Part B – Management Responses to Waterway Threats

3 Introduction

This section describes and discusses a number of the opportunities and challenges for waterway management in the West Gippsland region. Each subsection describes the issue and sets out the management response that will be pursued through the implementation of the Strategy.

3.1 Riparian Land

The land that adjoins rivers, creeks, estuaries and wetlands is known as riparian land (DEPI 2013a). Riparian land has a range of environmental, social, cultural and economic values. Healthy waterways depend on the condition of riparian land and in particular native vegetation on riparian land provides a range of functions including:

- filters run-off (sediments, nutrients and pathogens) from overland flow, improving water quality
- helps stabilise banks and reduces erosion, reducing the risk of damage during high flows and floods
- provides shade and helps regulate water temperature
- provides a supply of organic matter including large wood to the waterway
- provides habitat for fauna species including as a refuge from drought, flood and fire
- provides a store of carbon (DEPI 2013a).

Threats to riparian land include uncontrolled stock access, weeds (particularly willows), unmanaged vehicle access and modification through agricultural, industrial and urban development. This Strategy has a major focus on improving the condition of riparian land. In much of the region, erosion and damage to banks from flooding and altered water regimes is compounded by a lack of native vegetation on riparian land and uncontrolled stock access. Improving the extent and condition of native vegetation on riparian land and creating corridors of vegetation along waterways will have benefits for waterway function, habitat and will improve the waterways resistance to erosion and flood damage.

Through this Strategy, WGCMA will continue to work with private landholders, Crown frontage licensees, public land managers, water corporations and Traditional Owners to achieve the desired outcomes for riparian land.

3.2 Water Quality

Water quality reflects the environmental condition of waterways, but can also provide an integrated indicator of the health of whole catchments (DEPI 2013a). WGCMA, with its partners, has had a long history in working to improve water quality and significant progress has been made.

Through the previous *RHS* programs addressing water quality in the region included regulation of point source discharges, implementation of stormwater management plans; adoption of best management practices aimed at reducing sediment and nutrient losses from urban development, forestry and agricultural land, riparian fencing and revegetation remediation of gullies and slips. These programs have been well supported through partnerships with water authorities, EPA, DEPI and industry bodies such as GippsDairy.

More recently water quality has been considered as part of an integrated approach to waterway management. The *VWMS* states that waterway strategies will identify priority waterways that are 'regional hotspots' where environmental, social, cultural or economic values are threatened by poor water quality. The *VWMS* also highlights that any water quality actions will need to take into account the scale of the problem and the feasibility of effective action.

Pictured: Before (2005) and after (2007) works completed along a waterway in Boolarra

Through the Strategy prioritisation and risk analysis process (see Part C, Section 5), water quality (from elevated levels of nutrients, turbidity or salinity) was identified as a threat to a number of assets, including the Corner Inlet and Gippsland Lakes Ramsar sites and the Tarwin River. Actions that address water quality threats to the values of these waterways have been included in the work program (see Part D).

WGCMA will continue to work with regional water corporations, local government, EPA and DEPI in managing water quality issues where they align with the Strategy priorities and are feasible to deal with.

WGCMA and its regional partners will use water quality monitoring data from the Victorian Water Quality Monitoring Network, Regional Water Monitoring Partnerships and community monitoring programs to understand changes to water quality over time.

Further detail on the roles and responsibilities of agencies in relation to water quality management can be found in Appendix two.

3.3 Estuaries

A number of the estuaries of West Gippsland are susceptible to entrance closure caused by sand build up at the point where the estuary meets the open sea. Depending on the inflows, estuary shape, floodplain extent and sea state the entrance can remain closed for long periods.

When an estuary closes, there is an increase in water level which has significant environmental benefits including inundating adjacent wetlands and fringing wetlands. Flooding of adjoining land may also occur impacting on agricultural land and infrastructure such as roads and bridges. In this situation there can be pressure on government agencies to artificially open the estuary to relieve flooding. The decision to artificially open an estuary requires consideration of a range of environmental, social and economic values. There are a number of potential consequences of artificially opening estuaries at inappropriate times including fish deaths and the flushing of fish eggs and larvae out to sea. WGCMA has developed protocols to manage artificial openings on the Powlett River using the EEMSS decision support tool.

As the designated waterway manager WGCMA has the primary responsibility for decision making and the approval of conditions for an opening and also has the lead role for planning aspects such as coordinating the communications, storage of monitoring data and approving the works. The relevant public land manager (usually Parks Victoria or local government) has the lead works role including responsibility for implementation and operations related to estuary openings.

Currently WGCMA has protocols to manage artificial openings on the Powlett River using the EEMSS decision support tool. Other estuaries that are less regularly opened artificially include Merriman Creek, Bourne Creek and Ayr Creek. WGCMA aims to establish protocols for the management of all artificial estuary openings and more detailed estuary management plans where required in the lifetime of this Strategy.

EstuaryWatch is a community monitoring program that increases the community's participation in natural resource management while aiding estuary management decisions through the collection of information on water quality and estuary mouth condition. EstuaryWatch started in the West Gippsland region in 2009 and currently operates at the Powlett River and Coal Creek (Harmers Haven) estuaries.

Pictured: Traralgon Creek fishing platform

3.4 Urban Waterways and Development

Waterways in urban areas are often in poor environmental condition, typically due to impacts from adjoining land use and stormwater runoff. Although waterways in urban areas are often highly modified, they provide many important benefits for communities (DEPI, 2013a).

Riparian corridors along waterways play an important role in maintaining and improving waterway health. The maintenance and restoration of riparian corridors are essential to provide the appropriate environmental conditions to support social values of waterways especially in urban areas.

Management of urban waterways involves a number of agencies. WGCMA is responsible for waterway health while local government has broader responsibilities relating to the provision of open space, stormwater management, drainage, community wellbeing and have responsibilities for flood planning, prevention, response and recovery. WGCMA is funded to regulate works and activities on all waterways in our region and to deliver the priorities listed in this Strategy. Where an urban waterway is identified as a priority, the WGCMA will work with local government to improve the environmental condition of the waterway. For all other urban waterways the WGCMA will assist local government to obtain the necessary approvals to ensure that environmental outcomes are achieved when local government choose to actively manage a waterway for the benefit of their community.

