Image description - Barwon River

Corangamite Waterway Strategy 2014 - 2022

For the health of our rivers, estuaries and wetlands

State Government Victoria

CORANGAMITE CMA

Acknowledgments

In developing the Corangamite Waterway Strategy, the Corangamite Catchment Management Authority would like to acknowledge the input of our partner agencies and groups, the people who contributed by attending a pre-draft community session or listening post and making a written submission.

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The Corangamite CMA acknowledges the traditional custodians of the land where we work and pay our respects to the Elders past and present.

CHAIRMAN'S FOREWORD

The Corangamite Waterway Strategy follows the release of the Victorian Waterway Management Strategy in 2013 and provides the framework and work program for the management of rivers, estuaries and wetlands in the Corangamite region to support their environmental, social, cultural and economic values.

The *Corangamite Waterway Strategy 2014-2022* (CWS) aligns with and implements aspects of the *Corangamite Regional Catchment Strategy 2013-2019*. At the heart of these strategies is the need to encourage the community to participate in the protection, restoration and enhancement of natural resources across the Corangamite region. A motivated community, combined with sound science, increased knowledge and adequate resources, is essential for improving the health of our waterways.

We firmly believe integration is needed to achieve success and this is a clear focus of the CWS. Integrated catchment management brings together people, ideas and practices across land tenure boundaries, and across the range of natural resource themes. Integration is the approach the CMA will use in delivering the CWS and its programs, and we will encourage our partners to do the same.

The CWS was developed by the Corangamite Catchment Management Authority in partnership with regional communities, regional agencies involved in waterway management, Traditional Owners and other key stakeholders. It replaces the Corangamite River Health Strategy 2006-2011 and its associated addendum in 2010. The new strategy builds on the former with a number of improvements including a more integrated approach to waterway management as well as the inclusion of estuaries and wetlands.

This strategy identifies high value and priority waterways at the regional scale. It sets priority management activities which will be undertaken over the next eight years. A regional work program has been included to guide investment and improve or maintain the values and quality of these waterways.

This strategy looks forward, recognising the challenges of the task ahead, while understanding our past. Since European settlement of the Corangamite region, many land use decisions and practices once encouraged have damaged our natural resources. In some cases, the impact has been so great that critical resources such as water have been compromised, and native species have become threatened or some cases extinct.

We are inextricably linked to our catchment and we have a shared responsibility to act to ensure that the environment is healthy and supports our prosperity and wellbeing, and that future generations can enjoy the benefits. To this end we look forward to the ongoing investment and participation of our community. Together we will make a difference.

Alice Knight, OAM

Chairman,
Corangamite Catchment Management Authority

Contents

Introduction v

PART A – Context and strategy development

1. Regional overview 2
1.1 Geographic overview 2
1.2 History 3
1.3 Waterways 5

2. Strategic context 10
2.1 Legislation and policy 10
2.2 Roles and responsibilities 11
2.3 Review of the Corangamite River Health Strategy 2006-2011 11

3. Integrated catchment management 14
3.1 Overview 14
3.2 Opportunities 14
3.2.1 Community involvement in the management of waterways 14
3.2.2 Aboriginal aspirations 15
3.3 Challenges 17
3.3.1 Planning for climate change 17
3.3.2 Management of extreme events 17
3.3.3 Influence of the surrounding catchment 18
3.4 Strategic links 18
3.4.1 Management of recreational fisheries 18
3.4.2 Game hunting 20
3.4.3 Wetland management 20
3.4.4 Management of the Environmental Water Reserve 27
3.4.5 Estuary management 30
3.4.6 Management of urban waterways 32
3.4.7 Floodplain management 35
3.4.8 Public infrastructure 35
3.4.9 Management and use of water resources 36
3.5 Other management issues 37
3.5.1 The river channel 37
3.5.2 Riparian land 38
3.5.3 Management of invasive species 40
3.5.4 Water quality 41

4. Vision, goals and strategy development 42
4.1 Overview 42
4.2 Vision 43
4.3 Regional goals 43
4.4 Asset-based approach 45
4.5 Guiding principles 45
4.6 Program logic 45
4.7 Key steps of the prioritisation process 46
4.8 Consultation 51

PART B – Priorities, work summary and delivery

5. Regional priorities and work summary 53
5.1 Overview 53
Aire Landscape Zone 56
Bellarine Landscape Zone 62
Curdies Landscape Zone 68
Gellibrand Landscape Zone 73
Hovells Landscape Zone 80
Leigh Landscape Zone 85
Lismore Landscape Zone 91
Mid Barwon Landscape Zone 98
Moorabool Landscape Zone 104
Murdeduke Landscape Zone 111
Otway Coast Landscape Zone 116
Stony Rises Landscape Zone 123
Thompsons Landscape Zone 130
Upper Barwon Landscape Zone 136
Woady Yaloak Landscape Zone 143

6. Delivering the strategy 149
6.1 Delivery approach 149
6.2 Investment 149
6.3 Engagement and community participation 150
6.4 Annual work 151

7. Monitoring, evaluation and reporting 152
7.1 Overview 152
7.1.1 Developing an MER Plan 152
7.2 Monitoring 153
7.3 Evaluation 153
7.4 Reporting 154
7.5 Knowledge gaps and research 154
7.5.1 Value and threat data gaps 155
7.5.2 Addressing process limitations 155

PART C – Detailed regional work program
8.1 Overview 156
8.2 Aire Landscape Zone 158
8.3 Bellarine Landscape Zone 172
8.4 Curdies Landscape Zone 196
8.5 Gellibrand Landscape Zone 205
8.6 Hovells Landscape Zone 232
8.7 Leigh Landscape Zone 238
8.8 Lismore Landscape Zone 247
8.9 Mid Barwon Landscape Zone 271
8.10 Moorabool Landscape Zone 278
8.11 Murdeduke Landscape Zone 302
8.12 Otway Coast Landscape Zone 306
8.13 Stony Rises Landscape Zone 332
8.14 Thompsons Landscape Zone 369
8.15 Upper Barwon Landscape Zone 383
8.16 Woady Yaloak Landscape Zone 406
8.17 Glenelg Hopkins CMA Region 414

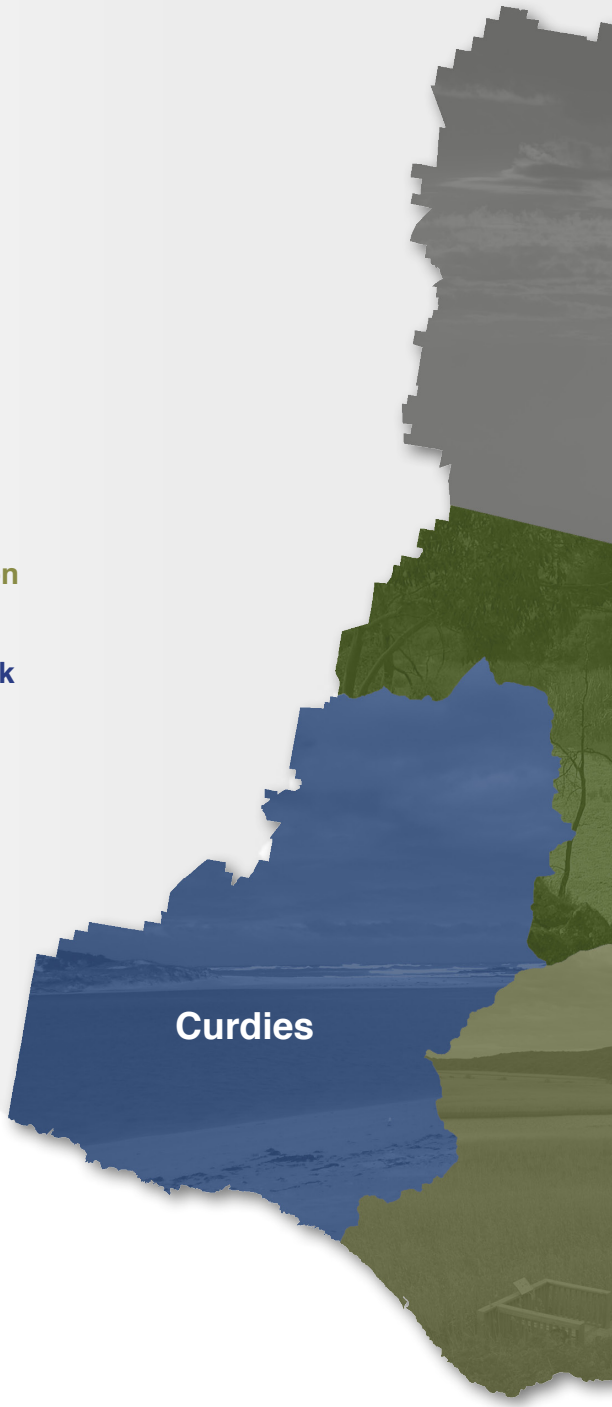
Glossary of terms and acronyms 416
References 420
Appendices 422
Appendix A – Legislation, strategies and policies 422
Appendix B – Partners and their roles and responsibilities in waterway management 424
Appendix C – Ramsar criteria met 427
Appendix D – Ramsar ecological character and Limits of Acceptable Change 433
Appendix E – Recommended monitoring needs for the Western District Lakes Ramsar site 435
Appendix F – A Cleaner Yarra River and Port Phillip Bay - Action Plan 436
Appendix G – List of AVIRA values and threats 440
Appendix H – AVIRA metrics/categories used to identify high value waterways 443
Appendix I – High value waterways 445
Appendix J – AVIRA rules for goals 452
Appendix K – Ranking priority waterways – risks assessment and feasibilities example 453
Appendix L – Priority waterways and priority waterway scores 455

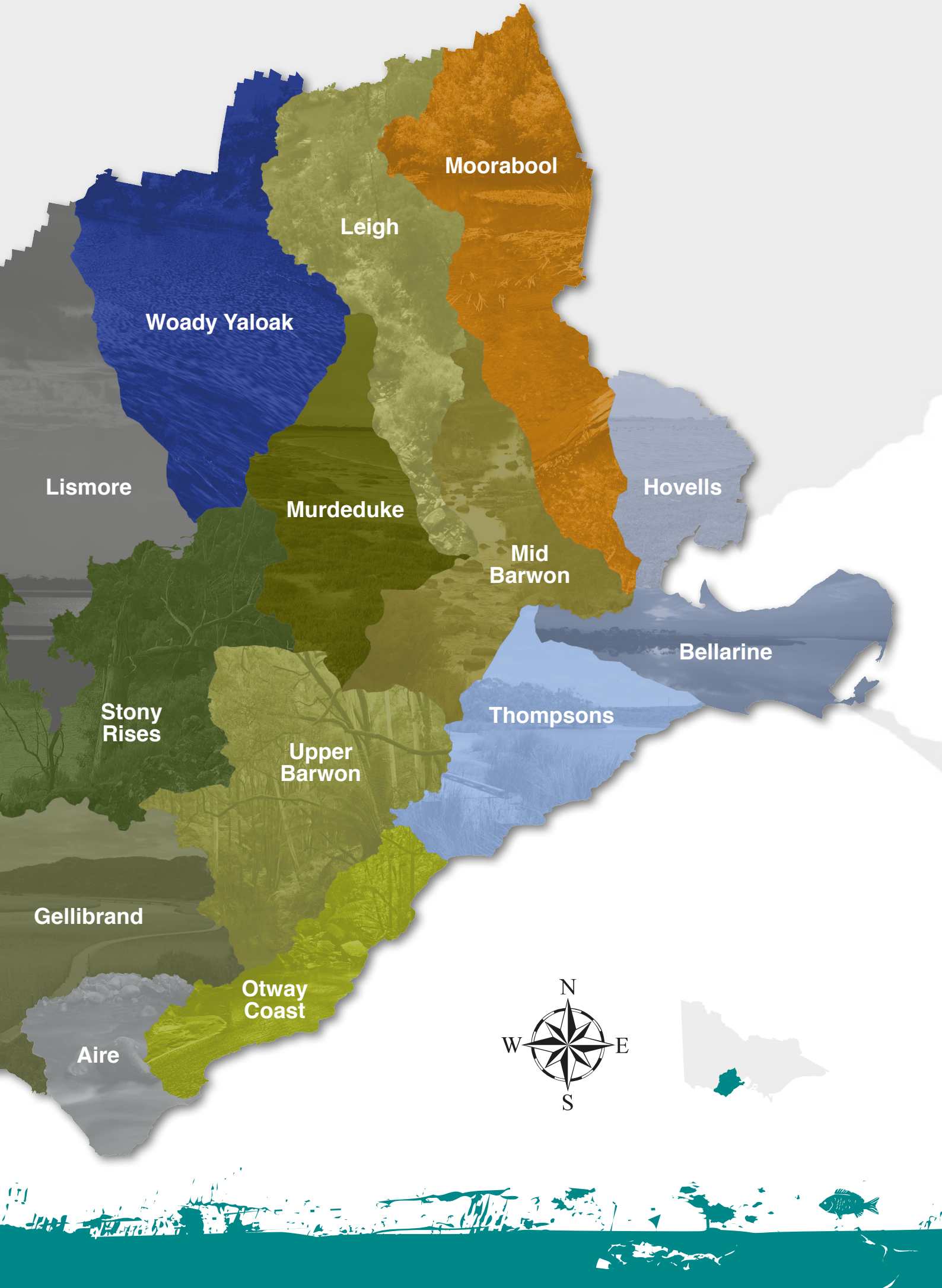
Corangamite

Landscape Zones

Click on a landscape zone to navigate directly to the summary of priorities and work for that zone.

- Aire
- Bellarine
- Curdies
- Gellibrand
- Hovells
- Leigh
- Lismore
- Mid Barwon
- Moorabool
- Murdeduke
- Otway Coast
- Stony Rises
- Thompsons
- Upper Barwon
- Woady Yaloak




Moorabool
Leigh
Woady Yaloak
Lismore
Murdeduke
Hovells
Mid
Barwon
Bellarine
Stony
Rises
Thompsons
Upper
Barwon
Gellibrand
Otway
Coast
Aire
N
W
E
S

Introduction

The waterways (rivers, estuaries and wetlands) of the Corangamite region are diverse and complex ecosystems and the 'lifeblood' of many communities. They have unique environmental values, providing habitat for native fish, invertebrates and water birds, while supporting extensive vegetation communities. They also have strong cultural and historic significance, are a focal point for recreation and tourism and their catchments provide our community with water for drinking, irrigation and industry.

The purpose of this *Corangamite Waterway Strategy* 2014-2022 (CWS) is to provide a framework and regional work program for the Corangamite Catchment Management Authority (CMA), in partnership with other agencies, industry and community groups to maintain or improve the condition of rivers, estuaries and wetlands so they can continue to support environmental, social, cultural and economic values.

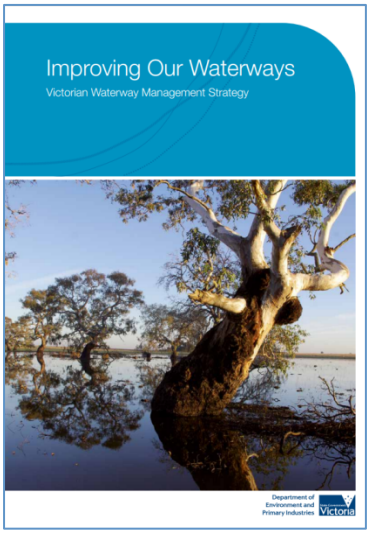
The CWS sets priorities and outlines a regional work program (summarised in Chapter 5 and detailed in Part C) to guide investment over the next eight years through to 2022. The CWS also guides the coordination of efforts by landholders, partner organisations and the wider community.

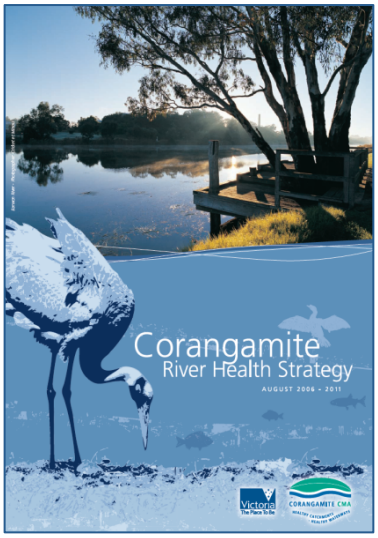
The regional community highly values the region's waterways and recognises that a coordinated and collaborative approach is required to improve their current condition.

The CWS now incorporates wetlands, thus replacing the *2006 Corangamite Wetland Strategy*. It also incorporates the updated management plan for the Western District Lakes Ramsar Site, which lies within the Corangamite region. Part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site also extends into Corangamite region, however a separate, updated management plan will be developed for this Ramsar Site in 2015/16 by the Department Environment and Primary Industries (DEPI). The CWS does include works to be undertaken for the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site wetlands that are located within the Corangamite region.

This strategy was prepared using the framework and guidance set out in the 2013 *Victorian Waterway Management Strategy* (VWMS), the Regional Waterway Strategy Guidelines (DEPI, 2013a), guidance notes for the development of the regional waterway strategies provided by DEPI, and aligns with the regional direction outlined in the 2013 *Corangamite Regional Catchment Strategy* (RCS).

The 2014-2022 CWS builds upon the 2006 *Corangamite River Health Strategy* (CRHS) and expands the scope of the former strategy to include estuaries and wetlands (and their associated floodplains) as well as rivers.





This CWS is structured in three parts and consists of eight chapters as follows:

PART A

CONTEXT AND STRATEGY DEVELOPMENT

Includes contextual information on the Corangamite region, its waterways, the *Corangamite Waterway Strategy* and its development. Presented in four chapters:

Chapter 1. Regional overview

Background information on the region, including a geographic overview and a historic account. Defines waterways, their condition and the connection people have to waterways.

Chapter 2. Strategic context

Covers relevant legislation and policy, roles and responsibilities and how the 2006 CRHS relates to the CWS.

Chapter 3. Integrated catchment management

Details what is needed for an integrated approach to waterway management and how this is addressed through the CWS. Includes opportunities, challenges and key strategic linkages.

Chapter 4. Vision, goals and strategy development

Presents the vision, regional goals and long-term resource condition targets and outlines the process for how the CWS was developed. Includes consultation and key steps in priority setting.

PART B

PRIORITIES, WORK SUMMARY, AND DELIVERY

Includes three chapters that detail the regional priorities and work, delivery and MER:

Chapter 5. Regional priorities and work summary

Presents high value and regional priority waterways with a summary of work for 15 geographic units termed 'landscape zones'. Describes community values and interests in each zone, acknowledges waterways of local importance and encourages community participation in waterway management.

Chapter 6. Delivering the strategy

Describes the approach to implementing the CWS, including adaptive management, investment, engagement and prioritising annual works.

Chapter 7. Monitoring, evaluation and reporting

Outlines the approach to monitoring, evaluation and reporting (MER) of the CWS and considers knowledge gaps and research.

PART C

DETAILED REGIONAL WORK PROGRAM

Provides detailed information and activities for each priority waterway, presented in a single chapter:

Chapter 8. Detailed regional work program

Presented in 15 Landscape Zones and includes maps, description of values and threats, long-term resource condition targets and sets management outcome targets. Details planned activities, lead and partner agencies and estimated costs.

CORANGAMITE CMA

PART A
Context and strategy development

1. Regional overview

1.1 Geographic overview

The Corangamite region comprises 13,340 km^2 of south-western Victoria, including 175 km of coastline extending to the tidal low water mark. It includes the shires of Colac Otway, Golden Plains, Surf Coast, and the Borough of Queenscliffe. Also included are most of the Cities of Ballarat and Greater Geelong, and parts of the shires of Corangamite, Moorabool, and Moyne (Figure 1.1). The Corangamite region is famous for its spectacular coastline (centred on the Great Ocean Road) stretching from north of Geelong as far west as the Twelve Apostles near Port Campbell. The region is also renowned for the historic gold mining precinct centred around Ballarat; and for the Victorian Volcanic Plain, which slopes west to east through the centre of the region, flanked by the Otway Ranges to the south and the Central Highlands to the north. The volcanic hills that emerge from the plains in the west provide a backdrop to large lakes set within an otherwise flat landscape. These Western District lakes are of international ecological significance for migratory birds, and are home to iconic fauna including the brolga, growling grass frog and Corangamite water skink.

In general terms, the region's climate is described as temperate Mediterranean, with rainfall dominant in winter and spring and characteristically hot and dry weather in summer and autumn. Rainfall is highest along the ridge of the Otway Ranges in the south (1500 – 1800 mm) and the Western Uplands in the north (1000 – 1100 mm). The central Victorian Volcanic Plain experiences much lower rainfall (500 – 600 mm), with the lowest rainfall recorded east of the Brisbane Ranges (400 – 500 mm). The future climate of the region is expected to be hotter and drier than today, with a higher frequency of extreme weather events, including an increased number of hot days and less rainfall, with the greatest rainfall reductions expected to occur in spring (IPCC, 2013).

Of the 1.3 million ha of land in the region 78% is in private ownership, of which land use is varied and generally related to land systems and climate. Primary production is important in the region with major industries including grazing, cropping, dairy, plantation forestry and horticulture.

The Corangamite region consists of four drainage basins that reflect the geology and landscape evolution of the region. These basins are the Barwon River, Lake Corangamite, Moorabool River and Otway Coast (refer to Figure 1.2 below). The major population centres of Ballarat and Geelong are becoming increasingly urbanised, encroaching on surrounding agricultural areas. The spatial distribution of the population is changing, with significant expansion in the coastal areas including Armstrong Creek, Torquay and the Bellarine Peninsula, as well as the Ballarat to Greater Geelong corridor centred on Bannockburn.

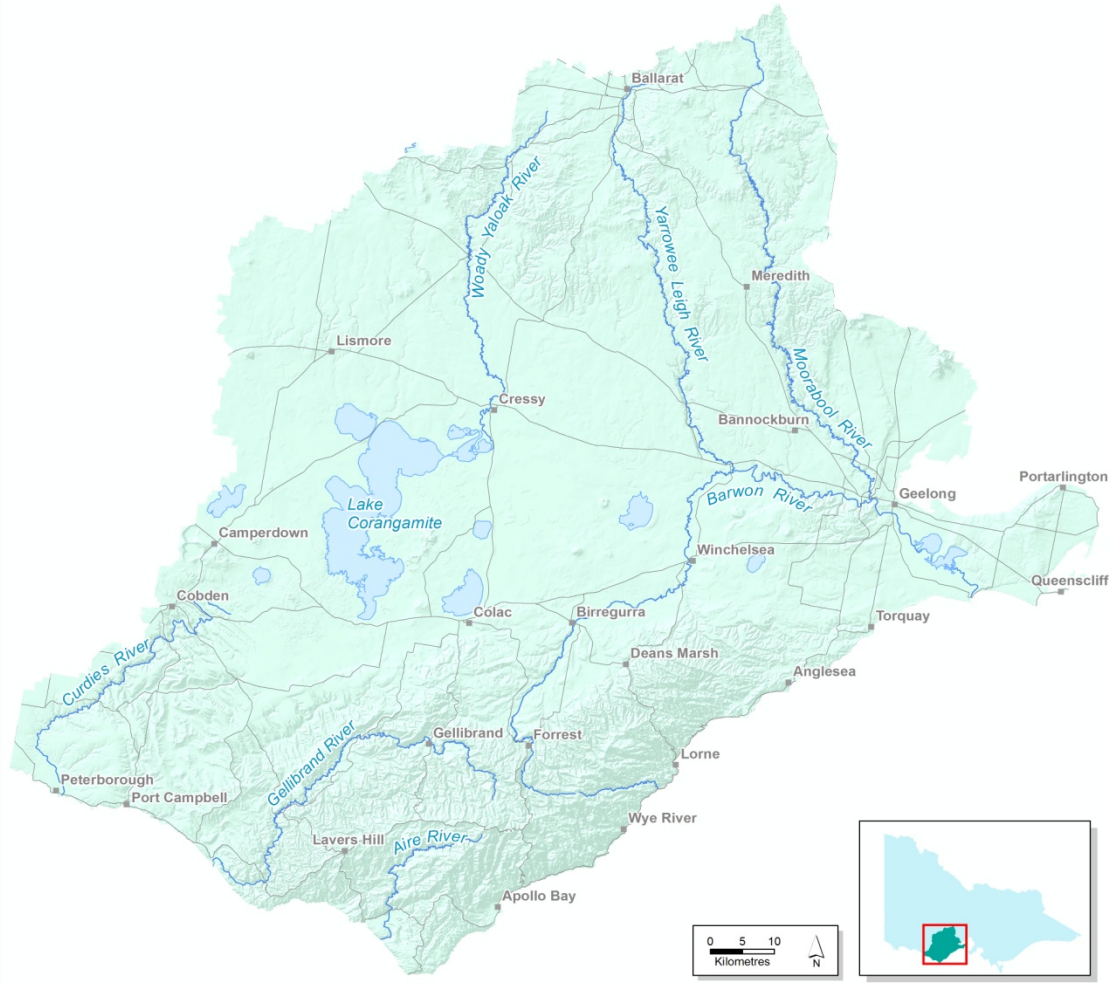


Figure 1.1 – Corangamite region

1.2 History

1.2.1 Pre-European settlement

There is known evidence of more than 30,000 years of occupation by Aboriginal people in the Corangamite region. Aboriginal people and their ancestors have cared for the environment for thousands of years, always acknowledging their innate responsibility to care for the land. During this time aboriginals left physical evidence of their activities, which now survive as cultural heritage sites and archaeological artefacts. Waterways were important for food, water and travel and many of these cultural sites are in close proximity to waterways.

The most common inland Aboriginal sites in the Corangamite region are stone artefact scatters, which are most likely the remains of resource processing locations or camps. Remains of campfires such as concentrations of charcoal, burnt rocks and burnt clay can also be found along with scarred trees that are a result of the removal of bark from trees for the construction of canoes, shields or containers. Less common sites are fish traps and stone houses. Along the coastline, the most common Aboriginal sites are shell middens, where discarded shells accumulated over time. These middens sometimes include animal bones, artefacts and charcoal and less frequently, Aboriginal burials.

European settlement of the continent is a relatively recent event, but one that dramatically changed the course of Australian history forever. Adapting to the effects of European settlement is a challenge that the Aboriginal community continues to respond to, and the preservation of Aboriginal cultural heritage is part of this challenge.

1.2.2 Post-European heritage

The first Europeans interested in pastoral settlement of southern Victoria began to land on the coast from Tasmania in the mid-1830s. At that time Victoria comprised the Port Phillip District of the British colony of New South Wales, and Tasmania was the penal colony of Van Diemen's Land. After the Henty brothers sailed from Western Australia to establish a farming base near Portland Bay in 1834, 'overstraiters' landed further east to explore the Corangamite region.

Less organised parties filled those areas abandoned or ignored by these pioneers. Initial movement was along the Moorabool and Barwon Rivers. First as squatters, then as pastoral licensees, these settlers established home stations along these rivers supported by outstations further afield. Salty and brackish waterholes in the Moorabool kept pushing settlement upstream, with the Moorabool headwaters reached in just a few years.

In the pastoral run period, licensees enlarged existing water holes, created instream dams and undertook limited drainage work. During the 1850s and into the 1860s parts of the Corangamite region were intensively mined for gold. Other parts were felled for timber processed by steam-powered forest sawmills. Land settlement intensified and diversified with the sale of Crown land into smaller subdivisions, supported by emerging towns in need of reliable water supplies. Water was moved across catchment boundaries and the politics of availability and allocation accelerated. Changes in stream volume and flow rate changed the physical form of river banks and beds, and in turn their water quality and biodiversity values, createing a shifting catchment mosaic. It is this early European settlement context that in part explains the contemporary focus on protecting the remaining flows for our stressed river systems.

In response to this settlement a new water landscape was also created. Many waterways, including lakes, became inaccessible to the community. At times considerable efforts were made to retain more water landscapes as part of the public domain, with strong cultural links established between particular communities and their special water places, such as Lake Wendouree in Ballarat. Reconnecting the many communities of Corangamite with their waterways, and engagement in the broader issues of catchment management, has been an emergent theme from both the region's pre-European and European settlement history.

1.2.3 Government involvement in waterway management

Prior to the 1970s the focus of waterway management was largely threat based with implementation of schemes designed to manage rivers and streams and protect social and economic assets (roads, bridges, towns and other infrastructure) from threats such as erosion and flooding. In the Corangamite region there were no local river management authorities. River related threats to assets such as infrastructure were usually managed by local government with technical advice and funding provided by the State River and Water Supply Commission or Soil Conservation Authority (SCA).

From the mid-1970s waterway management started to evolve from a narrow, localised erosion control and flood protection focus toward integrated catchment management. The SCA made significant steps towards integrated catchment management through their group conservation management approach to minimise land and water degradation. The SCA tackled significant gully and river erosion issues in the Corangamite region including asset protection works in the upper Barwon River catchment focussing on protection of road bridges and the Geelong and District Water Board's water supply channel from the West Barwon Dam to Wurdiboluc Reservoir.

The commencement of Landcare in 1986 heralded a stronger focus for community involvement in all aspects of catchment management in Victoria. In addition, community-based salinity planning groups had developed comprehensive government endorsed action plans to reduce the impact of salinity on predominantly agricultural land. In the Corangamite region, while the focus was protection of agricultural land, protection of wetlands and rivers became a high priority.

The 1990s were a period of significant advances in catchment management arrangements. The *Catchment and Land Protection Act 1994* created nine Catchment and Land Protection Boards with responsibility for co-ordinating integrated catchment management. In 1995 as part of the statewide review of waterway management arrangements, the Barwon, Moorabool, Corangamite Waterway Management Consultative Action Team (CAT) recommended a Waterway Management Authority be created for the Barwon, Moorabool and Corangamite basins. It also concluded that the optimum management structure in the longer term

Barwon River upstream of Winchelsea, 1946. Photo: Corangamite CMA

Parliamentary Public Works Committee inspecting floods at Lake Corangamite near Wool Wool, 1956. Photo: Corangamite CMA

should be one that provides for an organisation that deals with waterway management as well as broader catchment issues, within an integrated system.

In 1996 the Victorian Government established the Catchment Management Structures Working Party to help implement the Catchment and Land Protection Board Regional Catchment Strategies (RCS) as a key focus of Victoria's land and water program.

The Working Party recommended a community-based service delivery model for catchment management, integrating the advisory roles of the current Catchment and Land Protection Boards, Salinity Implementation Groups, Regional Development Committees and Waterway Management Authorities, to create Catchment Management Authorities.

The establishment of the Catchment Management Authorities in July 1997 represented the implementation of a co-ordinated waterway and integrated catchment management focus across the state with a major focus on project delivery through engagement and capacity building with local communities and stakeholders that remains in place to this day.

1.3 Waterways

The CWS focuses on the management, maintenance and improvement of all waterways within the region. For the purposes of the strategy waterways are defined as:

- All rivers and streams, including their floodplains (and floodplain wetlands) and estuaries.
- Non-riverine wetlands, lakes and impoundments.

These waterways are spread throughout the region across four major drainage basins. These basins and their associated major waterways are shown on Figure 1.2 and are as follows:

- **Moorabool Basin** - includes the Moorabool River which is the major river system flowing through the east of the region and Hovells Creek, a small creek system that rises in the southern foothills of the You Yangs and flows into Corio Bay.
- **Barwon Basin** - includes the Barwon River which rises in the northern slopes of the Otway Range and the Leigh River which begins in the central Victorian uplands around Ballarat, joining the Barwon River at Inverleigh.
- **Lake Corangamite Basin** - a landlocked system that includes the Woady Yaloak River and a number of small ephemeral creeks feeding Lake Corangamite as well we other significant lakes and wetlands.
- **Otway Coast Basin** - includes the Curdies River which occupies the western section, the Gellibrand, Aire and numerous small coastal streams which occupy the central Otways and the Erskine River, Spring and Thompson creeks which flow through the eastern section.

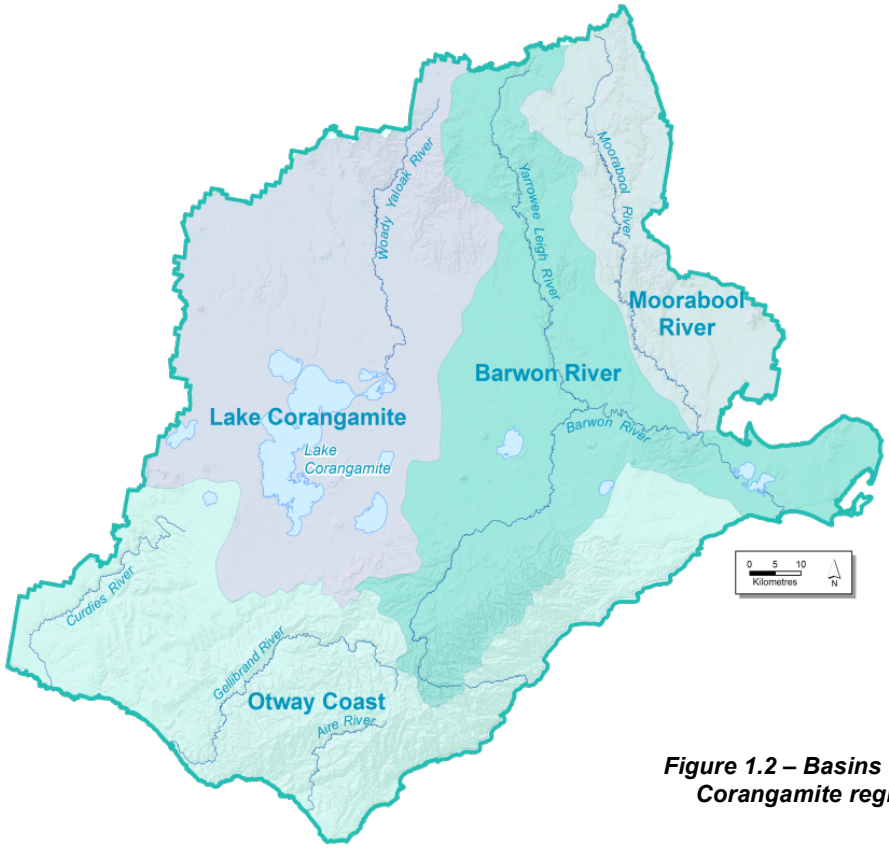


Figure 1.2 – Basins of the Corangamite region

1.3.1 Rivers and creeks

The statewide Index of Stream Condition (ISC) program is an integrated snapshot of the condition of rivers, creeks and estuaries, through the assessment of sub-indices relating to hydrology, physical form, streamside zone (riparian vegetation), water quality and aquatic life (macroinvertebrates).

The ISC program, undertaken for the third time in 2010, sampled 138 river and estuary reaches in the Corangamite region and revealed that 20 (11%) of these were in excellent condition (Figure 1.3).

It should be noted that a number of significant changes in methodology from previous surveys have occurred, which included the assessment of the entire reach through the use of remote sensing technologies instead of assessing a small number of random sites. These changes have resulted in a more accurate assessment in terms of assessing the whole of the reach and deviation from natural state. The ISC assesses stream condition against expected reference condition which takes account of the natural variability in the various measures of stream condition (e.g. a naturally eroding stream in steeper country is likely to have some erosion present).

The investigations revealed that stream condition across the Corangamite region varied. The majority of stream length in good and excellent condition was clustered in the heavily forested Otway Coast Basin (44% of stream length). In contrast, there were no streams in good or excellent condition in the highly modified Moorabool basin. The majority of stream lengths in the Barwon, Moorabool, and Corangamite basins were in moderate or poor condition.

Figure 1.3 provides an overview of the condition of rivers and creeks within the Corangamite region and per basin (based on 2010 data – DEPI 2013b). This information is presented spatially in Figure 1.4.

Detailed results for individual reaches within the Corangamite Region and an explanation and background to the Index of Stream Condition can be viewed via the internet on the DEPI website[1].

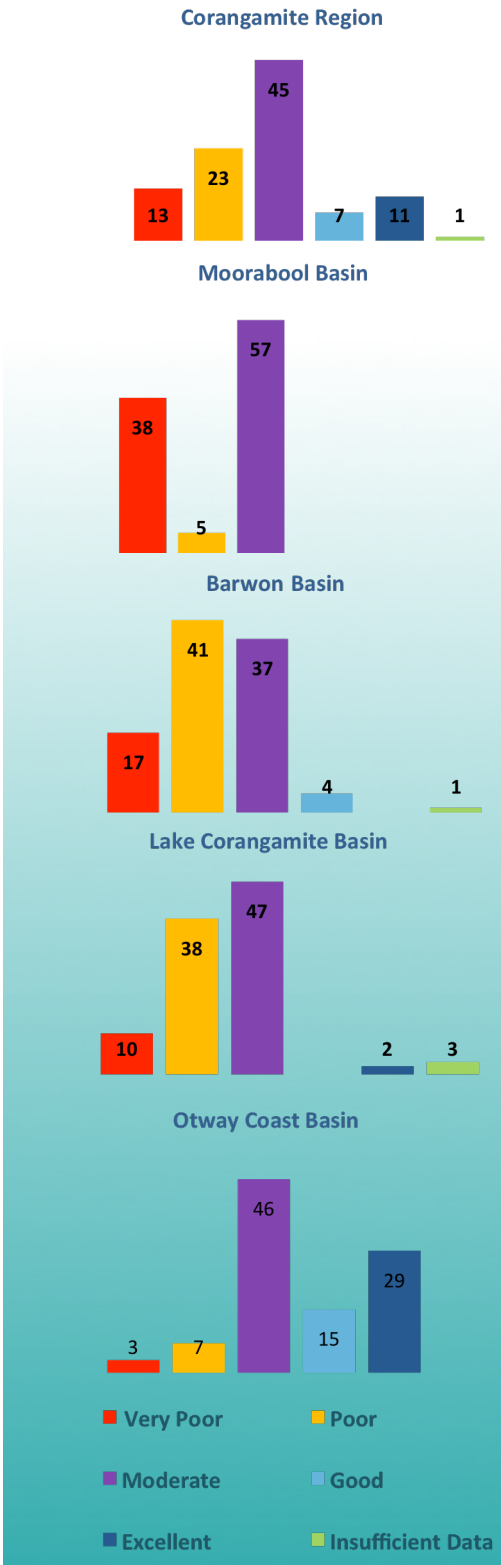


Figure 1.3 – River condition in the Corangamite region as a percentage of reaches (based on 2010 ISC data)

[1] www.depi.vic.gov.au/water/water-resource-reporting/Third-Index-of-Stream-Condition-report

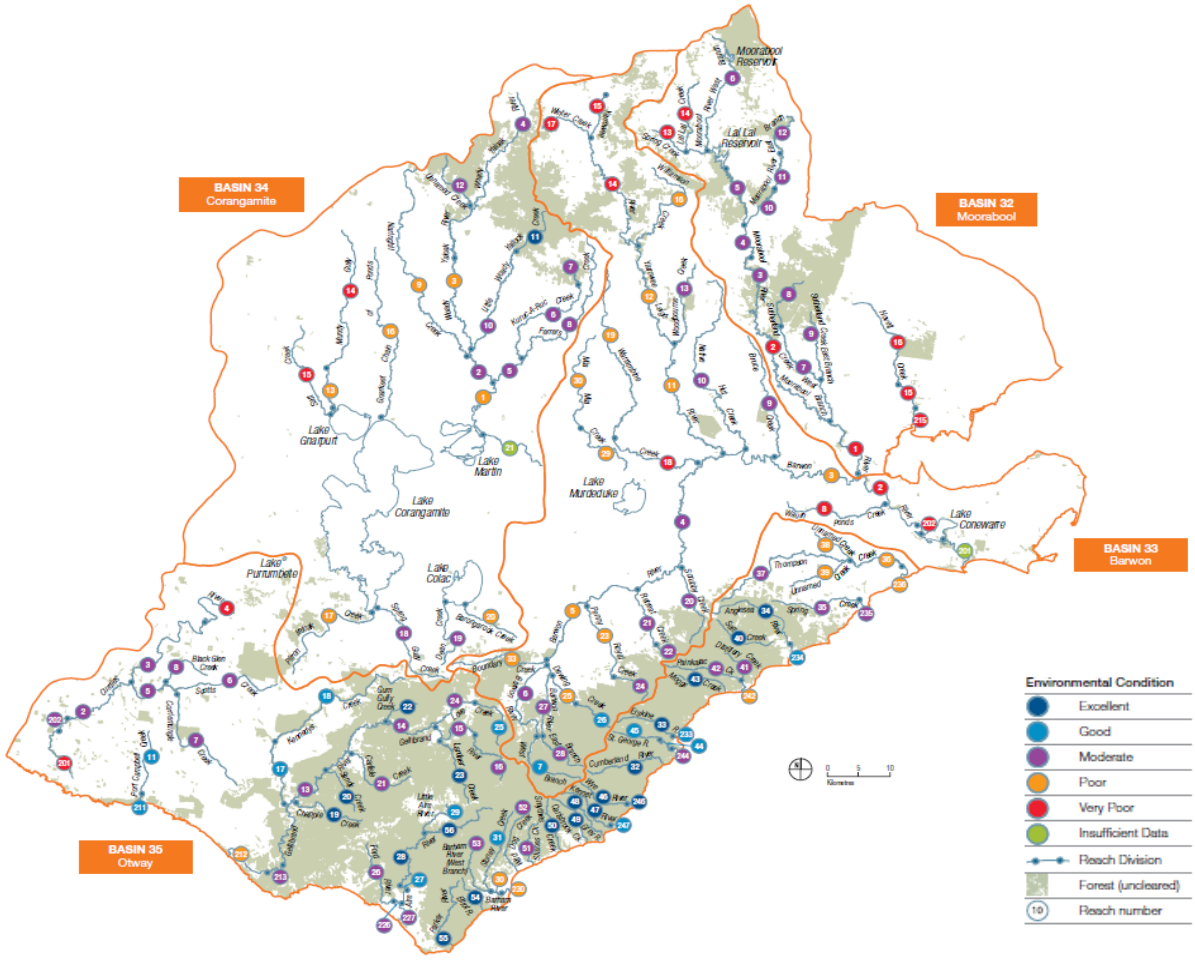


Figure 1.4 – Corangamite 2010 ISC Results (DEPI 2013b)

1.3.2 Estuaries

The condition of estuaries within the Corangamite region were assessed as part of the 2010 ISC process, with 18 estuaries included in the assessment (2 in the Barwon Basin and 16 in the Otway Coast Basin). From this assessment, 61% of estuaries were classified as being in moderate to excellent condition (Figure 1.5).

