17 Adaptive management

Logging water depth in the Gunbower Forest. Courtesy North Central CMA

Adaptive management

Guide to the chapter

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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, mangers 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 Environment[1].

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.

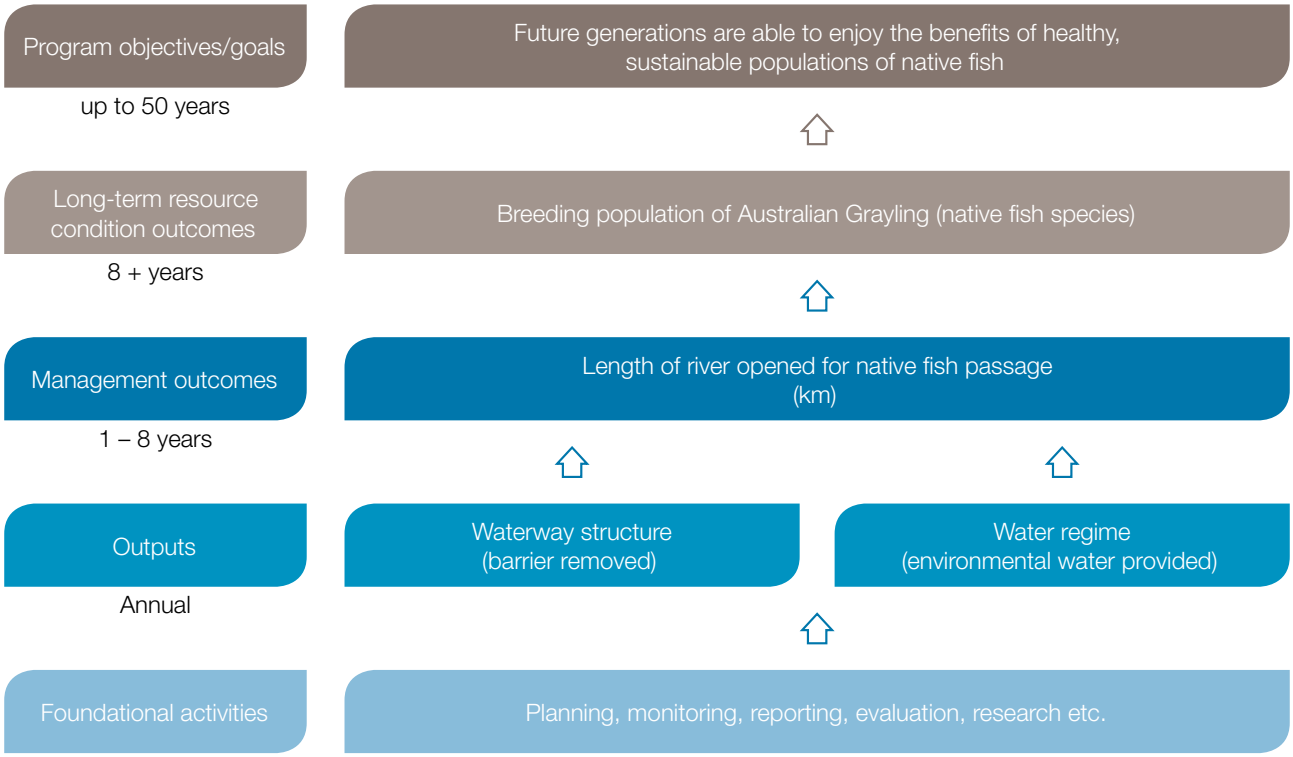


Figure 17.1: An example of a specific logic model showing the possible management activities (outputs) to increase habitat available for native fish movement (management outcome) and support breeding of native fish species (long-term resource condition outcome).

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 that 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).

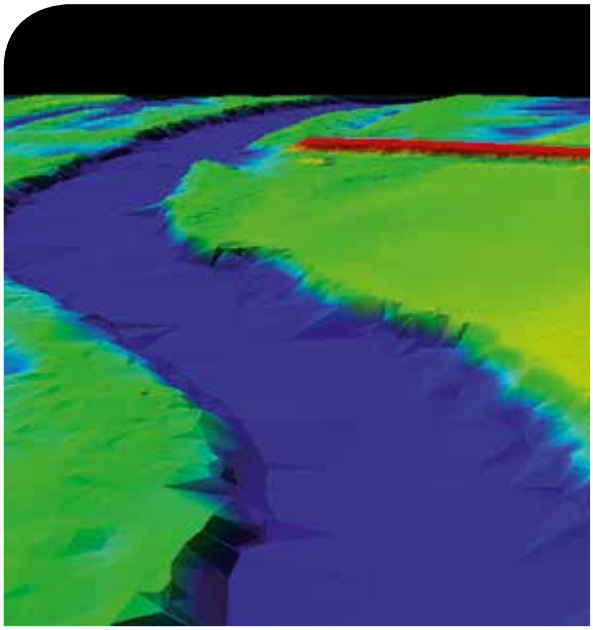
Who: Department of Environment and Primary Industries, waterway managers. **Timeframe:** 2014

