water activities Game hunting | ACTIVITY <ul style="list-style-type: none"> Recreational fishing Non-motor boating Motor boating Camping Swimming Beside water activities Game hunting | ACTIVITY <ul style="list-style-type: none"> Recreational fishing Non-motor boating Motor boating Camping Swimming Beside water activities Game hunting |
| PLACE <ul style="list-style-type: none"> Landscape | PLACE <ul style="list-style-type: none"> Landscape | PLACE <ul style="list-style-type: none"> Landscape |
| PEOPLE <ul style="list-style-type: none"> Community groups Use of flagship species | PEOPLE <ul style="list-style-type: none"> Community groups Use of flagship species | PEOPLE <ul style="list-style-type: none"> Community groups Use of flagship species |
| CULTURAL VALUES | | |
| Rivers | Wetlands | Estuaries |
| HERITAGE <ul style="list-style-type: none"> Aboriginal cultural heritage Post-European cultural heritage | HERITAGE <ul style="list-style-type: none"> Aboriginal cultural heritage Post-European cultural heritage | HERITAGE <ul style="list-style-type: none"> Aboriginal cultural heritage Post-European cultural heritage |
| ECONOMIC VALUES | | |
| Rivers | Wetlands | Estuaries |
| WATER <ul style="list-style-type: none"> Urban/Rural township water sources Rural water sources for production Water storages Water carriers Wastewater discharges | WATER <ul style="list-style-type: none"> Urban/Rural township water sources Rural water sources for production Water storages Water carriers Wastewater discharges | WATER <ul style="list-style-type: none"> Wastewater discharges |
| POWER GENERATION <ul style="list-style-type: none"> Hydroelectricity | POWER GENERATION <ul style="list-style-type: none"> Hydroelectricity | |
| OTHER RESOURCES <ul style="list-style-type: none"> Commercial fishing Extractive industries Timber harvesting and firewood collection | OTHER RESOURCES <ul style="list-style-type: none"> Commercial fishing Extractive industries Timber harvesting and firewood collection | OTHER RESOURCES <ul style="list-style-type: none"> Commercial fishing Extractive industries Timber harvesting and firewood collection |

Appendix 4.2: The threats to rivers, estuaries and wetlands considered in the regional priority setting process

| ENVIRONMENTAL VALUES | | |
|--|--|--|
| Rivers | Estuaries | Wetlands |
| ALTERED WATER REGIMES <ul style="list-style-type: none"> – Altered flow regimes – Increase in low flow magnitude – Reduction in high flow magnitude – Increase in proportion of zero flow – Change in monthly streamflow variability – Altered streamflow seasonality | ALTERED WATER REGIMES <ul style="list-style-type: none"> • Changed water regime | ALTERED WATER REGIMES <ul style="list-style-type: none"> • Altered marine exchange (intermittently open estuaries) <ul style="list-style-type: none"> – Increase in low flow magnitude – Reduction in high flow magnitude – Increase in proportion of zero flow – Change in monthly streamflow variability – Altered streamflow seasonality • Altered marine exchange (permanently open estuaries) <ul style="list-style-type: none"> – Intermittently open estuaries – Permanently open estuaries |
| ALTERED PHYSICAL FORM <ul style="list-style-type: none"> • Bank instability • Bed instability (Degradation) | ALTERED PHYSICAL FORM <ul style="list-style-type: none"> • Reduce wetland area • Altered wetland form | ALTERED PHYSICAL FORM <ul style="list-style-type: none"> • Bank instability • Reduced estuary extent |
| POOR WATER QUALITY <ul style="list-style-type: none"> • Degraded water quality • Thermal water pollution • Disturbance of acid sulfate soils | POOR WATER QUALITY <ul style="list-style-type: none"> • Changed water properties • Disturbance of acid sulfate soils | POOR WATER QUALITY <ul style="list-style-type: none"> • Degraded water quality • Disturbance of acid sulfate soils |
| DEGRADED HABITATS <ul style="list-style-type: none"> • Degraded riparian vegetation <ul style="list-style-type: none"> – Large trees • Loss of instream habitat <ul style="list-style-type: none"> – Large wood – sedimentation • Livestock access | DEGRADED HABITATS <ul style="list-style-type: none"> • Soil disturbance • Degraded buffer vegetation • Livestock access | DEGRADED HABITATS <ul style="list-style-type: none"> • Degraded estuarine vegetation • Livestock access |
| INVASIVE FLORA AND FAUNA <ul style="list-style-type: none"> • Invasive flora (riparian) <ul style="list-style-type: none"> – Trees – Shrub layer – Ground layer • Invasive flora (aquatic) • Invasive fauna (terrestrial) • Invasive fauna (aquatic) | INVASIVE FLORA AND FAUNA <ul style="list-style-type: none"> • Invasive flora (wetland) • Invasive fauna (terrestrial) • Invasive fauna (aquatic) | INVASIVE FLORA AND FAUNA <ul style="list-style-type: none"> • Invasive flora (riparian) <ul style="list-style-type: none"> – Trees – Shrub layer – Ground layer • Invasive flora (aquatic) • Invasive fauna (terrestrial) • Invasive fauna (aquatic) |
| REDUCED CONNECTIVITY <ul style="list-style-type: none"> • Barriers to fish migration • Reduced riparian connectivity <ul style="list-style-type: none"> – Longitudinal continuity – Vegetation width • Reduced floodplain connectivity | REDUCED CONNECTIVITY <ul style="list-style-type: none"> • Reduced wetland connectivity (TBD) | REDUCED CONNECTIVITY <ul style="list-style-type: none"> • Barriers to estuarine biota • Reduced floodplain and wetland connectivity |

Appendix 16.1: Types of management actions to manage risks from invasive species



Source: Department of Primary Industries, 2011. Invasive Pest, Plant and Animal Policy Framework.