It should be noted that ISC has not been developed to reflect all the complexities of estuarine environments and as a result has some limitations in its ability to accurately reflect estuary condition.

Specific assessments of waterway conditions for estuaries within Victoria are continuing to be developed, including the pilot Index of Estuary Condition (IEC). However at the time of preparation of the strategy, this data was not available for the assessment and prioritisation of estuaries for regional waterway strategies across Victoria. This data may be incorporated into the formal review of the CWS in 2017-18 (see Section 7.3).

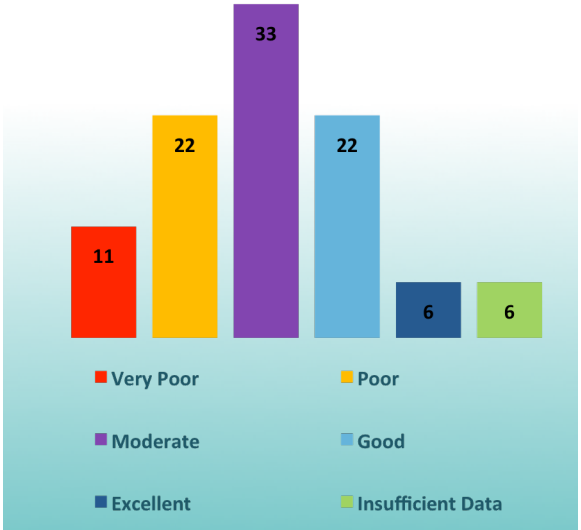


Figure 1.5 – Estuary condition in the Corangamite region as a percentage of reaches (based on 2010 ISC data)

1.3.3 Lakes and wetlands

The condition of a wetland affects its ability to provide environmental functions and values. The Index of Wetland Condition (IWC) was developed by DEPI and was used for the first time in a statewide assessment to assess high value wetlands in 2009/10 and set of representative wetlands in 2010/11 (Papas and Moloney, 2012). IWC assessments have also been undertaken at other wetlands in the region for specific programs such as WetlandTender (see Section 3.4.3). It uses a variety of measures to assess the condition of wetlands and provides a basis for future monitoring. The IWC detects loss of wetland habitat. The results can be used to identify threats to the values that wetlands support and to indicate wetland types that are most vulnerable to deterioration in condition.

The 2009/10 IWC assessment of high value wetlands covered wetlands in Ramsar sites and nationally important wetlands listed in A Directory of Important Wetlands in Australia (DIWA) (Environment Australia, 2001). Data from this assessment has been used to determine wetland condition for inclusion in this strategy (see Figure 1.6).

Although high value wetlands and some representative wetlands in the Corangamite region were assessed using the IWC in the statewide assessment rounds, there are a large number of wetlands in the region that have not had IWC assessments undertaken. This means there are significant knowledge gaps on condition of wetlands overall in the Corangamite region. Research, such as that through the Environmental Accounts trial[2] continues to close these gaps and will be required in future to help direct investments for improved wetland management.

[2] Information on this trial can be found on the following website: http://wentworthgroup.org/portfolio-item/corangamite-vic/.

1.3.4 Community connections to waterways

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

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

The Corangamite region has a strong history of community-based natural resource management, particularly through the Landcare movement and programs such as Waterwatch and the newly established EstuaryWatch. These volunteers undertake activities such as engaging landholders and local people in natural resource management, building partnerships as well as undertaking on-ground works, monitoring and sharing knowledge.

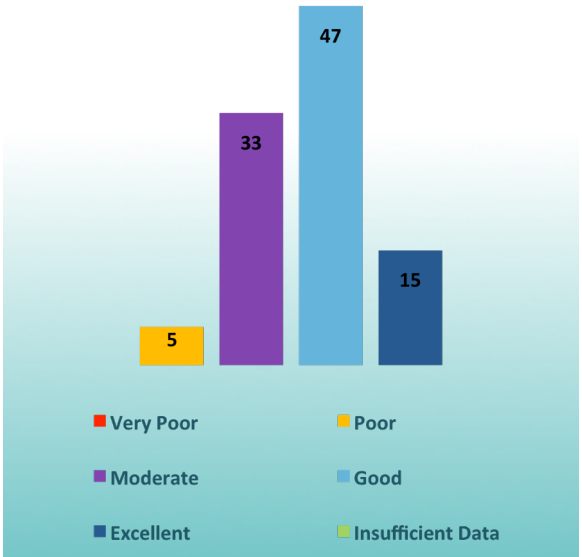


Figure 1.6 – Condition of wetlands in the Corangamite region as a percentage the total number of wetlands (based on 2009-2010 IWC data).

Left: Hospital Swamp. Photo: Corangamite CMA

These community participation programs also provide important opportunities for the Victorian Government and regional agencies to deliver education and awareness raising programs on sustainable waterway management and behaviours. Established community networks also deliver their own education and awareness raising activities that encourage broader adoption of sustainable land and water resources management by their peers.

1.3.5 Aboriginal connection to waterways

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

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

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

Until recently, Victorian Traditional Owners have not been able to participate in waterway management at a level that appropriately reflects their rights and interests. While Australian governments have ratified and established a range of international, national and state policies in relation to the rights of Aboriginal people, there is still much work to do with regard to the effective implementation of these policies. Victorian Traditional Owners have strong interests in healthy waterways and a right to be involved in regional waterway management on their Country. Future partnerships with Traditional Owners will be more successful if they are supported by improved engagement processes and the provision of specific capacity building opportunities. The CWS takes steps towards addressing this outcome for Traditional Owners through its development and delivery (refer to Section 3.2.2).

2. Strategic context

2.1 Legislation and policy

Legislation, strategies and policies relevant to the CWS are presented in Table 2.1. Further details of these can be found in Appendix A.

Table 2.1 – Relevant legislation, strategies and policies.

Scale	Legislation, strategy or policy
International	Ramsar Convention on Wetlands
	International migratory bird agreements: • Japan-Australia Migratory Bird Agreement (JAMBA) • China-Australia Migratory Bird Agreement (CAMBA) • Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) • Convention on the Conservation of Migratory Species of Wild Animals
National	*Environment Protection and Biodiversity Conservation Act 1999*
	Native Title Act 1993
	National Water Initiative
State	*Water Act 1989*
	State Environment Protection Policy (Waters of Victoria)
	Victorian Waterway Management Strategy 2013
	Flora and Fauna Guarantee Act 1988
	Coastal Management Act 1995
	Catchment and Land Protection Act 1994
	Wildlife Act 1975
Regional	Corangamite Regional Catchment Strategy 2013
	Western and Central Region Sustainable Water Strategies
	Corangamite Marine and Coastal Biodiversity Strategy 2009
	Corangamite Invasive Plant and Animal Management Strategy 2010
	Corangamite Landcare Support Plan 2013

2.2 Roles and responsibilities

The Corangamite CMA, along with nine other CMAs, was established in 1997 by the Victorian Government, under the *Catchment and Land Protection Act 1994*, with the aim of creating a whole of catchment approach to natural resource management in the state.

The primary goal of the Corangamite CMA is to ensure the protection and restoration of land and water resources, the sustainable development of natural resources-based industries and the conservation of our natural and cultural heritage within the Corangamite region. Under Part 10 of the *Water Act 1989*, CMAs are designated with responsibility for the management of waterways, drainage and floodplains. Under the C*aLP Act 1994* the Corangamite CMA is required to develop a *Regional Catchment Strategy* (RCS) and coordinate and monitor its implementation. The *Corangamite RCS 2013-2019* provides the long-term direction for integrated catchment management outcomes for the region.

In terms of waterway management, the Corangamite CMA's key functions are to:

- develop a regional Waterway Strategy and associated action plans
- develop and implement work programs
- authorise works on waterways and act as a referral body for floodplain planning applications
- act as referral body for licences to take and use water and construct dams and for water use and other waterway health issues
- identify regional priorities for environmental watering and facilitate water delivery
- provide input into water allocation processes
- develop and co-ordinate regional floodplain management plans
- manage regional drainage, as appropriate
- respond to natural disasters and incidents affecting waterways such as bushfires, floods and algal blooms
- undertake community participation and awareness programs.

The roles and responsibilities for partners in waterway management are presented in Appendix B.

2.3 Review of the Corangamite River Health Strategy 2006-2011

2.3.1 Overview

The *Corangamite River Health Strategy* (CRHS) 2006-2011 and its 2010 addendum provided a five-year framework for managing the region's rivers, lakes and estuaries. It identified a range of relevant community values, which encompassed environmental, social and economic factors. These values were matched to short and long-term targets, as well as long-term objectives to maintain and improve the health of the region's rivers, lakes and estuaries.

The CRHS was developed in close consultation with the community. Key partners such as Landcare, state and local government agencies and the broader community have helped deliver projects over the life of the CRHS. In 2010 new priorities were added to the CRHS, through an addendum, including planning for changing climatic conditions and protecting threatened species.

To inform the development of this CWS, a detailed review of the CRHS and its addendum was undertaken, including a survey of implementation partners. The following is a summary of the significant findings from the review and outcomes from the delivery of the CRHS.

2.3.2 Progress towards strategy targets

The CRHS set output targets for each of the priority river health actions. Data on the contribution towards the various targets was collected and mapped through the review process, and presented in the Regional Highlights publication[3].

A summary of contributions towards key targets is provided in Table 2.2 and mapped in orange in Figure 2.1.

It is important to note that the CRHS identified actions to reduce threats to river health values based on the likely levels of available funding from state, regional and national sources. The actual funding received for implementing these actions amounted to less than estimated and was subject to available government and regional funding sources and competing priorities throughout the life of the CRHS.

[3] Available on the Corangamite CMA website at the following link: http://www.ccma.vic.gov.au/admin/file/content2/c7/10678%20REGIONAL%20HIGHLIGHTSFINAL_05_03.pdf

Table 2.2 – Summary of targets achieved for 2006-2011

Target management	Target achieved
Riparian vegetation	Over 1,220 ha (88% of target) has been replanted with native riparian vegetation.
Riparian weed management (ha)	Over 200 ha (62% of target) of riparian weed management has been undertaken on priority waterways.
Willow management (km)	Over 210 km (93% of target) of priority waterways have had willows removed.
Construction of boardwalk and fishing platforms	100% of target boardwalks and fishing platforms were installed.
Stream bed stabilisation (km)	Over 35 km of stream bed stabilisation activities were undertaken. This was 155% of the target, as additional priorities were identified through investigations in the field.
Water quality monitoring (sites)	Water quality was monitored at 3,500 sites, which was 51% of the target. Dry conditions during the strategy implementation limited the number of sites where water quality could be monitored.
Number of barriers where fish passage restored	Fish passage was restored through a number of techniques including the removal of structures that limited fish migration and the construction of fishways on structures to facilitate fish migration. Over 600 km of waterways were opened up to native fish migration through these activities.
Length of river (km) where instream habitat has been reinstated (re-snagging)	The Barham River estuary near Apollo Bay had large wood (snags) reintroduced to provide habitat for estuarine fish species including Black Bream.

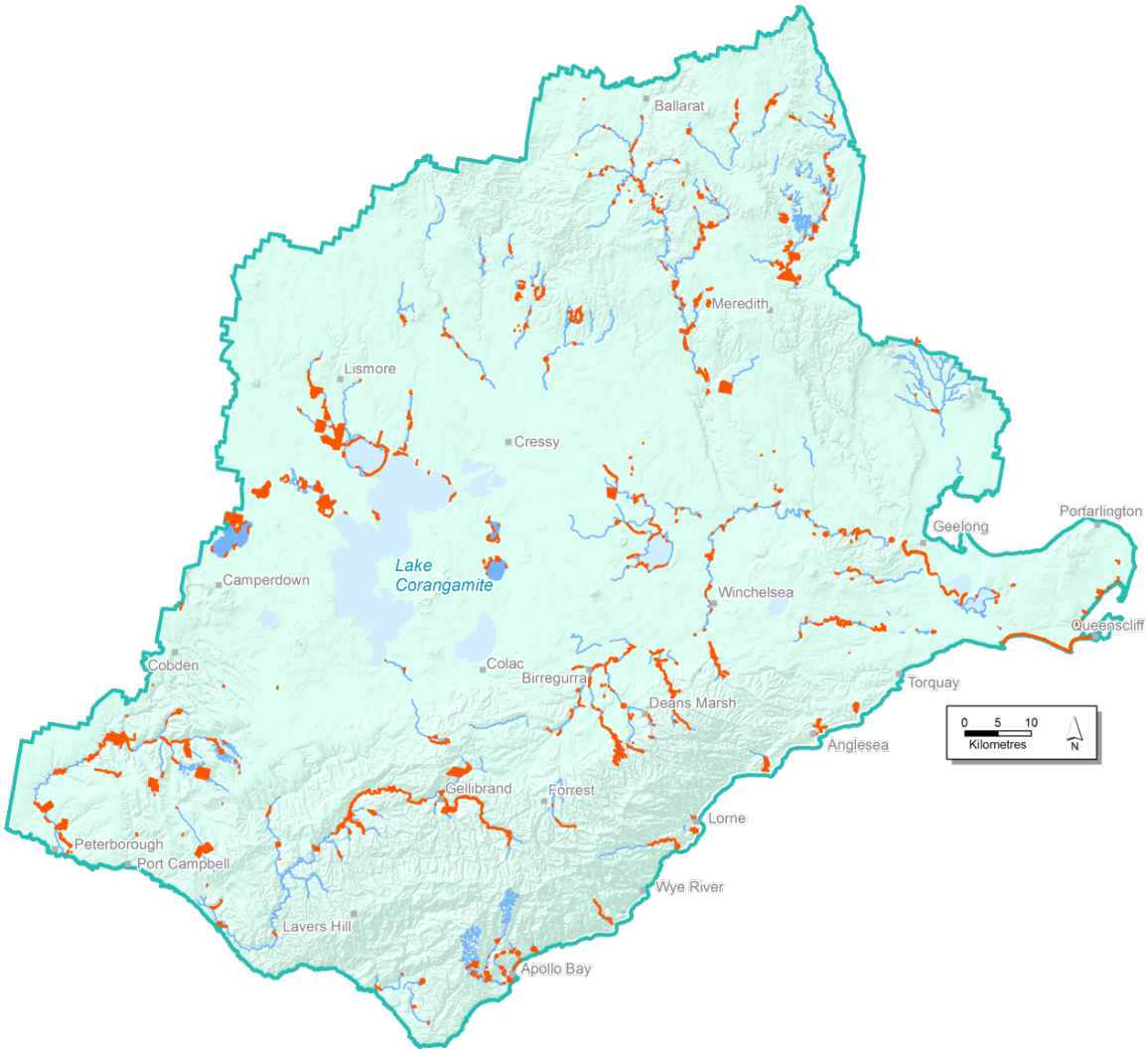


Figure 2.1 – On-ground river health works as part of the Corangamite River Health Strategy

2.3.3 Key findings

Despite the dry conditions experienced during the implementation of the strategy, significant progress was made towards achieving targets for on-ground works outputs. In the development of the CWS, a seasonally adaptive approach has been adopted to guide the annual on-ground works and environmental water planning processes. This will allow the Corangamite CMA to adapt this learning to the future works program so that it is flexible in response to climatic variability and use.

The use of targets was also reviewed in conjunction with the review of outputs. The key finding was that the resource condition targets could not be measured to demonstrate progress or in some cases they were not applicable. For example the targets relied heavily on the use of the Index of Stream Condition. Whilst this is a good measure of stream condition for long term trend analysis, it is not appropriate for measuring condition change at a fine scale, or for a short timeframe.

To address this finding the CWS will focus on measuring shorter term management outcome targets (expected change in condition). These will focus on outputs[4] so they can be more easily measured and reported on within the life of the CWS and beyond. The CWS has still set long-term resource condition targets, but these are used only as predictions to demonstrate the condition change we might expect as a result of delivering the on-ground actions.

The review also identified that it was critical to ensure that an appropriate Monitoring, Evaluation and Reporting (MER) plan and associated systems are in place upon finalisation of the strategy. This will ensure that the right data, in the right format, is collated throughout the strategy's implementation. This has been considered and incorporated in the development of the MER plan for the CWS.

As part of the review process a survey of implementation partners was also undertaken. The results of this were positive, with the majority of respondents being aware of and referring to the CRHS in the planning of the location and activities of their works around waterways. The results of this survey also helped to inform the consultative approach taken for the development of the CWS.

Below: the Corangamite region in drought, 2007. Photo: Alison Pouliot

[4] Outputs are the goods and services (e.g., km of fencing installed, number of ha vegetated) delivered as part of the regional work program'

3. Integrated catchment management

3.1 Overview

The role of the *Corangamite Regional Catchment Strategy* (RCS) is to provide long-term direction for integrated catchment management outcomes for the region. It does this by setting a long term vision and overarching catchment goal for the region, sets four foundations for change and actions for how to achieve these. It identifies regionally significant land, water and biodiversity assets and sets 20-year objectives for these and six-year management actions.

This same integrated focus extends to waterway management, recognising the importance of waterways as a connection between catchments, aquifers, streamside vegetation, estuaries and the marine environment, at the same time acknowledging the strong influence land use and catchment condition have in this context. Integrated catchment management also brings together people, ideas and practices across land tenure boundaries and a range of natural resource management (NRM) themes. All focussed on improving the coordination of on-ground action to maximise the benefit to catchment health.

The information presented in this chapter highlights the considerations needed to achieve integrated waterway management. It provides an overview of region-wide opportunities and challenges, and details key strategic links, regulatory functions and other policy issues affecting waterway health. It explains how the *Corangamite Waterway Strategy* (CWS) has, or intends to; incorporate these into regional waterway management. The *Victorian Waterway Management Strategy* (VWMS), the Corangamite RCS and other relevant national, state and regional policies and plans inform the direction of the CWS.

3.2 Opportunities

3.2.1 Community involvement in the management of waterways

At the heart of the Corangamite RCS is the need to encourage the community to participate, and have a sense of stewardship of catchment management. A motivated community, combined with sound science, the best available knowledge and adequate resources is essential for improving the health of the catchment.

The community value our rivers, estuaries and wetlands. All Victorians, from our cities to the regions, have a stake in waterway health and many want to have a say or be involved in their management.

People in the Corangamite region have a strong history of community-based natural resource management, particularly through the Landcare movement, programs such as Waterwatch and EstuaryWatch, as well as a variety of environment, industry and recreational groups. These groups and individuals are involved in waterway management planning, undertaking activities such as engaging and building partnerships, on-ground works, monitoring, building and sharing knowledge. Established community networks also deliver education and awareness-raising activities, and influence peers to improve waterway management.

The Corangamite CMA aims to review its engagement practices to make the most of opportunities to partner with the community to improve waterway health. As outlined in this strategy, the Corangamite CMA will do this by:

- encouraging community management of waterways, including those not directly listed as priorities in this CWS - further information can be found in Chapter 4
- supporting community monitoring programs such as Waterwatch and EstuaryWatch through continued support of volunteers,

program database maintenance and purchase of equipment
- supporting efforts and providing opportunities to build and share knowledge by hosting capacity building events, knowledge exchange and staff extension and assistance with community-based funding applications
- undertaking awareness-raising activities in the community through engaging with Waterwatch and EstuaryWatch programs.

In addition, there is a challenge and an opportunity to improve knowledge sharing for all parties involved in NRM to expand the collective understanding as well as to provide stronger evidence to support investment proposals. Working together to identify, share, respect and advocate agreed investment priorities that transcend both government and local priorities should:

- result in a more integrated approach to investment and on-ground NRM actions
- attract greater community participation in NRM from people otherwise not involved.

The newly-established Local Catchment Plans will help identify local and joint aspirations and priorities and how to incorporate these into future regional planning. There are currently two pilot plans underway in the Thompsons and Woady Yaloak landscape zones.

3.2.2 Aboriginal aspirations

As outlined in the VWMS, Aboriginal people view themselves as an integral part of waterway systems and Traditional Owners have strong cultural obligations to manage waterways in their own Country without affecting the ability of other communities to do the same. Aboriginal aspirations regarding waterway management span the full range of environmental, social, cultural and economic values that waterways provide.

A recent summary of the Aboriginal values and interests that Traditional Owner Groups in the Corangamite region seek included:

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

Aboriginal cultural heritage

Aboriginal occupation of the Corangamite region has extended thousands of years and is still thriving today. Past occupation can be seen from the physical evidence that Aboriginal people left behind. This evidence is of importance to Aboriginal people as it provides an important link to their culture and past. Quite often Aboriginal objects or places will be located near major food sources such as rivers, lakes, swamps and the coast, making waterways particularly significant.

The Aboriginal Heritage Act 2006 requires that the discovery of Aboriginal cultural heritage places or objects on public or private land in Victoria be reported to the Office of Aboriginal Affairs Victoria (OAAV). The OAAV works in partnership with landowners, land managers and Aboriginal communities to record, protect and manage these important places and objects.

If you have an Aboriginal cultural site or object on your property, reporting it will not affect ownership, or stop existing land use from continuing. In some cases current land management practises help to preserve Aboriginal heritage.

A scar tree found in the Corangamite region. Photo: Simone Werts

The Wathaurung Aboriginal Corporation (trading as Wadawurrung), is the only Registered Aboriginal Party (RAP) in the Corangamite region. They have identified their aspirations for waterways on Wadawurrung Country (see Table 3.1). RAPs have important roles and functions in managing and protecting Aboriginal cultural heritage in Victoria.

Management approach: *The Corangamite CMA will continue to work with the Wathaurung Aboriginal Corporation, Eastern Maar Aboriginal Corporation and Kuuyang Maar Aboriginal Corporation, as well as DEPI, Landcare and other community groups to improve Aboriginal involvement in waterway management within the Corangamite region in accordance with the aspirations outlined.*

Table 3.1 – Aspirations for waterways on Wadawurrung Country[5]

Aspiration	Description
Facilitate identification of cultural heritage features through 'Country Mapping'	The Wadawurrung Traditional Owners have commenced identifying cultural heritage features that are not formally recognised in Cultural Heritage Sensitivity Overlays. Property names in the language of traditional owners are an initial indication of a potential feature. Many early settlements were named after landscape features to enable Aboriginal guides to locate properties.
Private landholder collaboration to protect Aboriginal cultural heritage	As the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage on Wadawurrung Country, we believe that education is the key to raise awareness and reduce confusion and common misconceptions that are currently viewed as barriers to people reporting cultural heritage sites or objects.
	The Wadawurrung people would welcome private landholder collaboration to identify new cultural sites. There could be arrangements for landholders undertaking environmental works to receive additional incentives if cultural heritage assessments are allowed and where deemed necessary actions undertaken to protect sites or objects identified.
Provide capacity building opportunities	Wadawurrung people would encourage participation of Indigenous people in training programs to improve skills and increase employment opportunities in environmental programs. This is especially where these opportunities may facilitate employment opportunities through the support of the development of Aboriginal NRM Green Teams (see below).
Promote knowledge sharing	Wadawurrung people would like to be engaged in forums for information exchange and awareness raising, sharing experiences and knowledge about NRM and cultural heritage with other landholders.
Encourage planting of endemic species of Indigenous significance	Wadawurrung Traditional Owners are concerned about a loss of plant species that are traditionally used as bush tucker or for medicinal purposes. Revegetation programs are an opportunity to encourage planting of these species.
Facilitate employment opportunities	*NRM Green Teams.* Wadawurrung people expressed an interest in establishing natural resource management teams that could be contracted to conduct on-ground works such as weed control and revegetation projects. Capacity building would also be welcomed as a means of supporting team establishment.
	Cultural heritage advice. Wadawurrung people have skills to undertake due diligence assessments. Wadawurrung people can provide advice on statutory obligations, relating to particular projects, and on how to manage risk and protect Aboriginal cultural heritage (for example providing advice on whether permits, management plans etc. may be needed under the *Aboriginal Heritage Act 2006*).
Focus management effort on waterways that are under the greatest threat	All waterways are of significance to the Wadawurrung people. However, in the context of managing waterways the Wadawurrung believe that waterways under the greatest threat are more significant (and are where management efforts should focus). Examples in the Corangamite region include the Barwon, Yarrowee and Moorabool rivers.

[5] This information was provided by the Wathaurung Aboriginal Corporation and the Glenelg Hopkins CMA.

3.3 Challenges

The RCS identified the following key challenges for natural resource management in the Corangamite region:

- increasing participation
- identifying joint priorities for investment
- working together, integrating and coordinating management
- sourcing investment
- increasing and sharing knowledge
- accounting for investment
- population growth
- climate change
- achieving practice change on private land.

While it was not intended to be an exhaustive list, the RCS provides a comprehensive overview of the key challenges for NRM and outlines the approach to respond to these challenges. For further information see the RCS, which is available on the Corangamite CMA website[6].

Challenges that are particularly important for waterway management include:

- planning for climate change
- management of extreme events
- managing the influence of the surrounding catchment (and achieving practice change).

3.3.1 Planning for climate change

As detailed in the Corangamite RCS, the future climate of the region is expected to be hotter and drier than today, with a higher frequency of extreme weather events, including an increased number of hot days, increased bushfire danger and rising sea levels (DEPI, 2013c). The greatest rainfall reductions are expected to occur in the spring[7].

In a recent study to understand vulnerability of different wetland types to climate change it was found that there will likely be a decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands[8]. For south west Victoria, the most vulnerable wetlands were identified to be permanent and seasonal wetlands that are rainfall dependent.

Climate change will require public and private land managers as well as the broader community to adapt to new conditions, much as they already adapt to drought or periods of high rainfall. Changes in land management practices are inevitable. As knowledge about the potential impacts of climate change develops, objectives and actions to protect natural resources may need to be revised. Whilst it is not foreseen that targets will need to be revised during the life of this CWS, it is more than likely that future waterway strategies will need revised priorities, goals and targets. In the event that new knowledge suggests that goals or targets set for this CWS are not achievable, then these will be revised as this knowledge arises. It will also, however, present opportunities to capitalise on the new circumstances by, for example, changing tourism and recreation, introducing new crops and livestock enterprises and participating in 'carbon farming' initiatives.

The Corangamite CMA acknowledges that the potential impacts of climate change need to be considered now to ensure we appropriately plan for managing the region's natural assets, including its waterways, into the future. As a result, the Corangamite CMA's 'NRM Planning for Climate Change Project' will identify priority landscapes for carbon sequestration, and will help develop strategies to build landscape resilience and guide adaptation and mitigation actions to address climate change impacts on natural ecosystems.

The Corangamite CMA will work closely with CSIRO and other scientific experts, as well as engaging with regional NRM partners and the broader community, to develop an interactive web portal that will host the latest information, through spatial data layers, to assist waterway managers to plan for climate change. It is expected that this project will be completed by June 2016, however data and planning tools to help develop management strategies for the region's natural assets most susceptible to climate change, will be available in late 2014.

Management approach: *The Corangamite CMA will continue to use the best available science to plan for and adapt to climate change and will use new knowledge to revise existing goals and priorities where required.*

3.3.2 Management of extreme events

In the last decade, the Corangamite region has experienced several extreme events including extensive bushfires and periods of flooding. Waterways have evolved with natural flood and bushfire cycles and are adapted to benefit and recover from these periodic disturbances. Under natural conditions, floods and bushfires can be important for sustaining the region's ecology.

Floods drive many of the geomorphological and biological processes (i.e. nutrient cycling, that sustain the health of rivers, estuaries and wetlands). They can scour sediment deposits from in-stream pools, provide inputs of large woody habitat to waterways, aid dispersal of native species and open estuaries. In addition, many of Australia's plants and animals have evolved to survive bushfire events and many plants rely on bushfires to regenerate.

[6] http://www.ccma.vic.gov.au/admin/file/content2/c7/CCMA%20RCS%20FINAL%20JUNE%202013.pdf

[7] Further information can be found here: http://www.climatechange.vic.gov.au/regional-projections/corangamite

[8] Assessment of Climate Change Vulnerability for Wetlands in Victoria, DEPI 2013

Changes in catchment and floodplain land use from human settlement have contributed to an increased frequency and severity of floods. It is also possible that changes in climate may increase the intensity of future floods and bushfires in Victoria. Under these changed conditions, waterways may have a reduced ability to withstand or recover from these disturbances.

The adverse effects of floods and bushfire on waterways are primarily related to the following:

- erosion and mobilisation of sediment resulting in:
  - channel widening and/or avulsion (the abandonment of the main river channel in favour of a new course)
  - infilling of large pools by sediment
  - loss of vegetation and in-stream habitat
  - infrastructure damage
  - possible fish death events from lack of oxygen in the water
- damage to native riparian vegetation
- loss of or damage to fences protecting riparian vegetation
- acceleration of the spread of invasive species
- debris accumulating above bridges or culverts, threatening their integrity
- livestock loss and destruction of various high value crops.

The VWMS outlines the statewide approach to managing extreme events including, the development of a new *Victorian Floodplain Management Strategy*, the use of the Emergency Management Framework, alignment of regional waterway and floodplain management strategies and better alignment of bushfire management across the state.

Management approach: *The Corangamite CMA will work with DEPI, partner agencies and the community to manage extreme events in line with policy and the framework for emergency management outlined in the VWMS.*

3.3.3 Influence of the surrounding catchment

Activities on the land upstream, surrounding or adjacent to waterways (e.g. land clearing, installation of farm dams, forestry, and intensive animal industries), can have a significant effect on waterway condition through changed water regimes, erosion or water quality impacts from salinity, sediment and nutrient run-off. Integrating the management of the surrounding catchment with waterway management is critical and success relies on participation of the region's public and private landholders. This is particularly important in the Corangamite region's highly modified catchments, where 78% of the catchment is in private ownership and a large proportion used for agriculture.

The challenge for implementing the CWS is encouraging and integrating best practice land management to improve waterway condition.

3.4 Strategic links

3.4.1 Management of recreational fisheries

Recreational fishing provides an important social and economic contribution to Victoria's regional communities. The Corangamite region in particular, provides popular native and trout recreational fishing opportunities within its rivers, wetlands and estuaries.

DEPI (Fisheries Victoria) is focused on managing fisheries in a balanced way to ensure ecological sustainability and social and economic outcomes. As an example, Fisheries Victoria is keenly aware that exotic species can negatively affect native fish species by eating young or small bodied native fish, competing with native species for scarce food resources or through aggressive behaviours such as fin nipping. This means that there can be competing management priorities in some reaches where rare or threatened native fish species co-occur with exotic recreational fish species.

Fisheries Victoria is also responsible for implementing Victorian Government initiatives to improve recreational fishing opportunities by supporting fish habitat recovery works, improving angler access and facilities, fish stocking, protecting fisheries resources and education and compliance activities.

Recreational fishing is highly dependent on the condition of waterways including the availability of suitable habitat, water quality and water regimes to sustain productive fisheries. Recreational fishers acknowledged this critical dependency in surveys (2009 and 2012) that revealed "repairing where fish live" was the most important recreational fishing investment priority. This creates opportunities for the Corangamite CMA, Fisheries Victoria, and recreational fishers to work together to identify and collaborate on habitat related projects that lead to better fishing outcomes.

Key recreational fisheries

The Corangamite region includes many popular recreational fisheries. In 2012, a survey of recreational fishers highlighted that important fisheries in the region include the Barwon River and Lake Connewarre, Anglesea River, Lake Bullen Merri, Lake Purrumbete, Lake Tooliorook and Wurdiboluc Reservoir.

A more complete assessment of Victoria's recreational fishing waters can be found in a Guide to Inland Angling Waters of Victoria[9].

[9] Available at: http://www.depi.vic.gov.au/fishing-and-hunting/fishing-guides/inland-angling-guide

Strategic priorities

Fisheries Victoria invests in the following strategic priorities for the management of inland fishing in Victoria:

1. **protect key fisheries assets**
2. **advocate for fish habitat recovery works**
3. manage fish stocking
4. encourage compliance with regulations
5. improve angler access
6. develop recreational fishing opportunities.

The first two of these strategic priorities (**bold**) fall within the scope of this CWS.

Fishery management priorities

On 3 December 2013, Fisheries Victoria and the Corangamite CMA convened a workshop with key recreational fishing representatives to identify key fisheries management priorities for the region. The ideas and proposals from this forum were reviewed by Fisheries Victoria against project feasibility criteria and are captured as fishery management priorities (Table 3.2).

The outcomes of this workshop builds on past fishery management planning processes, in particular the 2008 Corangamite Fishery Management Plan.

***Management approach**: Where possible, the Corangamite CMA will work with Fisheries Victoria and key recreational fishing representatives to support implementation of fishery management priorities.*

Commercial fisheries

In addition to the many locations that are popular for recreational fishing, there are several locations where commercial eel fishing occurs. Eel fishing requires the issuing of a licence, of which a maximum of 18 are available state-wide. Licenced eel fisheries in Corangamite can be found within the Aire, Lismore and Bellarine landscape zones. Eel fishing is regulated under the *Fisheries Act 1995* and managed under the *Victorian Eel Fishery Management Plan 2002.*

Table 3.2 – Corangamite fishery management priorities

No.	Fishery management priorities
1	Build an understanding of estuary management planning with recreational fishers and identify opportunities to be involved in the planning process (e.g. engage VRFish and locally affiliated members).
2	Investigate opportunities to improve riparian and instream habitat and bank stability in popular river reaches in the Corangamite region (e.g. Curdies River at Boggy Creek and the Narrows, Barwon River at the Sheepwash, Gellibrand and Anglesea River etc.)
3	Establish aquatic habitat hotspots (demonstration sites) which include improving riparian habitat and fishing access (e.g. Gellibrand River downstream of Great Ocean Road Bridge).
4	Support the re-establishment of woody habitat in the Corangamite region based on the outcomes of DEPI's habitat mapping study recommendations.
5	Establish and promote two way communication with recreational fishers regarding Corangamite CMA operational programs via community reference groups, regional consultation forums, angling club meetings and public media.
6	Support targeted monitoring of fish populations and fisheries using citizen science (angling club records, angler diary programs etc.) in line with Corangamite CMA river health works.
7	Investigate the historical abundance, distribution and fishery importance of river blackfish and explore options to restore and enhance existing populations and fisheries.
8	Work with recreational fishers to investigate priorities to remove fish barriers in the Barwon-Moorabool River System (e.g. Baum's Weir, Buckley Falls etc.).
9	Promote recreational fisher awareness of, and participation in, *Corangamite Waterway Strategy* actions managed by the Corangamite CMA through regional consultation forums, angling club meetings and public media.

3.4.2 Game hunting

Game hunting is an important social activity in the Corangamite region for both local communities and interstate or overseas visitors that rely on the protection of the environmental condition of the region's waterways. Hunting is regulated under the *Wildlife Act 1975*, which aims to ensure that hunting is sustainably and ethically managed and has minimal impact on non-game species. The Game Management Authority (GMA) regulates all game hunting activity in Victoria.

In the Corangamite region recreational duck hunting is permitted (during the open season) in wetlands on private land with the owner's permission, in State Game Reserves and some other types of public land. In addition stubble quail hunting is permitted in some areas[10].

Many game hunting organisations have a long history of working to conserve habitat and restore wetlands. Hunting groups can assist with the management and conservation of waterbird species in Victoria by erecting nest boxes, restoring degraded wetlands, controlling invasive species and working with State wildlife authorities and other groups on monitoring and survey projects. Field and Game Australia have been active in the restoration of wetlands, such as those in the Lake Connewarre Complex on the Bellarine Peninsula and have provided input to the management of wetlands and environmental watering.

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

Management approach: *The Corangamite CMA will continue to work with the Victorian Government and recreational game hunting organisations to improve opportunities for access and input into habitat management, where appropriate.*

3.4.3 Wetland management

Wetlands provide significant and diverse natural ecosystems where specialist plants and animals have adapted to the boom and bust cycles of flood and drought. The Corangamite region is home to over 1,500 wetlands covering an area of 63,000 ha, which is 5% of the entire region. The wetlands range from massive open water saline lakes to shallow ephemeral freshwater meadows rich in floristic diversity, and include two nationally listed ecological communities. Wetland bodies are unevenly distributed throughout the Corangamite region with the majority (84% of the wetland area) occurring on the Victorian Volcanic Plain bioregion, which covers 46% of the catchment. Within this bioregion, lakes and wetlands have formed in volcanic craters, depressions due to lava collapse, and where drainage patterns have been interrupted by lava flows (LCC, 1976). Drainage is mostly internal to lakes or to groundwater. Seasonal variation in hydrology, the type of basalt substrate, and the great variety of catchment-to-surface area ratios and through-flows, combine to produce lakes and wetlands with an unusually wide range of salinities (ABRG, 1988). While 75% of wetland area occurs on public land, this represents only 25% of the number of wetlands so the large majority of wetlands occur on private land.

The Corangamite region has two sites recognised as wetlands of international importance under the Ramsar convention, and 24 wetlands of national importance (Directory of Important Wetlands Australia (DIWA), 2001). There are also two ecological communities that are listed as endangered under the EPBC Act 1999.

Wetlands are classified into types to inform wetland management. Monitoring the extent and condition of particular wetland types provides insight into the different activities that threaten these types of wetlands and the most appropriate management interventions that can be applied based on wetland types. Wetlands are difficult to define and classify and to date, Victoria has used the wetland classification system developed by Corrick and

Salt crusted rocks at Lake Weering. Photo: Donna Smithyman

[10] For further information visit the Game Management Authority website: http://www.gma.vic.gov.au/

Norman[11] which describe nine wetland categories. An updated wetland inventory for Victoria now provides information on a range of wetland attributes. DEPI is developing a new wetland classification system, based on key attributes in the inventory.

Wetlands are valued for the services they provide both to the environment and the community. These include biodiversity values, pollution control and detoxification, maintenance of water regimes, flood mitigation, commercial, recreation and tourism values, social, cultural, scientific and educational values. They can assist with climate change regulation through carbon sequestration and stabilise local climatic conditions, particularly rainfall and temperature[12].

Management of wetlands focuses on addressing the activities that cause threats to condition (the components and processes of wetland function and its ecological character) and the values (services and benefits) that they support. Threat sources have been reported as being up to ten times more prevalent at wetlands on private land than for wetlands on public land[13]. Activities that cause threats to wetlands include:

- potential impacts from climate change
- physical change (drainage, changing salinities)
- water storage, diversion and extraction
- inappropriate resource use (particularly cropping and non-strategic grazing)
- pest plants and animals
- poor waste management
- urbanisation and recreational impacts.

The variety of wetland types allows for a diversity of natural values across different wetlands. Maintaining the diversity in flora, fauna, water levels and chemistry, and its ecological character, is a key driver for wetland conservation. Maintaining ecological character will mean that a wetland can continue to provide its values, which on-ground activities through the CWS aim to maintain or improve. On-ground activities may include fencing, revegetation, invasive species management, grazing management, and water regime management/protection. In addition, regulatory measures such as land use planning controls protect wetlands by ensuring key threats to wetlands from land use and urban development are avoided.

Wetlands that are a priority for onground works over the next eight years can be viewed in Chapter 5, whilst specific activities are detailed in the regional work program (refer to Part C). In addition, specific responsibilities for the region's two Ramsar sites are discussed below.

[11] Corricks Wetland Classification Scheme, Corrick and Norman, 1980

[12] Holmes, J. and Papas, P. (2004). *Conceptual Framework for an Index of Wetland Condition in Victoria*. Department of Sustainability and Environment, Melbourne.

[13] State of the Environment Report, 2013

Wetland Tender

Many of the wetlands in the Corangamite region are on private land where land managers have little economic incentive to conserve them. In recognising this, the Corangamite CMA piloted the first WetlandTender, which was subsequently implemented across many parts of the state.

WetlandTender is a market based instrument, which assesses and compares the value of proposed works to improve the condition of wetlands on private land. WetlandTender identifies projects that represent the best value for money, while ensuring that the wetlands in the best condition and/or supporting threatened species or vegetation communities are prioritised for funding. Successful projects are implemented under management agreements with landholders. Covenants to permanently protect the wetland may be established as part of the project.

Corangamite CMA has implemented multiple WetlandTender rounds either as standalone projects or as a component of broader tender projects such as the Victorian Volcanic Plain (VVP) PlainsTender, and established management agreements covering more than 2,000 ha using this approach.

Ramsar sites

Overview

Australia has 65 sites (wetlands of international importance) listed under the Ramsar Convention, including 11 sites in Victoria. Wetlands in two of these Ramsar sites are located in the Corangamite region:

- Eight of the nine wetlands in the Western District Lakes Ramsar Site are located in the Corangamite region. The remaining wetland, Lake Bookar, is located in the Glenelg-Hopkins region (the work program from the GHWS is included in the CWS for Ramsar planning purposes).
- Several of the wetlands in the southern part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site are located in the Corangamite region. Wetlands in the northern part of the site are in the Port Phillip and Westernport region and marine areas remain outside of the jurisdiction of CMA's.

The Ramsar Convention is an intergovernmental treaty that provides the framework for international cooperation for the conservation and wise use of wetlands, one of the most threatened habitats in the world. To be listed as a Ramsar site, a wetland or wetland system needs to meet particular criteria based on international significance in terms of biodiversity and uniqueness of its ecology, botany, zoology, limnology, hydrology or importance to waterbirds. The Ramsar criteria met by each site (Appendix C) indicate the important environmental values present.

Ecological character and wise use

As a contracting party to the Ramsar Convention, Australia is required to maintain the ecological

character of its Ramsar sites at the time they were listed through conservation and wise use. Wise use is defined by the Convention as 'the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development'. The wise use concept is similar to the principles and approach adopted for the development of the CWS, whereby waterway condition is maintained (or improved) so that it can provide important values and functions now and into the future.

Ecological character is the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time. A change in ecological character is the human induced adverse alteration of any ecosystem component, process and or ecosystem benefit/service.

To assist in meeting these obligations an Ecological Character Description (ECD) has been prepared for the Western District Lakes Ramsar Site (Hale and Butcher, 2011) and one is underway for the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The ECDs identify ecosystem services/benefits (values) and physical, chemical and biological ecosystem components and processes that are considered critical to the ecological character of these Ramsar Site (Appendix D). They set limits of acceptable change (LACs) for these critical services /benefits, components and processes and identify indicators for monitoring the ecological character status of the Ramsar Site (see Appendix E).