17.3.4 Resource condition assessment: the Indices of Condition

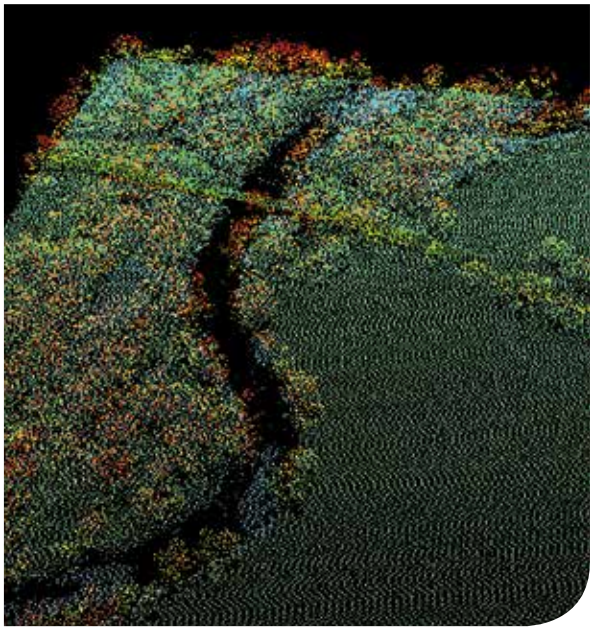
Resource condition assessment across Victoria is vital to understand the broader patterns and changes in the condition of waterways and provide information to help assess the success of the Victorian Waterway Management Program. Statewide monitoring of resource condition is undertaken using three specifically 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 Victoria, waterway managers. **Timeframe:** 2016

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 2010[4].

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 Rutherfurd

18 Management arrangements

Structural works for environmental benefits. Hattah Lakes National Park. Photographer: John Riddiford

Management arrangements

Guide to the chapter

18.1 Context

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- 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
The Department of Environment and Primary Industries is responsible for agriculture, fisheries, forestry, public land and the environment.	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: • 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.
The Environment Protection Authority Victoria is an environmental regulator and authority on environmental impacts.	The Environment Protection Authority (EPA) Victoria: • identifies the beneficial uses of water environments and the level of environmental quality needed to protect them through the *State Environmental Protection Policy (Waters of Victoria)* • 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.
Parks Victoria manages national, wilderness, state and regional parks, Melbourne's metropolitan parks and open space network as well as selected ports and waterways.	Parks Victoria: • 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.
Transport Safety Victoria is responsible for determining standards and procedures for navigation and maritime safety on state waters.	Transport Safety Victoria: • 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 *Marine Safety Act* (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 *Water Act 1989* 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 *Catchment and Land Protection Act 1994* 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 *Catchment and Land Protection Act 1994* 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	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. 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.
Victorian Coastal Council	The Victorian Coastal Council is appointed under the *Coastal Management Act 1995* to undertake strategic coastal planning and develop and oversee implementation of the *Victorian Coastal Strategy*. 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 *Victorian Environmental Assessment Council Act 2001*. 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 *Essential Services Commission Act 2001*. 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 *Water Act 1989*, 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 *Commissioner for Environmental Sustainability Act 2003* 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 billon 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