Appendix 16.2: Examples of existing invasive species lists (National and Victorian)

This does not represent a comprehensive list, and it should be noted that lists identified may change or be replaced/removed over time.

| Name | Reference | Type of invasive organisms covered |
|--|---|---|
| National | | |
| Weeds of National Significance (WoNS) | www.weeds.gov.au/weeds/lists/wons.html | Plants |
| Coordinating Committee for Introduced Marine Pest Emergencies Trigger List | www.daff.gov.au/mp/national_system/how-it-works/emergency_management/trigger_list | Marine pests |
| National priority pests: part II ranking of Australian marine pests | www.environment.gov.au/coasts/publications/imps/priority2.html | Marine pests |
| Sleeper weeds | www.weeds.gov.au/weeds/lists/sleeper.html | Plants |
| National noxious list and grey list species | http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/288425/Management-of-ornamental-fish-in-Australia.pdf | Invasive fish species |
| Noxious aquatic plants (declared aquatic plants of Australia) | www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/288425/Management-of-ornamental-fish-in-Australia.pdf (Appendix 3) | Aquatic weeds |
| Live import list | www.environment.gov.au/biodiversity/trade-use/lists/import/pubs/live-import-list.pdf | Animal and plant species |
| Victorian | | |
| Declared noxious aquatic species under <i>Fisheries Act 1995</i> | http://www.dpi.vic.gov.au/fisheries/pests-weeds-diseases/noxious-aquatic-species | All species types except mammals, birds, and amphibians |
| Advisory list of environmental weeds of aquatic habitats of Victoria | http://www.dse.vic.gov.au/__data/assets/pdf_file/0020/107192/Rankingaquaticweedsrev2.pdf | Aquatic weeds |

Appendix 17.1: Sub-components of the Indices of Condition

Index of Stream Condition

| Hydrology | Streamside Zone | Physical form | Water Quality | Aquatic Life |
|---|--|--|--|---|
| <ul style="list-style-type: none"> • Low flows • High flows • Zero flows • Seasonality • Variability | <ul style="list-style-type: none"> • Width • Fragmentation • Longitudinal continuity • Large trees • Structure • Weeds | <ul style="list-style-type: none"> • Bank stability • Artificial barriers • Instream large wood | <ul style="list-style-type: none"> • Total phosphorus • Turbidity • Salinity (EC) • pH | <ul style="list-style-type: none"> • AUSRIVAS • SIGNAL • EPT • No. Families |

Pilot Index of Estuary Condition

| Hydrology | Flora | Physical form | Sediment | Water Quality | Fauna |
|--|--|---|--|---|---|
| <ul style="list-style-type: none"> • Marine exchange • Mouth opening • Structures • Freshwater flow • ISC hydrology • Dams • Extractions • Salinity regime | <ul style="list-style-type: none"> • Aquatic macrophytes • Aquatic macroalgae • Fringing macrophytes • Microphyto-benthos • Phytoplankton | <ul style="list-style-type: none"> • Bathymetry • Sediment load • Barriers • Lateral connectivity | <ul style="list-style-type: none"> • Particle size • Bank erosion • Sediment respiration rate | <ul style="list-style-type: none"> • Turbidity • DO | <ul style="list-style-type: none"> • Fish • Birds |

Index of Wetland Condition

| Hydrology | Biota | Physical form | Soils | Water properties | Wetland catchment |
|--|---|--|---|---|---|
| <ul style="list-style-type: none"> • Seasonality • Frequency • Duration | <ul style="list-style-type: none"> • Life forms • Weeds • Altered processes • Vegetation structure and health | <ul style="list-style-type: none"> • Extent • Change in bathymetry | <ul style="list-style-type: none"> • Disturbance | <ul style="list-style-type: none"> • Nutrients • Salinity | <ul style="list-style-type: none"> • Land use intensity • Buffer width • Buffer continuity |

Acronyms

| Acronym | Full Description |
|--------------------------|---|
| ANZECC guidelines | <i>Australian and New Zealand guidelines for fresh and marine water quality</i> |
| AVIRA | Aquatic Value Identification and Risk Assessment |
| CAPs | Coastal Action Plans |
| CASS | Coastal Acid Sulfate Soils |
| CEWO | Commonwealth Environmental Water Office |
| CFI | Carbon Farming Initiative |
| CMA | Catchment Management Authority |
| COAG | Council of Australian Government |
| CoMs | Committee's of Management |
| Cth | Commonwealth |
| DEPI | Department of Environment and Primary Industries |
| DPI | Department of Primary Industries |
| DSE | Department of Sustainability and Environment |
| EC | Environmental Contribution |
| ECC | Environment Conservation Council (former) |
| EEFAM | Estuary Environmental Flow Assessment Method |
| EEMSS | Estuary Entrance Management Support System |
| ENRC | Environment and Natural Resources Committee |
| EPA | Environment Protection Authority |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> |
| EWMP | Environmental Water Management Plans |
| EWR | Environmental Water Reserve |
| FFG Act | <i>Flora and Fauna Guarantee Act 1988</i> |
| FO | Floodway Overlay |
| GDEs | Groundwater Dependent Ecosystems |
| IAP2 | International Association for Public Participation |
| IDGs | Irrigation Development Guidelines |
| IEC | Index of Estuary Condition |
| IPAPF | Invasive Plants and Animals Policy Framework |
| ISC | Index of Stream Condition |
| IWC | Index of Wetland Condition |
| IWCM | Integrated water cycle management |
| IWCP | Integrated Water Cycle Plan |