Management roles

There are many parties that have an interest in wetland management and management of Ramsar sites. Roles of these interest groups are varied and tenure and land management arrangements for Ramsar sites are complex. Table 3.3 describes the general roles of interest groups, whilst tables 3.4 and 3.5 highlight specific tenure and land management arrangements for each Ramsar lake.

Ramsar planning approach

Ramsar site management planning has been incorporated into the CWS in accordance with Policy 12.3 of the VWMS:

- Western District Lakes Ramsar Site: the CWS includes the planning requirements for this Ramsar Site.
- Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site: due to the complexity of management arrangements an individual updated management plan will be developed by DEPI, to be completed during 2015/16.

Table 3.3 –Interest groups and their roles in wetlands and Ramsar site management

Interest group	Role
Australian Government – Department of the Environment	The Australian Government Department of the Environment is the administrative authority within Australia for the Ramsar Convention on Wetlands of International Importance. The Australian Government meets its obligations under the Ramsar Convention by providing national wetland policy leadership and direction, working with state and territory governments through the Standing Council on Environment and Water, implementation of the EPBC Act 1999, and through the development of programs to improve the management of wetlands.
Department of Environment and Primary Industries	Set wetland management policy and implement the Ramsar Convention in Victoria. Support wetland conservation programs through advice and expertise. Coordinate programs that contribute to wetland conservation.
Corangamite CMA	Develop regional strategic directions for wetland conservation, including the development and implementation of the *Corangamite Waterway Strategy*. Deliver integrated catchment management by developing strategies, building cooperation, coordination and partnerships, brokering knowledge and investment and delivering key projects. Manage the Woady Yaloak diversion scheme.
Parks Victoria	Manage wetlands, including Ramsar wetlands, on land under its jurisdiction.
Committees of Management	Manage reserved Crown Land on behalf of the Minister, including domestic stock licensing (e.g. Lake Corangamite Committee of Management for Lakes Corangamite and Gnarpurt).
Advisory committees	Provide community input to specific management of components of Ramsar sites (e.g. the Lower Barwon Community Advisory Committee for water management in Reedy Lake and Hospital Swamps).
Victorian Environmental Water Holder	Oversee the holding and managing of Victoria's environmental water entitlements (the Water Holdings), including entitlements established at Ramsar sites (e.g. the Barwon River entitlement at Hospital Swamps and Reedy Lake).
Landholders	Protect and manage wetlands on their properties.
Community groups	Participate in wetlands conservation projects on both public and private land.
Traditional owners, Registered Aboriginal Parties and Aboriginal Affairs Victoria	Protect Aboriginal cultural interests and, as appropriate, share information on indigenous values. Approve and/or issue permits for on-ground work on all land tenure that disturbs or destroys aboriginal cultural heritage under the *Aboriginal Heritage Act 2006*. Approve Cultural Heritage Management Plans.
Local government	Incorporate waterway health and catchment management objectives, priorities and actions into statutory planning processes, and administer duties as a planning authority.

Western District Lakes Ramsar Site

The Western District Lakes Ramsar Site, which was listed as a Ramsar Site in 1982, consists of nine separate lakes located on the volcanic plains between Winchelsea and Camperdown approximately 150 km southwest of Melbourne (refer to Figure 3.1). The lakes are large, relatively shallow and dominated by open water. All of the lakes are saline except Lake Terangpom.

Each of the lakes is located on public land reserved under the *Crown Land (Reserves) Act 1978* with State Game Reserves and Wildlife Reserves also being subject to provisions in the *Wildlife Act 1975*. In addition there are sections of each of the lakes that are privately managed, or, where the public land is a narrow strip with private land adjacent. Table 3.4 sets out the characteristics and land tenure of the eight lakes in the Corangamite region and for Lake Bookar in the *Glenelg-Hopkins Waterway Strategy*.

Critical services/benefits for the Western District Lakes Ramsar Site include diversity of wetland types, physical habitat for feeding, breeding and moulting of waterbirds, priority wetland species and threatened species.

Critical components and processes are hydrology, salinity, vegetation and waterbirds. These are described further and the relevant LACs identified in Appendix D.

The ECD found that the LACs were exceeded for hydrology, salinity and waterbirds in the period associated with an extended drought from 1997 to 2010 in which wetlands in the Ramsar Site dried or came close to drying, salinity levels rose as water evaporated and there was little habitat available for waterbirds resulting in reduced waterbird numbers (Appendix D). The ECD also identified a longer term risk of decline in water levels and permanence associated with climate change.

Management activities to address the effects of reduced rainfall (or other hydrology matters) are limited as there are few opportunities for augmenting inflows, except at Lake Corangamite (see work program in Part C).

Migratory birds (Latham's snipe) at Lake Corangamite. Photo: Corangamite CMA.

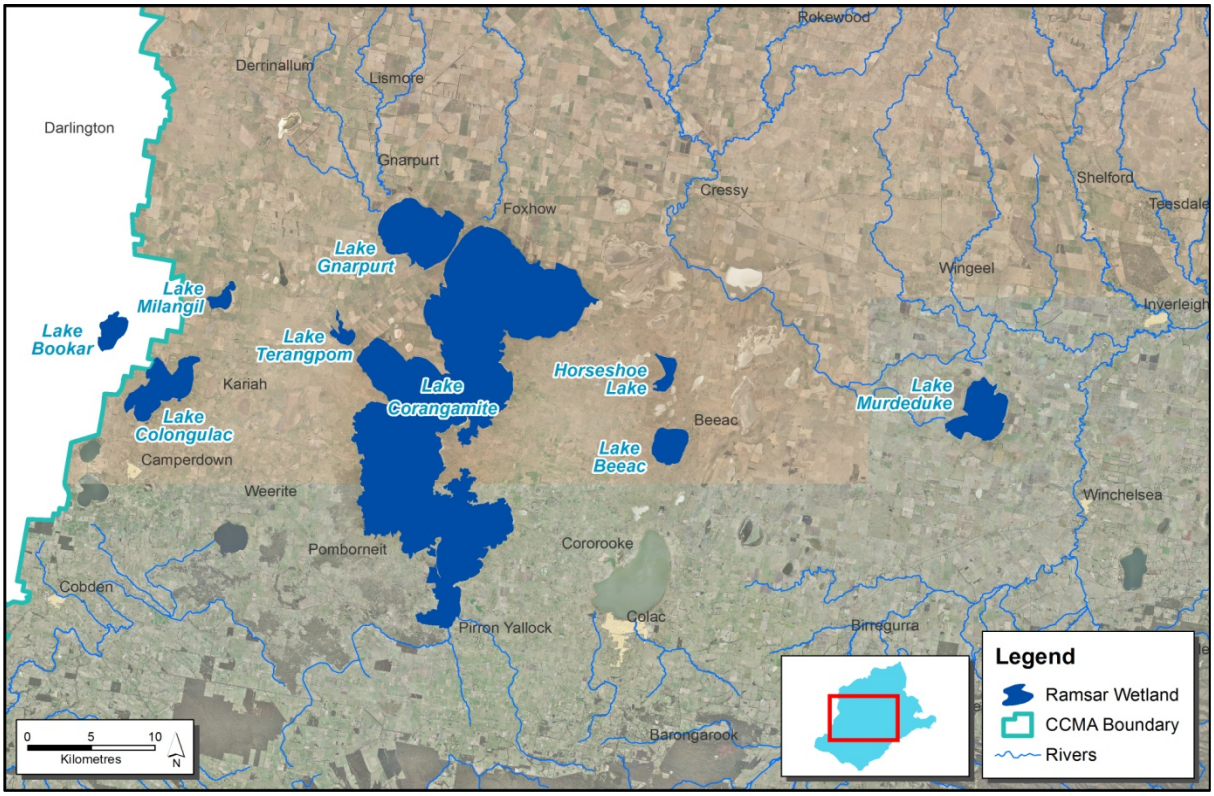


Figure 3.1 – Western District Lakes Ramsar Site

Table 3.4 – Key characteristics of the Western District Lakes Ramsar Site

Wetland	Area (ha)	Ramsar wetland type	Land tenure	Land Manager	CCMA Landscape Zone
Lake Corangamite	25,232	Permanent saline lake	Natural Features Reserve - Lake Reserve (*Crown Land (Reserves) Act 1978*)	Parks Victoria / Lake Corangamite Committee of Management	Lismore
Lake Gnarpurt	2,513	Permanent saline lake			
Lake Milangil	246	Permanent saline lake	Nature Conservation Reserve – Wildlife Reserve (*Crown Land (Reserves) Act 1978*)	Parks Victoria	
Lake Terangpom	220	Permanent freshwater lake			
Lake Colongulac	1,516	Permanent saline lake	Natural Features Reserve - Lake Reserve (*Crown Land (Reserves) Act 1978*)	Parks Victoria	Stony Rises
Lake Beeac	672	Seasonal/ intermittent saline lake	Nature Conservation Reserve – Wildlife Reserve (*Crown Land (Reserves) Act 1978*)		
Horseshoe Lake (Lake Cundare)*	301	Seasonal/ intermittent saline lake			
Lake Murdeduke	1,495	Permanent saline lake	Natural Features Reserve - State Game Reserve (*Wildlife Act 1975*)	Parks Victoria	Murdeduke
Lake Bookar (Glenelg Hopkins CMA region)	480	Permanent saline lake	Natural Features Reserve - State Game Reserve (*Wildlife Act 1975*)	Parks Victoria	N/A (Glenelg Hopkins CMA region)

*Horseshoe Lake is referred to as Lake Cundare in the Western District Lakes Ecological Character Description but is referred to as Horseshoe Lake within the CWS.

Site management

The Ramsar planning requirements for this site are now incorporated into this Strategy. Data was collated on key values and threats, which informed risk assessments and identified the required management activities for each wetland (following the process described in Chapter 4). A summary of management activities is provided within the respective landscape zones of Lismore, Stony Rises and Murdeduke within Chapter 5. Detailed information on the values and threats, specific management activities required to address the risks and links to the LACs for each wetland are listed in Part C.

Australia reports the ecological character of its Ramsar sites through a national Ramsar site rolling review. The findings are included in Australia's national report to the triennial Conventions of Contracting Parties to the Ramsar Convention. The broad aims of the Ramsar Rolling Review program are to:

- review and report the on status of the ecological character of Australia's Ramsar sites (including positive or adverse change);
- assist managing sites in order to maintain their ecological character, improving links between ecological character, site management plans and monitoring programs for critical components, processes and services and associated threats;
- provide input to a database of baseline and threat data;
- record updates as knowledge gaps are addressed and refinement of LACs;
- highlight issues and facilitate assessment of a potential change of character focussing on proactive management before the situation requires notification; and
- identify broad trends or common threats across site and jurisdiction boundaries.

Indicators to monitor the ecological character of the site are set out in the ECD and relate to the critical services/benefits, components and processes (Appendix E). Monitoring, evaluation and reporting for this Ramsar Site will be incorporated into a comprehensive MER Plan which will be developed for the CWS (refer to Chapter 7).

Cundare Pool/Lake Martin

Through developing this strategy, it was identified that Cundare Pool/Lake Martin, which is connected to Lake Corangamite, has significant values that could meet the Ramsar listing criteria. For example, the Ecological Character Description for the Western District Lakes Ramsar Site reports there were large numbers of birds at Lake Martin/ Cundare Pool (Hale and Butcher 2011). Therefore, this strategy intends to initiate an investigation, in accordance with Policy 12.6 of the VWMS, to propose an extension to the boundary of the Western District Lakes Ramsar Site. Further detail on Cundare Pool/Lake Martin can be found in Part C – regional work program.

Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site is located on the western shoreline of Port Phillip Bay. The Bellarine Peninsula and was listed as a wetland of international importance in 1982. The site includes freshwater wetlands, estuaries, intertidal shorelines, sub-tidal beds, inland saline wetlands and a wastewater treatment facility. It comprises six distinct wetland areas (refer to Figure 3.2), two of which are in the Corangamite region:

- Limeburners Bay: part of the coastal strip from Point Wilson to Limeburners Bay
- Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon estuary and part of Lake Murtnaghurt

The other areas that form part of this Ramsar Site include:

- Swan Bay
- Mud Islands
- Point Cooke/Cheetham, extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands
- Werribee/Avalon: extending from the Werribee River to The Spit and including the Western Treatment Pant
- Point Wilson, part of the coastal strip from Point Wilson to Limeburners Bay.

Although adjoining the Corangamite CMA region, Swan Bay is not assessed or included in the CWS as the Corangamite CMA's jurisdiction does not extend beyond the tidal low water mark. However, as identified through the Corangamite RCS, the impacts of the catchment on the marine environment need to be considered.

Land tenure within this Ramsar Site is complex and comprises a combination of conservation reserves, freehold land and unreserved Crown land. Table 3.5 outlines land tenure and the responsible land manager for areas relevant to the Corangamite CMA.

Site management

Specific management of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site will be determined through an updated management plan for the site, to be completed during 2015/16. However, significant values and key threats to the Ramsar Site have been identified through the CWS process for each of the two wetland areas in the Corangamite region. A risk assessment was conducted to identify the management activities for each wetland area and these activities are summarised in Chapter 5 for the Bellarine and Hovells landscape zones, with detailed actions provided in the regional work program (Part C).

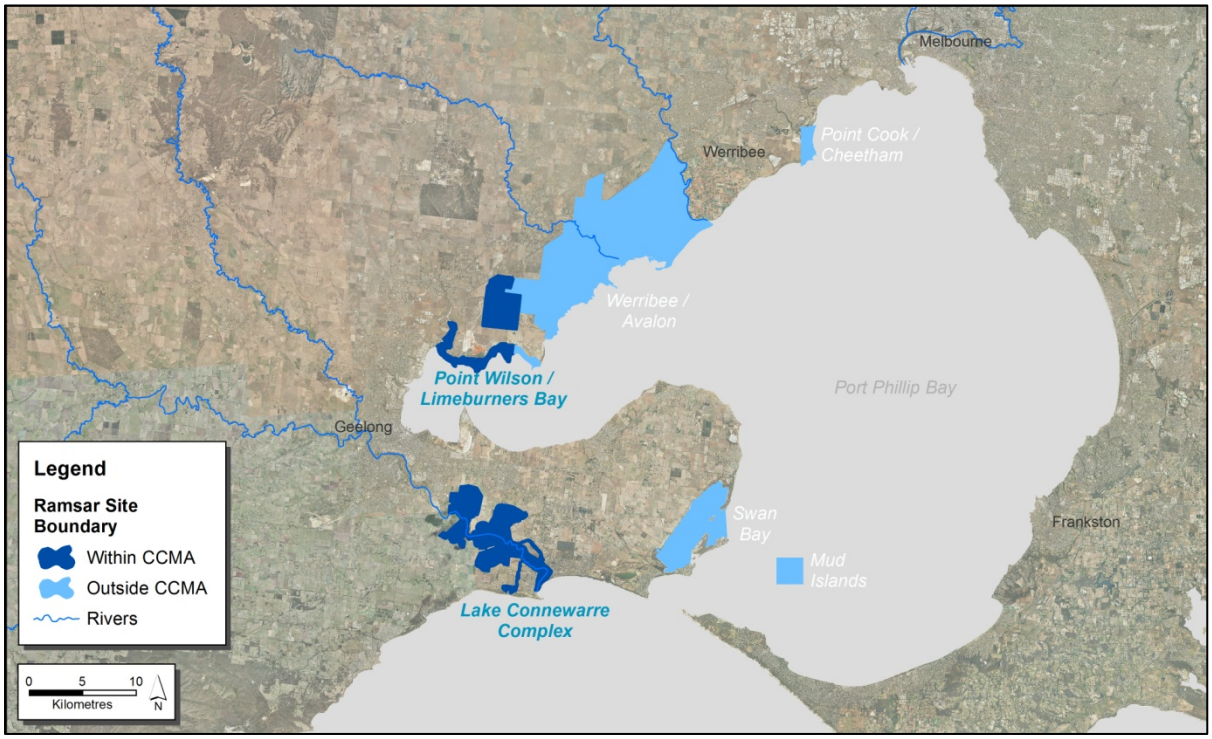


Figure 3.2 – Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site

Table 3.5 – Land tenure and management relevant to the Corangamite region within the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site

Area	Land tenure	Land Manager	CCMA Landscape Zone
Limeburners Lagoon (Hovells Creek Flora and Fauna Reserve)	Nature Conservation	Parks Victoria	Hovells
Limeburners Lagoon (State Nature Reserve)	Nature Conservation	City of Greater Geelong	
Swan Bay component of the Port Phillip Heads Marine National Park	Marine National Park	Parks Victoria	Bellarine
Lake Connewarre Complex – (Lake Connewarre State Reserve, Reedy Lake, Hospital Swamp, Salt Swamp, Barwon Estuary and part of Lake Murtnaghurt)	Natural Features Reserve - State Game Reserve (*Wildlife Act 1975*)	Parks Victoria	

Limeburners lagoon, Hovells Creek. Photo: Donna Smithyman

Nationally threatened ecological communities

Seasonal herbaceous wetlands (freshwater) of the temperate lowland plains

This community is listed under the EPBC Act 1999 as critically endangered. It includes both the plains grassy wetland EVC, and the Victorian Volcanic Plains freshwater swamps EVC. These vegetation communities are isolated, freshwater wetlands that are usually inundated on a seasonal basis through rainfall, and then dry out, so surface water is not permanently present. They have a vegetation structure that is open, i.e. woody cover is absent to sparse, and the ground layer is dominated by herbs (grasses, sedges and forbs) adapted to seasonally wet or waterlogged conditions. When standing water is present, wetland plants are clearly evident, however during drought or seasonal dry periods plants may not be visible above ground[14].

Management approach: *These wetlands have been addressed under goal ENV5 in the CWS where communities are known and data was available. Further investigation is required to update and improve knowledge on the distribution of these communities, and where this knowledge is obtained, revise priorities.*

Subtropical and temperate coastal saltmarsh (coastal saltmarsh)

The coastal saltmarsh ecological community was listed as vulnerable under the EPBC Act 1999 in August 2013. It occurs (generally) within a relatively narrow margin of the Australian coastline. It is found in areas under tidal influence, generally between the elevation of the mean high tide and the mean spring tide[15]. It often occurs in association with estuaries and can support a large amount of coastal and wetland birdlife, including the critically endangered orange-bellied parrot[16].

Management approach: *The Corangamite CMA will continue to manage this community via the Corangamite Marine and Coastal Biodiversity Strategy 2009. However, due to its recent listing under the EPBC Act 1999 the Corangamite CMA will investigate its inclusion into the CWS (upon review) and where necessary revise future priorities.*

[14] Listing advice for seasonal herbaceous wetlands (freshwater) of the temperate lowland plains: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/97-listing-advice.pdf

[15] Conservation advice for subtropical and temperate coastal saltmarsh: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/118-conservation-advice.pdf

[16] Orange-bellied parrot (*Neopheme chrysogaster)* listed as critically endangered under the EPBC Act 1999.

3.4.4 Management of the Environmental Water Reserve

The efficient and effective management of environmental water is vital to maintaining and improving the condition of some of our region's larger waterways. Environmental water management has evolved rapidly during the past 10 years with the establishment of the Victorian and Commonwealth environmental water holders as well as the implementation of a number of water management initiatives including: the Victorian Sustainable Water Strategies and the establishment of the *Commonwealth Water Act 2007*.

Artificial barriers, river regulation and water consumption have affected natural water regimes. Land use, licenced extraction for urban and town supply, licenced diversions for agricultural use and other stock and domestic use are all major contributors to altered stream flows. Water harvested for stock and domestic use from farm dams, waterways and groundwater bores remains outside the allocation and licensing framework. In addition climate change poses potential future threats to water supply and water regimes.

The objective of the Environmental Water Reserve is to "preserve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning and quality of water and other uses that depend on environmental condition".

Environmental water outcomes can be achieved using four types of water:

- environmental water entitlements
- obligations on consumptive entitlements
- 'above cap' water
- alternative sources of water, (e.g. licensed water discharge as a beneficial environmental use).

The Victorian Government's environmental flow assessment methodology (the FLOWS method), and the Estuary Environmental Flows Assessment Methodology inform water allocation decisions. These methods determine the water regime required to support environmental values.

Environmental Water Entitlements

An Environmental Entitlement is a volume of water held by the environment in perpetuity. The entitlements are a share of the available resource, either 'run-of-river' flows or inflows in storages released to meet specific environmental needs. The primary purpose of environmental water entitlements is to achieve environmental benefits. However, the delivery of environmental water for this purpose is likely to provide other benefits such as supporting social and cultural values, depending on the waterway's condition. The environmental water planning process, which is overseen by the Victorian Environmental Water Holder (VEWH) is shown in Figure 3.3.

Current entitlements

In Corangamite there are currently two environmental water entitlements: the Barwon River Environmental Entitlement and the Moorabool River Environmental Entitlement.

The Barwon River Environmental Entitlement is actively managed through Reedy Lake and Hospital Swamps, part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site (refer to section 3.4.3 above). These wetlands consist of a diverse range of aquatic vegetation communities and provide important feeding and breeding habitat for native fish and a number of wetland dependent bird species, including the nationally vulnerable Australian Painted Snipe and the critically endangered Orange-bellied Parrot. In addition, these wetlands have high recreational value to the communities surrounding Geelong and the Bellarine Peninsula.

The Moorabool River Environmental Entitlement allows an average of 2,500 ML (depending on climatic conditions) to be delivered downstream of Lal Lal Reservoir. Where possible it is used to improve flows downstream of She Oaks to the Barwon River. The entitlement helps to preserve native fish, including non-migratory species such as river blackfish, Australian smelt and southern pygmy perch, as well as short-finned eel and tupong. Other ecological values in the reach include a diverse population of macroinvertebrates and widespread platypus and water rat populations.

The following strategic activities are undertaken for planning and delivery of environmental water for these entitlements:

- collaborative development of the Seasonal Watering Plans, to inform statewide prioritisation of watering actions
- undertaking environmental water planning and delivery according to agreed operating arrangements
- increasing community engagement and communication surrounding environmental water management
- managing risks in line with the Victorian Environmental Watering Partnership Risk Management Framework
- reporting on environmental water delivery depth, rate, volume and ecological outcomes to the VEWH as required.

Full detail of the management approach for the Barwon and Moorabool rivers' environmental entitlements can be found in the Seasonal Watering Plan for the 2013-2014 watering year prepared by the VEWH. This report can be accessed on the VEWH website[17].

Environmental Water Management Plans

Environmental water management plans (EWMP), which outline long-term environmental objectives, desired flow regimes and management arrangements for each system, river reach and site identified for environmental watering, will be

[17] http://www.vewh.vic.gov.au/news-and-resources/resource-library/seasonal-watering-plan

developed for systems currently receiving an environmental entitlement.

These EWMPs will:

- outline long-term environmental objectives, desired flow regimes and management arrangements
- be developed progressively for each system/site identified as a long-term priority for environmental watering
- be updated as required with new information
- assume current water recovery commitments/targets.

***Management approach**: Corangamite CMA will work with the Victorian Government, water corporations and the VEWH in developing long-term planning for environmental watering of the Moorabool River, Barwon River and lower Barwon wetlands in the form of EWMPs.*

Future entitlements

In the region there are also waterways where a future environmental water entitlement would be beneficial. These include:

- Progressing the establishment of a 1,000 ML environmental entitlement for the Barwon River to be held in the West Barwon Reservoir (action 4.8b in the *Central Region Sustainable Water Strategy*). While the outcomes that can be achieved with 1,000 ML are limited, this volume will help preserve environmental values immediately downstream of the reservoir, identified as most directly impacted by reduced flows (CCMA, 2006). It is likely that this Environmental Entitlement will need to be increased in the future to help further mitigate the impact of the West Barwon Reservoir and achieve improved outcomes down the length of the Barwon River. Any future water recovery would be guided by monitoring, further investigations, and the Environmental Flow Determination for the Barwon River completed in 2006.
- The *Central Region Sustainable Water Strategy i*dentifies that environmental flows in the Moorabool River would need to be enhanced by about 20,000 ML to meet Environmental Flow requirements. To meet this shortfall, the Moorabool River would benefit from increased allocations held in Lal Lal Reservoir and other storages in the headwaters of the catchment. Table 4.5 of the *Central Region Sustainable Water Strategy* identifies potential future options to provide additional water for the Moorabool River. Any future water recovery would be guided by further investigations and the Moorabool River Water Resource Assessment completed in 2003 (SKM, 2003).

There are many other reaches in the Corangamite region where water extraction and use may impact downstream flows. Limited information is available on these impacts and needs to be investigated.

***Management approach:** Corangamite CMA will continue to investigate opportunities to improve management of current entitlements, and seek opportunities for future environmental water entitlements in line with the directions and mechanisms in the VWMS.*

Obligations on consumptive entitlements

Obligations on consumptive entitlements can include passing flow requirements, minimum flow requirements, or trigger levels to protect environmental values from the potential impact of groundwater extraction. These obligations include limiting use to protect water for the environment or modifying existing bulk entitlements or operating rules to modify the way water is extracted or diverted to achieve flow outcomes.

Consistent with the following actions of the *Western Region Sustainable Water Strategy*, the Corangamite CMA will continue to work to improve environmental flow outcomes for the Gellibrand River and Lake Corangamite as follows:

- Action 7.3 - Corangamite CMA will continue to work with Wannon Water and DEPI, in consultation with Southern Rural Water to assess a preferred water supply augmentation option and implementation process to improve critical flows in the Gellibrand River through the summer low flow period.
- Action 9.2 - Corangamite CMA will manage the Woady Yaloak Diversion Scheme by:
  - enlarging the Cundare Barrage outlet and amending the operating rules for the drainage scheme based on environmental flow investigations aimed at maximising the ecological benefit to Lake Corangamite and the adjoining Cundare Pool and Lake Martin;
  - maintaining the drainage scheme assets at a low operational level, enabling them to be easily brought back to full operation if required during wet years; and
  - reviewing the operation and continuation of the scheme in 2022, following a detailed analysis of the environmental impact of system operation and predicted and observed climate patterns.

***Management approach:** Corangamite CMA will continue to work to improve environmental flow outcomes and also work with the Victorian Government, water corporations and the Victorian Environmental Water Holder within the framework of the Victorian Waterway Management Strategy and the Water Act 1989 to provide advice to inform appropriate development of obligations on consumptive entitlements.*

'Above Cap' water

'Above cap' water is water available above limits on consumptive volumes of surface water and groundwater. Most water available to the environment is 'above cap' water, which can be an unreliable source of water. In regulated systems,

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

Management approach: *Corangamite CMA will work with the Victorian Government, water corporations and the VEWH within the framework of the VWMS and the Water Act 1989 to provide advice to inform appropriate development of obligations on licence conditions, rostering and restriction rules.*

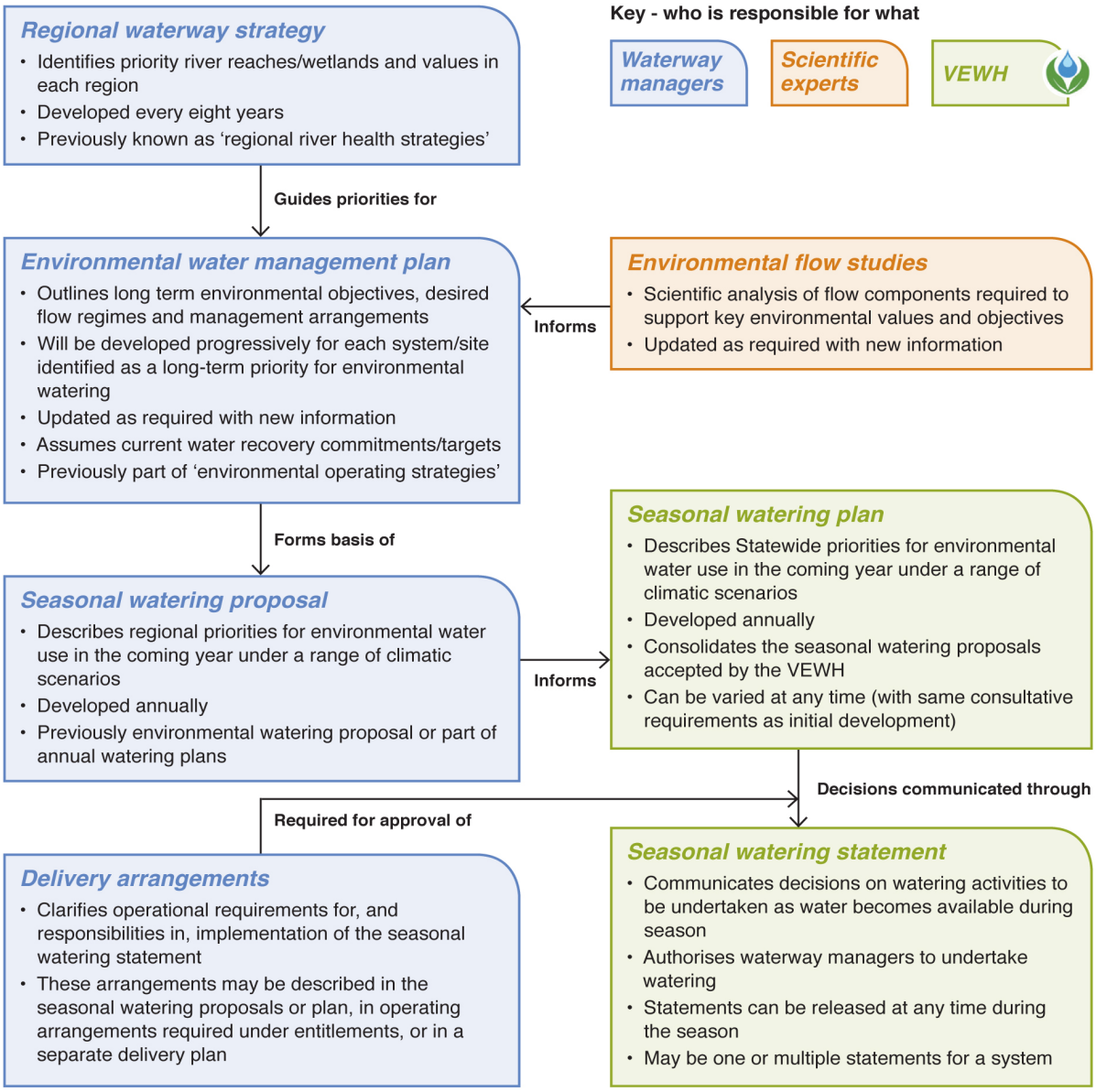


Figure 3.3 – The VEWH planning framework for decisions in environmental water management in Victoria

Alternative sources of water

Groundwater or treated wastewater can be discharged to waterways to provide environmental benefits. However, in some cases the negative effects counteract or outweigh any benefits provided. Proposals for using recycled water for environmental purposes must be carefully assessed on a 'case by case' basis and only implemented where they provide overall net benefits to the community.

There are currently two alternative sources of water providing environmental benefit in the Corangamite region:

- Discharge from the South Ballarat Treatment Plant has been identified as having an environmental benefit to the Leigh and Barwon rivers. Action 4.17a in the *Central Region Sustainable Water Strategy* specifies that Corangamite CMA and Central Highlands Water will work together to ensure that part of this discharge continues to be released for environmental flows.
- Groundwater accumulating in Fyansford quarry is now discharged to the lower part of the Moorabool and Barwon rivers to improve flows and environmental health. This is the

result of the implementation of Action 4.8a in the *Central Region Sustainable Water Strategy*.

Management approach: *Corangamite CMA will work with the Victorian Government, EPA, water corporations, local government and the VEWH within the framework of the VWMS and the Water Act 1989 to provide advice to inform appropriate use of alternative sources of water.*

Corangamite CMA responsibilities

Into the future, Corangamite CMA will undertake the following responsibilities for environmental water management in the Corangamite region:

- identify regional priorities for environmental water management through future waterway strategies, in consultation with the community
- assess water regime requirements of priority waterways to identify environmental watering needs to meet agreed objectives
- identify opportunities for, and implement, environmental works to improve efficiency of environmental water use
- propose annual environmental watering actions to the VEWH and implement the VEWH environmental watering decisions
- provide critical input to management of other types of environmental water including, but not limited to, passing flows management and 'above cap' water
- report on environmental water management activities undertaken.

3.4.5 Estuary management

Estuaries are the transition zone where freshwater draining from rivers mixes with the saltwater from the ocean to create unique and important ecosystems. They are partially enclosed water bodies that may be permanently or periodically open to the sea and have salinities that vary from almost fresh to very saline. As a result, estuarine ecosystems are highly complex and dynamic environments. Since estuaries are at the bottom end of catchments, their condition can be affected by activities occurring within the upstream freshwater catchment. Where the condition of catchments, rivers or estuaries is poor there are likely to be additional impacts on the marine receiving waters and adjoining local coastal areas.

Estuaries of the Corangamite region, particularly the Barwon River estuary and the numerous estuaries along the Great Ocean Road, are highly valued for recreational use (e.g. fishing, camping, swimming and boating and their significant contributions to local and regional economies through tourism).

The region's estuaries also provide opportunities for connecting with wildlife or enjoying the landscape, such as the spectacular scenery of the internationally-recognised Great Ocean Road.

The region's estuaries are also important environmental assets of the region's coastline. They support a range of distinctive aquatic and terrestrial plants and animals, including rare and threatened species and communities. They are important drought refuges, and provide significant breeding and feeding areas for birds, spawning areas and nursery habitat for fish. Vegetation and saltwater marshes (including the nationally vulnerable Coastal Saltmarsh) adjacent to estuaries maintain water quality, assist with nutrient cycling, and provide a buffer to catchment-derived sediments and pollutants entering the marine environment (DEPI, 2013).

Many of the estuaries in the Corangamite region are surrounded by dense coastal settlements (e.g. Lorne, Torquay, Barwon Heads, Peterborough and Apollo Bay), and can be exposed to intensive levels of recreation and use. Other threats to the condition of estuaries include:

- unpermitted estuary entrance openings, e.g. use of machinery to remove sand from the estuary mouth so it flows into the ocean, under unfavourable circumstances can cause fish death events, reduced water quality and interference with life cycles
- changes in water regimes – particularly reduced freshwater inflows from rivers
- high levels of sediment and nutrients
- pollution events, e.g. oil spills
- habitat modification
- land-claim (creating new land from areas that were previously below high tide – see Section 3.4.7 for more detail)
- invasion by weeds or pest animals
- salinisation, acidification and acid sulfate soils.

The VWMS provides the leading state-wide strategic direction on the management of the environmental condition of estuaries. The *Victorian Coastal Strategy* (VCC, 2014) will continue to provide strategic direction for coastal land use planning and sustainable development issues.

In the Corangamite region estuary condition management is part of the CWS rivers and wetlands regional work program detailed in Part C. In addition, the regional work program identifies where Estuary Management Plans need to be developed (or updated) and will help provide a clear overview of the activities required to maintain or improve the health of the region's priority estuaries.

Management approach: *The Corangamite CMA will work with the Victorian Government, the Victorian Coastal Council, Coastal Boards and regional partner organisations within the framework of the VWMS and the Victorian Coastal Strategy to effectively manage the environmental condition of estuaries within the Corangamite region.*

Estuary entrance management

There are 40 estuaries in the Corangamite region. All of these estuaries, with the exception of the Barwon River, are intermittent estuaries. This

means that they have sandbars that periodically close their connection to the ocean.

The closure of an estuary entrance can result in an increase in water level and inundation of adjacent land. Inundation is a natural process and plays an important role in the life cycle of many species and the cycling of nutrients. Periodic inundation of adjacent wetlands and fringing vegetation is also necessary to ensure their ongoing health. For some estuaries, reduced freshwater inflows reduce the frequency of flushing flows that open estuary entrances and result in increased periods of inundation. However, high water levels and prolonged inundation can have social and economic impacts through flooding of adjacent agricultural or residential land, roads and structures.

Artificially opening the estuary entrance to allow the excess water to flow out to sea can reduce the social and economic costs associated with estuaries flooding. However, there are potential environmental impacts associated with this intervention if conducted under the wrong conditions, or repeated over an extended period. The detrimental effects of artificial estuary entrance opening events can include:

- disruption to the natural patterns of variation in water quality
- impacts on plant and animal species, including mass fish deaths
- disruption of animal migration and reproductive cycles.

The Corangamite CMA regulates artificial estuary openings in the region, issuing works on waterway approvals under the *Water Act 1989*. To support estuary opening management in Victoria the Victorian Government developed the Estuary Entrance Management Support System (EEMSS).

The EEMSS provides information on estuary assets (ecological, social and economic) to assist estuary managers on estuary opening decisions. A scoring system of asset value and threat at various water heights helps inform why the estuary should or should not be opened at a given height. Water quality monitoring provides additional information to assist in decision making.

The EEMSS does not provide the decision, merely information on the risks associated with artificially opening an estuary.

Memorandum of Understanding

Where required, the Corangamite CMA in conjunction with relevant agencies will develop a Memorandum of Understanding (MOU) for estuary openings. On a case by case basis MOUs articulate roles and responsibilities, the process and the beneficiaries of artificial openings, this in turn guides management arrangements for the works component and estuary opening water quality monitoring requirements. The MOU will be signed by all parties and reviewed as required.

An Estuary Management Plan may be required on more complex systems where more detail is required to manage the land, waterway and broader environmental issues at play. Estuary Management Plans are currently in place on a number of estuaries including the Anglesea Estuary. An updated Estuary Management Plan was completed for the Anglesea estuary in part to address the complex interaction between estuary entrance opening and the impact of acid sulfate soils in the upper catchment. This management plan sets out activities for the key stakeholders (Corangamite CMA, local government, DEPI etc.) for the ongoing management of the system.

As specified in the VWMS, the land manger or delegated responsible entity (permit holder) identified in the relevant MOU will be responsible for carrying out the works component of artificial estuary entrance openings.

Corangamite CMA will undertake an investigation of alternative management options for protecting agricultural or residential land and infrastructure (built) assets that are regularly threatened by inundation due to estuary closures as necessary throughout the life of the CWS.

As information on the ecological needs of estuaries improves, this will be used to inform changes to existing management practices and MOUs in consultation with stakeholders and the community.

Management approach: *Where required, the Corangamite CMA in conjunction with relevant agencies will develop Memorandum of Understandings (MOU) or Estuary Management Plans for estuary openings.*

EstuaryWatch

EstuaryWatch is a community based estuarine monitoring program which started in 2006 as a partnership project through the Corangamite CMA and the Western Coastal Board, which aims to:

> *'Raise awareness and provide educational opportunities to the community in estuarine environments, and enable communities and stakeholders to better inform decision making on estuarine health'.*

EstuaryWatch groups monitor our estuaries, collecting information to enter into the EstuaryWatch online database[18].

Along with water quality monitoring, groups also photograph and record details of changing water levels, vegetation condition and the status of river mouths, i.e., whether they're open or closed to the sea. In addition, EstuaryWatch volunteers capture events such as algal blooms, fish deaths, floods, storm surges and illegal estuary openings. In 2014, 13 estuaries were being monitored through the EstuaryWatch program at 73 individual sites across the Corangamite region by over 80 active volunteer monitors.

[18] http://www.estuarywatch.com.au/pls/ewprod/f?p=105:101:1727652458581980

Due to the success of the roll out of program in the Corangamite CMA, and the value data collected in information estuary management, the program has now been expanded to other coastal regions, including Melbourne Water and the West Gippsland and Glenelg Hopkins CMAs.

Management approach: *continue to support EstuaryWatch and maintain EstuaryWatch groups collecting baseline data on estuary condition.*

EstuaryWatch volunteer at Anglesea estuary. Photo: Corangamite CMA

3.4.6 Management of urban waterways

Waterways are a focal point for many cities and towns throughout Victoria and most urban communities have a long history of interaction with their local waterways. Although waterways in urban areas are often highly modified, they provide important community benefits. Urban waterways often support recreation and tourism; provide a setting for a range of sports, festivals and major events; provide a meeting place and setting for recreational activities; as well as providing a focal point and sense of identity for the community.

Waterways in urban areas however, are often subjected to increasing pressures on their condition as urban development increases impervious (hard) surfaces, which increase runoff and alter the natural water cycle of catchments. Stormwater runoff can increase the frequency and intensity of flows which can degrade waterway condition and base flows that were previously supplied by slow infiltration through catchment soil and vegetation are reduced.

With population in the Corangamite region growing at one of the fastest rates in Victoria it is expected that the values of waterways in areas of urban growth will be under a much greater pressure from increased stormwater run-off. This includes areas such as Geelong and Ballarat, the Bellarine Peninsula, Winchelsea, Bannockburn, Inverleigh, along the coast near Torquay and new residential areas such as Armstrong Creek.

Stormwater impacts can be adequately managed in these areas but it relies on a coordinated and integrated approach. Research has shown that retaining stormwater in urban catchments for local use, or infiltrating stormwater into soils or vegetated areas could:

- improve waterway condition
- reduce reliance on drinking water supplies
- provide water to green urban spaces
- reduce the heat island effect in built environments
- reduce the risk of flooding.

Realising these multiple benefits requires greater integration of urban planning, water service planning and waterway management planning and improved co-ordination and collaboration between responsible agencies through whole of water cycle management. Integrated water cycle management and A Cleaner Yarra and Port Philip Bay Action Plan are examples of this approach and are discussed below.

Management approach: *The Corangamite CMA will continue to support local governments with stormwater management in urban growth areas and the development and implementation of urban stormwater management plans where appropriate.*

Integrated Water Cycle Management

There is an increasing focus on the integration of water and urban planning and the delivery of whole-of-water-cycle management in urban areas.

The Victorian Government has chosen Ballarat to lead the way in demonstrating a new approach to integrated water cycle management for regional cities. It has provided $1 million funding to the Living Ballarat Project for the local co-design of a whole-of-water-cycle management framework for Ballarat and its districts.

The framework is intended to set out clear and evidence-based options to make the best use of the interconnected components of the water cycle. It will reflect the community's values and preferences to reduce Ballarat's reliance on water from catchments and make the city more self-sustaining.

The adoption of whole-of-water-cycle management should reduce the impacts of urban development on waterway condition through increased retention, use and infiltration of stormwater at the local level.