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

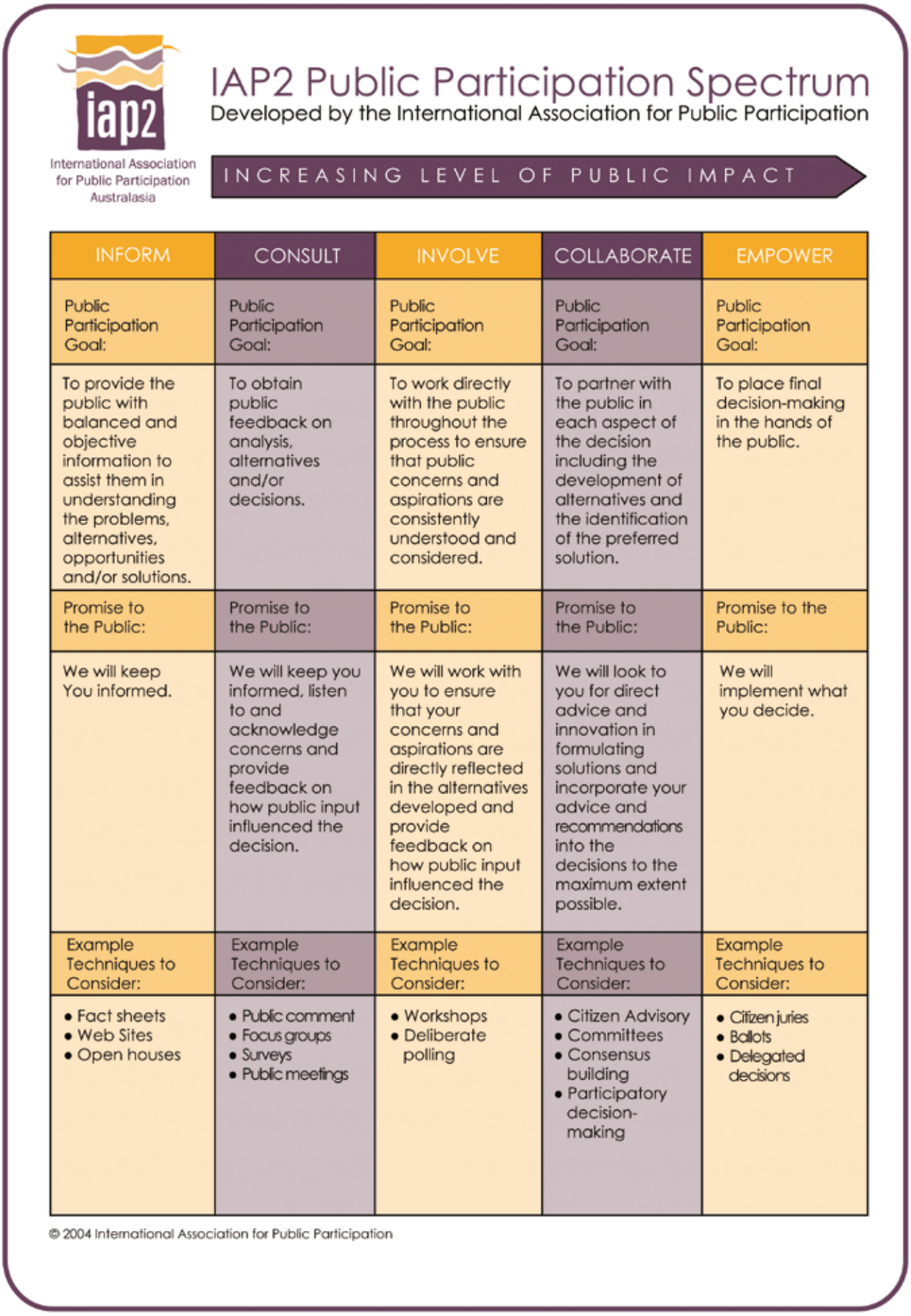
Members of the Stakeholder Reference Committee will be expected to provide advice and direction on key policies being developed for the Victorian Waterway Management Strategy (VWMS), particularly in relation to the implications for stakeholder groups. Note that two people are listed if there was a change 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



IAP2 Public Participation Spectrum

Developed by the International Association for Public Participation

International Association for Public Participation Australasia

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:
• Fact sheets • Web Sites • Open houses	• Public comment • Focus groups • Surveys • Public meetings	• Workshops • Deliberate polling	• Citizen Advisory Committees • Consensus building • Participatory decision-making	• Citizen juries • Ballots • Delegated decisions