The region's proximity to Melbourne means that regional centres will be subject to future population growth and urban development particularly in the Baw Baw, Latrobe and Bass Coast local government areas. Urban growth and development of land will put increasing pressure on waterways in these locations.

In line with the Victorian State Planning Policy Framework (clause 14.02) this Strategy supports implementation of the following principles and approaches in new urban developments.

Vegetated buffer (riparian corridors) at least 30 m wide on each side of a waterway should be retained and improved as part of new urban development. Passive recreation facilities such as shared walking trails should be integrated into these waterway corridors to provide both social as well as environmental linkages. Active recreation areas such as sports fields and playgrounds should be located adjacent to but outside the waterway corridor.

Wherever possible active street frontages should be provided to waterway corridors to ensure active surveillance can be achieved.

Developments in urban areas adjacent to existing vegetated waterway corridors or where vegetated waterway corridors will be established should also consider additional buffer requirements to cater for the expected bushfire hazard.

Consideration to this Strategy its supporting plans and the above principle must be taken into account in statutory planning decisions.

Pictured: works on waterways completed at Turton's Creek in South Gippsland

3.5 Works on Waterways Approvals

Inappropriate development in and around waterways can lead to bed and bank erosion, obstruction and alteration of flows, restriction of fish passage, changes to flood behaviour and impact on river health and water quality. It's land owners and land managers responsibility to seek appropriate advice and permits when planning work on a designated waterway (WGCMA undated).

In accordance with the *Water Act 1989*, any works or activities in, on, or over a designated waterway must have approval from WGCMA through a Works on Waterways approval.

Waterways designated by WGCMA include (but are not limited to) rivers, streams, creeks, gullies, wetlands, lakes, lagoons, swamps and estuaries. A waterway may not have water in it all the time.

A Works on Waterway approval is required for any demolition, construction or maintenance activities that may impact the health of a waterway. The types of works that require approval include, but are not limited to:

- crossings – bridges, fords, culverts
- deviations – waterway realignments
- extractions – sand, silt or gravel
- stabilisation – bank protection, retaining structures
- vegetation – fallen timber and vegetation removal, revegetation projects
- works – stormwater outlets, service crossings, etc
- other – jetty, river mouth opening, boardwalk etc.

3.6 Environmental Water

In Victoria, water that contributes to the health of waterways is provided in three ways.

1. Environmental water entitlements – water formally allocated for environmental purposes.
2. Obligations on consumptive entitlements (e.g. passing flows) – water set aside for multiple purposes including maintenance of water quality during low flows.
3. 'Above cap' water – water in excess of existing allocations for consumptive use (DEPI 2013a).

West Gippsland environmental entitlements exist in the regulated parts of the Thomson, Macalister and Latrobe rivers. In the unregulated systems, including all of South Gippsland basin and part of the Thomson and Latrobe basins, environmental water is provided primarily through managing existing diversions via license conditions, including rostering and restriction rules.

Managing environmental entitlements is focussed on providing water to meet system specific ecological objectives based on an understanding of identified shortfalls and ecological tolerances.

These are summarised in the following table.

Table 1 Summary of objectives for environmental entitlements in West Gippsland

System	High level objective	Highest priority flow components
Thomson	Maintain and improve self-sustaining populations of Australian grayling.	Autumn freshes Spring and autumn base flows
Latrobe	Rehabilitate stream habitat, through vegetation growth low in the river channel and formation of bars.	Freshes Winter/spring base flows
Macalister	Maintain and improve self-sustaining populations of Australian grayling.	Autumn freshes Autumn/winter base flows
Lower Latrobe Wetlands (Sale Common, Dowd Morass, Heart Morass)	Maintain a mosaic of complementary habitats for wetland flora and fauna.	Spring inundation Summer/autumn drawdown

There are unique opportunities to combine releases in the Thomson, Macalister and Latrobe systems in order to provide benefits for the Latrobe estuary and Lower Latrobe wetlands.

WGCMA completes a range of activities relating to the planning and delivery of environmental water including:

- leading the collaborative development of annual Seasonal Watering Proposals and provides input to the Victorian Environmental Water Holder on the state-wide prioritisation of watering actions
- undertaking planning for environmental water delivery according to a Seasonal Watering Statement and agreed operating arrangements
- undertaking community engagement and communication surrounding environmental water management
- managing shared risks in line with the Victorian Environmental Watering Partnership Risk Management Framework.

In addition, WGCMA participates in monitoring and reporting by:

- collecting data for specific systems to inform environmental watering priorities and actions (including the Victorian Environmental Flows Monitoring and Assessment Project)
- reporting on environmental water delivery to the VEWH as required.

The Strategy identifies the regional priorities for environmental water management over the eight year planning period and actions are incorporated into the relevant Waterway Management Units. These priorities include developing Environmental Water Management Plans (which have a 5-10 year planning horizon) and Seasonal Watering Proposals (annual plans) using recommendations from flows studies, technical reviews and learnings from adaptive management. Where watering actions are expected to inundate private land, consent will be obtained from landholders before the action is implemented. Environmental watering actions are contained in the work programs for priority waterways in Part C.

3.7 Groundwater Dependent Ecosystems (GDEs)

Much of the West Gippsland region is a rich source of groundwater suitable for livestock, domestic, garden and industrial use. In some areas, particularly along the Ninety Mile Beach coast and plains, the high yielding aquifers are important sources of water for irrigation and town water supply, including for major city centres like Sale in the east. Significant amounts of oil and gas are also extracted from aquifers underlying and off-shore from the West Gippsland region.

Shallow aquifers are often connected to waterways, providing a critical source of water during drought and helping to sustain base flows year round. Deeper confined aquifers may also be connected to waterways or to other aquifers that are connected to waterways, where they outcrop at or near the ground surface e.g. the upper Tarra River and the Latrobe Group Aquifer (which is hundreds of metres thick in places).