A similar regional approach has been developed for the broader Geelong region through the Barwon Integrated Water Cycle Management network, set up in 2012 as a partnership between local government, Barwon Water and the Corangamite CMA to explore whole-of-water-cycle management outcomes for the region. Building on successful water treatment and reuse projects, such as those at Kardinia and Eastern Parks in Geelong, the network has been successful in securing funding through the Office of Living Victoria to develop local whole-of-water-cycle management plans at key urban sites, including Colac, Geelong Ring Road Industrial Precinct and Johnstone Park in Geelong.

Further information on these and other initiatives relating to waterways in urban areas can be found on the Living Victoria website[19].

Management approach: *Corangamite CMA will work with the Victorian Government, the Office of Living Victoria, local government, water corporations and other regional partner organisations within the framework of the VWMS and the Living Victoria Initiative to pursue whole-of-water-cycle management outcomes for urban communities in the region.*

A Cleaner Yarra and Port Philip Bay Action Plan

The Yarra River and Port Phillip Bay are iconic natural assets that are highly valued by Victorians, as well as visitors from interstate and overseas. They support a wide range of environmental, social, cultural and economic values; many of which are dependent on environmental condition. While the Yarra and the Bay are overall in good condition, water quality can vary particularly after heavy rain. Water quality in the bay, including Corio Bay, and along beaches is highly valued for recreation and social events during summer but these are dependent upon the quality of water from rivers and catchments upstream.

Actions by a number of government agencies have been identified to improve water quality and ensure that current and future generations can have the confidence to use and enjoy the values provided by the Yarra River and Port Phillip Bay. These actions are specified in the A Cleaner Yarra River and Port Phillip Bay – A Plan of Action, released in early 2012. This plan focuses on four priority tasks to improve water quality in the Yarra River and Port Phillip Bay:

- enable more effective co-ordination between government agencies in protecting water quality and providing timely information to communities about water quality events
- manage threats to water quality, including pollution, litter and stormwater inputs by identifying new priority actions to address them
- develop easier ways for the community to access information about water quality of the Yarra and the bay
- support Victorians to take actions that care for and protect the Yarra and the bay.

Further detail regarding these actions can be found on the DEPI website[20].

Within the Corangamite region, a number of creeks, estuaries and wetlands are directly linked, through outflows or tidal inundation, to Port Phillip and Corio bays. In September 2013, the Corangamite CMA with DEPI, convened a workshop with local stakeholders to better explore opportunities to deliver the action plan within the Corio Bellarine basin. A number of opportunities and corresponding actions were identified through that workshop for implementing throughout the Corio Bellarine basin (see Appendix F).

Management approach: *Through the Barwon Integrated Water Cycle Management Network, the Corangamite CMA will work with the Victorian Government, Barwon Water, City of Greater Geelong, other key stakeholders and the community to manage the quality of waterways linked to Port Phillip and Corio bays through works that stem from the implementation of the Cleaner Yarra and Port Phillip Bay Action Plan.*

Barwon River Parklands

The Barwon River Parklands extend over 36 km linking the more established historic areas of central Geelong through rural farming areas of the picturesque Bellarine Peninsula to the thriving coastal tourism areas of Barwon heads. The parklands provide habitat for rare and threatened wildlife and significant biodiversity while supporting the open space, recreation, accessible natural assets and Geelong region community networks.

In 2006 the State Government made a commitment to establish a continuous chain of parks along the Barwon River, from the ring road in Geelong to the sea at Barwon Heads, by linking existing parks, wildlife reserves and public land through the Barwon River Parklands Project. The Barwon River Parklands Steering Committee was created to oversee this initiative with the various land and water managers co-operatively managing environmental values, recreational assets and community programs within the parklands. Key objectives of the project include:

- protection of the natural environmental and cultural values of the parklands and the Barwon River
- accessible opportunities for the recreational use and enjoyment of the parklands
- the active participation of local communities in the management, protection and operation of the parklands to improve community wellbeing
- integration with regional planning and landscape management policies and initiatives.

[19] http://www.livingvictoria.vic.gov.au/index.html

[20] www.depi.vic.gov.au

In addition, the *Barwon River Parklands Strategy* provides 23 key directions for the management of the parklands. This plan also proposes future management activities to achieve in part the strategic direction and objectives of the project.

Management approach: *Through the Barwon River Parklands Steering Committee, the Corangamite CMA will work with Parks Victoria, the City of Greater Geelong, the Victorian Government, other key stakeholders and the community to manage the quality of lower Barwon River through works and activities stemming from implementing the Barwon River Parklands Strategy.*

Breathing Life into the Yarrowee

The Victorian Government has invested $1 million in the Yarrowee River to improve its environmental and amenity values. The project is being delivered by the Corangamite CMA through contracted project management arrangements with the City of Ballarat. The project objectives are to:

- improve the Yarrowee River water quality
- reduce litter in the Yarrowee River
- control weeds
- stabilise eroding banks
- protect and enhance the native habitat
- improve pedestrian and cycle access
- build community custodianship of the river corridor.

The project focuses on 13 sites along the Yarrowee River between Brown Hill and Magpie where works will be undertaken progressively over a three-year period. Table 3.5 below summarises the activities being undertaken during that period.

Management approach: *Through the City of Ballarat Water Resources Advisory Committee, the Corangamite CMA will work with the City of Ballarat, Victorian Government, other key stakeholders and the community to manage the quality of Yarrowee River through works stemming from implementing the Breathing Life into the Yarrowee Project.*

Table 3.5 – Breathing life into the Yarrowee activities summary

Location	Proposed works
Yarrowee River near Ditchfield Lane	Construct path with defined drainage and erosion control works with understory plantings.
Yarrowee River opposite Bawden Street	Design and construct an appropriate pedestrian and emergency services vehicle crossing.
Yarrowee River and Warrenheip Creek Junction	Design and construct a wetland and pedestrian access linkage to Humffray Street.
Yarrowee River from Hill Street to Prest Street	Willow removal, weed control, erosion control and vegetation.
Yarrowee River at Prest Street	Extension of retaining wall along walking trail to prevent erosion.
Yarrowee River Prest Street to Redan Wetlands	Willow removal, weed control, erosion control and vegetation at selected locations.
Yarrowee River between Central Business District and Redan Creek	Design and implement a litter catchment project to target litter entering major drains and at the end of bluestone constructed channel. Include awareness and community engagement element.
Redan Wetland	Improve effectiveness of sediment settling ponds, weed control and re-vegetation.
Redan Creek/ Yarrowee Junction	Drainage alterations to prevent scouring and revegetation.
Redan Creek North of Skipton Street	Design and construct detention basin and litter trap.
Redan Creek from Leith Street to Cook Street	Bank stabilization to prevent sediment entry to Yarrowee River.
Yarrowee River from Redan Wetlands to Bala Street	Noxious weed control, willow removal and bank stabilisation at selected locations.
Yarrowee River from Bala Street Whitehorse Road	Noxious weed control, willow removal and bank stabilisation at selected locations.
Yarrowee River from Whitehorse Road to Docwra Street	Noxious weed control, willow removal and bank stabilisation at selected locations.

3.4.7 Floodplain management

The river channel, its floodplain and the wetlands that occupy depressions on the floodplain form part of a larger ecological system. Lateral connectivity between these landscape elements is important to sustain habitat for native plants and animals, promote nutrient cycling and provide flood storage and conveyance.

Connectivity between a river, the floodplain and floodplain wetlands can be disrupted by obstructions to the natural flow paths of floodwaters, changes to water levels within the river channel or reductions in the frequency of overbank flows.

The *Victorian Floodplain Management Strategy* (currently undergoing renewal) considers that rivers should, wherever possible, be allowed to flood naturally, maintaining connectivity to floodplains and their associated wetlands (DEPI, 2013). Accordingly, inappropriate floodplain development can impact on floodplain storage, connectivity and waterway function. Inappropriate development of floodplains and land subject to inundation can also increase the risk of flooding to existing property and built assets and public safety.

Management approach: *As identified in the Corangamite RCS and in line with the Victorian Floodplain Management Strategy (when completed), the Corangamite CMA will work with its partners to develop, adopt and implement a new Corangamite Floodplain Management Strategy.*

Statutory floodplain functions

The Corangamite CMA is the designated Floodplain Management Authority for the Corangamite region under the *Water Act 1989*. Key responsibilities include:

- overseeing the preparation of a regional floodplain management strategy for the Corangamite region that sets direction for regional flood management activities, including flood mapping, flood studies, floodplain management plans, flood awareness and education and asset management
- coordinating the collection, monitoring and reporting of flood information such as: flood photography, flood heights and flow rates and velocities in times of significant regional floods
- assisting municipal councils to incorporate flood mapping and development controls into their planning schemes to manage and reduce flood risk, e.g. reduce flood damages
- responding to land-use planning and building regulation referrals from local government, including the provision of advice on the impacts of climate change on inundation in coastal areas
- assisting the implementation of regional flood warning systems, such as the Barwon Flood Warning Network.

In addition, the Corangamite CMA is responsible for managing and maintaining the Woady Yaloak Diversion Scheme and Lough Calvert Drainage Scheme as operational flood mitigation schemes. Activities include inspection and service of drainage scheme infrastructure, weed and silt control along channels, water quality and quantity monitoring, operation of the schemes in times of flood and administration of grazing licences for the Cundare Pool, an area of crown land managed by the Corangamite CMA.

Regional flood and drainage management has recently been subject to review by the Victorian Environmental and Natural Resources Committee of parliament, and will inform the development of the government's new *Victorian Floodplain Management Strategy* – currently being finalised and the next round of regional floodplain management strategies to be developed by CMAs and Melbourne Water.

Management approach: *The Corangamite CMA will continue to fulfil its responsibilities under the Water Act 1989, as the designated Floodplain Management Authority for the Corangamite region.*

Connectivity

In some situations, works can be undertaken to reinstate hydrological connectivity to individual floodplain wetlands. Where individual wetlands have been isolated from overbank flows by infrastructure or past development, it may be possible to reinstate hydrological connectivity by removing or by-passing blockages in flow paths, e.g. flow connectivity was reinstated for part of the Karaaf wetlands near Breamlea through the installation of a new culvert under Point Impossible Road. Issues to be considered in seeking to reinstate connectivity include the values of the wetland, any impacts on the community, feasibility and cost- effectiveness, fish passage, integration with other management activities for waterways, such as environmental watering, riparian management and viability of the wetland under future flow regimes.

Management approach: *The Corangamite CMA will continue to work with the Victorian Government, local government, water corporations and other government authorities and local communities to deliver statutory floodplain management functions in the Corangamite region, and to investigate and implement priority floodplain connectivity measures where feasible.*

3.4.8 Public infrastructure

The protection of public infrastructure from waterway processes is an important consideration in waterway management. Public infrastructure is defined as structures, facilities, buildings or areas of land that are used for public or community purposes and are located in, across or adjacent to waterways (DEPI, 2013). Common examples include weirs, dams, bridges, roads, communication cables, levees, public buildings and sports fields. Public

infrastructure is distinguished from private assets (such as private land or buildings).

Waterway processes that can pose risks to public infrastructure include erosion, sedimentation, floods and avulsion.

Managing risks to public infrastructure is primarily the responsibility of the owner of that public infrastructure (asset owner). The level of protection required for public infrastructure will be determined by asset owners in consultation with the Corangamite CMA and informed by an assessment of risk that considers available information on:

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

Management approach: *The Corangamite CMA will work with the Victorian Government, asset owners and relevant beneficiaries of public infrastructure within the framework of the VWMS to manage the risks to public infrastructure from waterway processes in the Corangamite region.*

3.4.9 Management and use of water resources

Water storages

Major regional water storages, such as Lal Lal, West Barwon, Wurdiboluc, Moorabool, White Swan and Bostock reservoirs provide critical potable water supplies for drinking, irrigation and industry and in some cases offer recreational activities such as fishing and boating. Although these major dams may provide habitat for animals during dry periods, they can also impact on aquatic environments. These impacts, which can include changed water and temperature regimes, (i.e. cold water pollution), trapping of sediment and impediments to the movement of native fish, need to be appropriately managed.

Although the management of theses storages is vested in urban water corporations, such as Barwon, Central Highlands and Wannon Water, there is a need to consider how actions in the VWMS may support the overall management of water storages within the Corangamite region, particularly as they relate to provision of fish passage, provision of passing flows and environmental water releases.

Other, water storages or off takes, including farm dams and other diversions for agricultural use can also impact on aquatic environments and are regulated accordingly through licencing regimes managed by Southern Rural Water. Water harvested for stock and domestic use from farm dams, waterways and groundwater bores remains outside the allocation and licensing framework – refer section 3.4.4 for further details.

Management approach: *The Corangamite CMA, guided by the VWMS, will work with water corporations to ensure storage management planning processes align with government policy.*

Special water supply catchments

Many catchments supplying water for domestic, irrigation or other purposes within Victoria are protected under the *Catchment and Land Protection Act 1994*. These catchments have significant economic values as a source of water supply, both for domestic and stock and agricultural use.

Under this Act, Declared Special Areas (Water Supply Catchments) officially recognise designated catchments for water supply purposes. This process highlights to the community, land managers and planners, the importance of the catchment for water supply purposes (DEPI, 2011).

A key focus for these areas is their protection from the threat of bushfire, which can impact on water quality and quantity and long term security of supply. Another focus is the management of stock access to waterways particularly through prevention. This helps maintain the health of our waterways; our drinking water supplies; and the land and vegetation adjacent to waterways. Further detail on managing stock in special water supply catchments is provided by the Victorian Department of Health on their website[21].

Management approach: *The Corangamite CMA aims to manage threats to the values of special water supply catchments in the Corangamite region in partnership with urban water corporations, in line with the relevant goal and targets detailed in Chapter 4 and the management activities for specific catchments detailed in the regional work program (see Part C).*

Groundwater

Victoria's usable groundwater resources are relatively small and equal to about 10% of surface water resources.

Surface water from rainfall or other water bodies percolates through the ground to the water table (recharge) where it is stored in aquifers (a discrete layer of fractured rock, gravel, sand or limestone below the ground that is porous enough to hold and convey groundwater). Aquifers do not align with surface water catchments and some aquifers are interconnected to surface water resources across several basins.

In the Corangamite region, groundwater is valued by the community and shared by many users. It provides drinking water for many towns in the region (including Geelong and Ballarat).

[21] http://www.wioa.org.au/operator_resources/documents/vicdoh-protect_our_water.pdf

It is also used for irrigating crops, for drinking water for stock and for industrial purposes. It plays an important role in water cycles, provides water for some streams and wetland ecosystems, and is important for some terrestrial vegetation. The Corangamite CMA region's low stream flows and lack of topography suitable for dams has led to a high reliance on groundwater.

Groundwater resources in the Corangamite region are managed by Southern Rural Water, in line with the requirements of the *Water Act 1989* and associated government policies. Southern Rural Water has delegated responsibility for licensing bore construction and the take and use of groundwater, to groundwater diverters, and leads the development and implementation of groundwater management plans.

Groundwater management plans take into account the potential impact of groundwater extraction on streams, springs, wetlands and other Groundwater Dependent Ecosystems (GDEs). State policy and guidance on groundwater planning and licensing matters is provided by DEPI. Key policy documents include the Western Region and Central Region Sustainable Water strategies, and the new Groundwater Framework for Victoria (DSE, 2012b).

Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) are a subset of all ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson, *et al*. 2011). GDEs may include rivers, wetlands, estuaries and terrestrial vegetation.

Effective and sustainable management of GDEs in Victoria requires improved knowledge of the distribution, condition and environmental values of GDEs, including information about groundwater and surface water interactions. The initial focus will be on GDEs of high environmental value and high risk and those easily observed and monitored. Improved knowledge will enable managers to incorporate adequate consideration of those GDEs in groundwater management and allocation processes.

Management approach: *The Corangamite CMA will continue to work with regional water corporations and the Victorian Government to develop a better understanding of, and management approach for, GDEs throughout the life of the CWS.*

3.5 Other management issues

3.5.1 The river channel

The river channel[22] supports a range of important values such as water supply to industry, agriculture and urban centres, fishing, swimming and boating, as well as important habitat for native plants and animals.

Many of these waterway values depend on the environmental condition of the river channel. For example, boat ramps rely on the stability and composition of the bed and banks, while the best swimming spots are often within deep, natural pools. Stable bed and banks of the river channel help to improve the quality of water that flows to downstream users. Fishing success depends on healthy populations of fish species which, in turn, rely on the availability and condition of habitat in the river channel.

Threats that can potentially degrade the quality of the river channel include, but are not limited to, the following:

- ***Erosion, avulsion and sedimentation –*** large scale clearing of catchment vegetation, poor soil management practices and stock access to waterways can accelerate erosion within the river channel above natural rates.
- ***Damage to instream habitat*** – activities such as channelisation, the removal of large woody habitat and instream vegetation, undertaking works on waterways, building of dams and dredging or mining can negatively impact the instream habitat.
- ***Loss of connectivity –*** dams, weirs, culverts and road crossings are important public infrastructure, but may act as barriers preventing upstream and downstream movement of native fish and other animals and can also interrupt the transport of organic material and sediment.
- ***Extremes in climate*** – The potential impacts of climate change may include longer periods of low flow and more frequent extreme events (see Section 3.3.2).

Where catchments and water regimes are largely unaltered and erosion and sedimentation processes are comparatively balanced, the focus of management is on maintaining natural processes, managing invasive species and managing waterway related bushfire risks, flood risks and drought impacts.

Where natural river channel processes have been accelerated or changed by land use in the catchment or by changes to the water regimes, management of the river channel will focus on maintaining and improving the bed, banks, in-stream habitat, riparian land and surrounding catchment to improve resilience to the adverse

[22] The river channel is defined in the VWMS as the bankfull channel, including the bed and banks.

impacts of waterway processes on river channel condition and public infrastructure.

Options for changing river operations to improve the water regime in priority regulated rivers will be investigated as required. Further detail on river channel management activities for specific waterways is provided in the regional work program (see Part C).

3.5.2 Riparian land

Riparian vegetation is an important part of the terrestrial landscape. It acts as a refuge during dry times, can be the largest remnant of native vegetation in cleared catchments and acts as a wildlife corridor linking habitats, particularly in areas of high production where much of the terrestrial native vegetation has been cleared. Landscapes that contain waterways with remnant vegetation have been shown to have a greater diversity for aquatic and terrestrial birds than those without, or with little riparian vegetation.

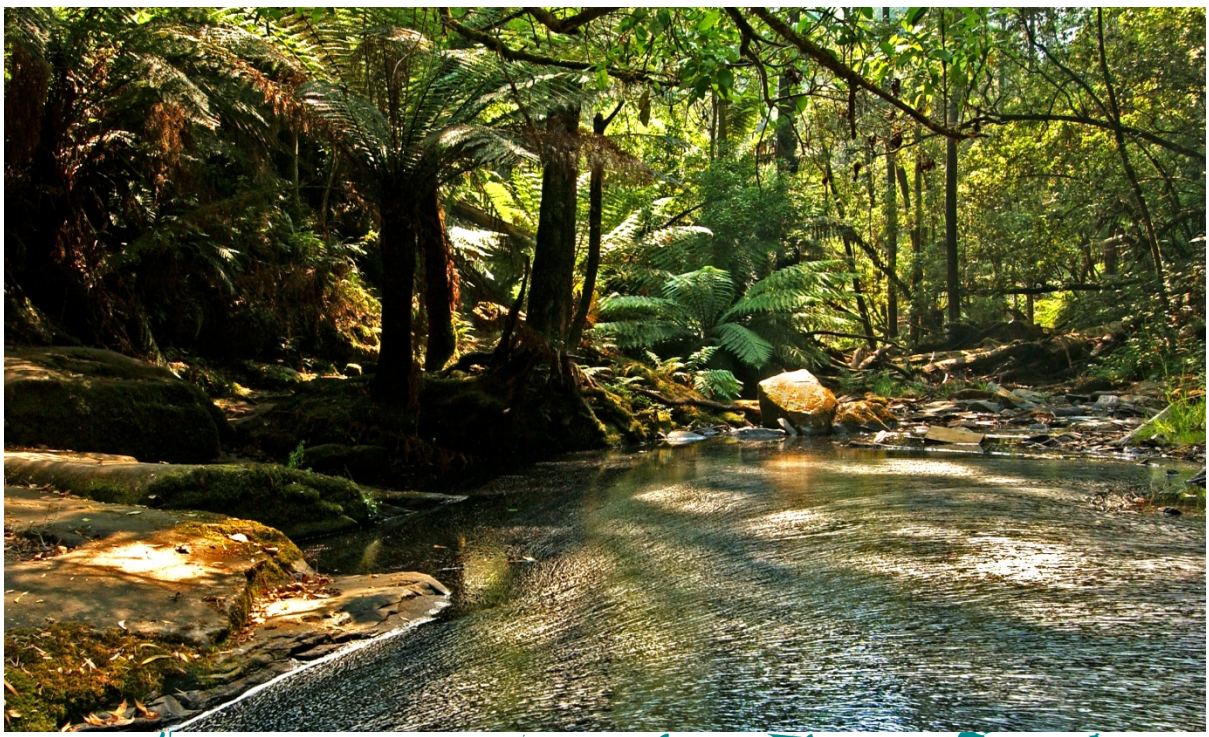
Victoria has a unique network of public riparian land known as Crown frontages (owned by the state), which were established in 1881 in recognition of their value as a public resource. Crown frontages occur mostly on rivers and larger creeks. Along smaller waterways in agricultural landscapes, riparian land is often privately owned. Also, land parcels alienated prior to that time do not have adjacent crown frontage reserves. Of an estimated 85,000 km of rivers and creeks in Victoria (therefore about 170,000 km of frontage), there are about 30,000 km of Crown frontages.

The influence of healthy riparian land on the condition and health of a waterway are numerous:

- trees provide a supply of organic matter to waterways, including large wood, which supports aquatic invertebrates and nutrient cycling
- vegetation on riparian land improves water quality in waterways, filtering out sediments, nutrients and pathogens in run-off from a range of land uses and catchment activities including agriculture, on-site domestic wastewater management and urban development. This protects public, rural and stock water supplies, improves water quality for fishing and recreation and helps reduce algal blooms downstream
- shade from riparian vegetation also helps regulate water temperature, which is important to native fish species and helps reduce the likelihood of algal blooms
- riparian land is also important for the storage of carbon
- riparian vegetation helps to stabilise stream banks and reduce erosion.

The major threats to riparian land are those that affect one or more of these key attributes. Of particular threat to the condition of riparian land is uncontrolled stock access to riparian areas and the bed and banks of waterways. Stock trampling can contaminate water and erode the banks. Other threats to the condition of riparian land include recreational pressure, weeds (especially willows, gorse and blackberry), unmanaged vehicle access and stream crossings, rubbish dumping, urban development, the collection of firewood and some agricultural practices (such as cropping too close to riparian land).

An example of intact, near natural riparian vegetation on the Erskine River. Photo: Alison Pouliot.



A partnership approach

Landholders are the key custodians of much riparian land in the Corangamite region. As the occupier of the property or frontage, they generally have good local knowledge of their riparian land and often undertake pest plant and animal management.

In order to manage this land and the adjacent waterway successfully, a partnership approach is required. The Corangamite CMA, guided by the VWMS and Corangamite RCS, will establish effective partnerships with landholders and provide information and investment for improved riparian management. The following tools may be used:

Riparian Management Agreements

Partnering with land managers will involve voluntary riparian management agreements (for Crown and private land) and licence arrangements with (adjoining) landholders. These agreements will be legally binding and set out co-investment and cost-sharing, management activities and responsibilities for land managers, the Corangamite CMA and any other applicable entity.

Riparian Management Licence

A riparian management licence for a Crown water frontage recognises that all or part of the frontage is being managed by a licensee to maintain and improve the riparian environment, e.g. fenced out and supporting native vegetation. A riparian management licence is typically generated through the conversion of an existing grazing licence as part of a Riparian Management Agreement. The long-term management responsibilities agreed to by the landholder in a Corangamite CMA agreement are incorporated as special conditions into a riparian management licence. These special conditions remain with the licence which may be transferred if the adjacent private land changes hands. Licences are generally renewed every five years. Most projects on Crown land that include fencing to manage stock access to a waterway qualify for a riparian management licence e.g. CMA, Landcare or privately funded projects (DEPI 2013).

Corangamite CMA investment in management activities

When entering voluntary partnerships with the Corangamite CMA for riparian management activities, landholders, including licensees on Crown frontages, will generally be responsible for the long-term management of the riparian fence and fenced riparian land, with the landholders' requirements specified in riparian management agreements and/or riparian management licences (when on Crown frontages).

The Corangamite CMA can contribute to the costs of management activities. The proportion that is paid for by the Corangamite CMA will comply with policy directions in the VWMS and available funding and depend on:

- its priority for riparian management activities (see Part B for priority waterways in the Corangamite region)
- the level of public benefit of the work
- the level of security of the agreement.

Typical activities where investment assistance from the Corangamite CMA can be provided include:

- ***Fencing to remove uncontrolled stock access to waterways and grazing on riparian zones –*** policy outlined in the VWMS states that where such government investment is applied, the area fenced will aim to be at least 20 m wide on average from the top of the bank and must not be narrower than 10 m in any one place.
- ***Revegetation or natural regeneration –*** through practices such as tube stock planting, direct seeding and management aimed at fostering natural regeneration.
- ***Pest plant and animal management –*** Landholders are currently required to manage certain pest plants and animals under the *Catchment and Land Protection Act 1994* for private riparian land and through licence conditions for Crown frontages.
- ***Off stream watering infrastructure and fees –*** Access to water for stock will continue to be available for landholders with riparian management licences for the adjoining Crown frontage when riparian fencing excludes stock from direct access to a waterway, through the issue of take and use licences. In such instances, the following is applicable:
    - The application fee will be paid for by the Corangamite CMA as part of the cost of a riparian management project.
    - The annual fee will be waived by rural water corporations for the first three years.
    - Licences will be issued for 15 years by rural water corporations (the current legislative maximum).

The Corangamite CMA will also continue to work with Landcare Networks where relevant to deliver priority riparian works through three-way riparian management agreements between the CMA, Landcare and landholder. This community based delivery approach enables Landcare to deliver on-ground projects aligned to the CWS, and supports the Landcare model for community based natural resource management. Under this arrangement, high-risk activities including major willow removal and engineered erosion control are typically undertaken by the CMA, fencing is undertaken by the landholder with a rebate payable, while site preparation and revegetation is undertaken by the regional Landcare Network.

Management approach: *The Corangamite CMA will continue to adopt a community based delivery model for riparian land management, where relevant.*

3.5.3 Management of invasive species

Invasive species are considered as one of the biggest threats to our environment. This concern is mirrored in the Corangamite region, shown most recently through a community profiling study, where 89% of landholders reported that they were concerned with the threat posed by invasive species (RMCG, 2013).

An invasive species is defined as a species occurring, as a result of human activities, beyond its accepted normal distribution and which threatens environmental, economic, cultural or other social values by the damage it causes (DEPI, 2013). Invasive species includes organisms endemic to a country other than Australia, or translocated native species.

Invasive species in waterways and along riparian land are an increasing threat to the health of rivers, estuaries and wetlands in the Corangamite region. Invasive plants such as willows, gorse and blackberry (Weeds of National Significance) as well as phalaris and tall wheat grass (in wetlands) are well established in the region and can be costly to control. Effective management of weed species needs to consider not only the physical removal of the weed, but also eliminating the source of dispersal in any system, which often extends beyond the limits of a single waterway.

Invasive fauna such as rabbits and foxes impact on waterways, particularly wetlands, but they can also affect revegetation. Predation by foxes is a major threat to fauna and many wetland bird species, particularly ground-nesting birds. Waterways where rabbits and foxes are an issue have been identified for this strategy and management interventions are suggested where they impact on particular waterway values. Although management is listed by site for this CWS, a landscape scale approach to management will be required to achieve success. This is particularly the case for control of predators such as foxes, whereby studies have shown that large scale (10,000+ ha) coordinated and sustained baiting programs are needed to effectively reduce fox activity (Robley *et al.* 2008). In addition there is little reliable knowledge concerning the consequences of pest animal control and the benefits or otherwise to native wildlife[23].

To assist in addressing this knowledge gap fox control programs should include pre- and post-control monitoring to determine the impact of pest animal control on native wildlife and further knowledge is needed to quantify the impacts of foxes on wetland bird communities.

Some invasive species (e.g. trout), can pose a risk to environmental values, but at the same time support values, such as recreational fishing (see Section 3.4.1). A balanced management approach is therefore required to reduce the impacts of invasive species that cause substantial harm, while continuing to acknowledge that in some limited cases invasive species may provide other benefits that are valued by the community.

Policy directions

The VWMS outlines the policy direction and framework for managing invasive plants and animals:

- ***Prevention and preparedness*** – Prevent new, high risk invasive species from establishing in Victoria or spreading to uninvaded Victorian catchments.
- ***Eradication*** – Eradicate high risk invasive species in the early stage of establishment.
- ***Containment*** – Contain high risk invasive species.
- ***Asset based protection*** – Reduce the impact of established invasive species on assets.

The *Corangamite Invasive Plant and Animal Management Strategy* (IPAMS) (2010) sets the regional approach for which the primary focus is to protect natural assets from the impacts of invasive species.

In line with policy direction outlined in the VWMS and the Corangamite IPAMS, the Corangamite CMA will work with partner agencies and the community in undertaking regional management activities to protect priority rivers, estuaries and wetlands from the threats posed by invasive species. Specific management activities for invasive species are determined through the priority setting process and detailed in the regional work program (see Part C).

Otway Eden project

Within the region's National Parks, which are well protected and have management regimes in place, there are some locations that have been identified as having a high level of significance due to the rarity of the ecosystems that exist within these. Due to their vulnerability, such sites require a greater level of consideration with respect to the impact of invasive plants and animals. These areas were identified in the Otway Ranges through the Otway Eden Project as high priority assets for protection from invasive plants (DSE, 2008).

The Corangamite CMA will work with DEPI, Parks Victoria and other partners in undertaking weed management activities to protect priority rivers, estuaries and wetlands, including the priorities identified in the Otways through the Otway Eden project.

Management approach: *Invasive species management will occur in line with policy direction outlined in the VWMS, the Corangamite IPAMS and other landscape scale planning (i.e. Otway Eden project). It will be conducted in accordance with best practice and consider the need for a landscape scale approach, coordinated effort and adequate monitoring.*

[23] http://www.environment.gov.au/archive/biodiversity/invasive/publications/feral-audit/summary.html

3.5.4 Water quality

The Corangamite CMA, in conjunction with partner organisations, has had a long history in working to improve water quality from the late 1990s in the region. The more recent asset based and targeted approach to waterway management ensures water quality impacts are considered as part of an integrated approach to waterway management. Significant progress has been made in improving water quality in the region by reducing wastewater discharge from towns, implementing Local Government Stormwater Management Plans, riparian protection works, and dealing with soil erosion and runoff from agricultural land.

The VWMS states that Regional Waterway Strategies will identify priority waterways 'regional hotspots' where environmental, social, cultural or economic values are threatened by poor water quality (DEPI, 2013a). The VWMS also highlights that any water quality activities will need to take into account the scale of the problem and the feasibility of effective action.

Through the CWS priority setting and risk analysis process water quality was identified as a threat to a number of assets.

Management approach: *The Corangamite CMA will continue to work with regional water corporations, local government, EPA and DEPI in managing water quality issues where they align with CWS priorities.*

Water quality monitoring

Water quality reflects the environmental condition of waterways, but can also provide an integrated indicator of the health of whole catchments (DEPI, 2013).

Management approach: *The Corangamite CMA and its regional partners will continue to use water quality monitoring data from Waterwatch and the Victorian Water Quality Monitoring Network (VWQMN) to understand changes to water quality over time and inform management practices throughout the life of the CWS.*

Acid sulfate soils

Acid sulfate soils are soils or sediments that contain (or once contained) high levels of reduced inorganic sulfur. When exposed to oxygen, the soils or sediments undergo a chemical reaction (called oxidation) that produces acid. Acid sulfate soils are known to have been oxidised for a small number of priority waterways in the Corangamite region and respective management activities are provided for these waterways.

There are also a large number of waterways where acid sulfate soils is known to exist but which have not been oxidised. These have been identified by listing acid sulfate soils as a threat within the regional work program so that the management approach (below) can be enacted in relevant areas.

Management approach: *Land use planning, works on waterways and water management decisions along these waterways need to carefully consider the potential for acid sulfate soils and prevent disturbance.*

Blue-green algae

The DEPI is the State coordinator for blue-green algae management under the Blue-Green Algae Coordination Framework. The objectives of this framework are for parties to work co-operatively for effective management of blue-green algae events. The framework is broadly based on emergency management principles described in the Emergency Management Manual Victoria.

Within the region, the Blue-green Algae Circular 2013-14 (DEPI, 2013e) identifies regional coordinators as responsible for coordinating the management of local blue-green algal blooms, as well as coordinating regional planning and preparedness for the management of regional blue-green algal blooms.

Management approach: *The Corangamite CMA will continue to work with DEPI, the regional coordinators, local government, EPA and the community in managing blue-green algal blooms in-line with policy direction provided by the state government.*

4. Vision, goals and strategy development

4.1 Overview

The *Corangamite Waterway Strategy* (CWS) was prepared as a requirement under the *Water Act 1989*, in accordance with the requirements of the *Victorian Waterway Management Strategy* (VWMS) (DEPI, 2013), the Regional Waterway Strategy Guidelines (DEPI, 2013a), guidance notes for the development of the regional waterway strategies provided by DEPI, and forms a key sub-strategy of the *Corangamite Regional Catchment Strategy* (RCS). It builds on a range of existing strategic waterway (river, estuary and wetland) management plans and information sources relevant to the region, including but not limited to the RCS, the *2006 Corangamite River Health Strategy (CRHS), 2006 Corangamite Wetland Strategy*, the *Central Region and Western Region Sustainable Water Strategies*, *Barwon River Parklands Strategy* and Barwon and Moorabool Seasonal Watering Proposals. Figure 4.1 shows the regional waterway strategies as the centre-piece of the state government's Integrated Waterway Management Planning Framework.

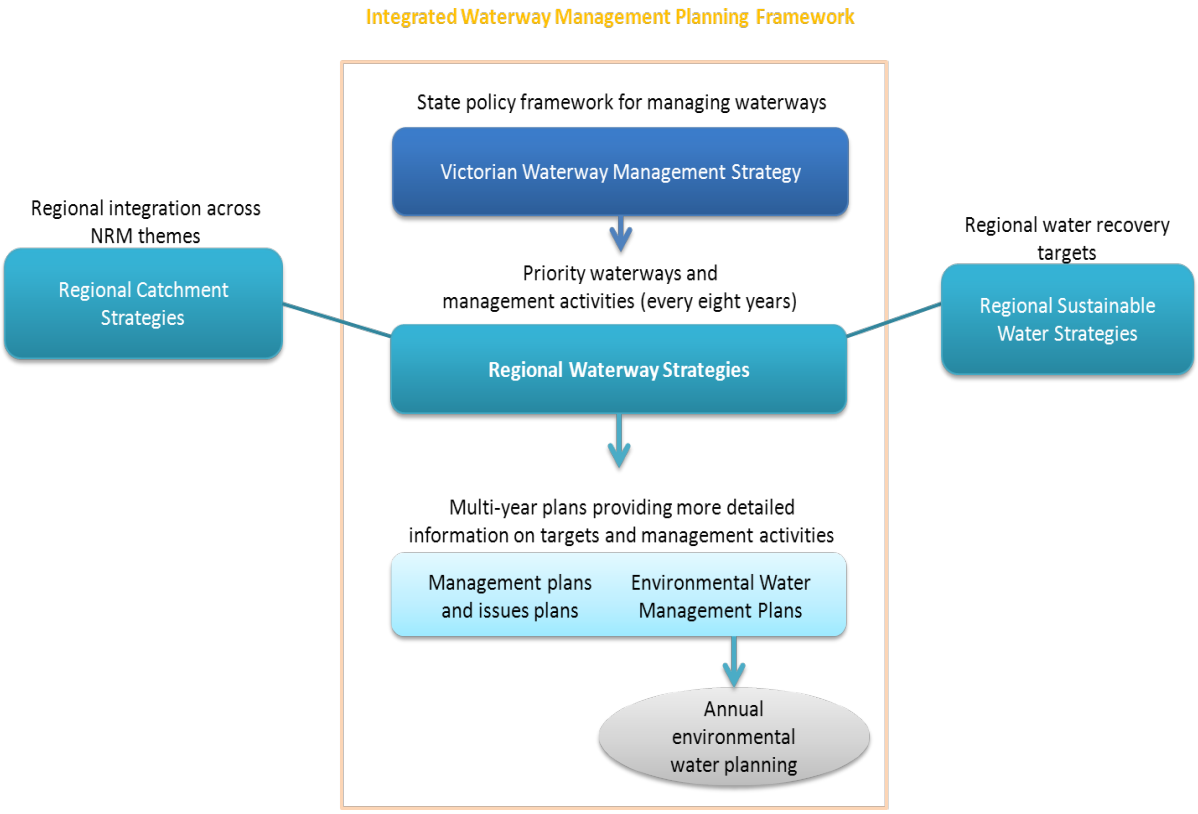


Figure 4.1 – The Integrated Waterway Management Planning Framework

4.2 Vision

To set broad directions for management and to help identify priority waterways in the Corangamite region, a vision and high-level regional goals were developed.

The purpose of the CWS is to deliver the aspirations and objectives for Victoria's waterways, identified in the VWMS and the Corangamite CMA region's vision, identified in the Corangamite RCS:

These visions have been used to guide the CWS and therefore the regional goals.

Vision for Victoria's waterways - "Victoria's rivers, estuaries and wetlands are valued, healthy and well-managed; supporting environmental, social, cultural and economic values that are able to be enjoyed by all communities" (DEPI, 2013)

Vision for the Corangamite region – "A healthy Corangamite catchment valued by engaged communities"

4.3 Regional goals

The goals for the CWS are aspirational and apply to a 20+ year timeframe; they reflect the VWMS approach and are consistent with the intent of the Corangamite RCS condition objectives. The goals are presented in Table 4.1.

The goals are based on the objectives detailed in the Corangamite RCS for rivers, estuaries, floodplains and wetlands and needed to:

- apply to a timeframe generally longer than 20 years
- account for the environmental, cultural, social, and economic importance of waterways
- have conceptual or qualitative links to management outcomes
- link to the Corangamite RCS and VWMS
- be region wide.

Other Corangamite RCS objectives associated with categories such as native vegetation and threatened flora and fauna are also likely to benefit from actions under the CWS, however it is not proposed to directly target these goals within the CWS.

The CWS will also deliver on the Corangamite RCS' Foundations for Change[24], with a specific focus on increasing the breadth and depth of participation through mechanisms such as joint action and community monitoring programs. This is also likely to incorporate actions around the engagement of Aboriginal communities in the planning and management of the region's waterways (see Section 3.2.2).

4.3.1 Targets

Long-term Resource condition targets

Long-term resource condition targets (RCTs) were developed based on the program logic structure (see Section 4.6). They predict the change expected in the values aimed to be maintained or improved through the CWS regional work program. They align to the CWS goals and given that change in environmental condition occurs over a long period of time, they have been set for a timeframe of greater than eight years (see Table 4.1).

The development of the RCTs was linked to either the values in AVIRA (see Section 4.7.1) or condition assessments in the various indices (i.e. Index of Wetland Condition, Index of Stream Condition and/or Index of Estuary Condition). In some instances, the AVIRA data did not provide a good basis for target setting (e.g. threatened species or other values with a presence or absence rating). Where RCTs were set for particular species, they were based on long term objectives from an existing action statement for that species or other similar basis.

Management outcome targets

Management outcomes are the expected and measurable changes over an eight-year works period in response to the management activities undertaken. These changes are the result of implementing the required management activities identified in the work program.

Management outcome targets have been set for all threats identified in the strategy, except water quality which has been excluded as we would not expect to see measurable change within the eight-year CWS timeframe.

These targets are presented in the regional work program (see Part C) and as recommended through the review of the CRHS, will be the basis for measuring success of the CWS.

It should be noted that the rollout of management activities will occur over the eight-year implementation period of the strategy and therefore some management outcomes, those that occur later in the eight-year implementation phase, may not be measurable when the strategy is reviewed.

[24] The four Foundations for Change detailed in the RCS are: increased breadth and depth of participation; increased investment and develop joint priorities; improved integration and coordination; and increased and widely shared knowledge.

Table 4.1 – Goals and resource condition targets for the CWS

Ref	Regional Goals	Long-term Resource Condition Targets
S1	**Maintain or improve waterway condition where it supports high social values.**	1. High value social attributes of waterways are maintained.
EC1	**Secure and manage waterways that provide significant economic benefits to the region.**	2. Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 3. Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.
ENV1	**Maintain the viability of populations of threatened native fish species.**	4. Known populations and habitat of Australian mudfish are maintained or improved[25]. 5. The condition of sites where Yarra pygmy perch currently occur show no further decline[26]. 6. The probability that important dwarf galaxias populations become self-sustaining is increased[27]. 7. The probability that important Australian grayling populations become self-sustaining is increased[28].
ENV2	**Maintain or improve the resilience of other threatened waterway dependent species.**	8. Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 9. All extant populations of the Corangamite water skink are maintained in systems of reserves and/or areas managed specifically for their conservation[29]. 10. Populations of growling grass frog are secured, particularly those occurring in known breeding habitats[30]. 11. All extant populations of Otway crayfish are secured.
ENV3	**Manage water for the environment to improve waterway condition.**	12. Environmental water entitlements for priority waterways are managed to maximise environmental outcomes.
ENV4	**Maintain or improve waterways with formally recognised significance.**	13. The ecological character of Ramsar wetlands is maintained or improved. 14. The condition of values of nationally important wetlands are maintained or improved. 15. The listed values of heritage rivers are maintained or improved.
ENV5	**Maintain the extent and condition of other significant wetlands (by type).**	16. The condition of freshwater marshes and meadows supporting the seasonal herbaceous wetlands ecological community[31] are maintained or improved.
ENV6	**Maintain waterways in near natural condition.**	17. All environmental values of near natural rivers and estuaries are maintained.