Appendix 3.1: Legislation relevant to waterway management

Victorian

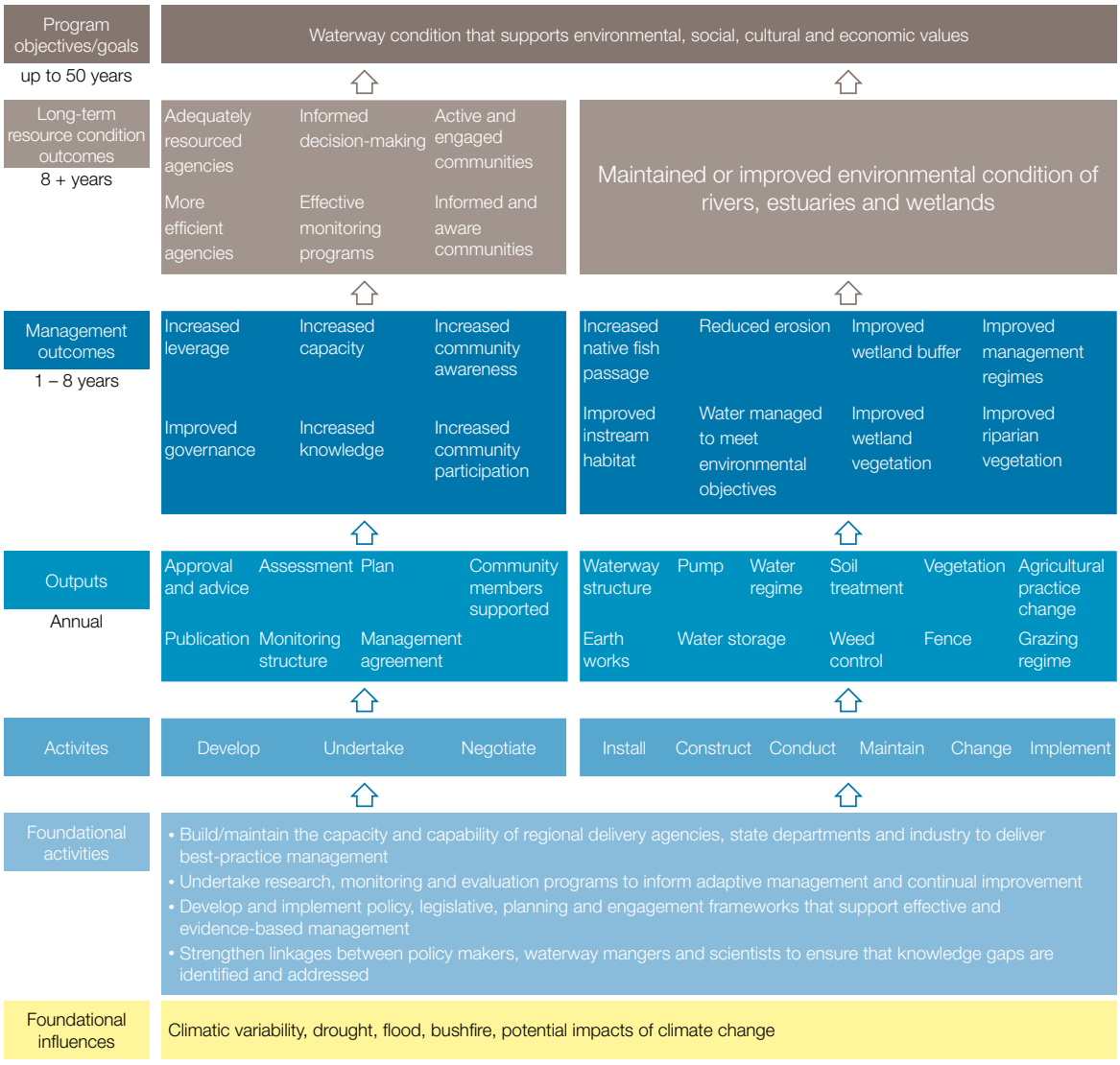
Water Act 1989
Catchment and Land Protection Act 1994
Heritage Rivers Act 1992
Environment Protection Act 1970
Crown Land (Reserves) Act 1978
Flora and Fauna Guarantee Act 1988
Land Act 1958
Climate Change Act 2010
Traditional Owner Settlement Act 2010
Aboriginal Heritage Act 2006
Sustainable Forests (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