Extraction of fluids and/or gases from aquifers that are directly or indirectly connected to waterways can adversely affect the water regimes of those waterways by changing the nature of their connection to the groundwater. The quality of groundwater in connected aquifers can also be impacted by human activity such as dryland and irrigation salinity, fertiliser use, dairy effluent and septic tank leakage. There is currently a high degree of community concern about the potential for adverse impacts to Gippsland's groundwater resources from unconventional onshore gas exploration and production should the current moratorium be lifted.

The *Gippsland Region Sustainable Water Strategy* (DSE 2011) contains policies and actions that address the high level protection of groundwater dependent ecosystems, and the management of groundwater from a resource sharing perspective, including the management of extractive industries and mining.

For the purposes of managing the extraction of groundwater, four groundwater catchments have been defined in the West Gippsland region: Central Gippsland, Seaspray, Moe and Tarwin. Each area encompasses connected groundwater (including areas of recharge, discharge and extraction) and contains one or more groundwater management areas (GMAs) or water supply protection areas (WSPAs). These are discrete areas of relatively intensive groundwater use due to good water quality and yield. Specific rules apply to both: GMAs are covered by non-statutory local management plans, and WSPAs by statutory groundwater management plans. There are eight GMAs and two WSPAs in the West Gippsland region. A groundwater management plan has been prepared for the Yarram WSPA which includes the on-shore area of the Latrobe Group Aquifer that has been declining at a rate of approximately one metre per year over the last 40 years.

While the technical and policy basis for identifying, understanding and protecting GDEs (especially waterways) has improved in recent years, significant knowledge and planning gaps remain. This Strategy, in line with the *VWMS*, focuses on the management of groundwater dependent waterways i.e. rivers, wetlands and estuaries. It does not include management of groundwater dependent terrestrial flora, fauna or vegetation communities, nor ecosystems within aquifers such as caves. WGCMA will continue to collaborate with other relevant organisations to improve knowledge of the values of and risks posed to groundwater dependent waterways, in order to inform management decisions by DEPI, WGCMA and SRW. This will include active participation in initiatives to improve understanding of potential impacts of emerging extractive industries such as coal seam gas production.

3.8 Invasive Plants and Animals

The *West Gippsland Invasive Plants and Animals Strategy* and *Victoria's Invasive Plants and Animals Policy Framework* identifies assets at high risk from invasive plants and animals (IPAs) and provides guidance for stakeholders and the community in tackling invasive species (WGCMA 2010).

These documents follow a biosecurity approach to IPAs. One of the key components of this approach is that once a pest becomes so widespread that containment (or eradication) is not possible, focus must shift to protecting specific parts of a region from the impacts of a pest plant or animal. This is termed an asset based approach to IPA management (WGCMA 2010).

In addition the *IPA Strategy* identifies a number of priority actions for asset protection. This includes: priorities for immediate on-ground action, priority for investigations or research and monitoring for action in future and to maintain previous gains.

The approach taken within this Strategy to identify priority waterways and develop an eight year work program is consistent with the approach set out in the *IPA Strategy.* Management actions developed to address IPA threats in priority waterways are broadly consistent with the three priority types in the *IPA Strategy*.

Weeds directly threaten native vegetation condition and extent for numerous waterways across the region and indirectly impact on the habitat of fauna that use waterways. Control of weed species including Willow, Blackberry and Hawthorn has been identified where the values of the waterway, particularly the extent and condition of native vegetation, is threatened by weed infestation. Surveillance and invasive plant assessments are also recommended for areas that are more remote or where the level of threat is less clear. Containment of Spartina infestations within Corner Inlet and Anderson Inlet has been identified in order to maintain highly valuable intertidal habitats that support migratory and resident bird populations.

Pictured: treating Spartina infestations, photo by Parks Victoria

Pictured: weeds directly threaten native vegetation condition and extent for many waterways in the region

Foxes and feral cats threaten bird, small mammal, amphibian and reptile populations that use waterway habitats. Fox control activities have been recommended where there are impacts to important migratory and resident bird populations. Carp and mosquitofish are key threats in a number of waterways across the region. Carp screens and drying are used as a strategy to minimise carp in wetlands where active water management is undertaken (i.e. lower Latrobe). In other circumstances, control of these populations has a low technical feasibility and actions to address carp and mosquitofish have not been recommended for implementation as part of the Work Program for priority waterways. The impacts of other animals including pigs and deer are less well known and their impact remains a knowledge gap for this Strategy.

Strong partnerships between agencies, community and industry increase the effectiveness of IPA programs particularly where the threat occurs across land tenures. This Strategy will continue to build on the success of previous partnership approaches to manage IPA threats to waterways.

3.9 Flooding, Storm and Bushfire

Flooding, storms and bushfire have acute impacts on waterways. They are, however, a natural part of the environment and waterways have evolved with natural flood and bushfire cycles and are adapted to benefit and recover from these periodic disturbances.

However future events may have a greater impact on waterways. This is as a result of modifications associated with clearing vegetation, and development combined with the likelihood of more extreme weather under climate change.

Waterways and their catchments are particularly vulnerable to high intensity large scale bushfires, particularly if they are followed by flooding. This combination of bushfire and flooding has the potential to transport large quantities of sediments and nutrients from burnt catchments and have a significant effect on waterway health.

West Gippsland has experienced a number of significant floods in recent years including in 2003, 2007, 2011 and in 2012. Runoff from catchments travels quickly down steep and narrow mountain valleys. The resulting floods in the upper catchment build rapidly and have significant power but often do not last long. In contrast, floods in the lowlands of the region are typically longer in duration. Drainage of floodwaters from lowland floodplains is often delayed by high sea levels resulting from the same weather situations responsible for the flood-producing rains.

The adverse effects of floods on waterway condition and values are primarily related to accelerated rates of river channel erosion, which can be exacerbated by past clearing of native riparian vegetation. Flood related channel change includes erosion that leads to loss of private and public infrastructure such as bridges, culverts, roads, water supply systems and power and telecommunications systems. Flood related channel change causes the loss of agricultural land through erosion of stream beds and banks (Alluvium 2011).

This type of damage includes:

- avulsion (the abandonment of the main river channel in favour of a new course)
- erosion and mobilisation of sediment resulting in:
  - channel widening
  - infilling of large pools by sediment
  - loss of vegetation and in-stream habitat
  - infrastructure damage
  - damage to native riparian vegetation
  - loss of large wood for in-stream habitat
  - loss of or damage to fences protecting riparian vegetation.