[25] This RCT is derived from the DSE Action Statement for the Australian mudfish (DSE, 2003a)
[26] This RCT is derived from the DSE Action Statement for Yarra pygmy perch (DSE, 2001).
[27] This RCT is derived from the National Recovery Plan for the dwarf galaxias (DSE, 2010).
[28] This RCT is derived from the National Recovery Plan for the Australian grayling (DSE, 2008a).
[29] This RCT is derived from the DSE Action Statement for the Corangamite water skink (DSE, 2003b)
[30] This RCT is derived from the National Recovery Plan for the Southern bell frog (growling grass frog) (DSE, 2012a).
[31] Listed as critically endangered under the EPBC Act 1999

4.4 Asset-based approach

As described in the VWMS (DEPI, 2013), broad threat-based approaches to natural resource management, such as investing in management of poor water quality or salinity over large geographic areas, have diminished across Australia over the past decade. This is in favour of using asset-based approaches, where planning focuses on important natural 'assets'. This approach allows us to manage natural resources in a more integrated and holistic way. It also assists to develop work programs to address many different threats to an asset, rather than one threat across a large geographic area.

An asset is a spatially defined, biophysical component of the environment (e.g. a river, estuary or wetland), that has particular values associated with it. The values associated with these assets can be classified as environmental, social, cultural or economic and are used to determine and describe an asset's importance.

By adopting an asset-based approach for the CWS we can maintain or improve waterways that:

- have the most significant values
- are under the greatest threat
- have a high likelihood of achieving success.

The focus on assets means that we are able to achieve the best outcomes for the region. However, in a local context, this means that not all locally important areas will be identified as regional priorities and these areas will rely upon continued community participation to improve waterway condition. As highlighted in Section 3.2.1, the CWS recognises the importance of community participation in waterway management and aims to encourage continued action in both priority waterways and other areas.

The asset-based approach used in the CWS has been guided by the VWMS, the Corangamite RCS and the Regional Waterway Strategy Guidelines (DEPI, 2013a).

4.5 Guiding principles

Development of the CWS has been guided by the following principles:

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

In line with these statewide principles, the CWS also recognises the importance of:

- programs such as Waterwatch, EstuaryWatch and Landcare to enable community participation in waterway management
- managing waterways in urban areas to support open space and amenity
- managing risks to community infrastructure through floodplain and waterway management and planning.

4.6 Program logic

The program logic provides the rationale for how the CWS will contribute to the regional goals and ultimately the vision.

The simplified program logic for the CWS is illustrated in Figure 4.2. It describes how within each year, specific management activities (outputs) will be delivered by regional agencies across the Corangamite region in order to achieve particular

management outcomes. Over the eight-year planning period, these outputs and outcomes, set as management outcome targets, will collectively contribute to either maintaining or improving the environmental condition of waterways (demonstrated by long-term resource condition targets). In the long-term, this will ensure that the region's goals can be met and waterways can continue to support environmental, social, cultural and economic values.

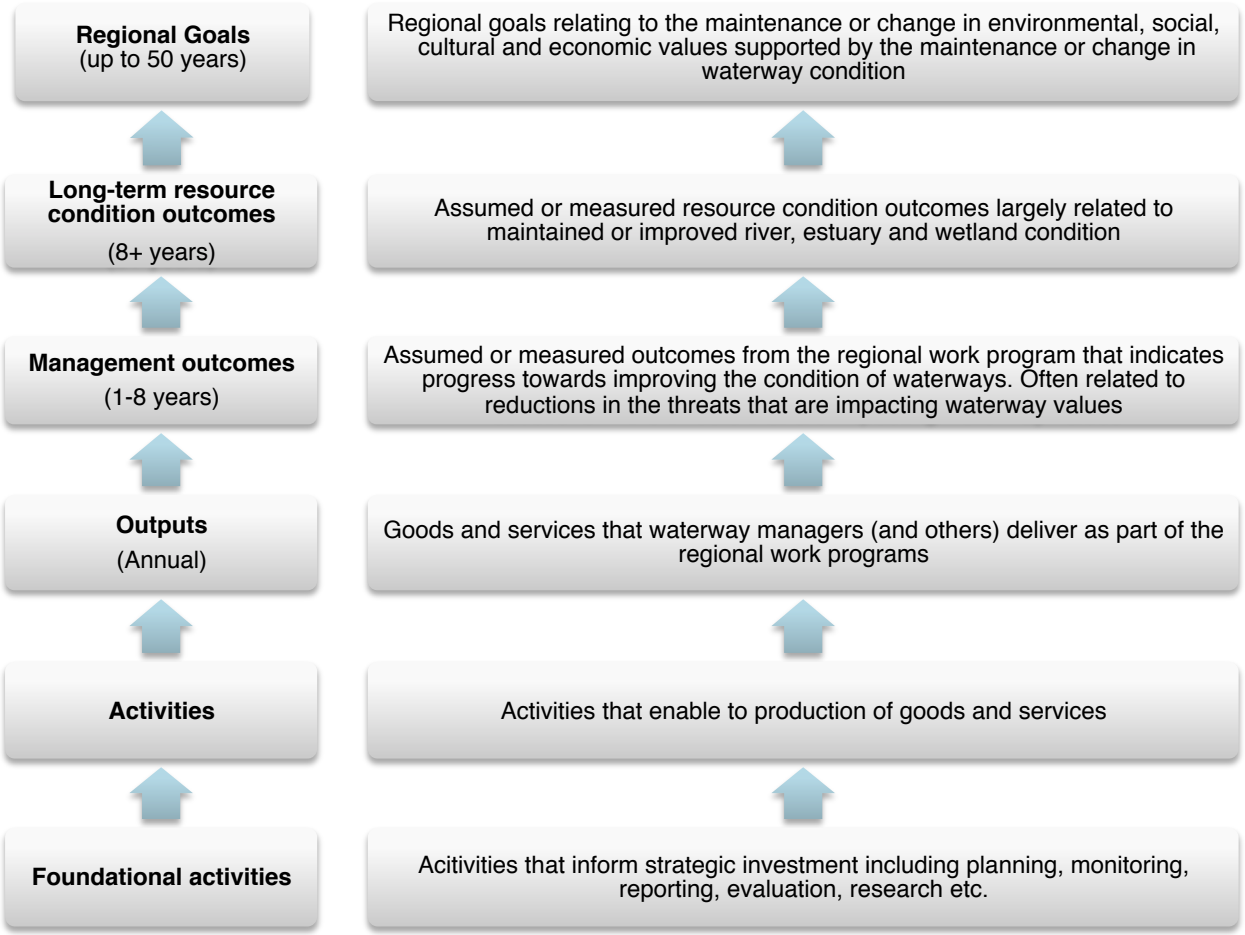


Figure 4.2 – Simplified program logic for the Corangamite Waterway Strategy (Adapted from DEPI, 2013a)

4.7 Key steps of the prioritisation process

This section describes the process followed for identifying priority waterways and developing the regional work program. The key steps are presented in Figure 4.3. Results of the process are detailed in Chapter 5 (Regional priorities and work summary).

4.7.1 Regional priority setting process

Waterways within the Corangamite region provide a wide array of values to the community. These values contribute to why a waterway is considered a priority and include environmental (e.g. native fish and vegetation), economic (e.g. water supply, supporting agriculture and production) cultural and social (e.g. recreation and aesthetics) values. There are also a number of threats which currently impact and have further potential to impact, on these values. Management activities will target these threats in order to maintain or improve the values of an asset.

While we would like to address the health of all waterways in the region, we do not have the necessary resources (people, funding, time) to complete such a task. Therefore, we have to find some way of allocating the available resources to the region's highest priority waterways, in other words, those waterways with greater inherent 'value'.

The key purpose of the CWS is to identify priority waterways for investment during the next eight years to ensure the condition of these systems is maintained or improved. This will in turn secure the

values they provide to the environment, the economy and the community into the future.

Assets

Identifying and ranking priority waterways in the Corangamite region was informed by the Aquatic Value Identification and Risk Assessment (AVIRA) decision support tool. AVIRA is an asset inventory, which:

- documents the environmental, social and economic values and threats associated with waterway assets (river reaches, wetlands and estuaries)
- assesses risks to values to assist in the planning for waterway management activities.

Figure 4.3 – Key steps in the regional priority setting process

For the Corangamite region, 118 river reaches, 17 estuaries and 81 wetlands were assessed. To assess each waterway, data was required on more than 30 different types of values and up to 21 different threats. Much of the data was from the Index of Stream Condition (ISC) and Index of Wetland Condition (IWC). This data was considered the best and most comprehensive information available. In addition, some data was sought from regional and local agencies and local knowledge was used where required. A comprehensive list of values and threats that were assessed for each waterway can be found in Appendix G.

One of the limitations of the AVIRA decision support tool is it can only assess waterways where a large amount of data exists. At this stage there is not an avenue to include waterways in the assessment process that do not have this data. To address this limitation the CWS recognises the importance of ongoing community participation in waterway management and aims to encourage continued action in both priority and other waterways as outlined in Section 3.2.1.

Landscape zones

Waterways are presented in the CWS (Chapter 5) in landscape zones (refer to Figure 5.1). Landscape zones are geographic units used for Corangamite CMA planning purposes. They were developed based on:

- major waterway sub-catchments
- bioregions
- existing remnant vegetation

- existing and potential community capacity to implement on-ground works (i.e. Landcare Network boundaries).

There are 15 landscape zones:

- Lake Corangamite Basin - comprises the Lismore, Stony Rises and Woady Yaloak landscape zones
- Barwon Basin - comprises the Leigh, Murdeduke, Upper Barwon, Mid Barwon and Bellarine landscape zones
- Moorabool Basin - includes the Moorabool and Hovells landscape zones
- Otway Coast Basin - includes the Curdies, Gellibrand, Aire, Otway Coast and Thompsons landscape zones which drain into the Southern Ocean and Bass Strait east of Cape Otway.

Identifying high value waterways

The VWMS states that waterways will be considered high value if they have 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/rural water sources).

For waterway assets in AVIRA, the above characteristics can be assessed using specific scoring rules as detailed in Appendix H. If a waterway meets one or more of these scoring rules, it is considered to be a high value waterway.

Results

Using the scoring rules detailed in Appendix H:

- 116 of 118 river reaches in the Corangamite region were identified as high value waterways
- all 17 estuaries in the Corangamite region were identified as high value waterways
- 80 of 81 wetlands in the Corangamite region were identified as high value waterways.

For the full list of high value waterways refer to Appendix I.

Identifying priority waterways

Almost all waterways within the Corangamite region were identified as high value waterways. In order to develop a realistic eight-year regional work program, this percentage must be reduced and prioritised.

The approach adopted was to first identify which high value waterways were linked to the regional goals. This involved the identification of relevant and/or attributable AVIRA values and determination of scoring cut-offs (or rules). AVIRA rules for linking high value waterways to regional goals are detailed in Appendix J.

There were 158 waterways that met one or more of the regional goals. These were then subject to a risk and feasibility assessment, and had a score calculated to determine priority status.

Assessing Risks

Within AVIRA, risk assessments are undertaken for each of the 158 waterways that aligned to regional goals. These risk assessments determine which of the threats in Appendix G need to be reduced or managed, in order to maintain or improve the values. It considers how much influence a threat might have on any one value (association), i.e., how likely it is that it will have an impact, and the consequence of those impacts. All values are assessed against all threats, e.g. for each priority wetland, each one of 33 different values are assessed against all 11 threats, resulting in 363 risk level assessments.

Considering technical feasibility

The risks for specific values (values that link to the regional goals) were the focus for considering technical feasibility. These values will be targeted through the CWS and therefore the focus for the work program is to manage any threats to these values.

For each identified threat, a 'first cut' of the technical feasibility (high, medium, low) of reducing each threat, i.e. implementing on-ground actions, was determined. This step allowed us to focus on the threats known to have feasible solutions. Threats that had a 'low' association with a value were not assessed for feasibility. There is only a remote possibility that these threats will have an impact. Social and/or economic factors were assessed later when developing the work program.

An example output is shown in Appendix K.

Calculating a priority waterway score

This step enables waterways comparisons based on the potential for threats to impact the waterway (risk level) and how likely we are to reduce this impact (feasibility). To calculate the score for a priority waterway, raw scores were calculated for each risk/feasibility combination as follows:

raw score = risk level x feasibility

where: risk level = 5–very high, 4–high, 3–moderate, 2–low, 1–very low

feasibility score = 3–high, 2–medium, 1–low

All raw scores for a waterway were then added and the total divided by the number of raw scores calculated. This produced a priority waterway score (ranging from 0 and 15).

Once priority waterway scores were calculated, the waterways could be ranked from highest score to lowest score.

Priority waterway scores can be seen in Appendix L. Waterways with higher scores generally have significant value and management of the threats is feasible, whilst waterways with very

low scores may have minimal threats and just require protection.

The Corangamite CMA has chosen to include all waterways with a priority score in the next stage (developing the work program). This is to ensure they can be considered for future funding and investment opportunities, recognising that the actual level of funding for the work program may mean that not all activities in the work program for lower ranked waterways can be achieved.

Results

Based on the above steps, the 213 high value waterways were refined to 158 priority waterways. The following refinements were made:

- river reaches - from 116 high value river reaches to 78 priority river reaches.
- estuaries - from 17 high value estuaries to 14 priority estuaries.
- wetlands - from 80 high value wetlands to 66 priority wetlands.

Priority waterways are shown on Figure 4.4 and compared to the high value waterways for the region. Priority waterways are detailed further in each landscape zone description provided in Chapter 5.

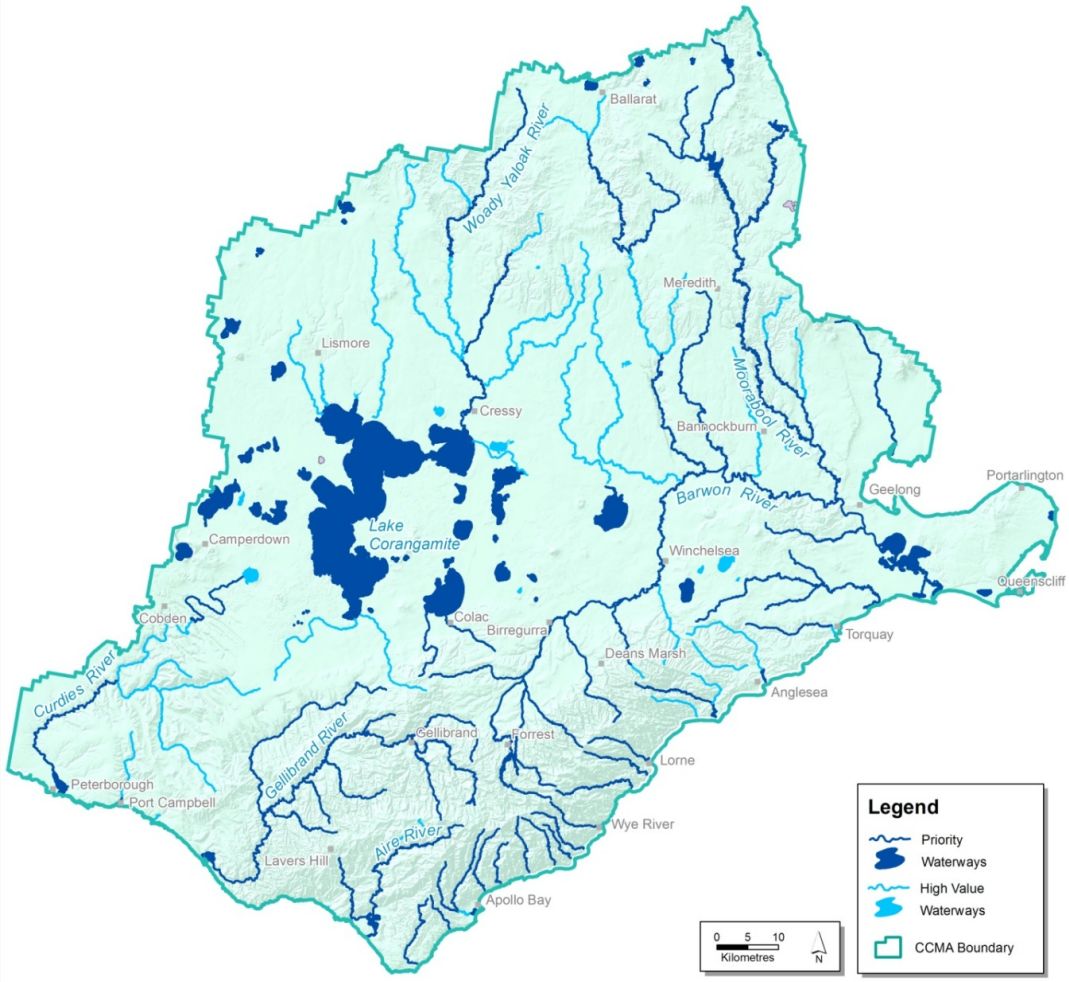


Figure 4.4 – High value and priority waterways in the Corangamite region

Other waterways

The Corangamite CMA recognises there are a number of waterways in the region that were not identified as a priority waterway under this strategy but are of significant value to the local communities living near these waterways.

The VWMS provides direction for the management of these waterways, highlighting that in some cases, management activities may be undertaken if:

- they are a source of threats to other priority waterways (e.g. downstream priority waterways)
- they provide important connectivity between priority waterways
- there is a serious risk to public infrastructure from waterway processes or an opportunity to reduce risks associated with extreme events (e.g. floods)
- there is strong community commitment to improving the condition of their local waterway

- work is required to meet statutory or regulatory obligations.

While these other waterways are not receiving direct attention under the CWS, we will continue to support the local management of these waterways through other avenues such as Landcare, Waterwatch and CMA extension, local catchment planning and assistance with exploring alternative funding. Further information on these opportunities will be provided in each of the landscape zone descriptions (see Chapter 5).

4.7.2 Approach to developing the regional work program

To develop the regional work program the management responses that are recommended through the risk assessments were used. These responses are based on the level of risk posed by threats and include the following:

1. maintain current level of condition
2. reduce threats to improve waterway condition over time.
3. fill data gaps to better understand the threats and/or values

Further detail on how the regional work program was developed is provided in Sections 5.1.2 and 5.1.3.

Maintaining current condition

For some priority waterways in the Corangamite region there is a low risk to the values. For these waterways, many of which are in excellent condition, the focus is to prevent an increase in threat level.

For these waterways condition will be monitored and intervention will only be implemented should a threat increase to an unacceptable level, or if the condition of the waterways deteriorates below baseline conditions set by the Index of Stream Condition.

Reducing threats

For the majority of priority waterways there is a moderate or high risk to the values. In these cases management activities have been prescribed to reduce the threats to the values identified, so that waterway condition can improve over time.

This has been applied only where the threat has a high or moderate association with the value and the activity to reduce the threat is feasible. Certain types of management activities will often address multiple threats, for example, planting riparian vegetation can improve bank stability, reduce sedimentation and improve water quality.

Fill data gaps

In few cases, information on the threats to priority waterways is unknown or poorly understood. For these waterways, further investigations have been prescribed to fill these data gaps and better understand the threats posed to the values so that management interventions can be prescribed where needed.

These investigations are only prescribed to priority waterways where we are unable to set other management activities due to knowledge gaps.

Other general data gaps that have been identified while developing this strategy will be addressed as discussed in Section 7.5.

4.7.3 Process limitations

Through the process of identifying priority waterways and developing the work program for the Corangamite region, several key limitations were identified:

- waterways assessed
- wetland condition data
- social values.

Waterways assessed

The CWS has assessed over 216 individual waterways, however, there are still many other waterways that could not be assessed. This was due to a lack of sufficient data to be able to provide an assessment of waterway condition, as well as limitations in the number of waterways that could feasibly be addressed through the strategy. The process relied solely on condition information available through the Index of Stream Condition (ISC), Index of Estuary Condition (IEC) and Index of Wetland Condition (IWC) to provide this assessment and inform the priority setting process.

At this stage there is not a process available to include other smaller waterways for assessment. To address this limitation the Corangamite CMA has actively sought information from the community on waterways of local importance during the strategy development and encourages action on waterways that are not considered in the assessment process (refer to Chapter 5, landscape zone summaries). Addition of other waterways to the next iteration of ISC, IEC and IWC needs to be considered for future strategies.

Wetland condition data

The Index of Wetland Condition assessments outlined in Section 1.3.3 only cover a small proportion of the wetlands in the Corangamite region. In addition to IWC assessments for wetlands in Ramsar and DIWA sites, other wetlands for which IWC assessments have been undertaken were included in the priority setting process for this strategy. However, there is still a significant knowledge gap on the condition of the region's wetlands and research is required over the longer term to close these gaps and help direct future investments in wetland management.

Social values

The data within AVIRA considered a range of different types of social values (activities) and these were scored accordingly. However, when using this data to set priorities, a waterway needed to have multiple types of activities, the data did not allow for a waterway to become a priority based on the number of users or visitors (regardless of their activities). For example, the Yarrowee River through

Ballarat services a major population centre and has high user numbers, but it meets only one of the four required values (or activities) and could not be considered a priority under the social goal. User or visitor numbers need to be included in the data and assessment process for future strategies to allow for a more comprehensive assessment of socially important waterways.

4.8 Consultation

The Corangamite CMA recognises the knowledge, skills and expertise of the local community and the value of their input in identifying issues and informing decisions within the region. During the development of the CWS, opportunities were taken to both inform and consult with the community and key agencies.

A project review group with CMA staff and board members was set up to oversee and provide advice on the development of the CWS, including the pre-draft consultation and public consultation planning.

4.8.1 General consultation

There were numerous meetings and presentations with partners and agencies including local government, water corporations, Landcare networks and Committees of Management informing them of the development of the CWS. In addition, an information sheet was developed and distributed to inform people of the strategy's purpose and development. This information sheet was updated and redistributed as the strategy progressed.

Data collected for AVIRA included consultation with key agencies to gain up to date datasets and input of local knowledge to cross-check the data. Data collation included a survey with more than 200 responses, to determine the region's flagship species.

The Corangamite RCS was endorsed in 2013 and involved an extensive consultation process with the regional community about the region’s goals and regionally important environmental assets including rivers, estuaries and wetlands. Information obtained through the RCS consultation process was used to develop regional goals, principles and relevant management activities for the region’s waterways.

4.8.2 Pre-draft CWS community sessions

In 2013 and 2014 the Corangamite CMA invited the community to take part in pre-draft community sessions across the catchment to identify the values, threats and aspirations people have for their local waterways. These sessions were run in conjunction with the local Landcare networks in 10 separate locations across the region. More than 200 community members attended the sessions. Information obtained from the sessions was used to cross-check AVIRA data (especially where major gaps were identified) and provide information for each landscape zone description (see Chapter 5). The sessions also provided the Corangamite CMA with information on waterways that are important to local communities, but may not be a focus of the CWS work program.

4.8.3 Aboriginal engagement

Input was sought from three Aboriginal organisations (Wathuarung Aboriginal Corporation, Eastern Maar Aboriginal Corporation and Kuuyang Maar Aboriginal Corporation) to identify their aspirations for rivers, estuaries and wetlands, on their country. Specifically:

- the importance of waterways and any specific values
- to identify any individual waterways of particular significance and/or importance.

The Wathuarung Aboriginal Corporation was able to identify aspirations and opportunities for Aboriginal people to be involved in waterway management and CWS delivery. This information is presented in Section 3.2.2.

4.8.4 Draft CWS public consultation

The draft strategy was released on Friday 18 July 2014 and was available for a period of one month for community and stakeholder feedback, closing on Monday 18 August 2014.

Feedback was provided to the Corangamite CMA via formal written responses (email or mail), a feedback response form and/or through an online survey.

Five listening posts provided an opportunity for people to discuss details of the draft CWS with key CMA staff.

A marketing and promotions campaign also occurred in the lead up to and throughout the consultation period. Marketing and promotions activities included newspaper advertisements and articles, radio advertisements and interviews, posts on Twitter and Facebook and email and mail through Corangamite CMA and Landcare distribution lists.

Overall 45 people participated in the listening posts and 55 written submissions were received (through a combination of online surveys and emailed or mailed responses). The responses were largely positive and the feedback received has assisted the Corangamite CMA to make many improvements to refine and finalise the CWS.

CORANGAMITE CMA

PART B
Priorities, work summary and delivery

5. Regional priorities and work summary

5.1 Overview

This chapter introduces the regional work program outlining the intent and its development. A summary for each of the 15 landscape zones (management units) in the Corangamite region (Figure 5.1) is provided. As a guide, each summary includes the following:

- **overview –** an overview and description of the landscape zone
- **waterways –** an overview of the waterways within the landscape zone, including:
  - community groups and community values
  - high value and priority waterways, as determined through the process outlined in Chapter 4
  - an overview of key values and threats in each landscape zone
- **work program – key management activities –** key management activities planned and an estimated cost for the eight-year life of the CWS.

In addition to the above, each summary includes a description of the ***other waterways*** in each landscape zone. As detailed at the end of Section 4.7.1, the Corangamite CMA recognises there are a number of waterways in each landscape zone not identified as a priority waterway in this strategy, but are of significant value to the local communities living near these waterways.

While these other waterways are not receiving direct attention under the CWS, Corangamite CMA will continue to support the local management of these waterways through other avenues such as Landcare, Waterwatch and CMA extension, local catchment planning and assistance with exploring alternative funding.

The landscape zones are adopted as key planning and management units by the Corangamite CMA. Zone boundaries are based on catchment and sub-catchment boundaries for waterways and take into account bioregions, existing remnant vegetation and existing and potential community capacity to implement on ground activities, i.e. Landcare network boundaries.

The full regional work program detailing all management activities, resource condition and management outcome targets, outputs, costs and responsibilities for all priority waterways is provided in Part C – regional work program.

5.1.1 Intent of the regional work program

The intent of the regional work program is to carry out management activities to:

- maintain or improve waterway values, targeted towards those that are of highest priority
- achieve the management outcome targets, which in turn assist in meeting predicted long-term resource condition targets and contribute to the goals of the CWS.

Figure 5.1 Landscape zones within the Corangamite region

5.1.2 Developing the regional work program

Management activities (outputs) were identified for all priority waterways for implementation during an eight-year period. Depending on the level of risk, management activities are focused on either maintaining the current environmental condition or reducing threats to improve condition over time.

Where multiple values exist, it is possible to identify management activities that are beneficial for all values, e.g. fencing a waterway to prevent stock access can reduce threats to water quality, in turn protecting water used for drinking or irrigation, protecting waterway dependent species, and improving conditions for recreational fishing.

Conceptual models were used to help select appropriate management activities, based on the best available knowledge. The models provide consistent, and as far as possible, evidence-based assumptions on:

- the relationships between values and threats
- the management objectives to reduce the threats to values
- the management activities available to achieve particular specified outcomes (e.g. fencing to prevent stock access and improve water quality).

5.1.3 Estimated costs

Costs have been estimated for planned activities for the eight-year life of the CWS. These are based on full cost, and include costs associated with activities of the Corangamite CMA as well as key partners and, where relevant, landholder contributions.

These costs, displayed in Table 5.1, provide an indication of the investment needed to deliver the CWS. The funding and resources available, level of community support and the impacts of extreme events all influence the delivery of this strategy. Corangamite CMA will develop investment proposals to support actions in the strategy as investment opportunities arise. Where relevant, project investment proposals will be prepared in conjunction with delivery partners and the community. Further information on investment to deliver this CWS can be found in Section 6.2.

Table 5.1 and the regional work program does not cost the following:

1. Activities corresponding with government waterway statutory funding, including:
    a. works on waterways permits and floodplain management
    b. management of the Barwon River through Geelong
    c. management of the Woady Yaloak Diversion and Lough Calvert Drainage Schemes.
2. Management of urban water storages or off takes by water corporations (Barwon Water, Central Highlands Water and Wannon Water)
3. Urban restoration that aims to improve urban waterway reaches in larger urban areas to improve the liveability of these centres. Funding for these activities is provided through various government initiatives, such as 'Breathing Life into the Yarrowee' project, implementation of the '2012 Barwon River Parklands Strategy' and 'whole of water cycle management' initiatives for Ballarat and Geelong.
4. Activities associated with implementing other strategies and management plans (e.g. the Anglesea River Estuary Management Plan).

Table 5.1 – Estimated costs for delivery of the Corangamite Waterway Strategy (refer to individual landscape zone summaries below, to view priority waterways for each fund).

Activity	Description	Estimated cost (8-years)
On-ground waterway activities	Total for all on-ground activities costed within the regional work program (Part C).	$ 42,990,750
Community engagement and capacity building	Community participation in waterway management through programs such as Waterwatch and EstuaryWatch and Landcare.	$ 3,850,000[1]
Environmental water management program	Environmental water planning, management and delivery (including delivery of a current and investigation of new environmental water entitlements).	$ 2,620,000
Agricultural best management practice (Ag BMP)	Implementation of best practice management on grazing properties for water quality improvement (with a focus on ground cover and nutrient management).	$ 164,000[2]
Waterway (including estuary and wetland) investigations, planning and advice	Addressing knowledge gaps, planning and investigations (i.e. Barwon fish barrier assessment, estuary planning, review and development of new strategies and action plans).	$ 2,750,000
	Total 8-yr cost	**$ 52,374,750**

[1] Includes costs for Waterwatch and EstuaryWatch only based on current funding levels – does not include Landcare costs.
[2] Costs are for education and extension only (and exclude where links can be made with other Ag BMP programs, on ground trials and research).

Aire

Landscape Zone

Overview

The Aire landscape zone is located at the very southern point of the region with Gellibrand to its north and west, and the Otway Coast to its east. The principal river system in the region is the Aire River and its tributaries, which flows into the Southern Ocean through a series of wetlands, and the Aire River estuary to the west of Cape Otway.

Catchment basin:
Otway Coast

Major towns:
Beech Forest, Lavers Hill

Local municipality:
Colac Otway Shire

Notable features

Of particular significance to the area is the Aire River, being the only river in the Corangamite region listed under the *Heritage Rivers Act 1992*, and possessing important nature conservation, scenic, recreational and cultural values.

Additionally, the Great Otway National Park extends throughout the landscape zone and features rugged coastlines, sandy beaches, rock platforms and windswept heathland in the south. In the north, the park features tall forests, ferny gullies, magnificent waterfalls and tranquil lakes and is of significant environmental, cultural, social and economic value to the region.

Waterways

There are 989 km of rivers and streams in the landscape zone and many of these are good to excellent condition. The major waterway for this landscape zone is the Aire River.

A number of important wetlands occur along the coastal fringe near Hordern Vale west of Cape Otway and include Lake Costin, Lake Craven, Lake Calder and Lake Horden. Rivers such as the Elliot and Parker to the east of Cape Otway also retain high levels of naturalness.

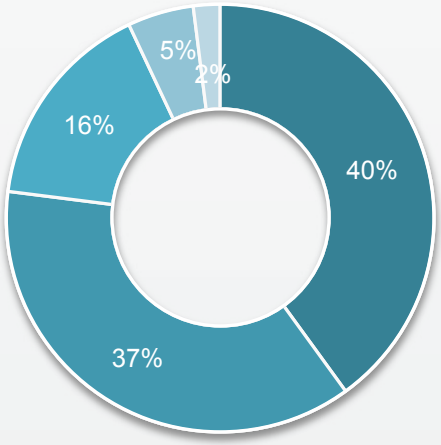
Community and their values

The Southern Otway Landcare Network provides support to the Hordern Vale and Glenaire Landcare groups. The Lavers Hill and District Progress Association are other groups operating in the area.

Some of the key waterway values identified by the Aire community during the development of the strategy include:

- strong historical connections with several generations accessing and utilising the waterways for agriculture
- numerous associated recreational activities including camping, fishing, hiking and game hunting
- support for biodiversity including many species of birds, remnant native vegetation and flagship species including platypus
- use of the waterways for supplying water to townships as well as access for stock.

Land use



- Forestry 40%
- Conservation 37%
- Grazing (non-dairy) 16%
- Dairy 5%
- Other 2%

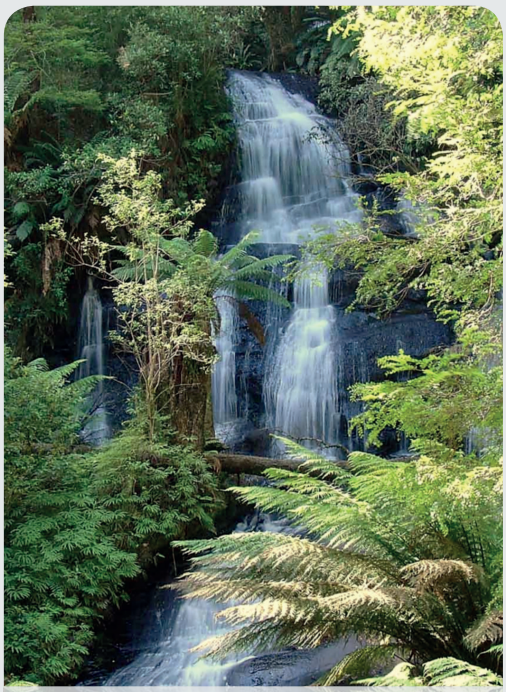
High value and priority waterways

High value and priority waterways are shown in Figure 5.2 for the Aire landscape zone. Ten of the 11 assessed river reaches, estuaries and wetlands have been identified as priorities. The goals that priority waterways align to are shown in Table 5.2.

Recent achievements

In 2010, through extensive consultation and planning, a 40 ha land parcel was purchased in the lower reaches of the Aire River. This land parcel included 2 km of river frontage and was transferred to the Crown and added to the Aire River Wildlife Reserve. The Southern Otways Landcare Network, Parks Victoria and the Corangamite CMA worked together to restore the site, which included 18 ha of riparian revegetation and 22 ha of wetland protection and regeneration.

Additionally, a population of the threatened Australian mudfish was recently discovered through an exploratory fish survey commissioned by the Corangamite CMA in the lower floodplain section of the Aire River. Results indicated that the species is likely present in patches throughout the Aire and Ford river floodplain in areas of suitable habitat.



Triplets Falls. Photo: Corangamite CMA

Values

The waterways in the Aire landscape zone are largely valued for their environmental condition and social amenity, with the Aire River listed as a Heritage River under the *Heritage Rivers Act 1992*.

Key values identified in the Aire landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- recreation, including camping, fishing, picnicking, sightseeing, walking tracks, game hunting and motor and non-motor boating
- areas of drought refuge.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

Parts of the Aire River and associated tributaries and wetlands have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce waterway quality through sedimentation and effluent contamination.

Willows *(Salix spp.)* are a Weed of National Significance[33] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat in reach 35-28 of the Aire River and in the longer term dispersal may compromise the condition of waterways lower down the river system.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands and estuary of the lower Aire River.

The Aire River estuary intermittently opens or closes depending on the prevailing conditions, e.g. freshwater flows, weather changes or tidal movements. Estuary closure can result in social and economic impacts through flooding of adjacent land. However, inundation is a natural process and has an important role in the life cycle of many species and the cycling of nutrients. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and its associated species. To address these impacts, a careful risk based approach needs to be taken to manage the Aire River estuary.

Full details of the threats to be addressed for priority waterways in the Aire landscape zone can be found in Part C – regional work program.

[33] *All Salix spp. except S. babylonica, S. X calodendron and S. X reichardtii.*

Table 5.2 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
35~26 – Ford River			✓	✓				
35~27 – Aire River			✓			✓		
35~28 – Aire River	✓					✓		
35~54 – Elliott River								✓
35~55 – Parker River								✓
35~56 – Aire River	✓					✓		
35~227 – Aire River	✓		✓	✓		✓		
50201 – Lake Horden						✓		
50203 – Lake Craven				✓		✓		
50205 – Lake Costin						✓		

Figure 5.2 – High value and priority waterways of the Aire landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Aire landscape zone are shown in Table 5.3. The detailed work program is outlined in Part C of this strategy.

Table 5.3 – Key management activities for waterways in the Aire landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	50201 – Lake Horden 50203 – Lake Craven 50205 – Lake Costin 35~227 – Aire River
Establish native indigenous vegetation	35~27, 35~227 – Aire River 50203 – Lake Craven 50205 – Lake Costin
Install riparian/wetland fencing	35~27, 35~227 – Aire River 50203 – Lake Craven 50205 – Lake Costin
Establish stewardship/management agreement	35~27, 35~227 – Aire River 50203 – Lake Craven 50205 – Lake Costin
Assess options for long-term management of land subject to inundation*	35~227 – Aire River
Review rural drainage management in line with government policy*	35~26 – Ford River 35~227 – Aire River
Undertake woody weed control	35~28 – Aire River
Implement a riparian land review*	35~56 – Aire River
Develop a management plan for the Aire estuary that incorporates a risk based approach to estuary openings*	35~227 – Aire River 50201 – Lake Horden 50203 – Lake Craven 50205 – Lake Costin
Conduct monitoring and maintenance to ensure that waterway remains in current condition*	35~54 – Elliott River 35~55 – Parker River
Investigate options to establish an EstuaryWatch group to collect baseline data on estuary condition*	35~227 – Aire River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$414,250***

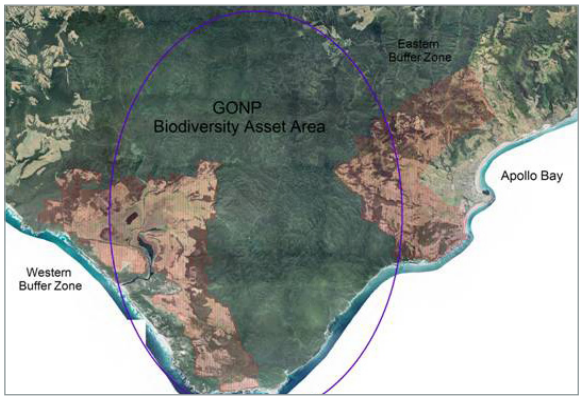
**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community also identified other waterways of local importance. Active local communities and groups continue to conduct work on these other waterways. An example includes work by the Southern Otway Landcare Network (SOLN) through the Greater Otway National Park weed buffer project. This significant pest plant project is being delivered in partnership with Parks Victoria and the Colac Otway Shire, with project funding provided by the Australian Government. The project commenced in July 2012 and has focused activities on identifying treatment sites, undertaking weed management activities and revegetating sites as appropriate.

Adopting an integrated catchment management approach, this project is designed to manage weeds on private land to protect and where possible enhance the natural environment of the Greater Otway National Park, while also improving farm productivity and waterway condition on local landholder properties in the Aire River region.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.



Designated Greater Otway National Park's Biodiversity Asset Area with weed buffer areas shown in red.
Source: SOLN website.

Bellarine

Landscape Zone

Overview

The Bellarine landscape zone encompasses the Bellarine Peninsula east of Geelong. It also includes a large portion of the southern suburbs of Geelong and the lower Barwon River. The area is renowned for its coastline and beaches and is a favourite holiday destination. Port Phillip and Corio bays provide the northern extremities while the southern coast faces onto the open waters of Bass Strait.

Catchment basin:
Barwon

Major towns:
Eastern and southern parts of Geelong, Drysdale, Queenscliff, Portarlington, Barwon Heads, Ocean Grove

Local municipalities:
City of Greater Geelong, Borough of Queenscliffe

Notable features

The Bellarine landscape zone contains a number of wetlands and lakes listed as wetlands of international significance under the Ramsar Convention as part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site.

The Bellarine area is also known for its stunning coastline, beautiful beaches and wineries, attracting large numbers of tourists annually with the population more than doubling in the warmer months.

Waterways

The major river in this landscape zone is the lower Barwon River, which is the main source of fresh water to the lower Barwon wetlands and estuary. Both the wetlands and estuary are significant features of the landscape and encompass a number of environmental, cultural, social and economic values.

The estuarine reach of the Barwon River incorporates a system of wetlands and lakes including Lake Connewarre, Reedy Lake, Hospital Swamp and Murtnaghurt Lagoon. These wetlands form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. They consist of a diverse range of aquatic vegetation communities, providing important feeding and breeding habitat for native fish and a number of wetland-dependent bird species, including the nationally vulnerable Australian painted snipe, and critically endangered orange-bellied parrot[34].

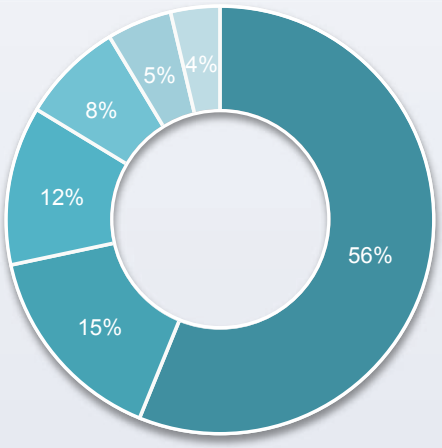
Community and their values

The Bellarine Catchment Network is a community driven initiative to protect and enhance the natural values of the Bellarine Peninsula. Thirteen community groups and seven agencies are represented on the network's committee. The network has achieved significant environmental and education outcomes for the Bellarine Peninsula.

There are also a number of active Waterwatch and EstuaryWatch volunteers operating within the Bellarine area.

[34] *Listed under the EPBC Act 1999*

Land use



- Grazing 56%
- Urban 15%
- Conservation* 12%
- Cropping 8%
- Peri Urban 5%
- Other 4%

*Approximate area of public land reserves including linear and coastal reserves

During the strategy's development, the Bellarine community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds of international significance
- spectacular scenery with intrinsic environmental value
- parks, picnic sites, lookouts, swimming areas, fishing and camping spots and walking tracks, such as the Bellarine Rail Trail
- a State Game Reserve, which supports a range of values including game hunting
- local waterways including Yarram and Frederick Mason Creeks, Mc Leods Waterholes and Lake Lorne, that support significant plants, animals and vegetation communities, as well as social and cultural values.

The region also includes the Barwon River Parklands and the urban reaches of the Barwon River through Geelong, which is highly valued for its environmental amenity and recreation, including rowing, water skiing, boating, walking tracks, kayaking and sightseeing.

Recent achievements

The tidal barrage near Reedy Lake impeded fish migration in the lower reaches of the Barwon River. In 2013, a vertical slot fishway was installed next to the tidal barrage, allowing unimpeded fish passage upstream for the first time in more than 100 years. Sixteen fish species have been recorded using the fishway, including the nationally threatened Australian grayling (Prototroctes maraena). It's estimated that two million fish used the fishway in the first 12 months after its installation.

In addition, the Corangamite CMA, in partnership with Parks Victoria and other members of the Lower Barwon Community Advisory Committee, continue to manage environmental water distribution in the Reedy Lake and Hospital Swamp complex. Work has included ecological monitoring, water delivery and infrastructure upgrades and maintenance.