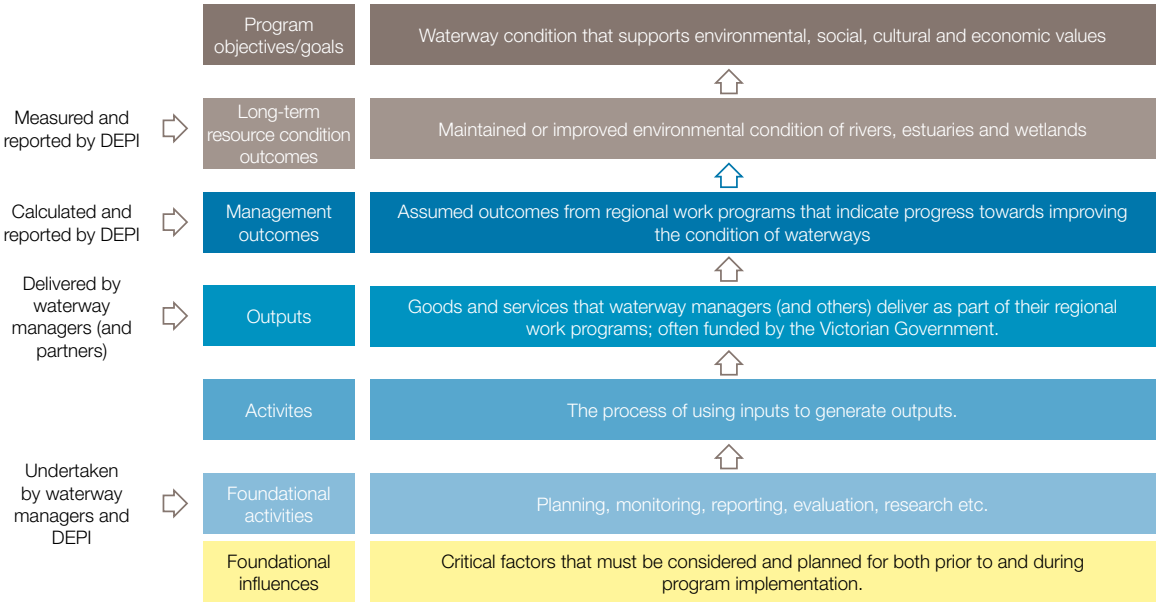
Full program logic for the Victorian Waterway Management Program



Externalities
- Land use change
- Population growth
- Government support
- Economic conditions
- Community expectations
- Landholder attitudes

Assumptions
- Management activities reduce threats
- Reduced threats improve condition
- Improved condition supports values
- Informed engaged communities value waterways and have improved behaviour
- Partnerships between government, community and industry lead to most effective management
- Priority setting ensures investment targeted to greatest gain
- Regional delivery model most effective method to deliver waterway programs

Explaining the program logic



Externalities
External influences that can impact on waterway condition and can obscure the program outcomes.

Assumptions
Assumptions establish causal links between outputs, management outcomes and longterm outcomes.
Assumptions also specify other factors that are likely to influence a program's planned work and its results.

Appendix 4.1: The values of rivers, estuaries and wetlands considered in the regional priority setting process.