Floods can also:

- affect estuaries and wetlands, primarily by carrying large amounts of sediment and nutrients into them, especially after bushfires
- accelerate the spread of invasive species
- cause debris to accumulate above bridges or culverts, threatening their integrity
- cause waste from sewage treatment facilities to enter waterways
- kill livestock and destroy various high value crops.

WGCMA has a role in flood recovery activities along waterways; particularly where public infrastructure and past government investment has been impacted by flooding.

The impacts of past floods have been explicitly considered in identifying the priorities and developing the Work Program for this Strategy.

Pictured: flooding, storms and bushfire are a natural part of the environment, but can have an acute impact on waterways

The Strategy incorporates learning from past floods and flood recovery programs by aiming to repair damage and improve the stability of waterways through both the establishment of a robust native vegetation corridor and structural works. Structural works will only be implemented where they have been based on a geomorphological assessment that considers site based issues within the context of the overall system trajectory.

3.10 Threatened Plants and Animals

West Gippsland supports a diverse and unique range of flora and fauna, with many species associated with the region's waterways and adjoining riparian land. A number of species have been listed as threatened at a federal level (under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)), and at a state level (under the *Flora and Fauna Guarantee Act 1988* (FFG Act) or Victorian Rare or Threatened Species (VROTS)).

Information on the distribution of threatened species in the region is based on records of observation and surveys. There have been some advances in modelling the potential habitat of threatened species through tools such as Nature Print. Despite this, data on the distribution of threatened species is patchy and not comprehensive in the region.

This Strategy focuses on improving the habitat values of waterways rather than focus on the species themselves. Where a threatened species is known to occur in a waterway actions will be undertaken to maintain and or improve the waterway condition and/or habitat for that species. In addition, the Strategy will support improvements in the knowledge base around threatened species.

Pictured: Top – Upper Macalister River in flood 2007, Bottom – Australian Grayling in Bunyip River

Pictured: Shaw Creek, habitat for threatened Galxias

Two nationally endangered vegetation communities are associated with wetlands of the West Gippsland region. Seasonal Herbaceous Wetlands are ephemeral, isolated freshwater wetlands. This wetland type is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC). In addition, Alpine *Sphagnum* Bogs and Associated Fens ecological community listed as nationally endangered under the *EPBC Act 1999*, and as threatened at a state level under the *Flora and Fauna Guarantee Act 1988*. This Strategy supports activities that aim to maintain the condition and extent of these two vegetation communities.

3.11 Climate Change

Australia has a highly variable climate with a naturally occurring cycle of wet and dry periods that vary from year to year. Further warming of the atmosphere is resulting in long term climate change or shifts in climate over many decades, which when superimposed on natural climate variability, is leading to a change in the frequency, intensity and duration of extreme events (CSIRO 2014).

Natural resource managers are beginning to plan for the likely impacts on natural assets from climate change and identify priority locations for climate change adaptation and mitigation activities to be undertaken.

Within this context the adaptive capacity of waterways needs to be supported so they are better able to cope with the potential impacts of climate change. The main impacts of climate change to be considered in the management of waterways include:

- reduced rainfall, runoff and stream flow
- dry soil conditions
- bushfire – increased frequency and intensity
- heatwave – increased frequency and duration
- increased intensity of rainfall events leading to flooding.

The current practice of managing threats to waterways and providing the appropriate environmental conditions to support values will remain an important adaptation strategy under climate change. This approach will maximise both the environmental condition and adaptive capacity of these systems.

WGCMA is undertaking the development of a regional plan for climate change. The plan will consider the likely impacts on natural assets from climate change and identify priority locations within the region for climate change adaptation and mitigation activities to be undertaken. The project will also aim to provide guidance on where bio diverse carbon sequestration plantings should be located in the region. This work will be presented in a sub-strategy that supports the *RCS*.

Part C – Approach to Prioritisation

4 Introduction

Waterways across the region have importance to the community; however the number of waterways in the region, and the scale of the threats to waterways, is far greater than our ability to influence their condition. The identification of priorities is a core component of regional planning for waterway management.

This Strategy prioritises waterways based on long term objectives for their condition that considers the level of threat and the environmental, social, cultural and economic values for the waterway. The best available information is used to support the priority setting and decision making processes.

4.1 Principles for Development and Implementation of the Strategy

The following principles apply to development and implementation of the Strategy:

- **Partnership approach** – partnerships with public land managers, landholders, industry bodies, Traditional Owners and community groups are critical to the success of waterway management programs. Partnership approaches will be a fundamental component of the implementation of this Strategy. Arrangements with delivery partners will be defined through annual works planning processes and formalised through service level agreements; based on the individual project objectives and funding requirements.
- **Community involvement** – communities will have the opportunity to be involved in waterway management and this participation can help foster increased stewardship of waterways.
- **Integrated catchment management** – management of waterways will consider the landscape context and recognise the importance of waterways for connectivity of hydrological and terrestrial systems.
- **Appropriate delivery mechanisms** – a range of approaches will be used to deliver the work program and consideration will be given to public versus private benefits and the cost sharing principles set out in the *VWMS* (DEPI 2013a). Delivery approaches will include: direct investment in on-ground works, grant and incentive programs, management agreements and covenants, market-based instruments, information and extension program and regulatory controls.
- **Value for money** – investment will be directed to management activities that achieve the output targets outlined in this Strategy and provide the most efficient and effective long-term improvements in waterway condition with the greatest community gain (including opportunities for multiple benefits).

- **Seasonally adaptive** – Implementation of this Strategy will be flexible in response to seasonal climatic variation. The choice of approach, method, timing and location of onground works (within the defined priorities) will consider seasonal conditions and short to medium term trends in climate.
- **Evidence-based decision making** – best available knowledge will underpin the design and delivery of waterway management programs and new information and knowledge will be incorporated into the delivery of the Strategy.