| Acronym | Full Description |
|------------|---|
| KEQ | Key Evaluation Questions |
| KPI | Key Performance Indicator |
| LCC | Land Conservation Council (former) |
| LSIO | Land Subject to Inundation Overlay |
| MDBA | Murray-Darling Basin Authority |
| MOU | Memorandum of Understanding |
| MSA | Marine Safety Act |
| NDRRA | Natural Disaster Relief and Recovery Arrangements |
| NEBRA | National Environmental Biosecurity Response Agreement |
| NRM | Natural Resource Management |
| NWI | National Water Initiative |
| NWQMS | <i>National Water Quality Management Strategy</i> |
| OLV | Office of Living Victoria |
| PBGM | Property Based Game Management |
| RCS | Regional Catchment Strategy |
| RRHS | regional River Health Strategy |
| RWS | regional Waterway Strategy |
| SEPP | <i>State Environment Protection Policies</i> |
| SEPP (WoV) | <i>State Environment Protection Policy (Waters of Victoria)</i> |
| SSAA | Sporting Shooters' Association of Australia |
| SWS | Sustainable Water Strategy |
| TUL | Take and Use Licence |
| VCMC | Victorian Catchment Management Council |
| VCS | Victorian Coastal Strategy |
| VEAC | Victorian Environment Assessment Council |
| VEFMAP | Victorian Environmental Flows Monitoring and Assessment Program |
| VRHS | <i>Victorian River Health Strategy</i> |
| VWMS | Victorian Waterway Management Strategy |
| VWQMN | Victorian Water Quality Monitoring Network |
| WMIS | Water Management Information System |
| WoNS | Weeds of National Significance |
| WSUD | Water sensitive urban design |
| WUL | Water Use Licence |

Glossary

Above cap water

The water available above limits on consumptive volumes of surface water and groundwater. It includes unregulated flows which cannot be kept in storage.

Algal bloom

A rapid increase in the population of algae that can occur in waterways, often caused by excess nutrients (particularly phosphorus and nitrogen).

Asset (in the context of the 'asset-based approach')

A spatially defined, biophysical component of the environment (for example, a river reach, an estuary or an individual wetland or wetland complex) that has particular values associated with it.

Aquatic invertebrate

Refers to insects, bugs and other small animals without a backbone that live in waterways.

Avulsion

An avulsion occurs when the main flow of a river rapidly and naturally shifts from one section of its channel to a new course.

Bankfull

Flows that completely fill the channel.

Barriers

Artificial instream structures, such as dams, weirs, causeways and culverts, that restrict the migration and movement of fish or other biota and can interrupt transport of organic material and sediment.

Baseflow

The component of streamflow supplied by groundwater discharge.

Biofilm

A thin, usually resistant, layer of microorganisms (such as bacteria) that form on and coat various surfaces.

Biolinks

Parts of the landscape which increase the connectivity of areas of intact native vegetation to enhance the ability of native plants and animals to disperse, recolonise and adapt naturally to climate change.

Brackish water

Water that is saltier than fresh water, but not as salty as sea water. It may result from the mixing of seawater with fresh water, as in estuaries.

Bulk Entitlement

The right to water held by water and other authorities defined in the *Water Act 1989*. It defines the amount of water that an authority is entitled to from a river or storage, and may include the rate at which it may be taken and the reliability of the entitlement.

Cap

An upper limit for the diversion of water from a waterway, catchment or basin.

Caring for our Country

Caring for our Country is an Australian Government natural resource management initiative.

Carry-over

Allows water entitlement holders to retain unused water at the end of a season for use in the following season (according to specified rules).

Catchment

The region from which all rainfall flows, other than that removed by evaporation, into waterways and then to the sea or terminal lake.

Catchment management authorities

Statutory authorities established under the *Catchment, and Land Protection Act 1994* to provide co-ordinated management of land and water resources.

Connectivity

Refers to the links between different habitats and species within a landscape

Consumptive use

Water that is provided for all human uses (i.e. non-environmental uses, use for people, agriculture or industry).

Controlled grazing

Controlling a stock grazing regime, within a fenced area by managing factors such as the timing, number of stock and duration of the grazing compared to having stock graze there all the time.

Crown land

Land that is owned by the State. Also often referred to as public land (although not all public land is actually Crown land).

Dissolved oxygen

The oxygen dissolved in water and freely available for use by aquatic organisms. It is vital for the survival of fish, invertebrates, bacteria, and underwater plants.

Drought refuge

A critical remaining water habitat in otherwise dry landscapes that help species survive drought. A typical example is a pool in a non-flowing stream channel fed by groundwater.

Environmental Contribution

Funds collected by urban and rural water corporations under the *Water Industry Act 1994* to promote the sustainable management of water or address adverse water-related environmental impacts.

Environmental flow assessment

Assessments of the water regimes needed to sustain the ecological values of water-dependent ecosystems at a low level of risk.