Fishway being installed at Tidal Barrage. Photo: Corangamite CMA.

High value and priority waterways

High value and priority waterways are shown in Figure 5.3 for the Bellarine landscape zone. All nine of the assessed river reaches, estuaries and wetlands within the Bellarine landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.4.

Values

The waterways in the Bellarine landscape zone are largely valued for their environmental condition, with internationally significant wetlands scattered throughout the landscape. Key values identified within the Bellarine landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- significant amphibian species
- significant fish species
- recreation, including swimming, fishing, game hunting, picnicking, sightseeing, walking tracks and motor and non-motor boating
- areas of drought refuge.

Key threats

The population of the Bellarine Peninsula is expanding fast with residential developments occurring in most towns on the peninsula, and along the lower Barwon River corridor at Armstrong Creek. Urban growth has placed pressure on existing infrastructure and land use, with the potential for associated impacts to adversely affect the values of the area. Threats linked to urban development and increased recreational use includes stormwater run-off and degraded water quality, soil disturbance, bank erosion and degradation of native riparian and estuarine vegetation.

The management of the system has been altered since settlement, significantly changing the water regime, with the greatest impact at Reedy Lake and Hospital Swamps. One of many changes to the system was the result of constructing the weir at the lower breakwater in 1898, where the Barwon River discharges to Lake Connewarre, to raise the river level upstream and prevent the incursion of saline estuary water.

Parts of the lower Barwon River and associated tributaries and wetlands have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands and estuary of the lower Barwon River.

Spartina *(Spartina spp.)* has been identified as a threat in a number of wetlands in the landscape zone.

Spartina invades and alters plant communities, notably saltmarsh vegetation communities, with both species in Victoria known to be a very serious threat.

Full details of the threats to be addressed for priority waterways in the Bellarine landscape zone can be found in Part C – regional work program.

Table 5.4 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
33~02 – Barwon River	✓	✓	✓	✓	✓			
33~08 – Waurn Ponds Creek			✓					
54573 – Hospital Swamp				✓	✓	✓		
54577 – Reedy Lake			✓	✓	✓	✓		
54584 – Lake Connewarre				✓		✓		
54595 – Lake Murtnaghurt						✓		
56117 – Lake Victoria				✓				
56131 – Salt Lagoon				✓				
33~201 – Barwon River	✓			✓		✓		

Figure 5.3 – High value and priority waterways in the Bellarine landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Bellarine landscape zone are shown in Table 5.5. The detailed work program is outlined in Part C of this strategy.

Table 5.5 – Key management activities for waterways in the Bellarine landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	33~02 – Barwon River 54573 – Hospital Swamp 54577 – Reedy Lake 54584 – Lake Connewarre 54595 – Lake Murtnaghurt
Establish native indigenous vegetation	33~02 – Barwon River 33~08 – Waurn Ponds Creek
Install riparian/wetland fencing	33~02 – Barwon River 33~08 – Waurn Ponds Creek 54573 – Hospital Swamp 54595 – Lake Murtnaghurt 56117 – Lake Victoria
Establish stewardship/management agreement	33~02 – Barwon River 33~08 – Waurn Ponds Creek 54573 – Hospital Swamp 54595 – Lake Murtnaghurt 56117 – Lake Victoria
Implement best management practice on grazing properties*	54577 – Reedy Lake
Ensure acid sulfate soils are considered in land use planning, works on waterways and water management decisions*	54573 – Hospital Swamp 54577 – Reedy Lake 54584 – Lake Connewarre
Undertake non-woody weed control – spartina*	54584 – Lake Connewarre 56131 – Salt Lagoon 33~201 – Barwon River
Deliver water to wetlands as per current entitlement (in consultation with the community and informed by the best available information) and develop long-term planning for environmental watering of the lower Barwon wetlands (EWMP)*	33~201 – Barwon River 54577 – Reedy Lake 54573 – Hospital Swamp
Investigate freshwater flows from adjoining land use*	54595 – Lake Murtnaghurt
Establish estuarine vegetation management plan	33~201 – Barwon River
Undertake an assessment of instream habitat (large wood) density*	33~02, 33~201 – Barwon River
Investigate and manage tidal barrage structural integrity*	33~02 – Barwon River
Implement the Barwon River Parklands Strategy for management of the lower Barwon River corridor*	33~02, 33~201 – Barwon River
Adopt 'whole of water cycle management' principles for new and existing developments	33~02, 33~201 – Barwon River
Fill knowledge gaps relating to impacts of water management at Reedy Lake and Hospital Swamp*	54577 – Reedy Lake 54573 – Hospital Swamp
Investigate and manage urban stormwater/water quality impacts*	33~02, 33~201 – Barwon River 54573 – Hospital Swamp 54577 – Reedy Lake 54584 – Lake Connewarre
Maintain EstuaryWatch groups collecting baseline data on estuary condition*	33~201 – Barwon River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$678,000**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community has identified other waterways such as Lakers Cutting, Freshwater Lake, Sand Island Lagoon, Yarram, Briggs and Frederick Mason creeks, McLeods Waterholes, Lake Lorne and coastal wetlands as important during the development of this strategy.

In the Bellarine region, a number of creeks and wetlands are directly linked, through outflows or tidal inundation, to Port Phillip and Corio bays. In September 2013, a number of opportunities and corresponding actions were identified through a workshop for implementing the Cleaner Yarra and Port Phillip Bay Action Plan in the Corangamite region, including the Bellarine area. Further detail is provided in Section 3.4.6 and Appendix F.

There are also a number of waterways, including Yarram and Frederick Mason creeks, that flow into and have the potential to impact the Ramsar listed Swan Bay. These waterways are not directly assessed through this strategy though will be considered through separate Ramsar site management plans aimed at maintaining the ecological character of Swan Bay. These are also good examples of other waterways that could be considered for adding into future waterway strategies (refer Section 7.5).

Active local communities and groups continue to conduct work on these other waterways. An example includes the ongoing work undertaken by the landholders and the Bellarine Landcare Group and Catchment Network on Yarram Creek, which is a small tributary flowing into Swan Bay. This work has involved significant effort from landholders preparing the site for subsequent fencing and revegetation.

The Bellarine Catchment Network's Yarram Creek protection enhancement project funded this work with support provided by the City of Greater Geelong.

Additional examples of work by local communities include:

- An environmental education program for the Bonnyvale wetlands. This program is being run through the Bellarine Catchment Network with the purpose of educating the community on the environmental issues within the wetlands.
- The Bellarine Ark 2 Project – this project focuses on the control of foxes and feral cats on the Bellarine Peninsula in an attempt to reduce their impact on indigenous wildlife in and around the Ramsar wetlands of Swan Bay and Lake Connewarre, including their tributaries. The project is Australian Government funded and managed by the Bellarine Landcare Group.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Below: Students from Our Lady Star of the Sea Primary School in Ocean Grove involved in the Bonnyvale wetlands environmental education program. Photo: Matt Crawley

Curdies

Landscape Zone

Overview

The Curdies landscape zone is located in the south-west corner of the region on the western edge of the Otway Ranges. It stretches from Port Campbell in the south nearly to Camperdown in the north at the headwaters at the Curdies River at Lake Purrumbete. The coastline along much of the Curdies landscape zone is known for its spectacular scenery and natural assets. The zone also forms part of one of the largest milk producing regions in Australia.

The Curdies River and its tributaries feed into the Curdies estuary near Peterborough.

Catchment basin:
Otway Coast

Major towns:
Cobden, Port Campbell, Timboon, Peterborough

Local municipalities:
Corangamite Shire, Moyne Shire

Notable features

This landscape zone is internationally renowned for its coastline, which has been sculpted over thousands of years to become one of the most impressive natural sites in Australia. Rock stacks, sheer limestone cliffs, as well as arches, islands and blowholes have been carved out of the soft cliffs by the wind and sea.

The Twelve Apostles, Loch Ard Gorge, Bay of Islands Coastal Park, Shipwreck Coast and Port Campbell National Park are all in this zone.

Parts of the Great Otway National Park also extend throughout this landscape zone and are of significant environmental, cultural, social and economic value to the region.

Waterways

There are 1,891 km of rivers and streams in the landscape zone and many of these are small or intermittent and have not been assessed in developing this strategy. The major waterway for this landscape zone is the Curdies River and associated tributaries.

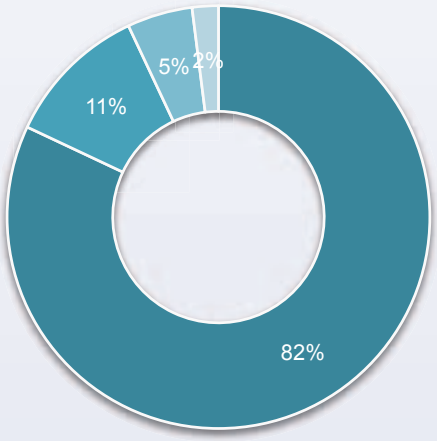
Other significant waterways in the area include Port Campbell Creek and Sherbrook River.

In total, there are 93 wetlands in this landscape zone making up 1.3% of the total area.

Community and their values

The local Landcare network is the Heytesbury and District Landcare Network and comprises Landcare groups for Bostocks Creek Catchment, Cooriemungle, Curdies Valley, Brucknell Creek and Newfield Valley. There are also active Waterwatch and EstuaryWatch members in the Curdies area.

Land use



- Dairying 82%
- Non-dairy grazing 11%
- Conservation 5%
- Other 2%

During development of this strategy the Curdies community identified some of the key values their waterways provide, which include:

- supporting biodiversity including many species of fish and birds, remnant native vegetation and flagship species including platypus
- numerous opportunities for recreation including picnic sites, swimming holes, camping, fishing, boating, kayaking and canoeing
- local history with many sites of historical significance to the region
- use of the waterways for supplying water to townships as well as access for stock.

High value and priority waterways

High value and priority waterways are shown in Figure 5.4 for the Curdies landscape zone. Four of the 12 assessed river reaches, estuaries and wetlands within the Curdies landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.6.

Recent achievements

In the Curdies catchment, 65 km of river frontage has been protected over the past 10 years. This work has included exclusion fencing, erosion control, revegetation and woody weed removal.

The Corangamite CMA has worked closely with the Heytesbury and District Landcare Network (HDLN) to deliver on-ground activities, and provide support and advice in the community.

A key achievement was the development of the Heytesbury Working Group, which was formed by field staff representing HDLN, CMA, DEPI and Corangamite Shire. During the group's active period Corangamite CMA's river health achievements doubled compared to previous years.

Fencing off and revegetating Curdies Inlet. Photo: Corangamite CMA

Values

The waterways in the Curdies landscape zone are largely valued for their environmental condition, social amenity and economic value to the community. Key values identified in the landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- rural water source
- aquatic invertebrate communities
- recreation including camping, picnics and barbecues, sightseeing, game hunting, boating, fishing, swimming and walking tracks.

Key threats

Parts of the Curdies River and associated tributaries and estuary have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Willows *(Salix spp.)* are a Weed of National Significance[35] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat in the upper reaches of the Curdies River and in the longer term dispersal may compromise the condition of downstream reaches of the river system.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands and estuary of the lower Curdies River.

The Curdies River estuary intermittently opens or closes depending on the prevailing conditions, e.g. freshwater flows, changes in weather or tidal movements. Estuary closure can result in social and economic impacts through flooding of adjacent land. However, inundation is a natural process and plays an important role in the life cycle of many species and the cycling of nutrients. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and its associated species.

To address these impacts, a careful risk based approach needs to be taken to manage the Curdies River estuary.

Full details of the threats to be addressed for priority waterways in the Curdies landscape zone can be found in Part C.

[35] *All Salix spp. except S.babylonica, S. X calodendron and S. X reichardtii*

Table 5.6 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
35~02 – Curdies River		✓	✓	✓				
35~04 – Curdies River		✓						
35~201 – Curdies Inlet	✓			✓				
35~211 – Port Campbell Creek	✓			✓				

Figure 5.4 – High value and priority waterways in the Curdies landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Curdies landscape zone are shown in Table 5.7. The detailed work program is outlined in Part C of this strategy.

Table 5.7 – Key management activities for waterways in the Curdies landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	35~201 – Curdies Inlet
Establish native indigenous vegetation	35~02, 35~04 – Curdies River 35~201 – Curdies Inlet 35~211 – Port Campbell Creek
Install riparian fencing	35~02, 35~04 – Curdies River 35~201 – Curdies Inlet 35~211 – Port Campbell Creek
Establish stewardship/management agreement	35~02, 35~04 – Curdies River 35~201 – Curdies Inlet 35~211 – Port Campbell Creek
Assess options for long-term management land subject to inundation*	35~201 – Curdies Inlet
Undertake woody weed control	35~02, 35~04 – Curdies River
Continue to adopt a risk based approach to estuary mouth opening*	35~201 – Curdies Inlet
Review and update current estuary management plan*	35~201 – Curdies Inlet
Maintain EstuaryWatch groups collecting baseline data on estuary condition*	35~201 – Curdies Inlet
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$ 1,586,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Cooriemungle, Scotts, Fentons, Wallaby, Spring, Squirrel, Whisky and Mosquito creeks as well as Lake Purrumbete as important during the development of this strategy. For example Lake Purrumbete was identified as an important waterbody for recreational fishing (refer Section 3.4.1).

Active local communities and groups continue to conduct work on these other waterways. An example includes projects managed through the Heytesbury District Landcare Network aimed at soil acidification and reduced organic material and the promotion of increased biodiversity on public and private land. A large component of the activities completed as part of these initiatives has involved fencing off, revegetating and controlling weeds on a number of waterways in the Curdies landscape zone to improve their condition.

In addition, the Newfield Valley Landcare Group has completed work on the upper reaches of Port Campbell Creek. This work was funded through the Victorian Government Communities for Nature Grants program and supported by the Heytesbury and District Landcare Network and the local community.

Activities either undertaken or planned include the assessment of water quality, habitat elements, fencing to exclude livestock, removal of weeds including blackberry and willow and planting and revegetating to reinstate known EVCs along sections of the creek in the Newfield area.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Port Campbell Creek after willow removal.
Source: HDLN Geoff Rollinson.

Gellibrand

Landscape Zone

Overview

The Gellibrand landscape zone is located in the southern part of the region to the west of Cape Otway. It includes the towns of Gellibrand and Lavers Hill, and the coastal towns of Princetown in the west and Johanna at its eastern extremity. The Gellibrand River and its tributaries are the main river system in this area, which discharges into the Southern Ocean through a series of wetlands and its estuary.

Catchment basin:
Otway Coast

Major towns:
Princetown, Lavers Hill, Johanna

Local municipalities:
Colac Otway Shire, Corangamite Shire

Notable features

The zone is known for its spectacular coastline, which is part of the Shipwreck Coast, including sites such as Wreck Beach at Moonlight Head, where the anchors of the Marie Gabrielle and the Fiji can be seen at low tide.

This area includes a part of the Great Ocean Walk as well as the Great Otway National Park, which provides significant environmental, cultural, social and economic value to the region.

Waterways

There are 3,107 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams which have not been assessed in developing this strategy. The major waterway for this landscape zone is the Gellibrand River and associated tributaries.

In total, there are 47 wetlands in the landscape zone making up 0.3% of the total area, with the coastal wetlands of the lower Gellibrand River of particular significance.

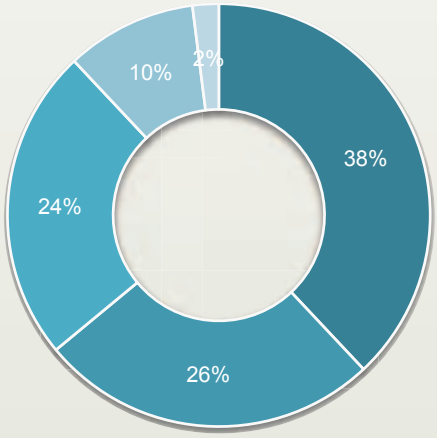
Community and their values

The local Landcare network is the Heytesbury and District Landcare Network, which supports the Princetown and Beech Forrest Fergusson Landcare groups. Waterwatch and EstuaryWatch members are also active in the Gellibrand landscape zone.

During the development of this strategy the Gellibrand community identified some key values their waterways provide, which include:

- support for biodiversity including many species of fish (including black fish) and birds, remnant native vegetation and flagship species including platypus
- numerous opportunities for recreation including picnic sites, swimming holes, camping, fishing, boating, holiday retreats, kayaking and canoeing
- local history with many sites of historical significance to the region including known Aboriginal artefacts

Land use



- Forestry 38%
- Conservation 26%
- Dairying 24%
- Non-dairy grazing 10%
- Other 2%

- consistent usage of the waterways across the landscape for stock watering and other agricultural activities, domestic use, as well as fire fighting and prevention.

High value and priority waterways

High value and priority waterways are shown in Figure 5.5 for the Gellibrand landscape zone. All 17 of the assessed river reaches, estuaries and wetlands within the Gellibrand landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.8.

Values

The upper Gellibrand River, its associated tributaries and water storages form part of a 'Special Water Supply Catchment' and are a source for urban and rural township water (including Warrnambool, Camperdown and other smaller towns in the South West). Other values identified include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- drought refuge
- rural and urban water source
- aquatic invertebrate communities
- recreation including camping, picnics and barbecues, sightseeing, game hunting, boating, fishing, swimming and walking tracks.

Key threats

Parts of the Gellibrand River and associated tributaries and estuary have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination, which can also impact on potable water supplies within the Gellibrand Special Water Supply Catchment.

Willows *(Salix spp.)* are a Weed of National Significance[36] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat in the upper reaches of the Gellibrand River and in the longer term dispersal may compromise the condition of waterways lower down the river system.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands and estuary of the lower Gellibrand River.

It was identified through the *2011 Western Region Sustainable Water Strategy* (SWS) that water extraction from the Gellibrand River for water supply purposes has the capacity to reduce flows over the summer months impacting on the health of the river. Other year round extraction for stock and domestic use also impact flows along the Gellibrand River.

The Gellibrand River estuary intermittently opens or closes depending on the prevailing conditions, e.g. freshwater flows, weather changes or tidal movements. Estuary closure can result in social and economic impacts through flooding of adjacent land. However, inundation is a natural process and has an important role in the life cycle of many species and the cycling of nutrients. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and species that live there. To address these impacts, a careful risk based approach needs to be taken to manage the Gellibrand River estuary.

Full details of the threats to be addressed for priority waterways in the Gellibrand landscape zone can be found in Part C – regional work program.

Recent achievements

The Corangamite CMA continues to work with landholders, the Heytesbury District Landcare Network, the Kennedy's Creek Catchment and Princetown Landcare Groups, Wannon Water, and local community groups to achieve positive waterway health outcomes for the Gellibrand landscape zone.

In recent times, more than 75 km of river frontage has been fenced off and revegetated, with willows being removed from over 80 km of river frontage. Much of this work aims to improve water quality in Wannon Water's off take reaches, and to this end Wannon Water has contributed $250,000 toward waterway projects from 2008-2013.

Gellibrand River. Photo: Corangamite CMA

[36] *All Salix spp. except S. babylonica, S. X calodendron and S. X reichardtii*

Table 5.8 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
35~13 – Gellibrand River		✓	✓					
35~14 – Gellibrand River		✓	✓					
35~15 – Gellibrand River	✓	✓						
35~16 – Gellibrand River	✓	✓						
35~17 – Kennedys Creek		✓		✓				
35~18 – Kennedys Creek				✓				
35~19 – Chapple Creek		✓						
35~20 – Sandy Creek		✓						
35~21 – Carlisle River		✓						
35~22 – Gum Gully Creek		✓						
35~23 – Lardner Creek		✓						
35~24 – Love Creek		✓		✓				
35~25 – Love Creek		✓		✓				
50211 – Princetown wetlands				✓		✓		
50212 – Princetown wetlands				✓		✓		
51903 – West Gellibrand Dam		✓						
35~212 – Gellibrand River	✓			✓		✓		

Above: Gellibrand Estuary. Photo: Judy Spafford

Figure 5.5 – High value and priority waterways in the Gellibrand landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Gellibrand landscape zone are shown in Table 5.9. The detailed work program is outlined in Part C of this strategy.

Table 5.9 – Key management activities for waterways within the Gellibrand landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	50211, 50212 – Princetown wetlands 35~212 – Gellibrand River
Establish native indigenous vegetation	35~14, 35~15, 35~16, 35~212 – Gellibrand River 35~17 – Kennedys Creek 35~19 – Chapple Creek 35~24, 35~25 – Love Creek 50211, 50212 – Princetown wetlands
Install riparian/wetland fencing	35~13, 35~14, 35~15, 35~16, 35~212 – Gellibrand River 35~17 – Kennedys Creek 35~19 – Chapple Creek 35~24, 35~25 – Love Creek 50211, 50212 – Princetown wetlands
Establish stewardship/management agreement	35~13, 35~14, 35~15, 35~16, 35~212 – Gellibrand River 35~17 – Kennedys Creek 35~19 – Chapple Creek 35~24, 35~25 – Love Creek 50211, 50212 – Princetown wetlands
Assess options for long-term management of land subject to inundation*	35~212 – Gellibrand River
Undertake woody weed control	35~14, 35~15, 35~16 – Gellibrand River 35~17 – Kennedys Creek 35~19 – Chapple Creek 35~24, 35~25 – Love Creek
Continue to adopt a risk based approach to estuary mouth opening*	50211, 50212 – Princetown wetlands 35~212 – Gellibrand River
Investigate sediment sources and sinks – particularly in Upper Gellibrand (including Love and Lardner catchments)*	35~15 – Gellibrand River
Establish a Gellibrand estuary management plan that includes estuarine vegetation*	35~212 – Gellibrand River
Investigate options to address summer low flow shortfalls – as identified under the *Western Region Sustainable Water Strategy**	35-212, 35-13, 35-14 – Gellibrand River
Investigate impacts to environmental flows throughout the broader Otway Coast catchment basin to secure and better manage environmental water where required*	35~14, 35~15, 35~16, 35~212 – Gellibrand River
Investigate and reinstate recreational native fish habitat*	35~14, 35~15, 35~16, 35~212 – Gellibrand River
Conduct monitoring and maintenance to ensure that waterway remains in current condition*	35~18 – Kennedys Creek, 35~20 – Sandy Creek, 35~21 – Carlisle River, 35~22 – Gum Gully Creek, 35~23 – Lardner Creek

- Continued over page

Table 5.9 – Key management activities for waterways within the Gellibrand landscape zone (continued)

Management Activity	Waterways
Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate*	51903 – West Gellibrand Reservoir
Maintain EstuaryWatch groups collecting baseline data on estuary condition*	35~212 – Gellibrand River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$4,324,000**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Ten Mile, Latrobe, Charley's and Yahoo creeks, Maggio's Swamp and Porcupine Wetlands as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes activities undertaken by Land and Water Resources Otway Catchment (LAWROC) implementing the Gellibrand Waterways Biolink Enhancement project. This project includes the fencing and revegetation of five sites on local waterways for the improvement of habitat for three species of possum, and also for reducing sediment and other pollutants in our waterways.

A total of 8,000 trees will be planted. This project is funded through grants from the Corangamite CMA, Landcare Australia and the Department of Families, Housing, Community Services and Indigenous Affairs.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Hovells

Landscape Zone

Overview

The Hovells landscape zone is located north-east of Geelong and forms part of the eastern most border of the Corangamite CMA region. The principle river system in the region is Hovells Creek, which traverses the township of Lara and flows into Corio Bay via Limeburners Lagoon.

Notable features

The Hovells landscape zone contains a number of wetlands, including Limeburners Lagoon, which form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. Serendip Sanctuary is also known for its wetlands and diverse birdlife and animals that frequent the sanctuary.

In addition, the Wurdi Youang (You Yangs) Regional Park is located in the north of the landscape zone and is of significant environmental, cultural and social importance, attracting a large number of visitors annually.

Waterways

There are 251 km of rivers and streams in the landscape zone. Many of these are minor or impermanent streams and have not been assessed in developing this strategy. The major waterway for this landscape zone is Hovells Creek and associated tributaries.

In total, there are 44 wetlands in the landscape zone making up 3% of the total area. Hovells landscape zone incorporates a system of coastal wetlands near Point Lillias and Point Wilson and the Limeburners Lagoon State Nature Reserve. These sites are part of the internationally significant Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. They consist of a diverse range of aquatic vegetation communities, providing important feeding and breeding habitat for amphibians and a number of wetland-dependent bird species, including the endangered fairy tern *(Sternula nereis nereis)* and little egret *(Egretta garzetta nigripes)*, and the vulnerable eastern great egret *(Ardea modesta)* and royal spoonbill *(Platalea regia)*[37].

Community and their values

The Geelong Landcare Network supports Landcare activities in the Hovells landscape zone, which includes Avalon, Brisbane Ranges and Corio Landcare groups. They also support the Anakie Tree Planting Group.

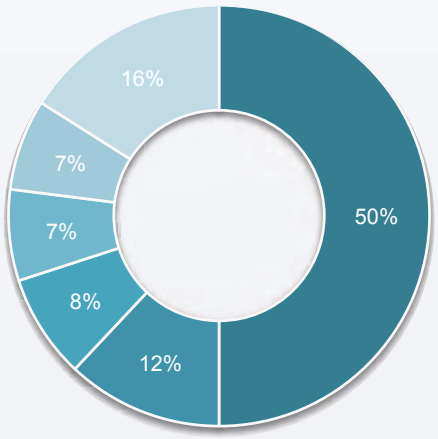
[37] *Listed under the Advisory List of Threatened Vertebrate Fauna in Victoria (DEPI, 2013)*

Catchment basin:
Moorabool

Major towns:
Parts of northern Geelong, Lara

Local municipality:
City of Greater Geelong

Land use



- Grazing 50%
- Urban development 12%
- Conservation 8%
- Peri Urban 7%
- Cropping 7%
- Other 16%

During the development of this strategy, the community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds and remnant native vegetation
- open wetlands and lagoons, which produce spectacular scenery with intrinsic environmental value, and its waterways that include a number of boardwalks and walking trails to enjoy a natural setting
- numerous opportunities for recreation including picnic sites, walking trails, fishing, kayaking, boating, rock-climbing and abseiling.

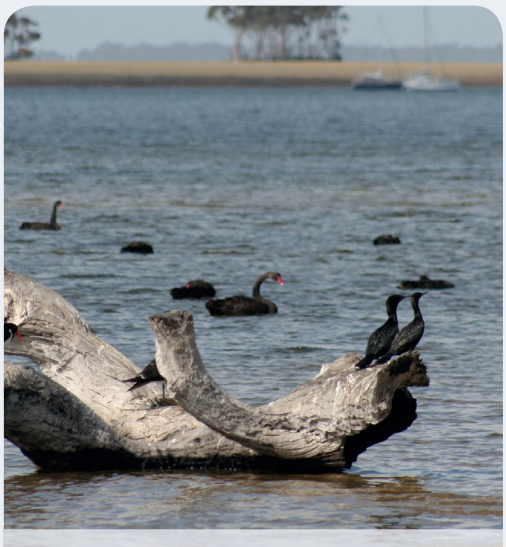
High value and priority waterways

High value and priority waterways are shown in Figure 5.6 for the Hovells landscape zone. All three of the assessed river reaches and estuary within the Hovells landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.10.

Limeburners Bay

In recognition of its high conservation values and internationally recognised significance under the Ramsar Convention, the City of Greater Geelong completed the Limeburners Bay Management Plan.

The key principles of this plan are to improve community knowledge, understanding and opportunities for Limeburners Bay, to protect its biodiversity and other natural values and to ensure ongoing monitoring and regular review of the plan and its implementation.



Limeburners Lagoon
Photo: Corangamite CMA

Values

The waterways in the Hovells landscape zone are largely valued for their environmental condition and social amenity, with the internationally significant wetlands in the coastal areas providing key habitat and breeding grounds for birds and amphibians as well as numerous recreational opportunities. Key values identified in the Hovells landscape zone include:

- known rare and threatened species
- significant bird and amphibian species and important bird habitat
- recreation, including picnicking, walking tracks and boating.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

Parts of Hovells Creek and associated tributaries and wetlands have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Disturbance to migratory shorebirds from recreational activities is a key threat to shorebirds in and around Limeburners Lagoon and along coastal wetlands.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands and lagoon of the lower parts of Hovells Creek.

Additional threats to the waterways of the area include reduced vegetation width and riparian connectivity; degraded riparian and estuarine vegetation; reduced estuary extent, bed instability and degradation; change in the flow regime and barriers to fish passage. Invasive flora are present, including boxthorn and in some areas, heavy serrated tussock infestations.

There is also potential for increased impacts to water quality in Hovells Creek via stormwater run-off and increased recreational use, from urban expansion around Lara.

Full details of the threats to be addressed for priority waterways in the Hovells landscape zone can be found in Part C – regional work program.

Table 5.10 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
32~15 – Hovells Creek				✓				
32~16 – Hovells Creek				✓				
32~215 – Limeburners Lagoon	✓			✓		✓		

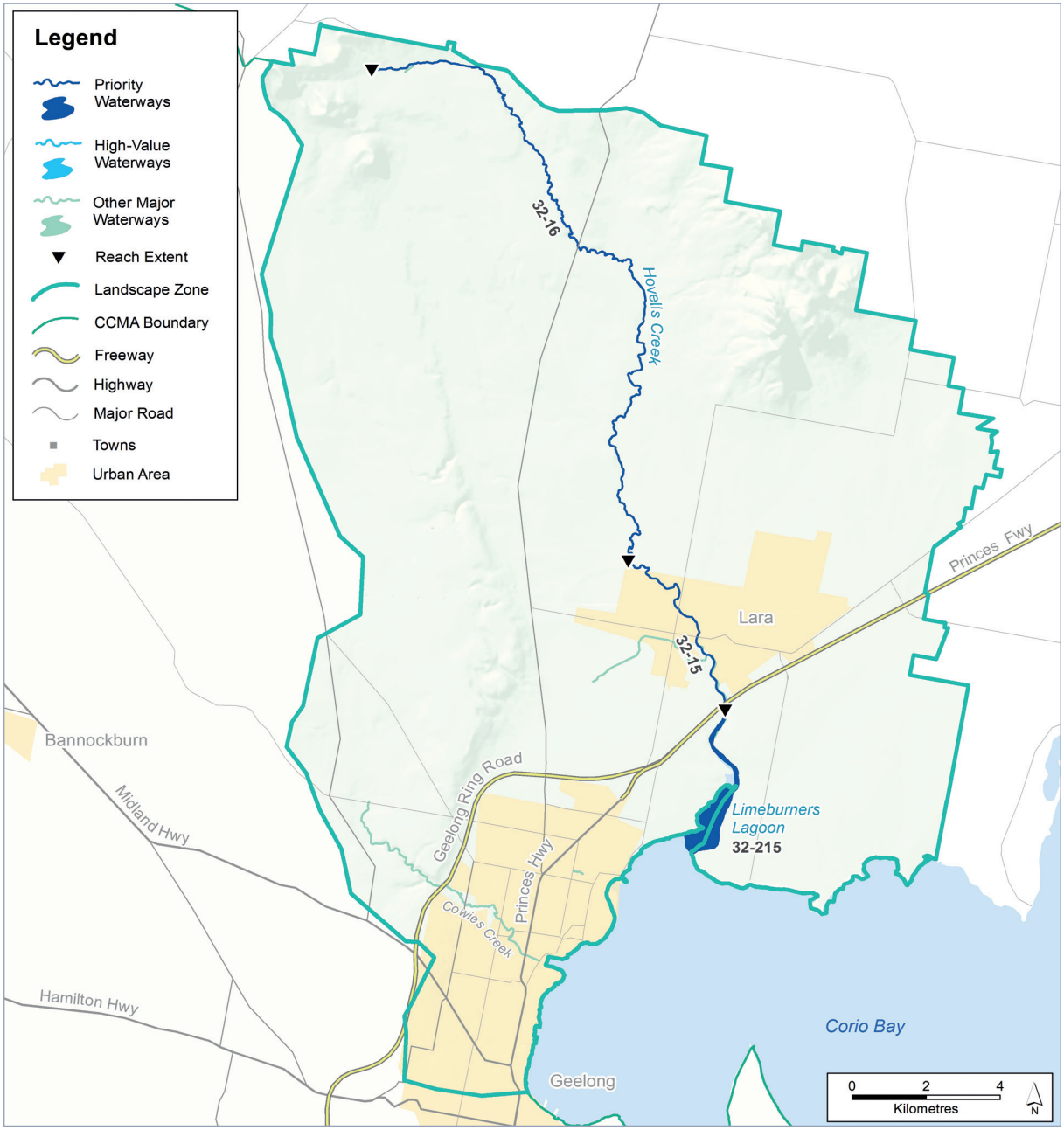


Figure 5.6 – High value and priority waterways in the Hovells landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Hovells landscape zone are shown in Table 5.11. The detailed work program is outlined in Part C of this strategy.

Table 5.11 – Key management activities for waterways in the Hovells landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	32~15 – Hovells Creek 32~215 – Limeburners Lagoon
Establish native indigenous vegetation	32~15, 32~16 – Hovells Creek 32~215 – Limeburners Lagoon
Install riparian/wetland fencing	32~15, 32~16 – Hovells Creek 32~215 – Limeburners Lagoon
Establish stewardship/management agreement	32~15, 32~16 – Hovells Creek 32~215 – Limeburners Lagoon
Undertake non-woody weed control	32~215 – Limeburners Lagoon
Implement best management practice on grazing properties*	32~16 – Hovells Creek
Investigate options for and management of weir under Old Melbourne Road*	32~215 – Limeburners Lagoon
Investigate and manage urban stormwater/water quality impacts*	32~15, 32~16 – Hovells Creek 32~215 – Limeburners Lagoon
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$805,600**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

In the Hovells region, a number of creeks and wetlands are directly linked, through outflows or tidal inundation, to Port Phillip and Corio bays. In September 2013, a number of opportunities and corresponding activities were identified through a workshop for implementing the Cleaner Yarra and Port Phillip Bay Action Plan in the Corangamite region; including the Bellarine area (further detail is provided in Section 3.4.6 and Appendix F).

Active local communities and groups continue to conduct work on these other waterways. An example includes Lake Serendip, which comprises a chain of lakes and wetlands within Serendip Sanctuary that flow into Hovells Creek near Lara and ultimately into Limeburners Lagoon and Corio Bay.

The sanctuary, managed by Parks Victoria, is known for its birdlife, with over 150 species of birds, which breed at or visit Serendip Sanctuary including brolga, whistling kite, yellow-billed spoonbill and tawny frogmouth. The wetlands are a significant drought refuge for wildlife as well as a stronghold for significant EVCs within the region containing remnant open grassy woodland and wetland vegetation.

Local community groups and members often volunteer their time to help revegatate the sanctuary.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Above: Royal spoonbills. Photo: Corangamite CMA

Leigh

Landscape Zone

Overview

The Leigh landscape zone is located between the Woady Yaloak and Moorabool landscape zones and stretches from Ballarat in the north to Inverleigh in the south.

The Yarrowee-Leigh river system is the principle source of water for the area and feeds into the Barwon River at Inverleigh.

Catchment basin:
Barwon

Major towns:
Ballarat, Inverleigh

Local municipalities:
Golden Plains Shire,
City of Ballarat

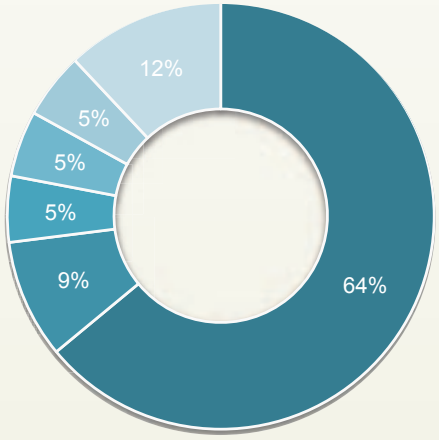
Notable features

Ballarat and the region have a rich gold mining history which includes the gold rush period during the mid-to-late 1800s. This gold rush, while notable in the colonial history of Victoria, also had a major impact on the health of the Yarrowee and Leigh rivers. Part of the Yarrowee River flows through Ballarat's central business district and was placed underground through a bluestone-lined channel.

Of particular local significance for their environmental values are the gorges extending along parts of the Leigh River. Due to the gorge's steep escarpments they remain largely non-arable, protecting bands of remnant vegetation and providing important corridors of habitat for wildlife.

Lake Wendouree, which is on the Directory of Important Wetlands in Australia, is also a significant recreational lake for locals and visitors alike, having hosted international level rowing, fishing and yachting events.

Land use



- Grazing 64%
- Forestry 9%
- Urban 5%
- Conservation 5%
- Peri Urban 5%
- Other 12%

Waterways

There are 1,689 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams, which have not been assessed in developing this strategy. The major waterway for this landscape zone is the Yarrowee-Leigh River.

There are 74 wetlands in the landscape zone, which make up 0.8% of the total area. Significant water bodies include Lake Wendouree as well as White Swan and Gong Gong reservoirs, which supply water to the city of Ballarat and surrounding communities.

Community and their values

The Landcare Network in the zone is the Leigh Catchment Group, which supports the Grenville, Napoleons/Enfield, Ross Creek, Upper Williamsons Creek, Wattle Flat-Pootilla, Garibaldi and Leigh Districts Landcare groups. There are also active Waterwatch members in the Leigh area.

During the strategy's development, the Leigh community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds, remnant native vegetation and flagship species including platypus

- confined valleys with spectacular scenery with intrinsic environmental value, and its associated reaches that include parks, picnic sites, lookouts, swimming holes, fishing and camping spots and historic bridges
- numerous opportunities for recreation including picnic sites, swimming holes, camping, fishing, rowing and kayaking
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

Recent achievements

The Victorian Government has invested $1 million in the Yarrowee River to improve its environmental and amenity values. Corangamite CMA in partnership with the City of Ballarat and the Leigh Catchment Group are delivering the project.

The three year project commenced delivery in 2013 and includes a series of actions and activities to improve the health of the Yarrowee River through Ballarat.

The Leigh River. Photo: Alison Pouliot

High value and priority waterways

High value and priority waterways are shown in Figure 5.7 for the Leigh landscape zone. Six of the 11 assessed river reaches and wetlands within the Leigh landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.12.

Values

The Yarrowee-Leigh River system contains a number of water storages and is a source for urban and rural township water for Ballarat and a number of surrounding towns. Other values identified include:

- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- recreation, including picnicking, sightseeing, walking tracks and non-motor boating.

Key threats

The Yarrowee-Leigh River system is a highly modified and regulated waterway with parts of the upper reaches traversing urban landscapes through Ballarat as well as containing water storages for urban and rural use.

Flow deviation through major headworks to supply urban water has altered both the quantity and quality of natural flows. Additionally, the Leigh River system is a major tributary to the Barwon River. As such, its changed flow regimes can impact the health of the lower Barwon River, including Lake Connewarre and Reedy Lake. Stormwater run-off has also been identified as a threat to the downstream sections of the waterway and has been a focus of the draft whole-of-water-cycle strategic framework for Ballarat *– Help shape our water future - Ballarat and region.*

Much of the Leigh River and associated tributaries have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Willows *(Salix spp.)* are a Weed of National Significance[38] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat on the Yarrowee River and Williamson Creek.

Full details of the threats to be addressed for priority waterways in the Leigh landscape zone can be found in Part C – regional work program.

[38] *All Salix spp. except S. babylonica, S. X calodendron and S. X reichardtii.*

Table 5.12 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
33~11 – Leigh River		✓						
33~14 – Yarrowee River		✓						
33~16 – Williamsons Creek		✓						
54038 – Lake Wendouree	✓			✓		✓		
54116 – White Swan Reservoir		✓						✓
54124 – Gong Gong Reservoir		✓						

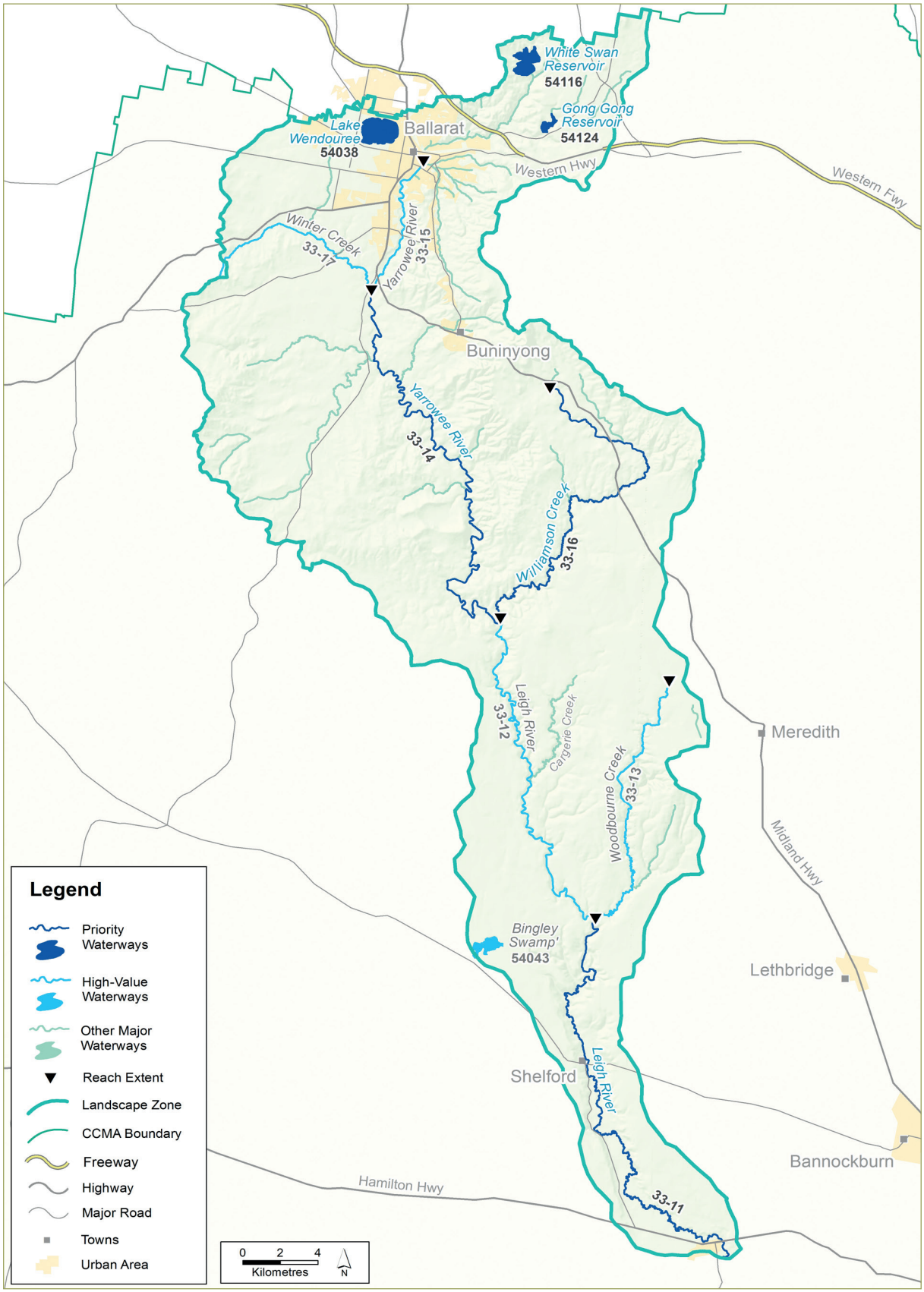


Figure 5.7 – High value and priority waterways in the Leigh landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Leigh landscape zone are shown in Table 5.13. The detailed work program is outlined in Part C of this strategy.