4.2 Asset Based Approach

Contemporary approaches to natural resource management aim to target public investment to parts of the landscape that are high value, rather than trying to manage threat based issues across larger areas. This approach (known as the asset based approach) identifies important areas based on their values and allows development of integrated programs to address threats and provides the basis for identifying priorities for investment. An asset in this context is a spatially defined biophysical component of the environment (for an example a river, estuary or wetland) that has particular values attached to it.

The values associated with these assets can be classified as environmental, social, cultural or economic.

Pictured: Top – Willow Grove River restoration, Bottom – aerial view of Anderson Inlet

With limited resources available for natural resource management, the focus on priority areas means that public resources will be directed to the areas of highest environmental, social, cultural and economic value.

AVIRA

A key foundation tool to develop the Strategy is the Aquatic Values Identification and Risk Assessment (AVIRA) database. AVIRA identifies the environmental, social and economic values and associated risks to these values for waterways across the region. This information has been used to identify high value waterways and has been used to undertake a risk assessment to inform the priority setting process.

4.3 Consultation

Communication and engagement has underpinned the development of the Strategy and has been informed by a detailed communications and engagement plan. The aim of consultation has been to ensure that there is appropriate and relevant opportunities for stakeholder and community input into developing the Strategy.

The Strategy has been developed using an evidence based approach with best available knowledge including the local knowledge of community members and stakeholders.

Communications and engagement activities have been based around testing the priorities and developing the targets and work program. Objectives of communication throughout the Strategy development have been:

- to inform key stakeholders and the community of the Strategy development process, its progress and outcomes and when they will be invited to contribute
- to test draft priorities and actions with key stakeholders to ensure regional knowledge and needs are explicitly considered in the drafting of the Strategy
- to enable feedback on the draft Strategy.

The following stages of Strategy development have involved communication and engagement with stakeholders and the community:

- review of the *RHS*
- collection of data on environmental, social, cultural and economic values and the threats to waterways for AVIRA
- raising awareness of the development of the Strategy and its intended use
- informing stakeholders and the community of the Strategy process, its progress and outcomes
- involving stakeholders in the prioritisation of waterways and work program development through:
  - feedback and revision the Regional Goals and linked values
  - feedback and revision of the priority waterways
  - input to the development of targets and work program
  - review of the draft Strategy.
- public release of the draft Strategy for a four week period
- revision and finalisation of the Strategy based on the feedback received during consultation.

The draft Strategy was released for a four week public consultation period. The Strategy was updated following the consultation period in response to submitted comments from community members and government agencies. More detail on communications and engagement activities throughout the Strategy process can be found in Appendix twelve.

4.4 Vision and Goals

To achieve its vision WGCMA has defined a series of regional goals to assist in prioritising waterways and management activities. The goals apply to a 20+ year timeframe and are linked up to the vision and down to the targets (condition, outcome and activities) within program logic (see section 5.3).

The fifty year vision for the Strategy is: *Our rivers, estuaries and wetlands are well managed to provide connectivity across our landscape, and are widely valued and appreciated for the benefits they provide*.

The nine regional goals were developed in consultation with regional stakeholders and recognise the diversity of community values of the region's waterways. The regional goals are set out below.

- Maintain and improve the habitat and condition of waterways to support water dependent animals and plants.
- Reduce future impacts to public infrastructure resulting from physical changes to a waterway associated with floods and storms.
- Maintain the ecological character of significant wetlands and estuaries.
- Provide system connectivity between rivers, estuaries and wetland.
- Improve the condition of urban waterways in partnership with Local Government.
- Maximise the ecological outcomes from the available environmental water.
- Support community use, participation, advocacy and stewardship in the region's waterways.
- Maintain and improve the values of Heritage Rivers.
- Provide appropriate environmental conditions to support the economic values of waterways in the region.

A description of the intent of each regional goal and the information used to prioritise waterways based on the goal is provided in Appendix four.

4.5 High value waterways

The *VWMS* defines high value waterways as having one or more of the following characteristics:

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

High value waterways include waterways important for their high social, cultural and economic values, as well as waterways with high environmental values, including those in near-natural and ecologically healthy condition.

In the West Gippsland region almost all waterways were identified as high value. Information on the values relating to each individual high value waterway is available in Appendix five. This reflects the value the community places on many waterways in the region. The process to further refine the number of waterways, for management attention over the next eight years, is described below.

5 Description of Prioritisation Process

To identify priority waterways, the regional goals and the analysis of high value waterways (described in Section 4.4 and 4.5) were filtered using information on the:

- values aligned with regional goals
- threats and the level of risk to those values
- feasibility, costs and effectiveness of addressing risks.

The process for identifying priority waterways and developing the eight year work program for priority waterways is summarised in Figure 5.

Figure 5 Process for identifying priority waterways

A more detailed description is provided below for each step in the process, further information on the supporting tools can be found in Appendix six.

Step 1: Regional goals

Prioritising waterways requires high value waterways to be linked to the goals of the Strategy. Regional goals for waterway management were defined in consultation with the Steering Group. Goal development was informed by the Strategic Directions for priority waterways (WGCMA 2013) and the policies outlined in the *VWMS*. The goals were refined through consultation with the WGCMA Board and regional stakeholders.

Step 2: High value waterways

High value waterways were identified through assessment based on the *VWMS* definition of 'High Value Waterways'.

For river and estuary assets, these characteristics were assessed using information from the Aquatic Values Identification and Risk Assessment (AVIRA) database, for wetlands the information source was the *West Gippsland Wetlands Plan*. The assessment used specific scoring rules defined by the DEPI guidelines for the preparation of this Strategy. A summary of the assessment based on AVIRA can be found in Appendix five.

Step 3: Filter high value waterways that align with regional goals

This step involved identifying which of the high value waterways triggered one or more of the regional goals. A set of rules was developed linking the regional goals to specific values within AVIRA and the *West Gippsland Wetlands Plan* (see Appendix four).

Step 4: Incorporate local knowledge to refine and validate assets considered

Local knowledge was used to refine the regional goals and ensure the linked values were sensible and reflected the diversity of waterway values and management issues in the region. Consultation on priorities occurred through the Steering Group and a series of workshops with key partner organisations and one-on-one meetings.