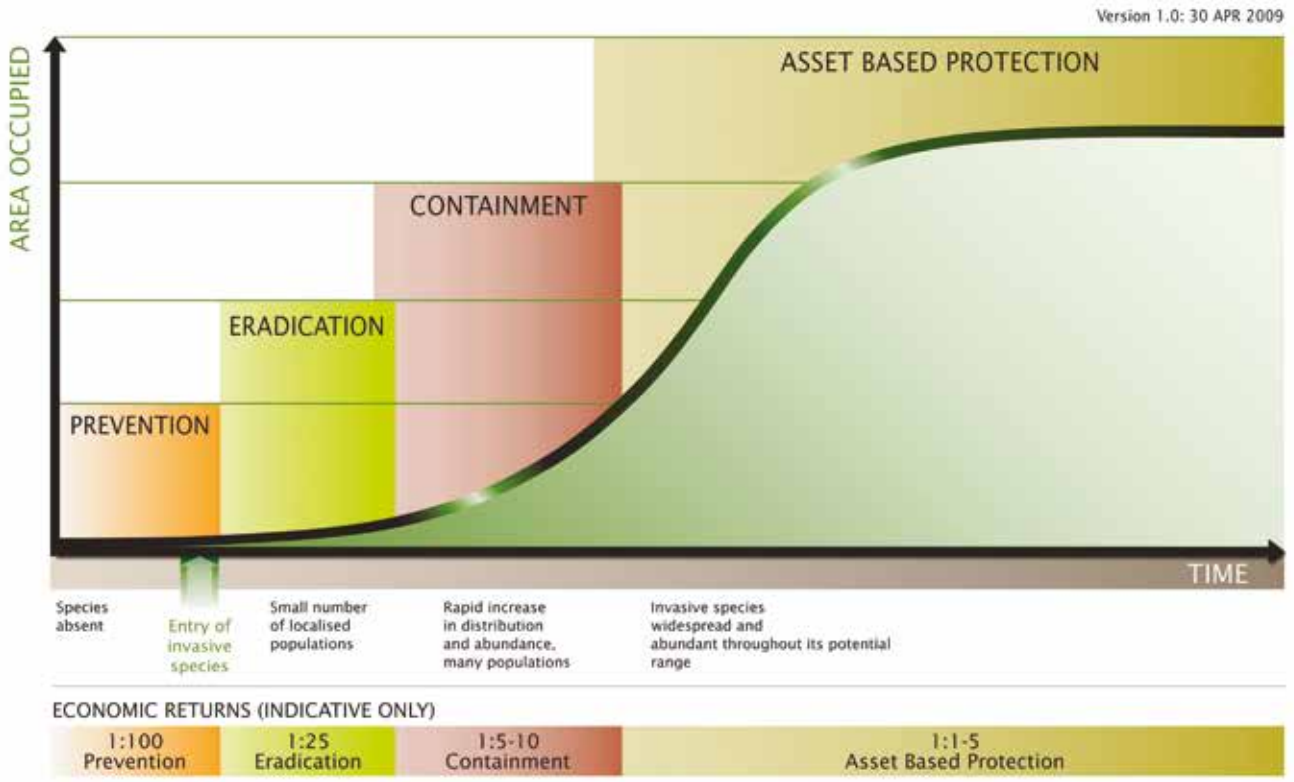
ENVIRONMENTAL VALUES		
Rivers	**Wetlands**	**Estuaries**
FORMALLY RECOGNISED SIGNIFICANCE • National Significance – Living Murray Icon Sites – National Heritage Sites • State Significance – Heritage Rivers – Icon Rivers – Essentially Natural Catchments – Victorian Parks and Reserves – Victorian Heritage Sites	**FORMALLY RECOGNISED SIGNIFICANCE** • International Significance – Ramsar Sites – East Asian-Australasian Flyway Sites • National Significance – Nationally Important Wetlands – Living Murray Icon Sites – National Heritage Sites • State Significance – Heritage Rivers – Essentially Natural Catchments – Victorian Parks and Reserves – Victorian Heritage Sites	**FORMALLY RECOGNISED SIGNIFICANCE** • International Significance – Ramsar Sites – East Asian-Australasian Flyway Sites • National Significance – Nationally Important Wetlands – National Heritage Sites • State Significance – Heritage Rivers – Essentially Natural Catchments – Victorian Parks and Reserves – Victorian Heritage Sites
REPRESENTATIVENESS • Representative Rivers	**REPRESENTATIVENESS** • Representative Wetlands (TBD)	**REPRESENTATIVENESS** • Representative Estuaries (TBD)
RARE OR THREATENED SPECIES/COMMUNITIES • 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	**RARE OR THREATENED SPECIES/COMMUNITIES** • Significant fish • Significant birds • Significant amphibians • Significant invertebrates • Significant reptiles (aquatic) • Significant reptiles (riparian) • Significant mammals • Significant flora • Significant wetland Ecological Vegetation Communities	**RARE OR THREATENED SPECIES/COMMUNITIES** • Significant fish (resident) • Significant fish (dependent) • Significant birds • Significant reptiles • Significant flora • Significant estuarine Ecological Vegetation Classes
NATURALNESS • Aquatic invertebrate community condition • Native fish • Riparian vegetation condition	**NATURALNESS** • Aquatic invertebrate community condition (TBD) • Native fish (TBD) • Wetland vegetation condition	**NATURALNESS** • Native fish (TBD) • Estuary vegetation condition (TBD)
LANDSCAPE FEATURES • Drought refuges • Important bird habitats • Biosphere reserves	**LANDSCAPE FEATURES** • Drought refuges • Important bird habitats • Biosphere reserves	**LANDSCAPE FEATURES** • Drought refuges • Important bird habitats • Biosphere reserves