Table 5.13 – Key management activities for waterways within the Leigh landscape zone

Management Activity	Waterways
Establish native indigenous vegetation	33~11 – Leigh River 33~14 – Yarrowee River 33~16 – Williamson Creek
Install riparian fencing	33~11 – Leigh River 33~14 – Yarrowee River 33~16 – Williamson Creek
Establish stewardship/management agreement	33~11 – Leigh River 33~14 – Yarrowee River 33~16 – Williamson Creek
Implement best management practice on grazing properties*	33~14 – Yarrowee River
Undertake woody weed control	33~14 – Yarrowee River 33~16 – Williamson Creek 54038 – Lake Wendouree
Maintain the function of an urban wetland	54038 – Lake Wendouree
Maintain the discharge into the Yarrowee Leigh from South Ballarat Treatment Plant as a beneficial environmental use – as per the *Central Region Sustainable Water Strategy*, and examine opportunities to better replicate natural flow regimes*	33~11 – Leigh River 33~14 – Yarrowee River
Adopt whole of water cycle management principles to reduce the impact of stormwater run-off on the health of Yarrowee Leigh and downstream waterways*	33~14 – Yarrowee River
Enhance the upstream reach in line with the Breathing Life back into the Yarrowee Project*	33~14 – Yarrowee River 33~15 – Yarrowee River
Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate*	54116 – White Swan Reservoir 54124 – Gong Gong Reservoir
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$4,951,000**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Cargerie, Woodbourne, Winter, Dog Trap, Union Jack and Canadian creeks as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes recent work undertaken by the landholders and the Leigh Catchment Group on Cargerie Creek, which is a small tributary that flows into the Leigh River Gorge.

This work involved significant effort from the landholders to prepare the site for subsequent fencing off and revegetation. This project was supported by the Leigh Catchment Group and funded through the Corangamite CMA's Securing the Health of the Barwon Project.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Above: Cargerie Creek. Photo: Corangamite CMA

Lismore

Landscape Zone

Overview

The Lismore landscape zone is located in the region's north-west corner, north of and including Lake Corangamite. It is bordered to the east by the Woady Yaloak landscape zone and to the south by the Stony Rises landscape zone. It occurs within the Victorian Volcanic Plain bioregion that features Mount Elephant; an extinct volcano that shaped a large part of the area's character.

This landscape zone contains a number of creeks and streams that terminate at Lake Corangamite, which is the largest permanent inland lake in Australia.

Catchment basin:
Lake Corangamite

Major towns:
Lismore, Derrinallum

Local municipality:
Corangamite Shire

Notable features

The Lismore landscape zone contains four wetlands listed under the Western District Lakes Ramsar site. Several threatened plant species occur within the site. The lakes are used for various purposes, including recreational fishing and duck hunting as well as grazing, commercial fishing, and wastewater disposal.

Waterways

There are 736 km of rivers and streams in this zone and many of these are minor or impermanent streams, which have not been assessed in developing this strategy.

There are 187 wetlands in the landscape zone making up 22.5% of the total area. The major waterway for the area is Lake Corangamite, with its southern edge providing the southern border of the landscape zone. The majority of wetlands in the Lismore landscape zone are located on private land.

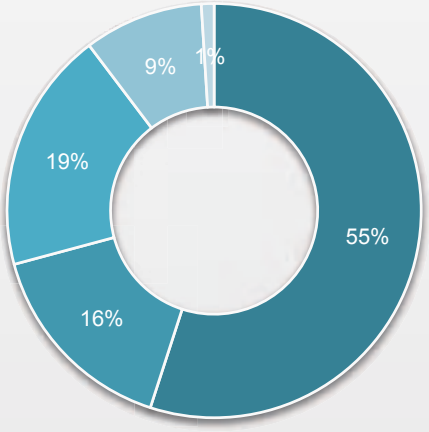
Community and their values

The Corangamite Lakes Landcare Network is the local Landcare network relevant to this area, which comprises the Lismore Land Protection Group, Cundare Duverney, Leslie Manor, Weerite and Weering Eurack Landcare groups (the latter two are also in the Stony Rises landscape zone).

During developing this strategy, the Lismore community identified some of the key values their waterways provide, which include:

- support for biodiversity including the brolga[39], Corangamite water skink[40], growling grass frog[41] and many other species of fish and birds and remnant native vegetation

Land use



- Grazing 55%
- Cropping 16%
- Conservation* 19%
- Forestry 9%
- Other 1%

*Lake Corangamite makes up the majority of the land managed for conservation purposes

[39] *Listed as Vulnerable on the DEPI Advisory List of Threatened Species*

[40] *Listed as Endangered under the EPBC Act 1999*

[41] *Listed as Vulnerable under the EPBC Act 1999 and as Endangered under the IUCN Red List.*

- numerous opportunities for recreation including fishing and boating, picnic sites, swimming and camping
- consistent use of the waterways across the landscape for stock watering and other agricultural activities
- socially important waterways such as Lake Tooliorook and Deep Lake for recreation and environmentally important waterways such as Lake Gnarpurt and Lake Corangamite.

High value and priority waterways

High value and priority waterways are shown in Figure 5.8 for the Lismore landscape zone. Fifteen of the 20 assessed river reaches and wetlands within the Lismore landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.14.

Recent achievements

The Lismore Land Protection Group in partnership with a landholder fenced and revegetated a 4.3 km reach of waterway frontage along Browns Waterholes and Mundy Gully, which flows into Lake Gnarpurt. The work included the installation of 5 km of fencing and the planting of 6000 trees to maintain and improve habitat for threatened species such as the growling grass frog and to improve water quality by excluding stock, and filtering runoff entering these waterbodies.

Corangamite CMA's 2011-12 Corangamite Landcare Grants funded this work as part of a waterway protection, linking and restoration project.

Fencing and revegetation along Browns Waterholes. Photo: Rod Eldridge.

Values

The waterways in the Lismore landscape zone are largely valued for their environmental condition and social amenity, with four wetlands (Lakes Corangamite, Terangpom, Milangil and Gnarpurt) included as a part of the Western District Lakes Ramsar Site. Key values identified in the Lismore landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes and wetland vegetation condition
- significant bird species and important bird habitat
- significant fish, reptile and amphibian species
- recreation, including camping, fishing, picnicking and game hunting
- areas of drought refuge.

Key threats

The majority of waterways in the Lismore landscape zone have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce waterway quality through sedimentation and effluent contamination.

Tall wheatgrass *(Thinopyrum ponticum)* is a drought tolerant, summer active, tussock-forming perennial that grows two-metres high and is used to restore land affected by salinity. It is also a serious weed that invades native ecosystems reducing biodiversity and creating monocultures. Tall wheatgrass has been identified as a threat to a number of wetlands in the Lismore landscape zone. In addition, invasive species such as spiny rush, silver poplars, desert ash and boxthorn are known to exist along waterways in the Lismore landscape zone and may impact on their condition.

As detailed in the *Western Region Sustainable Water Strategy*, management of the Woady Yaloak Diversion Scheme during times of high flows to protect surrounding land from inundation has impacted on water levels in these wetland systems. This change in inflow has in turn increased salinity levels and has impacted on the long term ecology of the wetlands.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands of the Lismore landscape zone.

In addition, the Ecological Character Description for the Western District Lakes Ramsar Site (Hale and Butcher 2011) identifies climate change, activities that modify natural flow such as drainage, diversion and extraction, pollution from urbanisation and agricultural runoff, agricultural impacts such as grazing, invasive species and disturbance from fishing and/or duck hunting as threats to the Ramsar lakes.

Full details of the threats to be addressed for priority waterways in the Lismore landscape zone can be found in Part C – regional work program.

Table 5.14 – Priority waterways against regional goals

Goals		S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
50406 – Lake Corangamite				✓	✓		✓		
50561 – Lake Terangpom					✓		✓		
50663 – Lake Milangil					✓		✓		
50700 – Kooraweera Lakes					✓		✓		
50718 – Lake Gnarpurt					✓		✓		
50722 – Kooraweera Lakes					✓		✓		
51400 and 51487 – Widderin Swamps							✓		
51432 – Deep Lake		✓			✓				
51439 – Lake Logan					✓				
51463 –	Banongill Network				✓		✓		
51465 –							✓		
51469 –							✓		
51491 – Lake Tooliorook		✓							
52208 – Cundare Pool/Lake Martin					✓		✓		

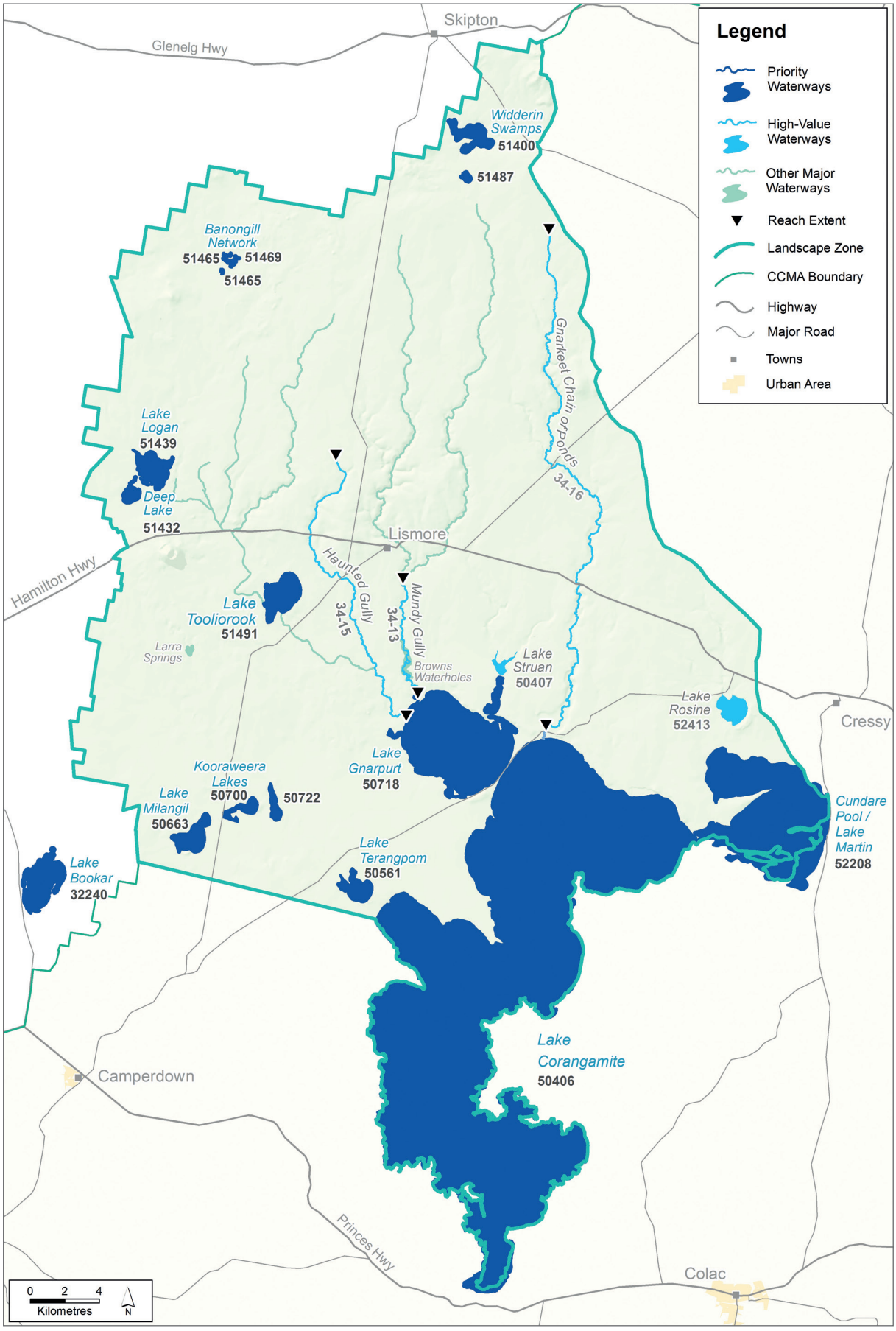


Figure 5.8 – High value and priority waterways in the Lismore landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Lismore landscape zone are shown in Table 5.15. The detailed work program is outlined in Part C of this strategy.

Table 5.15 – Key management activities for waterways in the Lismore landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	50406 – Lake Corangamite 50561 – Lake Terangpom 50663 – Lake Milangil 52208 – Cundare Pool/Lake Martin 50718 – Lake Gnarpurt 50700, 50722 – Kooraweera Lakes 51400, 51426 – Widderin Swamps 51463, 51465, 51469, 51487 – Banongill Network
Establish native indigenous vegetation	50406 – Lake Corangamite 50663 – Lake Milangil
Install wetland fencing	50406 – Lake Corangamite 50561 – Lake Terangpom 50663 – Lake Milangil 52208 – Cundare Pool/Lake Martin 50718 – Lake Gnarpurt 50700, 50722 – Kooraweera Lakes 51400, 51426 – Widderin Swamps 51463, 51465, 51469, 51487 – Banongill Network
Establish stewardship/management agreement	50406 – Lake Corangamite 50561 – Lake Terangpom 50663 – Lake Milangil 52208 – Cundare Pool/Lake Martin 50718 – Lake Gnarpurt 50700, 50722 – Kooraweera Lakes 51400, 51426 – Widderin Swamps 51463, 51465, 51469, 51487 – Banongill Network
Implement best management practice on grazing properties*	51439 – Lake Logan
Establish a management plan for Cundare Pool/Lake Martin - Review operating rules for the Woady Yaloak Diversion Scheme in line with the *Western Region Sustainable Water Strategy**	50406 – Lake Corangamite 52208 – Cundare Pool/Lake Martin
Establish management agreement – controlled grazing regime*	50406 – Lake Corangamite 50663 – Lake Milangil 50718 – Lake Gnarpurt 52208 – Cundare Pool/Lake Martin 51463, 51487 – Banongill Network
Modify sill – Cundare culvert upgrade	50406 – Lake Corangamite 52208 – Cundare Pool/Lake Martin
Establish non-woody weed control	50406 – Lake Corangamite 50561 – Lake Terangpom 52208 – Cundare Pool/Lake Martin 50700 – Kooraweera Lakes

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Table 5.15 – Key management activities for waterways in the Lismore landscape zone (continued)

Management Activity	Waterways
Investigate options for Ramsar listing of Cundare Pool/ Lake Martin*	52208 – Cundare Pool/Lake Martin
Conduct investigation to update threat data and determine the management interventions required*	52208 – Cundare Pool/Lake Martin
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$3,328,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Mundy Gully, Salt Creek (Haunted Gully), Browns waterholes, Gnarkeet Chains of Ponds and Ettrick and Larra Springs as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes the Priority Waterway Protection, Enhancement and Restoration Project. During 2010 tributaries of Ramsar listed wetlands in the Lismore landscape zone were fenced and protected through a Lismore Land Protection Group Community Action Grant funded by the Australian Government.

This project involved Landcare members undertaking activities to improve waterway condition, manage threatened species and their habitat (including the growling grass frog), reduce erosion and sediment loads transporting to waterways, provide shelter for stock and increase habitat for biodiversity.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Mid Barwon

Landscape Zone

Overview

The Mid Barwon landscape zone is located to the west of Geelong and extends north to Meredith and to the west past Winchelsea.

The main river system for the area is the Barwon River and its tributaries Native Hut Creek and Stony Creek. Like the Murdeduke landscape zone, the Mid Barwon landscape zone makes up part of the Barwon catchment basin.

Catchment basin:
Barwon

Major towns:
Winchelsea, Bannockburn

Local municipalities:
Golden Plains Shire,
Surf Coast Shire,
City of Greater Geelong

Notable features

The mid reaches of the Barwon River flow through this landscape zone. These reaches actually commence in the Upper Barwon landscape zone near Birregurra, and flow through the Mid Barwon landscape zone near Winchelsea and to Fyansford in the east. There are numerous tributaries feeding into the Barwon River in this zone, including Native Hut and Bruce's creeks. There are sections of the Mid Barwon River with good riparian environments that support red gum woodlands and a number of significant species.

This zone is part of the Victorian Volcanic Plain bioregion, which covers 2.3 million ha, extending across south-west Victoria from Melbourne to Portland. This is a productive agricultural region, and was one of the first areas settled for agriculture around Geelong. It also contains highly valuable grasslands, grassy woodlands and scattered wetlands.

Waterways

There are 703 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams, which have not been assessed in developing this strategy. The major waterway for this landscape zone is the Barwon River.

There are 104 wetlands in this zone, making up 1.8% of the total area. Significant water bodies include Lake Gherang and the Wurdiboluc Reservoir, which supply potable water to Geelong, Anglesea, Torquay and the Bellarine Peninsula.

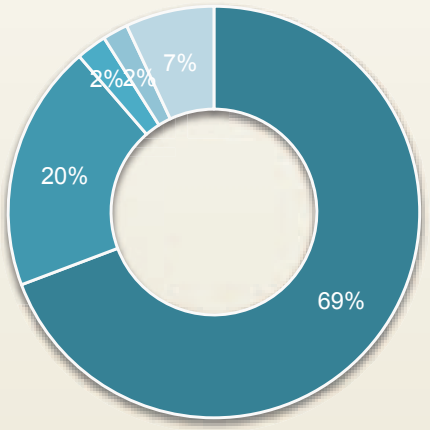
Community and their values

The Geelong Landcare Network supports the Barrabool Hills, Batesford Fyansford Stonehaven and Bamganie-Meredith Landcare groups. The Leigh Catchment Group is also active in the northern part of this landscape zone. There are also active Waterwatch members within the Mid Barwon region.

During the strategy's development, the Mid Barwon community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds, remnant native vegetation and flagship species including platypus

Land use



- Grazing 69%
- Cropping 20%
- Urban 2%
- Conservation 2%
- Other 7%

- confined valleys with intrinsic environmental value, with parks, picnic sites, lookouts, swimming holes and fishing
- consistent usage of the waterways across the landscape for stock watering and other agricultural activities.

High value and priority waterways

High value and priority waterways are shown in Figure 5.9 for the Mid Barwon landscape zone. Four of the six assessed river reaches and wetlands within the Mid Barwon landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.16.

Recent achievements

The Corangamite CMA works closely with landholders, Landcare groups, Waterwatch and other community groups in an effort to improve the condition of the waterways in the landscape zone and raise awareness of the issues these waterways face.

The declining condition of the Barwon Basin has been recognised in recent years and a variety of restoration programs have been undertaken in the Mid Barwon area.

In the past five years, 13 km of waterways have been fenced and 50 ha of land revegetated.

Buckley's Falls on the Barwon River. Photo: Alison Pouliot

Values

The waterways in the Mid Barwon landscape zone are largely valued for their environmental condition and social amenity. Key values identified in the Mid Barwon landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- significant native fish and amphibian species
- recreation, including fishing, picnicking, walking tracks, game hunting and motor and non-motor boating
- areas of drought refuge
- urban and rural township water storages.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats to be addressed

The population of Geelong is expanding with residential developments occurring along the lower Barwon River corridor in the Highton and Fyansford areas, as well as along Bruce Creek through Bannockburn. Urban growth has placed pressure on existing infrastructure and land use, with the potential for associated impacts to adversely affect the values of the area. Threats linked to urban development and increased recreational use include stormwater run-off and degraded water quality, soil disturbance, bank erosion and degradation of native vegetation.

Much of the Barwon River and associated tributaries have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the Barwon River and associated tributaries.

Within the river channel of the Barwon River there are a number of threats to the condition of the waterway including bed instability and degradation; change in flow regime and reduced riparian connectivity; degraded riparian vegetation and reduced vegetation width; barriers to fish passage and loss of instream woody habitat.

Full details of the threats to be addressed for priority waterways in the Mid Barwon landscape zone can be found in Part C – regional work program.

Table 5.16 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
33~03 – Barwon River	✓	✓	✓					
33~04 – Barwon River[42]	✓	✓	✓					
33~10 – Native Hut Creek		✓						
54643 – Wurdiboluc Reservoir		✓		✓				

[42] *Activites for reach 33~04 of the Barwon River are included in the Upper Barwon landscape zone summary.*

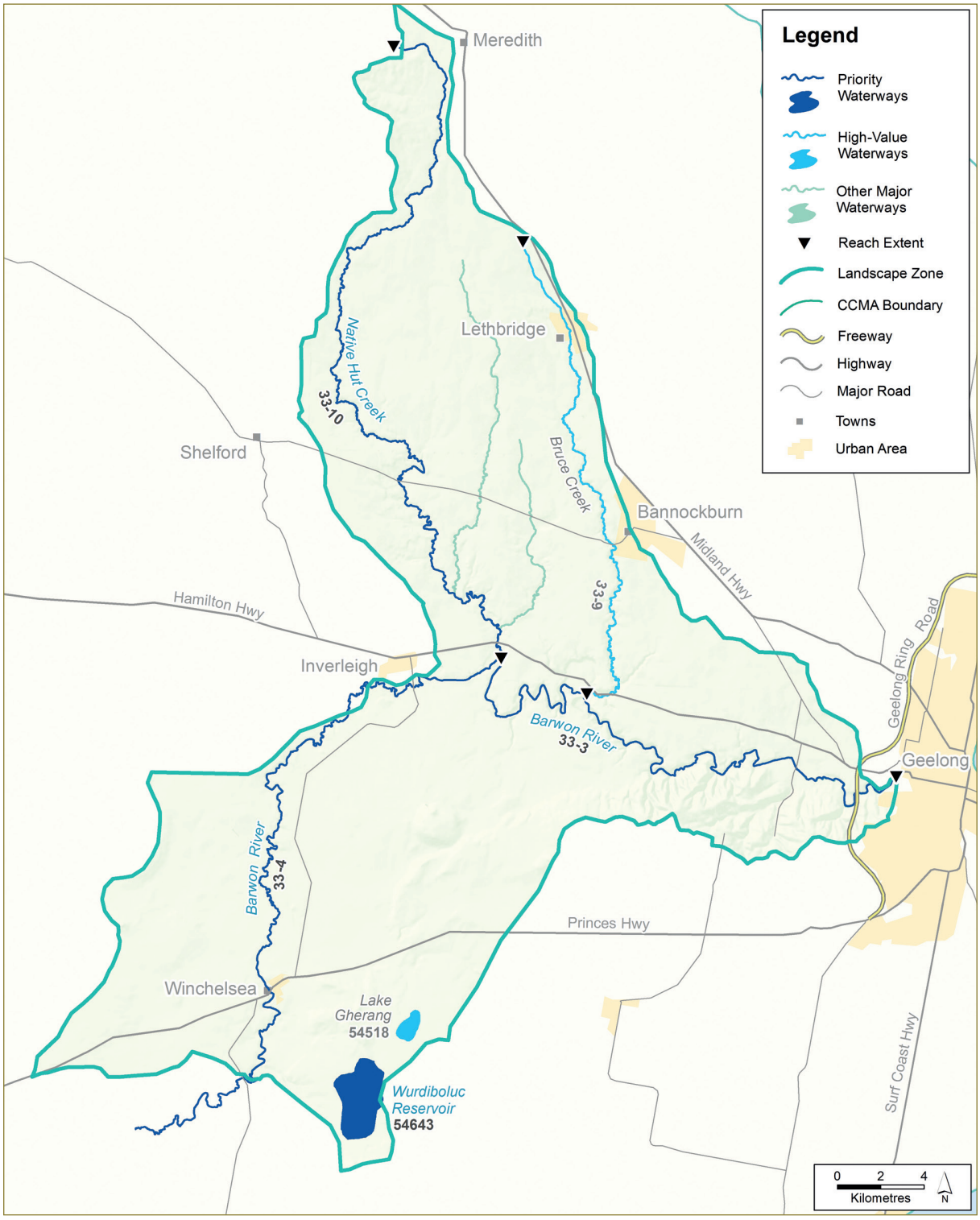


Figure 5.9 – High value and priority waterways in the Mid Barwon landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Mid Barwon landscape zone are shown in Table 5.17. The detailed work program is outlined in Part C of this strategy.

Table 5.17 – Key management activities for waterways within the Mid Barwon landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – rabbit control	33~03 – Barwon River
Establish native indigenous vegetation	33~03 – Barwon River 33~10 – Native Hut Creek
Install riparian fencing	33~03 – Barwon Rive 33~10 – Native Hut Creek
Establish stewardship/management agreement	33~03 – Barwon Rive 33~10 – Native Hut Creek
Undertake and assessment and management of fish barriers in the Barwon and Moorabool catchments*	33~03 – Barwon River 33~10 – Native Hut Creek
Implement best management practice on grazing properties*	33~03 – Barwon River
Undertake an assessment of instream habitat (large wood) density*	33~03 – Barwon River
Investigate stream instabilities*	33~10 – Native Hut Creek
Investigate and manage urban stormwater/water quality impacts in line with whole of water cycle management principles*	33~03 – Barwon River
Implement the Barwon through Geelong Management Plan and *Barwon River Parklands Strategy**	33~03 – Barwon River
Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate*	54643 – Wurdiboluc Reservoir
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$970,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Bruces, Spring and Stony creeks as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes Bruces Creek, which is a tributary of the Barwon River and traverses the Golden Plains region and the town of Bannockburn. In recognition of its ecological, cultural and social importance to the local area, in 2013 the Golden Plains Shire prepared the Bruces Creek Open Space Reserve Management Plan to guide management and development of Bruces Creek through Bannockburn.

The plan's management objectives are to maintain and where possible, improve the condition of the remnant native vegetation communities within the reserve while providing for low impact public passive recreation.

More information can be found on the Golden Plains Shire website[43].

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Remnant river red-gum (Eucalyptus camaldulensis) along Bruces Creek. Photo: Bram Muller.

[43] *http://www.goldenplains.vic.gov.au/page.aspx*

Moorabool

Landscape Zone

Overview

The Moorabool landscape zone is located in the north-east of the region and stretches from Fyansford on the outskirts of Geelong in the south to the top of the Moorabool River basin east of Ballarat in the north.

The main source of water is the Moorabool River and its tributaries, which then flow into the Barwon River at Fyansford. The Moorabool River is highly regulated containing a number of water storages and weirs, the largest being Lal Lal Reservoir, which provides water for Ballarat as well as Geelong and Meredith.

Catchment basin:
Moorabool

Major towns:
Meredith, Gordon, parts of Geelong

Local municipality:
Golden Plains Shire, Moorabool Shire, City of Greater Geelong

Notable features

Of particular local significance for their environmental values are the gorges along parts of the Moorabool River. Due to the steep escarpments within these gorges they remain largely non-arable, protecting bands of remnant vegetation and providing important corridors of habitat for wildlife.

Significant land use in the landscape zone includes agriculture (especially in the upper reaches of the basin where waterways are often not as defined). Key issues for waterway management include reduced river flow and legacy issues from past waterway practices.

Waterways

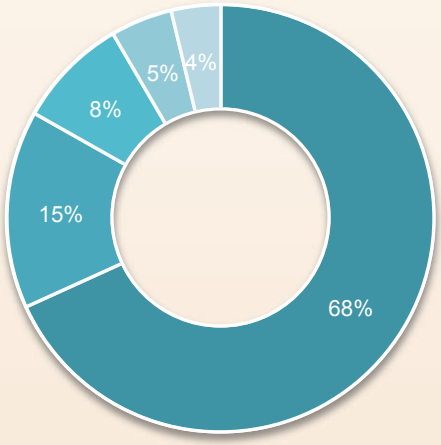
There are 2,151 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams, which have not been assessed in developing this strategy. The major waterway for this landscape zone is the Moorabool River.

There are 132 wetlands in the landscape zone making up 1.1% of the total area. Significant water bodies including Lal Lal, Bostock and Moorabool Reservoirs divert water from the Moorabool catchment to supply water to Ballarat and Geelong, as well as other towns within the area.

Community and their values

There is a history of community involvement in waterway management throughout the catchment, most recently demonstrated by successful lobbying that resulted in an environmental water entitlement. This allocation is to improve flows and the health of the Moorabool River south of Lal Lal Reservoir. Additionally, local community groups, working through the Landcare network (Moorabool Catchment, Lal Lal Catchment and Maude Landcare groups), People for a Living Moorabool, Waterwatch and other avenues, have actively worked towards more sustainable use of water, and for improving biodiversity values.

Land use



- Grazing 68%
- Forestry 15%
- Horticulture* 8%
- Cropping 5%
- Conservation 4%

*Wine grapes and vegetables (predominantly potatoes).

During the development of this strategy, the Moorabool community identified some key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds, remnant native vegetation and flagship species including platypus
- confined valleys, which produce spectacular scenery with intrinsic environmental value and associated reaches that include parks, picnic sites, lookouts, swimming holes, fishing and camping spots and historic bridges
- numerous opportunities for recreation including picnic sites, swimming holes, camping, fishing, kayaking, rock-climbing and abseiling
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

Recent achievements

In addition to changes brought about by river regulation and increasing water consumption between 1997 and 2009, south-eastern Australia experienced the worst drought on record. The prolonged drought conditions resulted in a qualification of rights for critical human supply in November 2006. This cut passing flow requirements leading to a series of prolonged cease to flow events along the Moorabool River. The river was reduced to isolated pools significantly reducing the recruitment of native fish and reducing the habitat available for platypus and other aquatic species dependent on the Moorabool River (Environous, 2008).

At this time 240 ML was allocated by Central Highlands Water to environmental flows. These releases, managed by the Corangamite CMA, prevented these pools from drying and enabled these important refuges to survive the drought.

Moorabool River. Photo: Alison Pouliot

High value and priority waterways

High value and priority waterways are shown in Figure 5.10 for the Moorabool landscape zone. Seventeen of the 20 assessed river reaches and wetlands within the Moorabool landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.18.

Values

The Moorabool River, its associated tributaries and water storages in the north form part a 'Special Water Supply Catchment' and are a source for urban and rural township water including Ballarat, Geelong and Meredith. Other values identified include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- rural water source
- aquatic invertebrate communities.

Key threats

The Moorabool River is a highly regulated waterway with several large water storages in the upper reaches. In the lower reaches between She Oaks and Batesford there are nine private diversion weirs that have increased the extent of slow flowing habitat and reduced habitat diversity, as well as posing a significant barrier to fish migration.

Flow deviation through major headworks to supply urban water, land use, licenced and unlicenced extraction and potentially climate change have impacted on both quantity and quality of flows with the Moorabool River receiving less than 50% of its natural stream flow in an average year and less than 25% in a drought year. Sedimentation and sand slugs brought about from these flow changes have also impacted on the habitat of fish species, as well as other social amenities, e.g. filling in swimming holes. Additionally, the Moorabool River system is a major tributary to the Barwon River. As such, the flow-stressed nature of the Moorabool River impacts on the health of the lower Barwon River, including the Ramsar listed Lake Connewarre wetland complex.

The population of Geelong is expanding with residential developments occurring along the lower Moorabool River corridor in the Batesford and Fyansford areas. Urban growth has placed pressure on existing infrastructure and land use, with the potential for associated impacts to adversely affect the values of the area. Threats linked to urban development and increased recreational use include stormwater run-off and degraded water quality, soil disturbance, bank erosion and degradation of native vegetation.

Much of the Moorabool River and associated tributaries have been subjected to grazing pressures, which has impacted on the quality of water and riparian vegetation, which can impact on potable water supplies within the Moorabool Water Supply Catchment.

Full details of the threats to waterways in the Moorabool landscape zone can be found in Part C of this CWS.

Table 5.18 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
32~01 – Moorabool River		✓	✓		✓			
32~02 – Moorabool River		✓			✓			
32~03 – Moorabool River		✓			✓			
32~04 – Moorabool River		✓			✓			
32~05 – Moorabool River West Branch		✓			✓			
32~06 – Moorabool River West Branch		✓						
32~07 – Sutherland Creek West Branch		✓	✓					
32~10 – Moorabool River East Branch		✓						
32~11 – Moorabool River East Branch		✓						
32~12 – Moorabool River East Branch		✓						
32~13 – Spring Creek		✓						
32~14 – Lal Lal Creek		✓						
55526 – Wilson Reservoir		✓						
55553 – Lal Lal Reservoir		✓		✓				
55560 – Moorabool Reservoir		✓		✓				
55588 – Bostock Reservoir		✓						
56000 – Korweinguboora Reservoir		✓						

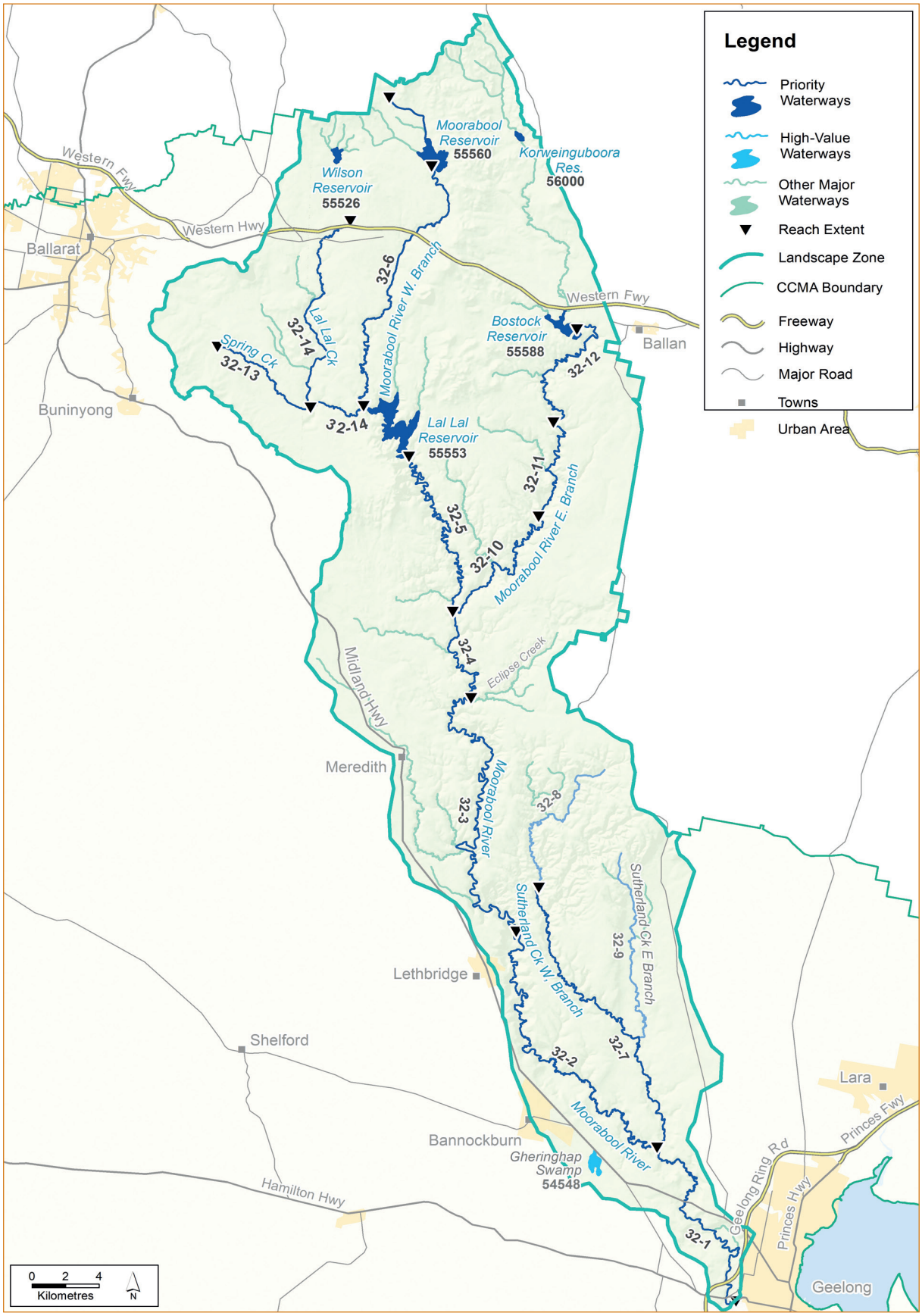


Figure 5.10 – High value and priority waterways in the Moorabool landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Moorabool landscape zone are shown in Table 5.19. The detailed work program is outlined in Part C of this strategy.

Table 5.19 – Key management activities for waterways within the Moorabool landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – rabbit control	32~01, 32~02, 32~03, 32~04 – Moorabool River 32~05 – Moorabool River West Branch 32~07 – Sutherland Creek West Branch
Establish native indigenous vegetation	32~01, 32~02, 32~03, 32~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~07 – Sutherland Creek West Branch 32~10, 32~11,32~12 – Moorabool River East Branch 32~13 – Spring Creek 32~14 – Lal Lal Creek
Install riparian fencing	32~01, 32~02, 32~03, 32~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~07 – Sutherland Creek West Branch 32~10, 32~11,32~12 – Moorabool River East Branch 32~13 – Spring Creek 32~14 – Lal Lal Creek
Establish stewardship/management agreement	32~01, 32~02, 32~03, 32~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~07 – Sutherland Creek West Branch 32~10, 32~11, 32~12 – Moorabool River East Branch 32~13 – Spring Creek 32~14 – Lal Lal Creek
Undertake an assessment and management of fish barriers in the Barwon and Moorabool catchments*	32~01, 32~02 – Moorabool River
Deliver current environmental water entitlement and develop long-term planning for environmental watering of the Moorabool River (EWMP)*	32~01, 32~02, 33~03, 33~04 – Moorabool River 32~05 – Moorabool River West Branch
Investigate impacts to environmental flows throughout the broader Moorabool catchment basin to secure and better manage environmental water where required.*	32~01, 32~02, 33~03, 33~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~10, 32~11 – Moorabool River East Branch 32~12 – Moorabool River East Branch
Implement best management practice on grazing properties*	32~01, 32~02, 33~03, 33~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~10, 32~11 – Moorabool River East Branch 32~12 – Moorabool River East Branch
Undertake an assessment of instream habitat (large wood) density*	32~02, 32~04 – Moorabool River
Undertake woody weed control	32~03, 32~04 – Moorabool River 32~05, 32~06 – Moorabool River West Branch 32~10, 32~11 – Moorabool River East Branch 32~13 – Spring Creek 32~14 – Lal Lal Creek
Develop land and gully stabilisation plan for the Eclipse Creek catchment*	32~03 – Moorabool River
Investigate and manage urban stormwater/water quality impacts in line with whole of water cycle management principles*	32~01 – Moorabool River

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Table 5.19 – Key management activities for waterways within the Moorabool landscape zone (continued)

Management Activity	Waterways
Investigate stream instabilities*	32~07 – Sutherland Creek West Branch 32~13 – Spring Creek
Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate*	55553 – Lal Lal Reservoir, 55526 – Wilsons Reservoir, 55560 – Moorabool Reservoir, 55588 – Bostock Reservoir, 56000 – Korweinguboora Reservoir
Maintain the discharge into the Moorabool River from Batesford Quarry as a beneficial environmental use – as per the *Central Region Sustainable Water Strategy*	32~01 – Moorabool River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$7,018,000**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as the west branch and parts of the east branch of Sutherland Creek and Dolly's Creek as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes activities on the Moorabool River by the Friends of Buckleys Falls facilitated through the Barwon River Parklands project and funding through the Victorian Government Communities for Nature Grants. This involved the removal of large woody weeds including willows and community based revegetation, on the lower reach of the Moorabool River at Fyansford – a reach not previously identified as a priority.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Friends of Buckley Falls member, Tony Woolford, with CMA Catchment Officer - Wayne McLaren - discussing the Fyansford restoration project. Photo: Corangamite CMA.

Murdeduke

Landscape Zone

Overview

The Murdeduke landscape zone is located in the centre of the region and is surrounded predominantly by the Stony Rises, Woady Yaloak, Leigh and Mid Barwon landscape zones.

Water through the region is provided via Mia Mia Creek and via Warrambine Creek into the Barwon River.

Catchment basin:
Barwon

Major towns:
Wingeel, parts of Inverleigh

Local municipalities:
Golden Plains Shire,
Colac Otway Shire,
Surf Coast Shire

Notable features

This zone is part of the Victorian Volcanic Plain bioregion, which covers 2.3 million ha, extending across south-west Victoria from Melbourne to Portland. This is a productive agricultural region, which contains highly valuable grasslands, grassy woodlands and many scattered wetlands.

Lake Murdeduke is a wetland listed under the Western District Lakes Ramsar Site and is also listed as a state game reserve under the *Wildlife Act 1975.*

Waterways

There are 460 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams which have not been assessed in developing this strategy. The major creeks for this landscape zone are Warrambine and Mia Mia creeks, the former is linked via a drainage channel to the Woady Yaloak Diversion Scheme.

There are 132 wetlands in the landscape zone, making up 4.1% of the total area. The most significant of these is Lake Murdeduke.