Environmental flow regime

The timing, frequency, duration and magnitude of flows for the environment.

Environmental flow studies

The study of the flow requirements of particular basin's river and wetland systems used to inform policy decisions on the management and allocation of water resources.

Environmental water

Water to support environmental values and ecological processes.

Environmental Water Reserve (EWR)

The share of water resources set aside to maintain the environmental values of a water system.

Estuary

The zone where a river meets the sea, influenced by river flows and tides and characterised by a gradient from fresh to salt water.

Fish passage

Provision for the movement or migration of fish past barriers.

Fishway

A structure that facilitates fish passage past a barrier.

Floodplain

Low-lying land adjacent to a river or stream with unique ecosystems dependent on overflow from flood events.

Flow regime

The range of flows experienced by a waterway throughout the seasons and years which may include base flows, low flows, high flows, overbank flow and cease to flow (drying) events.

Fragmented landscapes

Landscapes where vegetation or habitat size has been reduced or disconnected, usually by human activity.

Freshes

Small and short peaks in flows; a 'flush' of water through a waterway, which occurs generally in the summer and spring months (but may occur in other seasons).

Gigalitre (GL)

One billion (1,000,000,000) litres.

Groundwater dependent ecosystem

Natural ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain their ecological processes.

Habitat

The natural home or environment of an animal, plant, or other organism.

Hectare (ha)

Ten thousand square metres.

Hydrological regime

Changes with time in the rates of flow of rivers and in the levels and volumes of water in rivers, lakes, reservoirs, and wetlands. The hydrologic regime is closely related to seasonal changes in climate.

Instream

The component of a river within the river channel, including pools, riffles, woody debris, the river bank and benches.

Instream structures

Infrastructure constructed within waterways to alter, contain or control water flows. Examples include weirs and dams.

Integrated catchment management

Integrated catchment management is the co-ordinated involvement of agencies, stakeholders and the general public in policy making, planning, and management to promote sustainable use of natural resources.

Large woody habitat

A dead tree, or portion of a tree, that has fallen or been laced into a stream. Usually considered to be greater than 0.1 m in diameter, and over a metre long. Also called snags.

Levee

An embankment that is built in order to prevent a river from overflowing.

Low flow

Flows that provide a continuous flow over the bottom of the channel, but do not fill the channel to any great depth. The term is most often used in relation to baseflows that occur over the drier periods of the year that are sustained for some period (weeks to months), due to short bursts of rain.

Lowland

Lowland rivers and streams are slow flowing and found in relatively flat areas.

Megalitre (ML)

One million (1,000,000) litres.

Overbank flows

Flows that spill over the channel onto the floodplain.

Pathogens

Disease causing microorganisms, such as bacteria, fungi, and viruses, found commonly in sewage, hospital waste, run-off water from farms, and in water used for swimming.

Peri-urban

The area of land immediately adjoining an urban area; between the suburbs and the countryside.

Ramsar Convention

Provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources.

Ramsar Site

Wetlands of international importance, designated under the Ramsar Convention.

Reach

A length of stream, typically 20 to 30 km long, which is relatively homogenous with regard to the hydrology, physical form, water quality and aquatic life.

Refuge

Areas where plants and animals can take refuge, during times of climatic or biological stress and which support the individuals that will recolonise the surrounding landscape when conditions improve. Refuges provide conditions suitable for survival of species that may be declining elsewhere.

Regulated flows/systems

Systems where the flow of the river is regulated through the operation of large dams or weirs.

Representative rivers

These are rivers that can be used to represent the major river classes that once occurred naturally across Victoria. They also need to be in good condition to be representative. A list of the suggested representative rivers can be found in the *Victorian River Health Strategy (2002)*.

Return flows

The portion of water that 'returns' to the river (or water supply) system after a watering event. This water can be revised for floods or other environmental watering downstream.

Riparian

Refers to land or vegetation that adjoins a river, creek, estuary, lake or wetland.

Sustainable diversion limit (Victoria)

The maximum amount of water that can be taken from an unregulated sub-catchment for consumptive use during the winter-fill period to avoid unacceptable risk to the environment. It also prevents the issuing of new summer water extraction licences.

Sustainable diversion limit (Murray-Darling Basin)

The maximum amount of water that can be taken for consumptive use from 2019 under the Murray-Darling Basin Plan.

Sustainable Water Strategies

The maximum amount of water that can be taken from an unregulated sub-catchment for consumptive use during the winter-fill period to avoid unacceptable risk to the environment. It also prevents the issuing of new summer water extraction licences.

The Living Murray

A water recovery project focussed on improving the environmental health of six icon sites in the Basin. The six designated sites are Barmah-Millewa Forest, Gunbower-Koondrook-Perricoota Forest, Hattah Lakes, Chowilla Floodplain/Lindsay-Wallpolla Islands, Lower Lakes/Coorong/Murray Mouth, and the River Murray Channel.

Thermal stratification

The formation of layers of different temperatures in a lake or reservoir.

Unregulated system

A system that does not contain any major dams or diversion weirs which control the flow of water in the system.

Waterways

Rivers and streams, their associated estuaries and floodplains (including floodplain wetlands) and non-riverine wetlands.

Waterway condition/waterway health

Waterway condition (or waterway health) is an umbrella term for the overall state of key features and processes that underpin functioning waterway ecosystems (such as species and communities, habitat, connectivity, water quality, riparian vegetation, physical form, and ecosystem processes such as nutrient cycling and carbon storage).