Step 5: Identify threats to values

Within AVIRA, a risk assessment was undertaken for each waterway resulting in 836 risk level assessments, e.g. 38 values are assessed against 22 threats for each waterway asset. To help rank priority waterways, the focus of the risk assessment was refined to consider; those risks to specific values linked to the regional goals; and where there were high – very high risks or where there were low levels of risk.

All river reaches and estuaries identified in the above process were assessed for risk (subject to data availability).

Step 6: Identify high level management activities and assess feasibility

For each identified risk, a 'first cut' of the technical feasibility (rated high, medium, low) of reducing each threat was determined. Social and/or economic factors were assessed during the development of the works program.

Step 7: Existing obligations and commitments

There are a number of legislative, funding and community obligations and commitments that need to be recognised and considered in the risk assessment and priority setting process. Some of these existing obligations and commitments include:

- maintaining the ecological character of the Gippsland Lakes and Corner Inlet Ramsar sites
- managing rivers listed under the *Heritage Rivers Act* (the Thomson and Aberfeldy rivers)
- threatened species and communities
- managing environmental water entitlements
- managing urban waterways of high community value
- managing the Environmental Water Reserve.

Current long term projects funded through the Victorian and Australian governments including:

- Environment Contribution Levy – Regional Waterway Program
- Australian Government National Landcare Program 'Corner Inlet Connections'
- Australian Government National Landcare Program 'Alpine peatland and associated fen communities'.

Step 8: Assess the cost effectiveness of investments

The WBCS (Waterway Benefit Cost Scoring) Tool supports further assessment of waterway assets in a way that integrates information about value, threat and technical feasibility from AVIRA. This provides a more complete set of information that can be used to compare the relative cost-effectiveness and ranking of projects to maintain or improve these assets.

It is designed to enable a rapid assessment of a large number of assets, for example by an expert group, with sufficient knowledge of both the assets under consideration and a general grasp of the factors required to determine a WBCS. The variables that feed into the WBCS are:

- value of the asset
- impact of works
- adoption, based on the attractiveness of works by private citizens (if required)
- risks, that is the likelihood that the project could fail due to factors such as socio-political, administrative constraints or failure of partner cooperation
- time lag for benefits to occur
- short-term cost of project (ie the cost to implement a set of works that address the risks to the asset)
- annual cost of maintaining outcomes from the project in the longer term.

The first steps use information from AVIRA. Specifically, it provides the asset values compiled in AVIRA and the impact of works which were calculated from the assessment of risk level and feasibility.

Additional information was needed to calculate the remaining variables.

The WBCS Tool also considers uncertainty through an assessment of the information quality used to estimate variables and identify the major knowledge gaps.

Workshops involving internal WGCMA staff provided information to assist the WBCS tool process.

Step 9: Finalise priority waterways

Taking into account all the information provided in steps one to eight, a list of indicative priorities was developed.

Step 10: Develop eight year work program

The work program was developed using information from the following sources:

- The AVIRA risk assessment. This assessment identified the specific values and risks to be addressed through the work program for individual assets.
- WGCMA staff and consultants. Expert knowledge helped identify the types of management actions and the quantities required.
- Conceptual models linking management activities to threats and values. These were reviewed to ensure management activities were appropriate to address the risks.
- Existing plans and strategies. Priorities from existing sub strategies and plans were included where appropriate.

Factors also considered include:

- total cost of eight year work program
- current and past investment
- existing obligations (including statutory and environmental water)
- achievability of targets
- landholder adoption and community support.

5.1 Types of Priorities

The prioritisation process resulted in two types of priorities, defined on the level of risk (see Figure 6). Where there was a high risk to values; the focus for management is to reduce the threats to waterway condition, these waterways were assigned the priority type '*threat reduction*' and are displayed in red in the maps below.

Where there was a low risk to values or there had been substantial past investment in addressing the risks, the aim of management is to maintain waterway condition. These waterways were assigned the priority type 'maintain values/ past works', typically these waterways will require a lower level of intervention.

	Low risk to values	**High risk to values**
Priority waterways	Management activities to maintain waterway condition	Management activities to reduce threats to waterway condition
Other waterways	Not a priority within the eight-year planning period	Management activities only if they: • reduce threat to high value waterways • provide connectivity • protect public infrastructure or reduce risks from extreme events • maintain or strengthen community commitment to improving the condition of local waterways • are required to meet statutory or regulatory obligations.

Figure 6 Summary of outcomes from prioritisation (from DEPI 2013a)

For both priority types the risks to these waterways were determined to be feasible and cost effective to address through the eight year work program. See Figure 6 on page 41.

The final set of priority waterways are shown in Figure 7 and Figure 8. A full list of the priority waterways is set out in Appendix seven, two additional maps are provided in Appendix eight, showing the Strategy priorities in the context of the RCS priority landscape areas.

The maps also indicate the region's two Ramsar sites. There is an obligation to address these in the Strategy to fulfil Ramsar planning requirements. The areas covered by the Ramsar Management Plans are identified in Figure 8.

It should be noted that the Corner Inlet Ramsar Site planning has been incorporated in its entirety into the work program, however planning for the Gippsland Lakes Site has not.

A separate process is underway in partnership with EGCMA, Parks Victoria, GLMAC and DEPI to renew the Gippsland Lakes Ramsar Plan during 2015. Management activities that fit within existing WGCMA programs and obligations within the Gippsland Lakes Ramsar Site have been included in this Strategy.

The Strategy provides an update to the priorities within *West Gippsland Fishery Management Plan* and was completed through a process agreed to by DEPI and the WGCMA. The Strategy also provides for the inclusion of priorities related to Aboriginal cultural values. These were identified through an alternative process that was negotiated and agreed to by both the WGCMA and Traditional Owners. Other social values have been considered explicitly in the standard prioritisation process used for this Strategy.