SOCIAL VALUES		
Rivers	**Wetlands**	**Estuaries**
ACTIVITY • Recreational fishing • Non-motor boating • Motor boating • Camping • Swimming • Beside water activities • Game hunting	**ACTIVITY** • Recreational fishing • Non-motor boating • Motor boating • Camping • Swimming • Beside water activities • Game hunting	**ACTIVITY** • Recreational fishing • Non-motor boating • Motor boating • Camping • Swimming • Beside water activities • Game hunting
PLACE • Landscape	**PLACE** • Landscape	**PLACE** • Landscape
PEOPLE • Community groups • Use of flagship species	**PEOPLE** • Community groups • Use of flagship species	**PEOPLE** • Community groups • Use of flagship species
CULTURAL VALUES		
Rivers	**Wetlands**	**Estuaries**
HERITAGE • Aboriginal cultural heritage • Post-European cultural heritage	**HERITAGE** • Aboriginal cultural heritage • Post-European cultural heritage	**HERITAGE** • Aboriginal cultural heritage • Post-European cultural heritage
ECONOMIC VALUES		
Rivers	**Wetlands**	**Estuaries**
WATER • Urban/Rural township water sources • Rural water sources for production • Water storages • Water carriers • Wastewater discharges	**WATER** • Urban/Rural township water sources • Rural water sources for production • Water storages • Water carriers • Wastewater discharges	**WATER** • Wastewater discharges
POWER GENERATION • Hydroelectricity	**POWER GENERATION** • Hydroelectricity	
OTHER RESOURCES • Commercial fishing • Extractive industries • Timber harvesting and firewood collection	**OTHER RESOURCES** • Commercial fishing • Extractive industries • Timber harvesting and firewood collection	**OTHER RESOURCES** • 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 – 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** • Changed water regime	**ALTERED WATER REGIMES** • Altered marine exchange (intermittently open estuaries) – 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) – Intermittently open estuaries – Permanently open estuaries
ALTERED PHYSICAL FORM • Bank instability • Bed instability (Degradation)	**ALTERED PHYSICAL FORM** • Reduce wetland area • Altered wetland form	**ALTERED PHYSICAL FORM** • Bank instability • Reduced estuary extent
POOR WATER QUALITY • Degraded water quality • Thermal water pollution • Disturbance of acid sulfate soils	**POOR WATER QUALITY** • Changed water properties • Disturbance of acid sulfate soils	**POOR WATER QUALITY** • Degraded water quality • Disturbance of acid sulfate soils
DEGRADED HABITATS • Degraded riparian vegetation – Large trees • Loss of instream habitat – Large wood – sedimentation • Livestock access	**DEGRADED HABITATS** • Soil disturbance • Degraded buffer vegetation • Livestock access	**DEGRADED HABITATS** • Degraded estuarine vegetation • Livestock access
INVASIVE FLORA AND FAUNA • Invasive flora (riparian) – Trees – Shrub layer – Ground layer • Invasive flora (aquatic) • Invasive fauna (terrestrial) • Invasive fauna (aquatic)	**INVASIVE FLORA AND FAUNA** • Invasive flora (wetland) • Invasive fauna (terrestrial) • Invasive fauna (aquatic)	**INVASIVE FLORA AND FAUNA** • Invasive flora (riparian) – Trees – Shrub layer – Ground layer • Invasive flora (aquatic) • Invasive fauna (terrestrial) • Invasive fauna (aquatic)
REDUCED CONNECTIVITY • Barriers to fish migration • Reduced riparian connectivity – Longitudinal continuity – Vegetation width • Reduced floodplain connectivity	**REDUCED CONNECTIVITY** • Reduced wetland connectivity (TBD)	**REDUCED CONNECTIVITY** • 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 *Fisheries Act 1995*	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
• Low flows • High flows • Zero flows • Seasonality • Variability	• Width • Fragmentation • Longitudinal continuity • Large trees • Structure • Weeds	• Bank stability • Artificial barriers • Instream large wood	• Total phosphorus • Turbidity • Salinity (EC) • pH	• AUSRIVAS • SIGNAL • EPT • No. Families

Pilot Index of Estuary Condition

Hydrology	Flora	Physical form	Sediment	Water Quality	Fauna
• Marine exchange • Mouth opening • Structures • Freshwater flow • ISC hydrology • Dams • Extractions • Salinity regime	• Aquatic macrophytes • Aquatic macroalgae • Fringing macrophytes • Microphyto-benthos • Phytoplankton	• Bathymetry • Sediment load • Barriers • Lateral connectivity	• Particle size • Bank erosion • Sediment respiration rate	• Turbidity • DO	• Fish • Birds

Index of Wetland Condition

Hydrology	Biota	Physical form	Soils	Water properties	Wetland catchment
• Seasonality • Frequency • Duration	• Life forms • Weeds • Altered processes • Vegetation structure and health	• Extent • Change in bathymetry	• Disturbance	• Nutrients • Salinity	• Land use intensity • Buffer width • Buffer continuity

Acronyms

Acronym	Full Description
ANZECC guidelines	*Australian and New Zealand guidelines for fresh and marine water quality*
AVIRA	Aquatic Value Indentification 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	*Environment Protection and Biodiversity Conservation Act 1999*
EWMP	Environmental Water Management Plans
EWR	Environmental Water Reserve
FFG Act	*Flora and Fauna Guarantee Act 1988*
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	Natual Resouce Management
NWI	National Water Initiative
NWQMS	*National Water Quality Management Strategy*
OLV	Office of Living Victoria
PBGM	Property Based Game Management
RCS	Regional Catchment Strategy
RRHS	regional River Health Strategy
RWS	regional Waterway Strategy
SEPP	*State Environment Protection Policies*
SEPP (WoV)	*State Environment Protection Policy (Waters of Victoria*)
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	*Victorian River Health Strategy*
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, argriculture 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 ublic in policy making, planning, and management to romote 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 rives 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 are 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

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

Action 5.1 **Timeframe:** 2019

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.