Wetland

Wetlands are areas, whether natural, modified or artificial, subject to permanent or temporary inundation, that hold static or very slow moving water and develop, or have the potential to develop, biota adapted to inundation and the aquatic environment. They may be fresh or saline.

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List of Actions

4 Regional waterway management

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| Action 4.1 | Timeframe: 2014 |
| Develop regional Waterway Strategies in accordance with guidelines published by the (then) Department of Sustainability and Environment in December 2012. | |
| Who: Waterway managers , regional agencies and boards, in consultation with Traditional Owners, the regional community and other key stakeholders. | |
| Action 4.2 | Timeframe: late 2013 |
| Develop principles for managing serious risks to public infrastructure from waterway processes. | |
| Who: Department of Environment and Primary Industries , waterway managers, floodplain managers, asset owners. | |
| Action 4.3 | Timeframe: late 2013 |
| A transparent and consistent regional priority setting process will be run, in consultation with the community, to underpin development of the regional Waterway Strategies. | |
| Who: Waterway managers , regional communities. | |

5 Community participation

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| Action 5.1 | Timeframe: 2019 |
| Evaluate the use of information from the first <i>My Victorian Waterway</i> survey to inform the development of future social research into waterway management. | |
| Who: Department of Environment and Primary Industries , waterway managers, Environment Protection Authority Victoria, Marine Safety Act waterway managers. | |
| Action 5.2 | Timeframe: 2020 |
| Conduct the second <i>My Victorian Waterway</i> survey prior to the renewal of the <i>Victorian Waterway Management Strategy</i> . | |
| Who: Department of Environment and Primary Industries , waterway managers. | |
| Action 5.3 | Timeframe: 2016 |
| Develop information for the public about the importance of healthy waterways, good management practices and waterway management issues. | |
| Who: Department of Environment and Primary Industries , waterway managers, Marine Safety Act waterway managers, Environment Protection Authority Victoria. | |

6 Victorian Traditional Owner involvement in waterway management

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| Action 6.1 | Timeframe: late 2013 |
| Develop the Department of Environment and Primary Industries' Aboriginal Inclusion Action Plan. | |
| Who: Department of Environment and Primary Industries . | |
| Action 6.2 | Timeframe: late 2013 |
| Provide guidance to waterway managers regarding Traditional Owner engagement for the regional Waterway Strategies. | |
| Who: Department of Environment and Primary Industries , waterway managers, Traditional Owners. | |

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| Action 6.3 | Timeframe: 2015 |
| Investigate methods for identifying Aboriginal values associated with waterways and how they can be better incorporated in regional planning processes for waterways. | |
| Who: Department of Environment and Primary Industries, waterway managers, Traditional Owners. | |
| Action 6.4 | Timeframe: 2015 |
| Evaluate engagement of Traditional Owners in the development of the regional Waterway Strategies. | |
| Who: Department of Environment and Primary Industries, waterway managers, Traditional Owners. | |
| Action 6.5 | Timeframe: from 2012 |
| Education, training and capacity building for Traditional Owners and Aboriginal Victorians will be improved by inviting Traditional Owners and Aboriginal Victorians to nominate leaders or individuals with specific aptitude, knowledge or skills, for: | |
| <ul style="list-style-type: none"> • a scholarship for the biennial Graduate Certificate of River Health offered by The University of Melbourne • a position within the Department of Environment and Primary Industries Graduate Recruitment Program • a scholarship for the Graduate Diploma of Natural and Cultural Resource Management offered by the Institute of Koorie Education, Deakin University. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |

8 Environmental water management

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| Action 8.1 | Timeframe: 2014 |
| The Victorian Environmental Water Holder will identify and create engagement opportunities for state level stakeholders who have an interest in environmental watering. | |
| Who: Victorian Environmental Water Holder. | |
| Action 8.2 | Timeframe: 2014 |
| All environmental water holdings will be reviewed, to ensure that they incur applicable headworks, delivery and resource management charges. Ministerial guidance will be provided to clarify the nature of charges that are applicable for environmental water holdings. With regard to the costs incurred by the Victorian Environmental Water Holder, funding will be subject to standard budgetary processes. | |
| Who: Department of Environment and Primary Industries, waterway corporations, Victorian Environmental Water Holder. | |
| Action 8.3 | Timeframe: 2014 |
| The costs associated with environmental entitlements managed by the Victorian Environmental Water Holder and delivered by waterway managers on behalf of other entitlement holders will be identified to ensure these costs are passed on to the appropriate entitlement holders. | |
| Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. | |
| Action 8.4 | Timeframe: 2014 |
| Clearly specify and verify the role of each relevant body involved in planning, delivery and facilitating the delivery of environmental water to manage any risks to third parties. | |
| Who: Victorian Environmental Water Holder, waterway managers, Department of Environment and Primary Industries, water corporations. | |