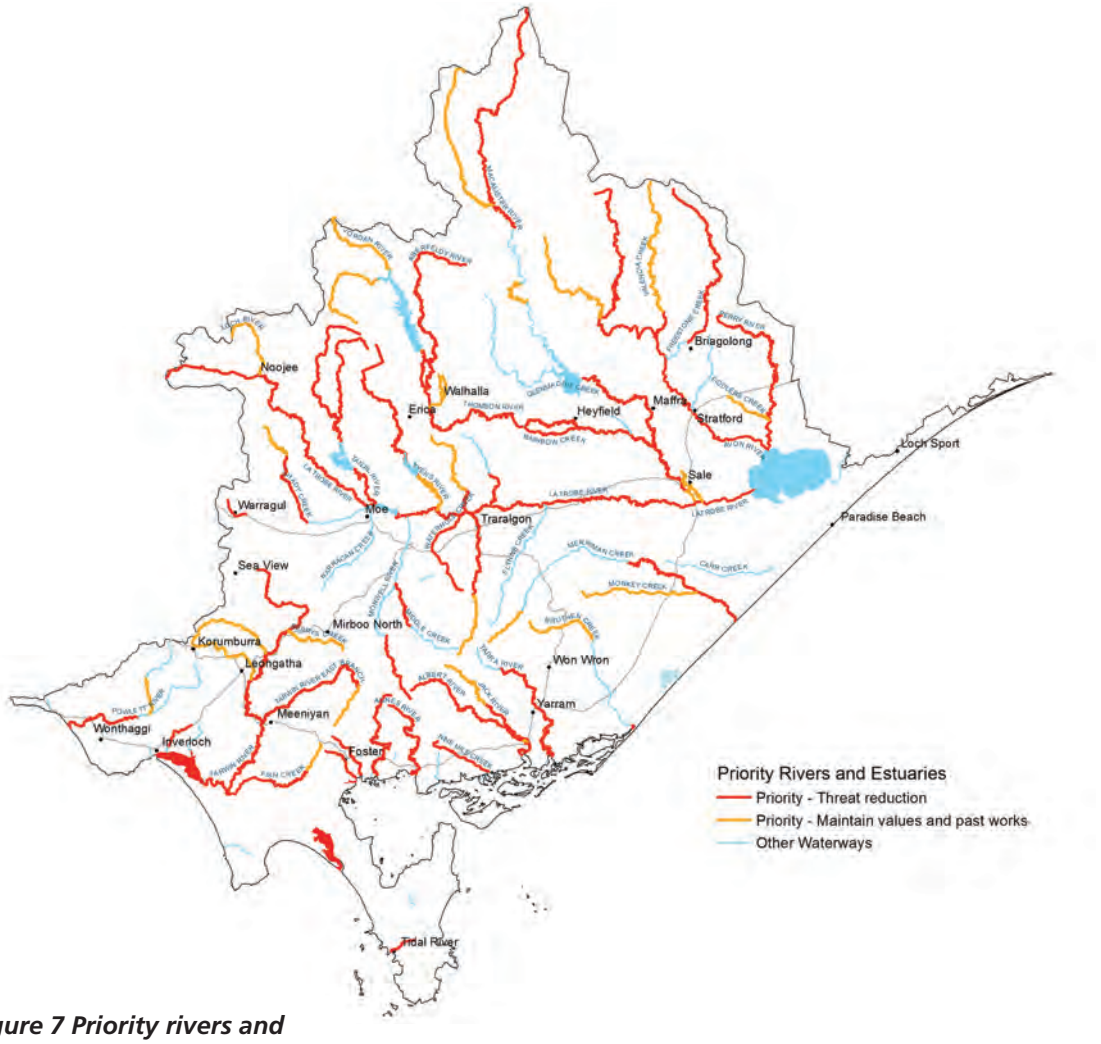

Figure 7 Priority rivers and estuaries in the West Gippsland region

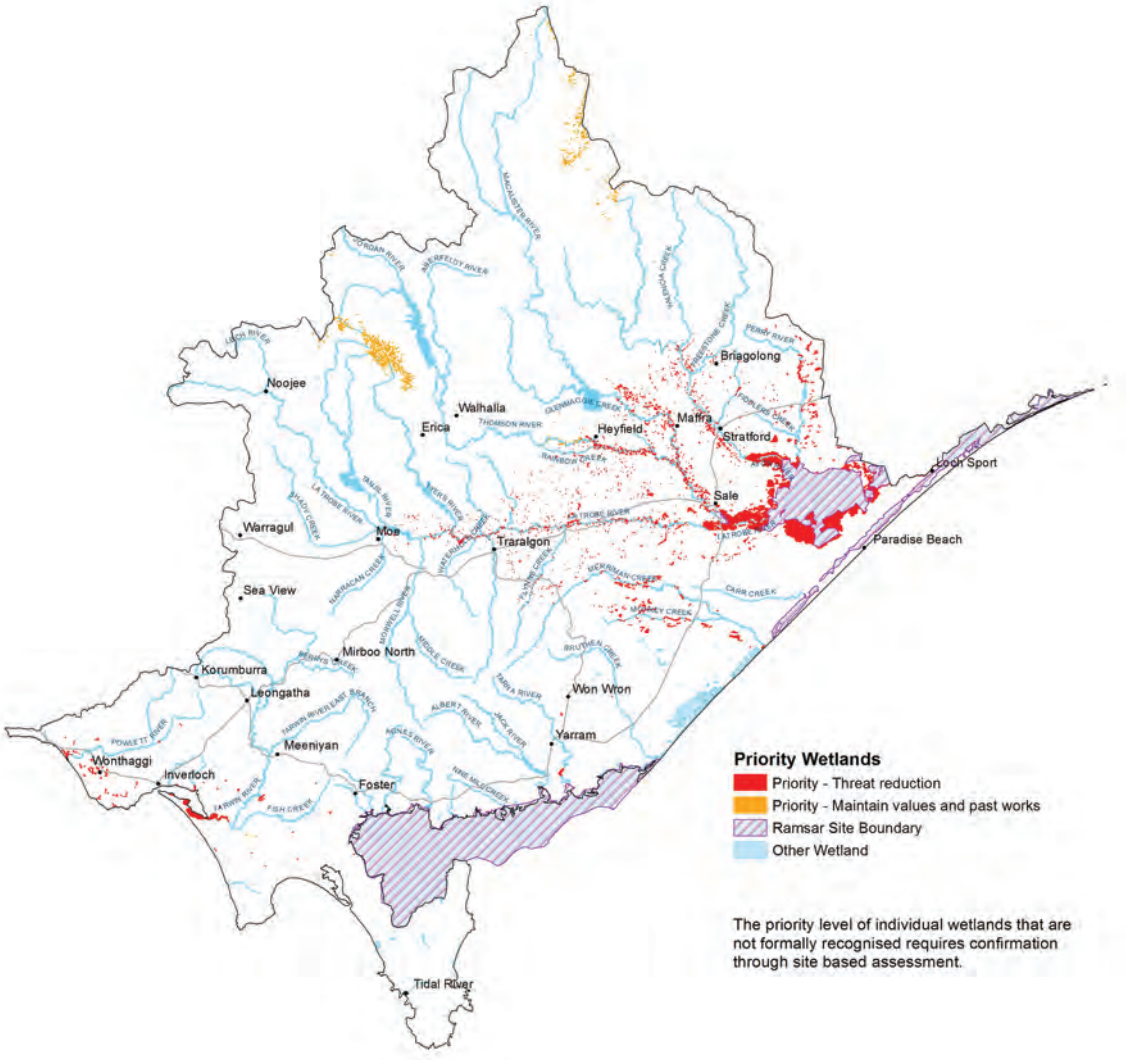

Figure 8 Priority wetlands in the West Gippsland region

5.2 Management Activities in Non-Priority Areas

The majority of Government investment in waterway management through the Strategy is directed to works on priority waterways. However, there are also circumstances when investment can occur on non-priority waterways.

Investment in works on these other waterways should address the following criteria:

- reduce threats to priority waterways, for example from erosion, sedimentation, weeds or poor water quality
- provide connectivity in a landscape context
- protect public infrastructure or reduce risks from extreme events and natural disasters
- support community groups who have a commitment to improving the condition of local waterways
- in the case of regulatory controls which apply across all designated waterways in Victoria and works that are required to comply with legal or statutory requirements.

5.3 Program Logic and Targets

Program logic provides a 'road map' to present the theory behind a program and what is expected to be achieved by it. Program logic for the Strategy describes how specific management activities and outputs will be delivered. Over the eight year period of the Strategy, program logic shows the chain of events that will lead to preserving the high value of waterways in the West Gippsland region.