Action 5.2 **Timeframe:** 2020

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.

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

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.

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:

- 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

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.

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 *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.

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:

- 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

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.

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 *Land Act 1958*), 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.	

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

Action 10.1	Timeframe: TBD following review of the framework for statutory policies
Review and update the *State Environment Protection Policy (Waters of Victoria)*. **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

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.	

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

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.

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

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.

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

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

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

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 *Technical Guidelines for Waterway Management* 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:

- 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 *Victorian Waterway Management Strategy* 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.

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 *Victorian Waterway Management Strategy* 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.

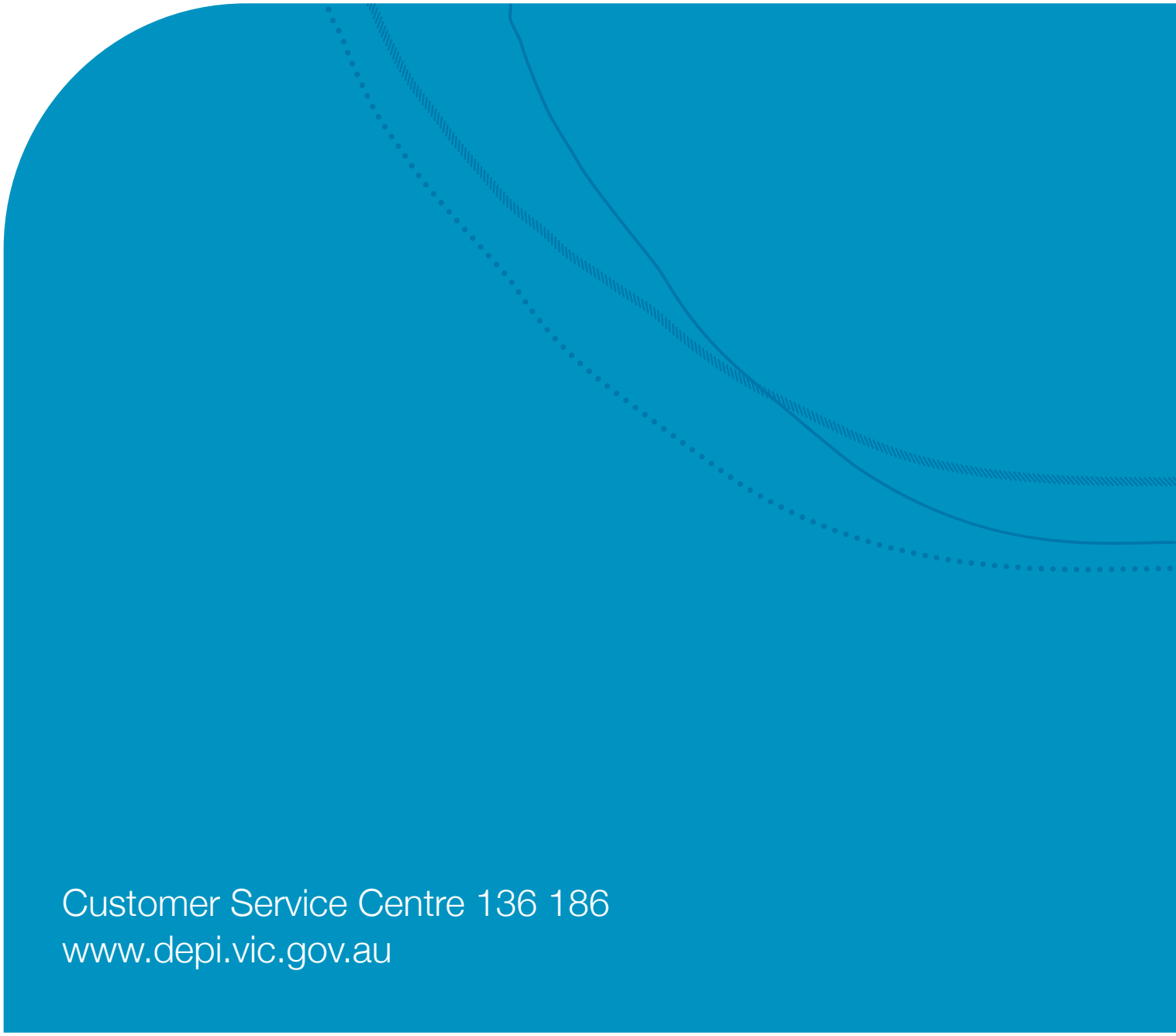
18 Management arrangements

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.

Notes



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