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| Action 8.5 | Timeframe: late 2013 |
| Engage with the Murray-Darling Basin Authority for the development of its constraints management strategy for environmental watering. | |
| Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, water corporations, waterway managers. | |
| Action 8.6 | Timeframe: 2015 |
| Review and update subordinate instruments to the <i>Water Act 1989</i> as necessary to reflect policy for robust and transparent water allocation decision-making. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 8.7 | Timeframe: 2014 |
| Develop guidelines to support the development of local management plans to ensure fair arrangements for water users and the environment. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 8.8 | Timeframe: 2014 |
| Identify and prioritise types of high value groundwater-dependent ecosystems to inform regional waterway planning processes and water allocation decisions. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 8.9 | Timeframe: 2015 |
| Develop method(s) to assess the contribution of groundwater in supporting the priority types of groundwater-dependent ecosystems. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 8.10 | Timeframe: 2014 |
| Develop guidelines to help licensing authorities consider the risk to groundwater-dependent ecosystems, including: | |
| <ul style="list-style-type: none"> • management principles (for example, setting trigger levels) • how to consider groundwater-dependent ecosystems in licensing decisions and groundwater-related management plans where appropriate | |
| Who: Department of Environment and Primary Industries, water corporations, waterway managers. | |
| Action 8.11 | Timeframe: 2015 |
| Develop a program to monitor the ecological response of priority estuaries to environmental watering. | |
| Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. | |
| Action 8.12 | Timeframe: 2015 |
| Develop a program to monitor the ecological response of priority wetlands to environmental watering. | |
| Who: Department of Environment and Primary Industries, Victorian Environmental Water Holder, waterway managers. | |

9 Riparian management

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| Action 9.1 | Timeframe: 2014 |
| Develop minimum standards for the management of licensed Crown frontages. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.2 | Timeframe: 2015 |
| Investigate the costs and benefits to landholders and the Victorian Government of managing Crown frontages under licence. | |
| Who: Department of Environment and Primary Industries. | |

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| Action 9.3 | Timeframe: 2015 |
| Review the roles and responsibilities of the Department of Environment and Primary Industries and waterway managers for the management of Crown frontages. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.4 | Timeframe: 2018 |
| Review and reform the legislation relating to the management of riparian land, particularly Crown land (focussing on the <i>Land Act 1958</i>), to streamline the administration and management of Crown frontages and to enable it to support the Victorian Government's objective for the management of riparian land. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.5 | Timeframe: 2014 |
| Develop and distribute information to Crown frontage licensees (as part of the next Crown frontage licence renewal) explaining what is required to meet licence obligations and provide further information about riparian management. | |
| Who: Department of Environment and Primary Industries. | |
| Action 9.6 | Timeframe: 2016 |
| Develop and implement improved compliance approaches for Crown frontages, including stronger action against serious breaches of licence conditions and unauthorised occupations. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.7 | Timeframe: 2016 |
| Develop information for the real estate and legal industries to inform prospective riparian property buyers that land along rivers is often public land. | |
| Who: Department of Environment and Primary Industries. | |
| Action 9.8 | Timeframe: 2016 |
| Develop systems at the point of sale to alert prospective buyers of riparian property abutting Crown frontage that the land adjacent to the river is Crown and subject to a licence. | |
| Who: Department of Environment and Primary Industries. | |
| Action 9.9 | Timeframe: 2014 |
| Develop systems to alert the Department of Environment and Primary Industries and waterway managers when property adjoining a Crown frontage is sold or the title transferred. | |
| Who: Department of Environment and Primary Industries. | |
| Action 9.10 | Timeframe: 2014 |
| Develop information for fire suppression agencies, waterway managers and landholders about fire behaviour in riparian land. | |
| Who: Country Fire Authority, Department of Environment and Primary Industries, waterway managers. | |
| Action 9.11 | Timeframe: 2014 |
| Prepare guidance material for water corporations for the management of risks to drinking water quality arising from stock in waterways upstream of drinking water offtakes. | |
| Who: Department of Health, Department of Environment and Primary Industries, water corporations. | |
| Action 9.12 | Timeframe: 2016 |
| Develop cost-sharing guidelines for riparian management activities that detail a sliding scale of public investment based on the level of public benefit. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.13 | Timeframe: 2014 |
| Develop guidelines for riparian fence construction in flood prone areas. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.14 | Timeframe: 2016 |
| Develop options for resourcing ongoing management of fenced riparian land. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |

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| Action 9.15 | Timeframe: 2014 |
| Develop a toolkit of approaches waterway managers can employ for long-term engagement of landholders with riparian management agreements. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 9.16 | Timeframe: 2015 |
| Develop and strengthen existing programs aimed at developing awareness by landholders and recreational users of their rights and responsibilities regarding access to and recreational use of Crown frontages. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |

10 Water quality

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| Action 10.1 | Timeframe: TBD following review of the framework for statutory policies |
| Review and update the <i>State Environment Protection Policy (Waters of Victoria)</i> . | |
| Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria. | |
| Action 10.2 | Timeframe: 2017 |
| Publish the fourth Victorian water quality assessment for Victoria's rivers. | |
| Who: Department of Environment and Primary Industries. | |
| Action 10.3 | Timeframe: 2016 |
| Review the appropriateness of the location, information collected and cost-share arrangements for sites in the Victorian Water Quality Monitoring Network. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations, Environment Protection Authority Victoria. | |
| Action 10.4 | Timeframe: 2015 |
| Clarify and strengthen roles, responsibilities and accountability for agencies involved in managing water quality incidents. | |
| Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria, waterway managers, Marine Safety Act waterway managers water corporations, Parks Victoria and other relevant government departments. | |
| Action 10.5 | Timeframe: 2016 |
| Identify and document current knowledge of how acid sulfate soils threaten environmental, social, cultural and economic values of waterways and identify those factors that pose the greatest risk. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 10.6 | Timeframe: 2016 |
| Support research to address priority knowledge gaps in water quality management. | |
| Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria, waterway managers. | |