Program logic shows that in the long term, the regional goals for the Strategy sit at the highest level and illustrate what should be achieved over the 20+ year period.

Three levels of targets are described in the work programs.

Long Term Resource Condition Targets – eight + years, this is the assumed resource condition and is framed around the values of the waterway; it is aspirational in its intent.

Management Outcome Targets – one to eight years, this is the resource outcome being aimed for through the eight year work program.

Management Activities / Outputs – annual, this refers to the quantity of works that will be undertaken to reach the management outcome.

Activity (output) and outcome targets were developed based on the results from the risk analysis of each priority waterway, conducted using the AVIRA framework and database. They were also informed by the guiding principles, the consultation process with partners and the community, as well as by the considerations outlined in Part B. Development of the work program and long term resource condition targets were informed by the assumptions outlined in the conceptual models for rivers and estuaries (DSE 2012).

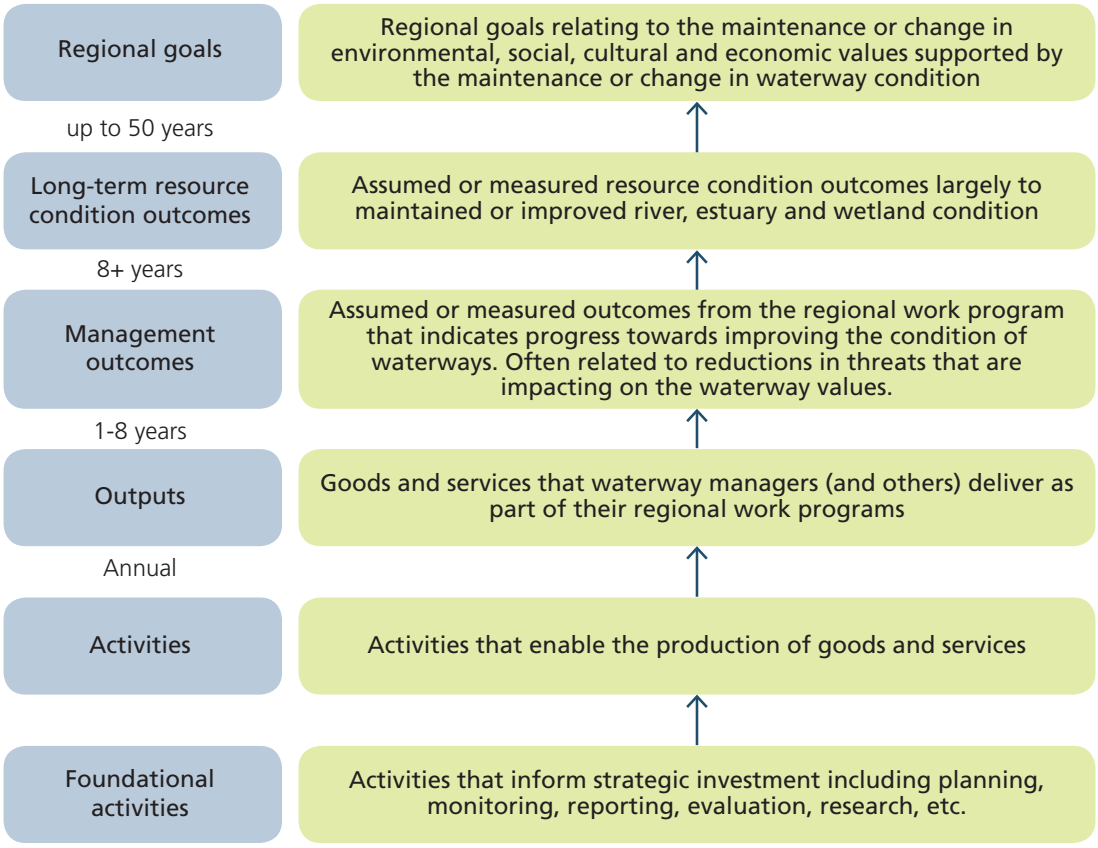

Figure 9 Program Logic for the Waterway Strategy (from DEPI 2013a)