11 The river channel

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| Action 11.1 | Timeframe: 2014 |
| Review and update the Statement of Obligations issued by the Minister for Water to catchment management authorities. | |
| Who: Department Environment and Primary Industries, catchment management authorities. | |
| Action 11.2 | Timeframe: 2016 |
| Develop guidelines on best-practice standards for minimising risks to works and activities in waterways from flood damage. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |

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| Action 11.3 | Timeframe: 2015 |
| Develop guidelines on the assessment of flood risk posed by large woody habitat and instream vegetation. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 11.4 | Timeframe: 2015 |
| Prepare updated guidance for managing large woody habitat, including information for the community. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 11.5 | Timeframe: 2016 |
| Develop guidelines to assist waterway managers in determining appropriate environmental requirements when assessing proposals for new private dams. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations, local government. | |
| Action 11.6 | Timeframe: 2016 |
| Develop best practice guidelines for the appropriate design, approval and construction of fishways and other fish passage works. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 11.7 | Timeframe: 2015 |
| Develop a suite of fish passage design guidelines for use at small scale structures. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 11.8 | Timeframe: 2016 |
| Develop and implement a statewide program for monitoring the performance of fishways and fish passage works. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 11.9 | Timeframe: 2014 |
| Develop performance, operation and maintenance guidelines for fishways and fish passage works. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |

12 Wetlands

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| Action 12.1 | Timeframe: 2014 |
| Endorse the ecological character descriptions and updated Ramsar information sheets for Victoria's Ramsar sites that are being developed by the Australian Government. | |
| Who: Department of Environment and Primary Industries, Ramsar site managers, waterway managers. | |
| Action 12.2 | Timeframe: 2015,2018 |
| Monitor the ecological character of Ramsar sites and provide information to the Australian Government on the status of ecological character and Ramsar site documentation for inclusion in three-yearly national reports to the Ramsar Convention. | |
| Who: Department of Environment and Primary Industries, Ramsar site managers. | |
| Action 12.3 | Timeframe: 2015 |
| Evaluate and renew management planning for Victoria's Ramsar sites. | |
| Who: Department of Environment and Primary Industries, Ramsar site managers, waterway managers, other agencies involved in Ramsar site management. | |
| Action 12.4 | Timeframe: as required |
| Develop, implement, monitor and evaluate management response strategies for any Ramsar sites where monitoring indicates that a change in ecological character has occurred or is likely to occur. | |
| Who: Department of Environment and Primary Industries, Ramsar site managers, Australian Government. | |

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| Action 12.5 | Timeframe: 2016 |
| Prepare guidance for landholders on sustainable use of wetlands, including guidance on sustainable stock grazing in appropriate circumstances. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.6 | Timeframe: 2016 |
| Educate and train natural resource management professionals working with landholders about the importance of wetland conservation and prepare guidance to assist them in identifying management options to improve protection of high value wetlands on private land. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.7 | Timeframe: 2015 |
| Investigate the extent and impact of different land use practices on high value wetlands. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.8 | Timeframe: 2016 |
| Improve information about wetland vegetation and develop guidance to assist local government in the application of native vegetation planning controls for wetland vegetation. | |
| Who: Department of Environment and Primary Industries, waterway managers, local government. | |
| Action 12.9 | Timeframe: 2014 |
| Identify wetlands that have a high value for protecting or improving landscape connectivity. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.10 | Timeframe: 2014 |
| Develop a framework to manage risks to waterways from rural drainage. | |
| Who: Department of Environment and Primary Industries. | |
| Action 12.11 | Timeframe: 2015 |
| Undertake research to identify high value coastal wetlands that are vulnerable to sea level rise and quantify risks and opportunities for adaptation to predicted future salinity and water regimes. | |
| Who: Department of Environment and Primary Industries, waterway managers, regional coastal boards, Gippsland Lakes Ministerial Advisory Committee. | |
| Action 12.12 | Timeframe: 2020 |
| Maintain the Victorian wetland inventory, allowing for updates of wetland attributes in response to new knowledge or changes to attributes and ensure wetland information is accessible to landholders, community networks and groups, local government and natural resource managers. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.13 | Timeframe: 2015 |
| Develop and apply a method to routinely monitor changes in wetland extent and changes in wetland water regime. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 12.14 | Timeframe: 2016 |
| Improve the framework for identifying high value wetlands and assessing risk. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |

13 Estuaries

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| Action 13.1 | Timeframe: 2014 |
| Consider outstanding actions and strategic directions (related to estuaries) in Coastal Action Plans during development of the regional Waterway Strategies. | |
| Who: Waterway managers, regional coastal boards. | |

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| Action 13.2 | Timeframe: 2018 |
| Review and update current Estuary Management Plans or develop new plans as required. | |
| Who: Waterway managers, Parks Victoria, regional coastal boards, local government, committees of management, Department of Environment and Primary Industries, Department of Transport, Planning and Local Infrastructure. | |
| Action 13.3 | Timeframe: late 2013 |
| Implement a risk-based assessment process to help inform estuary entrance management decisions. | |
| Who: Waterway managers. | |
| Action 13.4 | Timeframe: 2016 |
| Identify land or built assets that regularly are the subject of requests to open an estuary entrance and determine if any alternative actions can be undertaken to minimise the long-term threat of inundation. | |
| Who: Waterway managers. | |
| Action 13.5 | Timeframe: 2020 |
| Review and update planning controls in local planning schemes to include areas that are subject to inundation due to estuary entrance closure, which are not currently addressed. | |
| Who: Waterway and floodplain managers, local government. | |
| Action 13.6 | Timeframe: 2016 |
| Review vulnerability of estuaries from coastal sea level rise and other potential impacts of climate change to inform appropriate adaptation strategies. | |
| Who: Department of Environment and Primary Industries, Department of Transport, Planning and Local Infrastructure, waterway managers, local government. | |

15 Extreme events of flood and bushfire

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| Action 15.1 | Timeframe: 2014 |
| Review and improve the process for developing, assessing and reporting on the implementation of flood claims under the Victorian Government Natural Disaster Funding Assistance Program. | |
| Who: Department of Environment and Primary Industries, Department of Treasury and Finance, waterway managers. | |

16 Invasive species management in waterways

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| Action 16.1 | Timeframe: 2016 |
| Assess the risks of inland aquatic invasive species spread through the Victorian water grid. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 16.2 | Timeframe: 2015 |
| Develop an information system for planning, delivering and recording invasive species management activities, results and outcomes that provide consistent data for performance and investment reporting. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 16.3 | Timeframe: 2016 |
| High risk pathways for the spread of invasive species in waterways will be identified. | |
| Who: Department of Environment and Primary Industries, waterway managers, water corporations. | |
| Action 16.4 | Timeframe: 2016 |
| Develop education and awareness raising material on community and industry roles for invasive species management in waterways. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |

17 Adaptive management

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| Action 17.1 | Timeframe: 2014 |
| Develop and refine work standards for management activities (outputs) to ensure effective and consistent implementation of onground works across the state. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.2 | Timeframe: 2016 |
| Review the content and purpose of the <i>Technical Guidelines for Waterway Management</i> following development of the work standards. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.3 | Timeframe: 2014 |
| Develop a program for intervention monitoring that targets priority locations and relationships for investigation over the short to medium-term (5 - 10 years). | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.4 | Timeframe: 2016 |
| Review the pilot Index of Estuary Condition program and assess the feasibility of conducting a statewide assessment of estuary condition. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.5 | Timeframe: 2016 |
| Identify, establish, monitor and maintain a network of long-term waterway monitoring sites (including both work and non-work sites). | |
| Who: Department of Environment and Primary Industries, Environment Protection Authority Victoria, waterway managers. | |
| Action 17.6 | Timeframe: 2014 |
| Develop standards for spatial reporting of output data. | |
| Who: Department of Environment and Primary Industries, catchment management authorities. | |
| Action 17.7 | Timeframe: annually |
| Report on outputs and financials each year through the following reports: | |
| <ul style="list-style-type: none"> • Annual investment reports • Catchment Management Authority Annual Reports • Catchment Management Authority Corporate Plans • Annual environmental watering booklet • Victorian Environmental Water Holder Annual Report | |
| Who: Catchment management authorities, Victorian Environmental Water Holder. | |
| Action 17.8 | Timeframe: 2016 and 2020 |
| Report statewide progress against the targets outlined in the <i>Victorian Waterway Management Strategy</i> through the 'Report Card' series. | |
| Who: Department of Environment and Primary Industries, catchment management authorities. | |
| Action 17.9 | Timeframe: 2017 |
| Review interim progress of implementing management activities in the regional Waterway Strategies. | |
| Who: Catchment management authorities. | |

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| Action 17.10 | Timeframe: 2021 |
| Undertake an independent review of the regional Waterway Strategies (management activities and targets) to inform the development of the next regional Waterway Strategies. | |
| Who: Independent reviewers, Department of Environment and Primary Industries, catchment management authorities. | |
| Action 17.11 | Timeframe: 2020 |
| Complete an independent review of the <i>Victorian Waterway Management Strategy</i> to inform development of the next strategy. | |
| Who: Independent reviewer, Department of Environment and Primary Industries, waterway managers. | |
| Action 17.12 | Timeframe: 2014 |
| Use key knowledge gaps or relationships in which there are low confidence in the logic models to inform the prioritisation of research projects at both the state and regional levels. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.13 | Timeframe: 2015 |
| Develop a knowledge exchange plan that maximises the exchange of information across the Victorian Waterway Management Program and to the broader community. | |
| Who: Department of Environment and Primary Industries, waterway managers. | |
| Action 17.14 | Timeframe: 2014 |
| Review the content of the Graduate Certificate in River Health course to improve links with the Victorian Waterway Management Program. | |
| Who: Department of Environment and Primary Industries, The University of Melbourne, waterway managers. | |
| Action 17.15 | Timeframe: 2014 and 2016 |
| Provide one scholarship for a Department of Environment and Primary Industries staff member to participate in the Science to Policy Leadership Program run by the Peter Cullen Trust. | |
| Who: Department of Environment and Primary Industries. | |
| Action 17.16 | Timeframe: 2015 |
| Provide scholarships for staff in the Department of Environment and Primary Industries and catchment management authorities to participate in the fifth Graduate Certificate of River Health course. | |
| Who: Department of Environment and Primary Industries, catchment management authorities. | |

18 Management arrangements

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| Action 18.1 | Timeframe: 2016 |
| Develop principles and criteria to guide future funding allocation to catchment management authorities for waterway management and collect the necessary data to apply the principles and criteria in the period 2016/17 - 2019/20. | |
| Who: Department of Environment and Primary Industries, catchment management authorities. | |



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