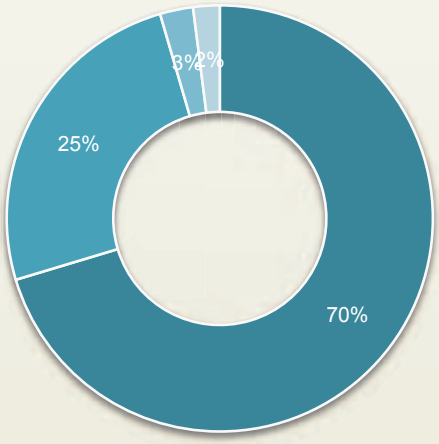
Community and their values

The Geelong Landcare Network support community groups including the Leigh District Landcare Group in this landscape zone. The Leigh Catchment Group is also active in the northern region of this landscape zone. In addition, Waterwatch members have been active in the Murdeduke area.

During the strategy's development, the Murdeduke community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish and birds, as well as remnant native vegetation
- numerous opportunities for recreation including picnic sites, swimming holes, fishing and four-wheel driving
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

Land use



- Grazing 70%
- Cropping 25%
- Conservation* 3%
- Other 2%

*Consists predominantly of Lake Murdeduke

High value and priority waterways

High value and priority waterways are shown in Figure 5.11 for the Murdeduke landscape zone. One of the five assessed river reaches and wetlands within the Murdeduke landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.20.

Values

The waterways in the Murdeduke landscape zone are largely valued for their environmental condition. Key values identified within the Murdeduke landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- areas of drought refuge.

Key threats

The majority of waterways in the Murdeduke landscape zone have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Tall wheatgrass *(Thinopyrum ponticum)* is a drought tolerant, summer active, tussock-forming perennial that grows two-metres high and is used to restore salinity affected land. It is also a serious weed that invades native ecosystems reducing biodiversity and creating monocultures. Tall wheatgrass has been identified as a threat to a number of wetlands in the Murdeduke landscape zone.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands of the Murdeduke landscape zone.

In addition, the Ecological Character Description for the Western District Lakes Ramsar Site (Hale & Butcher, 2011) identifies climate change activities that modify natural flow such as drainage, diversion and extraction, pollution from ubranisation and agricultural runoff, agricultural impacts such as grazing, invasive species and disturbance from fishing and/or duck hunting as threats to the Ramsar Site.

Full details of the threats to be addressed for priority waterways in the Murdeduke landscape zone can be found in Part C – regional work program.

Above: Red fox. Photo: Corangamite CMA

Table 5.20 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
52422 – Lake Murdeduke				✓		✓		

Recent achievements

As part of the Corangamite CMA's responsibility for managing the Woady Yaloak Drainage Scheme, a grade control structure (rock chute) was constructed on Warrambine Creek to prevent further bed erosion near Inverleigh.

The Victorian Government funded this work, which was completed in consultation with the local community.

Rock chute installation. Photo: Corangamite CMA

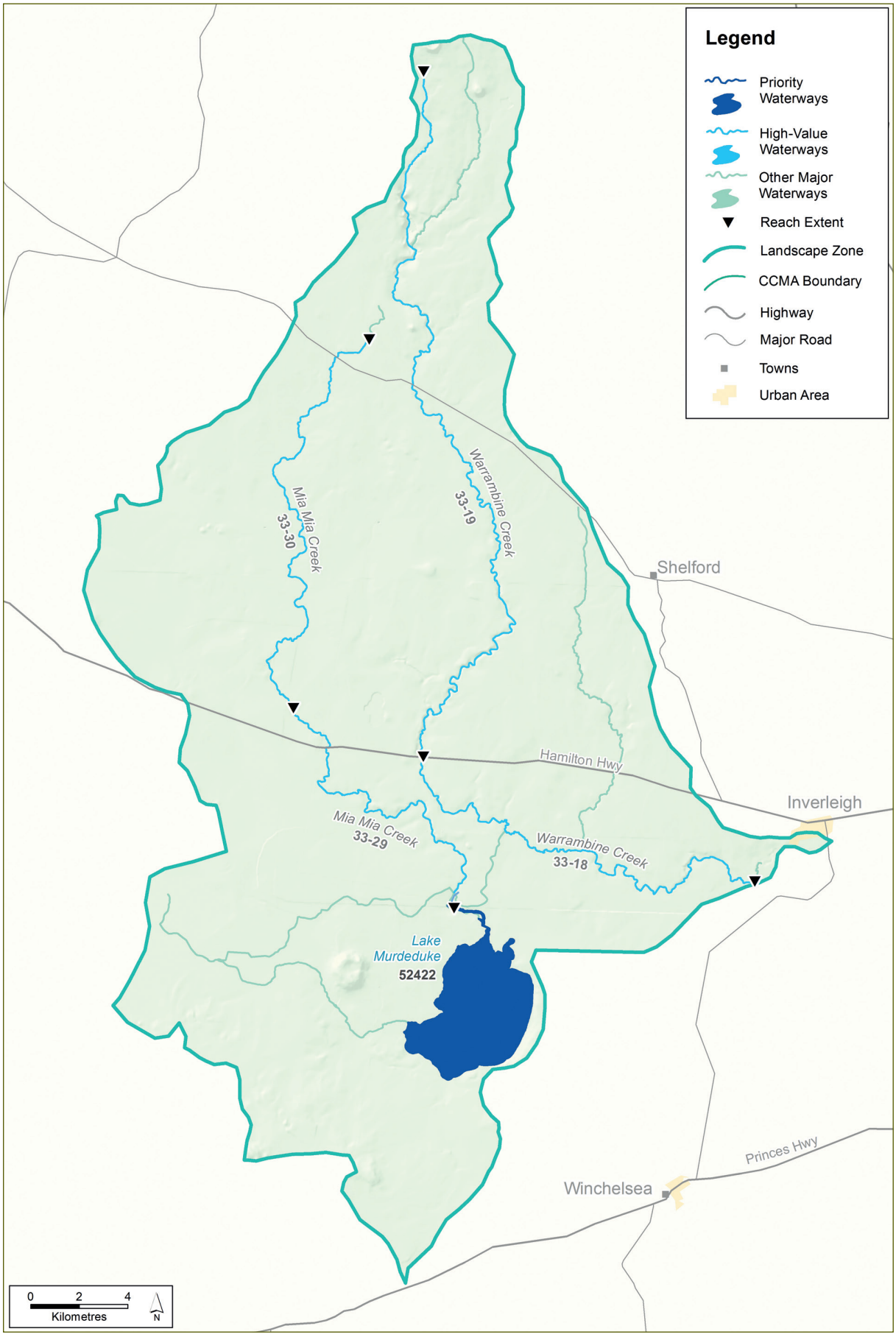


Figure 5.11 – High value and priority waterways in the Murdeduke landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Murdeduke landscape zone are shown in Table 5.21. The detailed work program is outlined in Part C of this strategy.

Table 5.21 – Key management activities for waterways in the Murdeduke landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	52422 – Lake Murdeduke
Install wetland fencing	52422 – Lake Murdeduke
Establish stewardship/management agreement	52422 – Lake Murdeduke
Establish non-woody weed control	52422 – Lake Murdeduke
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$180,000**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Mia Mia, Five Mile and Warrambine creeks as important during the development of this strategy and fit this category.

Active local communities and groups continue to conduct work on these other waterways. An example includes work undertaken by the local community restoring parts of Warrambine Creek.

Through a Corangamite CMA funded tender project, the community and landholders reinstated vegetation and controlled stock access to protect and enhance riparian grassland communities along Warrambine Creek.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Above: Mia Mia Creek. Photo: Donna Smithyman

Otway Coast

Landscape Zone

Overview

The Otway Coast landscape zone is located between Apollo Bay in the south-west and Eastern View (between Lorne and Aireys Inlet) in the north-east. The zone is on the coastal side of the Otway Ranges.

The Otway Coast contains a variety of coastal streams, rivers and estuaries including the Barham, Erskine, Wye, Kennett and Cumberland, which intersect with the Great Ocean Road.

Catchment basin:
Otway Coast

Major towns:
Lorne, Wye River, Apollo Bay

Local municipalities:
Colac-Otway Shire,
Surf Coast Shire

Notable features

The Great Otway National Park extends through landscape zone and features rugged coastlines, sandy beaches, rock platforms and windswept heathland in the south. In the north, the park features tall forests, ferny gullies, magnificent waterfalls and tranquil lakes. This area, which includes the Great Ocean Road draws visitors from all over the world for its significant environmental, cultural, social and economic values.

As a result of the national park, conservation is the largest land use in the zone, which is indicative of the rugged landscape and coastline remaining largely inaccessible to early European settlers, protecting large areas of native forest for the conservation of wildlife. This also means that a large portion of this landscape zone is under the management of Parks Victoria.

Waterways

There are 1,280 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams, which have not been assessed in developing this strategy. Major waterways for this landscape zone include the Barham, Erskine, Wye, Kennett and Cumberland rivers and associated estuaries.

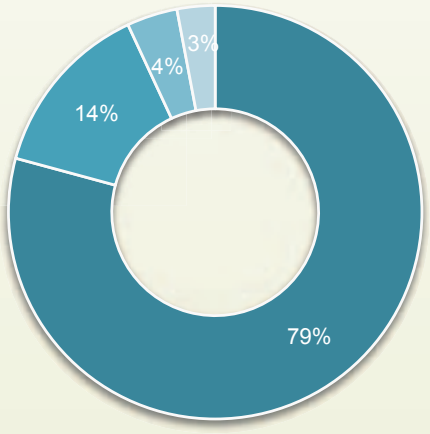
Community and their values

The Southern Otway Landcare Network supports the Apollo Bay, Otway Barham Catchment and Wye to Wongarra Landcare groups and the Lornecare group operates as an independent entity. Waterwatch and EstuaryWatch members are also active within the Otway Coast landscape zone.

During developing this strategy the Otway Coast community identified some of the key values their waterways provide, which include:

- support for biodiversity including many significant species of fish, such as Australian grayling[44], birds, remnant native vegetation and flagship species including platypus

Land use



- Conservation 80%
- Grazing 14%
- Forestry 4%
- Other 3%

[44] *Listed as Vulnerable under the EPBC Act, 1999*

Recent achievements

Since implementing the Corangamite River Health Strategy in 2006, work has occurred in the Otway Coast waterways in partnership with the Apollo Bay Landcare Group and the Southern Otway Landcare Network.

Activities have included managing willows along the lower reaches and estuary of Wild Dog Creek, installing fences and revegetating parts of the Wild Dog estuary, and constructing fishways in Wild Dog Creek, Skenes Creek and Barham River East Branch to allow fish passage through previously inhibited waterways.

Before

After

Above: Fish passage installation on the Barham River East Branch. Photos: Corangamite CMA

- numerous opportunities for recreation including walking, swimming, camping, fishing, boating and kayaking
- use of the waterways for supplying water to townships and to small businesses, e.g. caravan parks.
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

High value and priority waterways

High value and priority waterways are shown in Figure 5.12 for the Otway Coast landscape zone. Eighteen of the 19 assessed river reaches and estuaries within the Otway Coast landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.22.

Values

The waterways in the Otway Coast landscape zone are largely valued for their environmental condition and social amenity, with a number of waterways considered to be of near natural condition. Key values identified in the Otway Coast landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant native fish and bird species
- recreation including swimming, camping, fishing, picnicking, sightseeing, walking tracks, game hunting and non-motor boating
- urban or rural township water sources
- significant aquatic invertebrate communities.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

Parts of the Otway Coast waterways and estuaries have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination, which can also impact on potable water supplies within Special Water Supply Catchments.

Willows *(Salix spp.)* are a Weed of National Significance[45] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat in reach 35~31 of the Barham River and in the longer term dispersal may compromise the condition of waterways lower down the river system.

[45] *All Salix spp. except S. babylonica, S. X calodendron and S. X reichardtii*

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the estuaries of the Otway Coast landscape zone.

Urban growth, as experienced along the Erskine River in Lorne, has placed pressure on existing infrastructure and land use, with the potential for associated impacts to adversely affect the values of the area. Threats linked to urban development and increased recreational use include stormwater run-off and degraded water quality, soil disturbance, bank erosion and degradation of native vegetation including estuarine vegetation.

All of the estuaries in the Otway Coast landscape zone intermittently open or close depending on the prevailing conditions, e.g., freshwater flows, weather changes and tidal movements. Estuary closure can result in social and economic impacts through flooding of adjacent land. However, inundation is a natural process and has an important role in the life cycle of many species and the cycling of nutrients. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and species that live there. To address these impacts, a careful risk based approach needs to be taken to manage the intermittently opening estuaries.

Full details of the threats to be addressed for priority waterways in the Otway Coast landscape zone can be found in Part C – regional work program.

Table 5.22 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
35~31 – Barham River East Branch	✓	✓	✓					
35~32 – Cumberland River	✓		✓					✓
35~33 – Erskine River	✓		✓					
35~44 – St George River	✓		✓					
35~45 – St George River		✓						
35~46 – Wye River			✓					✓
35~47 – Kennett River								✓
35~48 – Grey River								✓
35~49 – Carisbrook Creek			✓					✓
35~50 – Smythes Creek								✓
35~51 – Skenes Creek			✓					
35~52 – Wild Dog Creek			✓					
35~53 – Barham River West Branch		✓						
35~230 – Barham River	✓			✓				
35~233 – Erskine River	✓		✓					
35~244 – St George River	✓							
35~246 – Wye River			✓					
35~247 – Kennett River			✓					

Figure 5.12 – High value and priority waterways in the Otway Coast landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Otway Coast landscape zone are shown in Table 5.23. The detailed work program is outlined in Part C of this strategy.

Table 5.23 – Key management activities for waterways in the Otway Coast landscape zone

Management Activity	Waterways
Establish native indigenous vegetation	35~31 – Barham River East Branch 35~46 – Wye River 35~51 – Skenes Creek 35~52 – Wild Dog Creek 35~53 – Barham River West Branch 35~230 – Barham River 35~233 – Erskine River 35~246 – Wye River 35~247 – Kennett River
Install riparian fencing	35~31 – Barham River East Branch 35~51 – Skenes Creek 35~52 – Wild Dog Creek 35~53 – Barham River West Branch 35~230 – Barham River
Establish stewardship/management agreement	35~31 – Barham River East Branch 35~51 – Skenes Creek 35~52 – Wild Dog Creek 35~53 – Barham River West Branch 35~230 – Barham River
Modify outlet waterway structure/rock ramp	35~31 – Barham River East Branch
Modify culvert crossing/baffles in fishway	35~31 – Barham River East Branch
Investigate and manage urban stormwater/water quality impacts in line with whole of water cycle management principles*	35~233 – Erskine River
Continue to adopt a risk based approach to estuary mouth opening*	35~230 – Barham River 35~233 – Erskine River
Undertake woody weed control	35~31 – Barham River East Branch 35~246 – Wye River 35~247 – Kennett River
Remove fish barrier by replacing existing crossing with clear span bridge	35~31 – Barham River East Branch 35~44 – St George River
Investigate impacts to environmental flows throughout the broader Otway Coast catchment basin to secure and better manage environmental water where required*	35~44, 35~45 – St George River
Conduct monitoring and maintenance to ensure that waterway remains in current condition*	35~48 – Grey River 35~49 – Carisbrook Creek 35~50 – Smythes Creek 35~33 – Erskine River
Maintain EstuaryWatch groups collecting baseline data on estuary condition*	35~51 – Skenes Creek 35~52 – Wild Dog Creek 35~233 – Erskine River 35~230 – Barham River 35~244 – St George River 35~246 – Wye River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$2,137,700**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The Barham River downstream of the east and west branch confluence was identified by the community as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes work completed by the Southern Otway Landcare Network protecting and revegetating large sections of the Barham River. Since 2006 the network has worked with Barwon Water and the Corangamite CMA and been guided by the Otway Barham Reference Group to protect and enhance water quality, aquatic habitats and degraded terrestrial vegetation adjacent to the Barham River. With funding provided by Barwon Water and the Corangamite CMA through the Managing Our Great Ocean Road Estuaries project, more than 80% of the Barham River has now been protected and revegetated.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Barham River revegetation work as part of the 'Hills to the Sea' restoration Project. Photo: Corangamite CMA.

Stony Rises

Landscape Zone

Overview

The Stony Rises landscape zone is located in the west of the region and its northern border is formed by the southern border of Lake Corangamite. Large areas of volcanic rock formed from the most recent volcanic activity typify this region and provide its characteristic 'stony rises' landscape.

Water flows are mainly from the Barongarook and Pirron Yallock creeks into Lakes Colac and Corangamite respectively. Although Lake Corangamite is not located in this zone, much of the land in the zone drains to the lake and has a major impact on its management.

Lakes and wetlands provide many of the natural values of the Stony Rises landscape zone. Some of these lakes are part of the Western District Lakes Ramsar Site and others of national, state and regional significance.

Catchment basin:
Lake Corangamite

Major towns:
Colac, Camperdown

Local municipalities:
Colac Otway Shire, Corangamite Shire

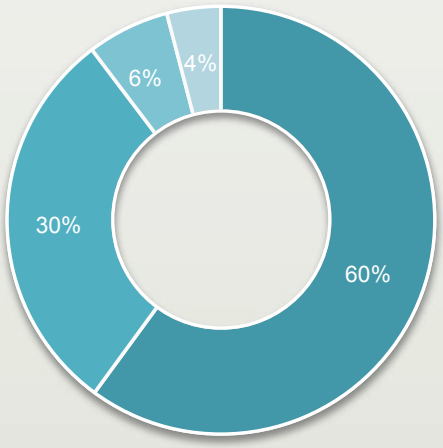
Notable features

Undulating landscape of volcanic flows characterise the Stony Rises area, which represents the most recent volcanic activity in Australia.

The zone is dotted with small wetlands, many of which form part of the seasonal herbaceous wetlands (freshwater) of the temperate lowland plains, which are listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act, 1999.*

Within the Stony Rises landscape zone, Lakes Colongulac, Beeac and Horseshoe Lake are included under the Western District Lakes Ramsar Site. The lakes are used for various purposes, including recreational fishing and duck hunting as well as grazing.

Land use



- Grazing 60%
- Dairy 30%
- Conservation 6%
- Other 4%

Waterways

There are 946 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams that have not been assessed in developing this strategy.

There are 535 wetlands in the landscape zone making up 9.2% of the total area. Significant wetlands include Lakes Colongulac, Beeac, Bullen Merri and Colac. The majority of wetlands in the Stony Rises landscape zone are located on private land.

Recent achievements

The Corangamite CMA has worked with Lions and Rotary clubs, as well as Barongarook Landcare Group, to protect 1.4 km of waterways and wetlands along sections of Barongarook Creek.

In addition, the Corangamite CMA is continuing to work with the Colac Otway Shire, Lake Colac Coordinating Committee, DEPI, EPA, Barwon Water, local business and community groups to manage Lake Colac as a recreational, social, environmental and economic asset.

Restoration of an ephemeral wetland feeding into Barongarook Creek. Photos: Andrew Gray.

Community and their values

The Stony Rises landscape zone includes Landcare Networks and many individual groups. The Friends of Mt Leura and the Mt Leura and Sugar Loaf Development Committee are supported by the Heytesbury and District Landcare Network. The Weering-Eurack and Weerite Landcare groups are part of the Corangamite Lakes Landcare Network and are supported by the Lismore Land Protection Group. The Alvie Tree Planting Group, Stony Rises Landcare Group, Pirron Yallock Landcare Group and Barongarook Landcare Group operate independently in the zone. There are also active Waterwatch members in the Stony Rises region.

During developing this strategy, the Stony Rises community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish, bird, reptile and amphibian as well as remnant native vegetation
- numerous opportunities for recreation including picnic sites, swimming holes, camping, fishing, kayaking and motor and non-motor boating
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

High value and priority waterways

High value and priority waterways are shown in Figure 5.13 for the Stony Rises landscape zone. Twenty-six of the 31 assessed river reaches and wetlands within the Stony Rises landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.24.

Values

The waterways in the Stony Rises landscape zone are largely valued for their environmental condition and social amenity, with a number of wetlands of international or national significance. Key values identified in the Stony Rises landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes and wetland vegetation condition
- significant bird species and important bird habitat
- significant fish, reptile and amphibian species
- recreation, including camping, fishing, picnicking, sightseeing and walking tracks
- areas of drought refuge.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

The majority of the Stony Rises waterways have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Gorse *(Ulex europaeus)* and blackberry *(Rubus fruticosus aggregate)* are Weeds of National Significance and are known to adversely impact waterways through reducing water quality and availability, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Gorse and blackberry were identified as a threat in reach 34~20 – Barongarook Creek.

In addition, invasive species such as tall wheat grass and boxthorn are known to exist along waterways in the Stony Rises landscape zone and may impact their condition.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the wetlands of the Stony Rises. Other feral species known to exist within the landscape zone include rabbits and wild pigs, which have the potential to impact on the condition of waterways.

In addition, the Ecological Character Description for the Western District Lakes Ramsar Site (Hale & Butcher, 2011) identifies climate change activities that modify natural flow such as drainage, diversion and extraction, pollution from ubranisation and agricultural runoff, agricultural impacts such as grazing, invasive species and disturbance from fishing and/or duck hunting as threats to the Ramsar Site.

Full details of the threats to be addressed for priority waterways in the Stony Rises landscape zone can be found in Part C – regional work program.

Table 5.24 – Priority waterways against regional goals

Goals		S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
34~19 – Dean Creek					✓				
34~20 – Barongarook Creek					✓				
50435 – The Basins					✓		✓		
50505	Red Rock Lakes				✓		✓		
50509					✓		✓		
50522 – Lake Werowrap							✓		
52028 – Lake Coragulac					✓				
50527; 50536; 50547; 50555; 50563; 50566	Stonyford-Bungador Wetlands						✓		
50597 – Lake Bullen Merri		✓							
50614 – Lake Colongulac					✓		✓		
50680 – Lake Koreetnung					✓				
50725 – Lake Weeranganuk					✓				
52178 – Lake Colac		✓			✓				
52181 – Lake Ondit					✓				
52222 – Horseshoe Lake							✓		
52225 – Lake Beeac							✓		
52297	Upper, Middle and Lower Lough Calverts						✓		
52308 – Eurack Swamp					✓		✓		
52629							✓		
52632							✓		
52634 – Lough Calvert					✓		✓		

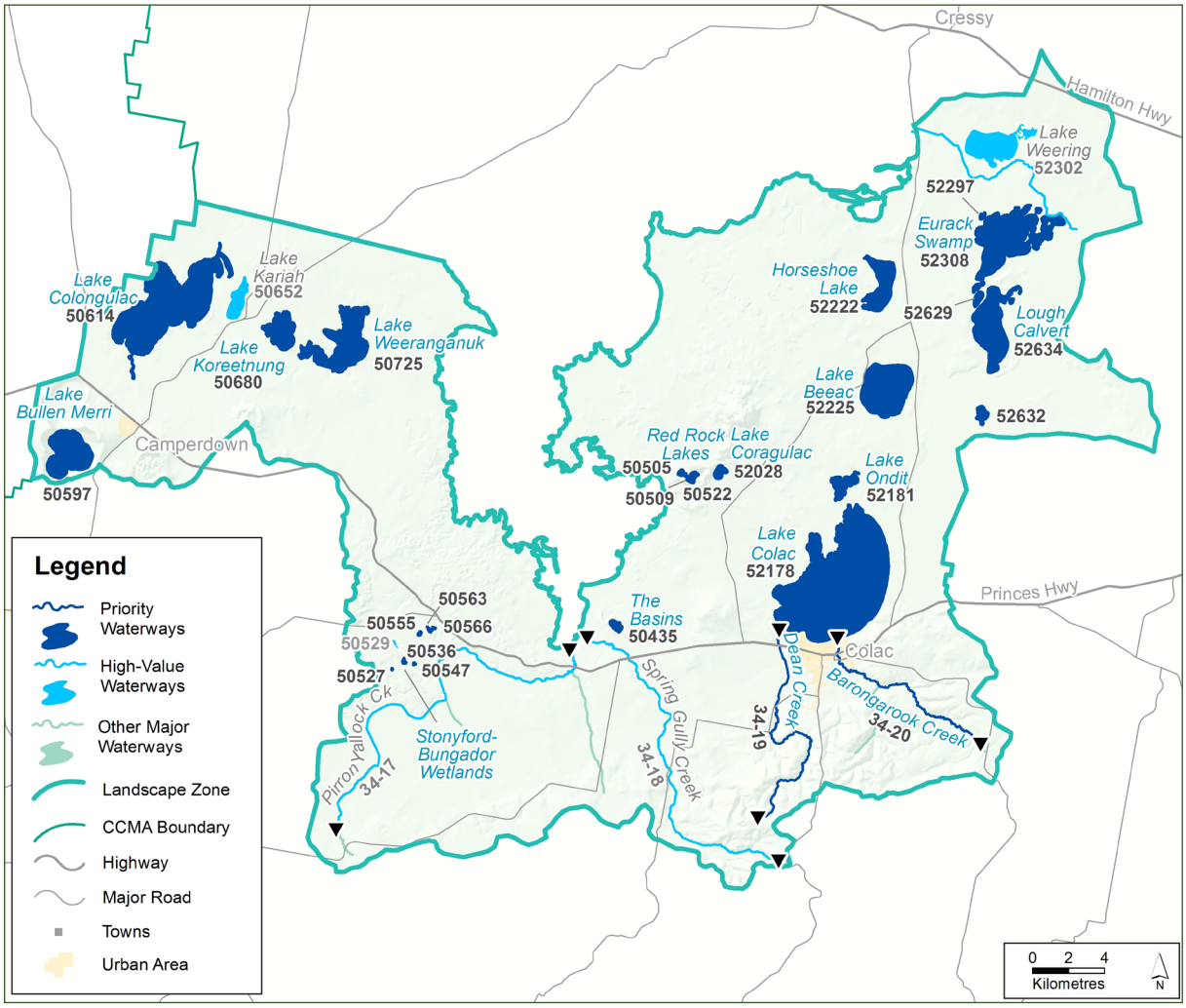


Figure 5.13 – High value and priority waterways in the Stony Rises landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Stony Rises landscape zone are shown in Table 5.25. The detailed work program is outlined in Part C of this strategy.

Table 5.25 – Key management activities for waterways in the Stony Rises landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	34~19 – Dean Creek 34~20 – Barongarook Creek 50505, 50509, 50522 – Red Rock Lakes & The Basins 50527, 50536, 50547, 50555, 50563, 50566 – Stonyford-Bungador Wetlands 50597 – Lake Bullen Merri 50614 – Lake Colongulac 50680 – Lake Koreetnung 50725 – Lake Weeranganuk 52181 – Lake Ondit 52222 – Horseshoe Lake 52225 – Lake Beeac 52297, 52308, 52629, 52632, 52634 – Lough Calverts & Lake Thurrumbong#
Establish native indigenous vegetation	34~19 – Dean Creek 34~20 – Barongarook Creek 50505, 50509, 50522 – Red Rock Lakes & The Basins 50563 – Stonyford-Bungador Wetlands 50597 – Lake Bullen Merri 50614 – Lake Colongulac 52028 – Lake Coragulac 52178 – Lake Colac 52181 – Lake Ondit 52297 – Lough Calverts & Lake Thurrumbong#
Install riparian/wetland fencing	34~19 – Dean Creek 34~20 – Barongarook Creek 50505, 50509, 50522 – Red Rock Lakes & The Basins 50527, 50536, 50547, 50555, 50563, 50566 – Stonyford-Bungador Wetland 50597 – Lake Bullen Merri 50614 – Lake Colongulac 50725 – Lake Weeranganuk 52178 – Lake Colac 52181 – Lake Ondit 52222 – Horseshoe Lake 52225 – Lake Beeac 52297, 52308, 52629, 52632, 52634 – Lough Calverts & Lake Thurrumbong#
Establish stewardship/ management agreement	34~19 – Dean Creek 34~20 – Barongarook Creek 50505, 50509, 50522 – Red Rock Lakes & The Basins 50527, 50536, 50547, 50555, 50563, 50566 – Stonyford-Bungador Wetland 50597 – Lake Bullen Merri 50614 – Lake Colongulac 50725 – Lake Weeranganuk 52178 – Lake Colac 52181 – Lake Ondit 52222 – Horseshoe Lake 52225 – Lake Beeac 52297, 52308, 52629, 52632, 52634 – Lough Calverts & Lake Thurrumbong#
Finalise and implement the Colac Integrated Water Cycle Management Plan*	52178 – Lake Colac 34~19 – Dean Creek 34~20 – Barongarook Creek

- Continued over page

Table 5.25 – Key management activities for waterways in the Stony Rises landscape zone (continued)

Management Activity	Waterways
Implement best management practice on grazing properties*	50505, 50509 – Red Rock Lakes & The Basins
Establish non-woody weed control	50614 – Lake Colongulac 50680 – Lake Koreetnung 50725 – Lake Weeranganuk 52222 – Horseshoe Lake 52634 –Lough Calverts & Lake Thurrumbong#
Undertake woody weed control	34~20 – Barongarook Creek
Establish management agreement – controlled grazing regime*	50505, 50509, 50522 – Red Rock Lakes & The Basins 50536, 50547, 50555, 50563, 50566 – Stonyford-Bungador Wetlands 52222 – Horseshoe Lake 52297, 52308, 52629, 52632, 52634 – Lough Calverts & Lake Thurrumbong#
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$2,813,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*
#Lake Thurrumbong is located within the Upper Barwon landscape zone, however activities are included here as it forms part of a wetland complex with the Lough Calverts.

Other waterways

The community identified other waterways such as Pirron Yaloak and Spring Gully creeks, as well as lakes Kariah and Weering as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes work undertaken by the Stony Rises Blackberry Action Group in controlling blackberry across the landscape zone and its waterways.

The action group was formed in October 2013 and has achieved over 690 ha of blackberry control; entered 15 landholders into three-year management agreements; and undertaken a community information session regarding the management of blackberry on private land.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Above: The Stony Rises Blackberry Action Group Steering Committee. Photo courtesy of the Stony Rises Landcare Management Network

Thompsons

Landscape Zone

Overview

This landscape zone is located to the south west of the Bellarine landscape zone and includes the coastal strip just past Aireys Inlet taking in the coastal slopes of the Otway Ranges. Its northern extremity crosses the Princes Highway east of Winchelsea.

The main waterways traversing the landscape zone are the Anglesea River as well as Spring, Painkalac and Thompson creeks.

Catchment basin:
Otway Coast

Major towns:
Torquay, Anglesea, Aireys Inlet, Breamlea

Local municipalities:
Surf Coast Shire,
City of Greater Geelong

Notable features

The Thompsons landscape zone is known for its surf coast, with a stunning coastline, beautiful beaches and waterways, attracting large numbers of tourists annually with the population more than doubling through the warmer months.

Parts of the landscape zone include the coastal slopes of the Otway Ranges along the Great Ocean Road. As a result, conservation is the second largest land use in the zone, 27% of the total area, which is indicative of the rugged landscape and coastline remaining largely inaccessible to early European settlers, protecting large areas of native forest for the conservation of wildlife.

Waterways

There are 1,048 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams, which have not been assessed in the development of this strategy.

There are 56 wetlands in the landscape zone making up 1.9% of the total area.

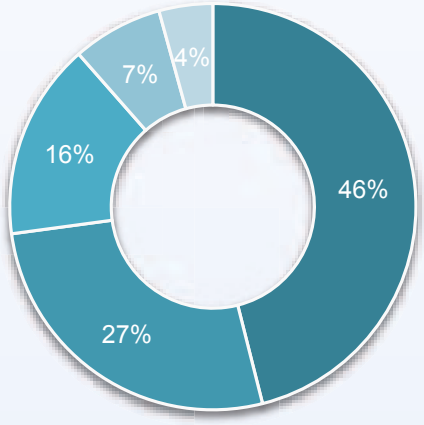
Community and their values

The Surf Coast and Inland Plains Network is the local Landcare network and includes the Thompsons Creek and Torquay Landcare groups as well as the Jan Juc and Torquay Coast Action Groups. The Anglesea, Aireys Inlet Society for the protection of flora and fauna (ANGAIR) as well as,Waterwatch and EstuaryWatch members are also active within Thompsons landscape zone.

During developing this strategy the Thompsons community identified some of the key values their waterways provide, which include:

- support for biodiversity including many significant species of fish, (e.g. Yarra pygmy perch), birds and amphibian (e.g. growling grass frog), remnant native vegetation and flagship species including platypus

Land use



- Grazing 46%
- Conservation 27%
- Forestry 16%
- Urban/Peri-urban 7%
- Other 4%

- numerous opportunities for recreation including walking, swimming, paddle boarding, educational activities, camping, fishing, boating and kayaking
- use of the waterways for supplying water to townships and to small businesses, e.g. caravan parks
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

High value and priority waterways

High value and priority waterways are shown in Figure 5.14 for the Thompsons landscape zone. Nine of the 16 assessed river reaches, estuaries and wetlands within the Thompsons landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.26.

Values

The waterways in the Thompsons landscape zone are largely valued for their environmental condition and social amenity, with a number of waterways containing known populations of threatened species.

Recent achievements

The Estuary Entrance Management Support System (EEMSS) has been implemented on the Painkalac, Anglesea and Thompson estuaries. The EEMSS is a database that stores information on assets of the estuary system and how different water heights impact upon those assets.

Additionally, the Corangamite CMA has been working with the Surf Coast and Inland Plains Network to protect nationally listed Yarra pygmy perch populations within the Thompson Creek.

Above: Yarra pygmy perch (Nannoperca obscura). Photo: ARI; Right: Painkalac Creek estuary. Photo: Alison Pouliot

Key values identified in the Thompsons landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant native fish, e.g. Yarra pygmy perch, amphibian, e.g. growling grass frog and bird species
- recreation including swimming, fishing, picnicking, sightseeing, walking tracks, camping and boating.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

Parts of the waterways and estuaries in the Thompsons landscape zone have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting the Painkalac Estuary.

All of the estuaries in the Thompsons landscape zone intermittently open or close depending on the prevailing conditions, e.g. freshwater flows, weather vagaries, tidal movements. Estuary closure can result in social and economic impacts through flooding of adjacent land. However, inundation is a natural process and has an important role in the life cycle of many species and the cycling of nutrients. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and species that live there. To address these impacts, a careful risk based approach needs to be taken to manage the intermittently opening estuaries.

Serrated tussock *(Nassella trichotoma)* is a Weed of National Significance and is known to adversely impact waterways through outcompeting other species and reducing aquatic and riparian biodiversity. Serrated tussock was identified as a threat in a number of waterways within the Thompson landscape zone.

Full details of the threats to be addressed for priority waterways in the Thompsons landscape zone can be found in Part C – regional work program.

Table 5.26 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
35~35 – Spring Creek				✓				
35~36 – Thompson Creek			✓					
35~37 – Thompson Creek			✓					
35~38 – Duneed Creek			✓					
35~39 – Merrijig Creek			✓					
35~42 – Painkalac Creek		✓						
35~234 – Anglesea River	✓							
35~236 – Thompson Creek				✓				
35~242 – Painkalac Creek	✓							

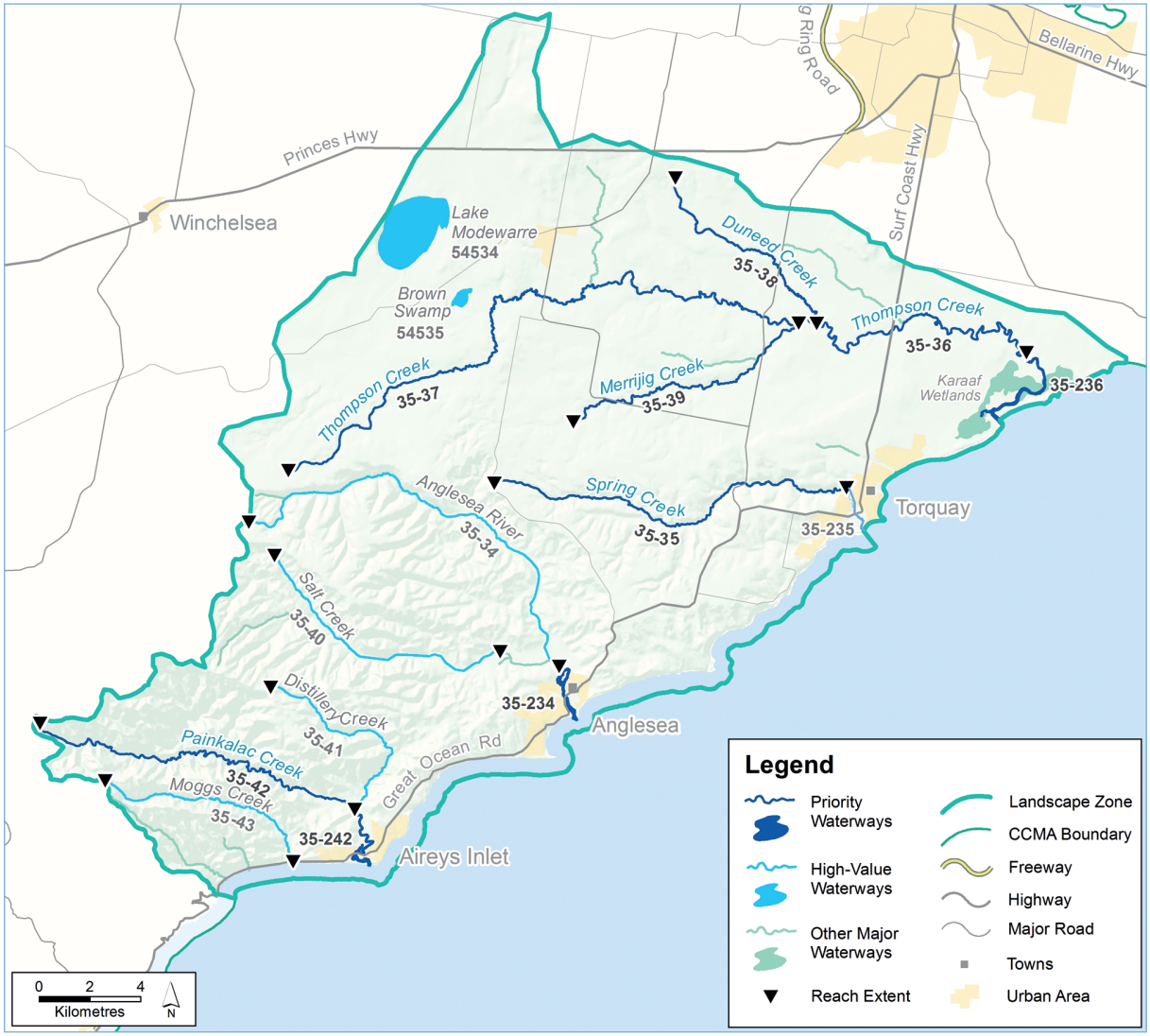


Figure 5.14 – High value and priority waterways in the Thompsons landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Thompsons landscape zone are shown in Table 5.27. The detailed work program is outlined in Part C of this strategy.

Table 5.27 – Key management activities for waterways in the Thompsons landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – rabbit control	35~36, 35~37 – Thompson Creek 35~38 – Duneed Creek 35~39 – Merrijig Creek
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	35~236 – Thompson Creek
Establish native indigenous vegetation	35~35 – Spring Creek 35~36 , 35~37 – Thompson Creek 35~38 – Duneed Creek 35~39 – Merrijig Creek 35~234 – Anglesea River 35~242 – Painkalac Creek

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Table 5.27 – Key management activities for waterways in the Thompsons landscape zone (continued)

Management Activity	Waterways
Install riparian fencing	35~35 – Spring Creek 35~236, 35~36, 35~37 – Thompson Creek 35~38 – Duneed Creek 35~39 – Merrijig Creek
Establish stewardship/management agreement	35~35 – Spring Creek 35~236, 35~36, 35~37 – Thompson Creek 35~38 – Duneed Creek 35~39 – Merrijig Creek
Continue to adopt a risk based approach to estuary mouth opening*	35~234 – Anglesea River 35~236 – Thompson Creek 35~242 – Painkalac Creek
Establish non-woody weed control	35~236 – Thompson Creek 35~35 – Spring Creek
Establish woody weed control – gorse	35~38 – Duneed Creek
Undertake an assessment and management of fish barriers*	35~37 – Thompson Creek
Implement the Anglesea estuary management plan*	35~234 – Anglesea River
Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk*	35~234 – Anglesea River
Investigate impacts to environmental flows throughout the broader Otway Coast catchment basin to secure and better manage environmental water where required*	35~42, 35~242 – Painkalac Creek
Investigate stream bed instabilities*	35~42 – Painkalac Creek
Maintain EstuaryWatch groups collecting baseline data on estuary condition*	35~35 – Spring Creek 35~242 – Painkalac Creek 35~236 – Thompsons Creek 35~234 – Anglesea River
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$1,714,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Distillery, Salt, Moggs and Jan Juc creeks as well as the Barwon swamp wetlands as important during developing this strategy. The Karaaf wetlands are also of particular importance as they contain coastal saltmarsh, a nationally vulnerable ecological community (refer to Section 3.4.3).

Active local communities and groups continue to conduct work on these other waterways. An example includes work by the Torquay Landcare Group on the wetlands and riparian zones of Spring Creek in Torquay. In recognition of the ecological, cultural and social importance to the local area, the Torquay Landcare Group initiated a restoration project on the small wetlands and riparian areas along Spring Creek. This work has been supported by the Surf Coast Shire, local businesses, community groups and schools as well as local community members. The purpose of this work is to maintain and where possible, improve the condition of the remnant native vegetation communities within the reserve while providing for low impact public passive recreation and environmental awareness.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Upper Barwon

Landscape Zone

Overview

This landscape zone is located along the inland slopes and plains of the Otway Ranges to the north of Lorne and east of Colac. Water mainly flows through upper reaches of the Barwon River and its tributaries.

Catchment basin:
Barwon

Major towns:
Forrest, Deans Marsh, Birregurra

Local municipalities:
Colac-Otway Shire, Surf Coast Shire

Notable features

Parts of the landscape zone near the headwaters of the Barwon River and a number of its tributaries include the Otway Ranges. Parts of both the Great Otway National Park and Otway Forest Park are in the zone. As a result, 6% of the total area is used for conservation and is the third largest land use in the landscape zone.

Grazing for livestock (beef, sheep and dairy) and forestry dominate the area with 89% of the landscape zone dedicated to these practices, bringing significant economic benefits to the region.

Waterways

There are 1,822 km of rivers and streams in the landscape zone and many of these are minor or impermanent streams which have not been assessed in developing this strategy.

There are 53 wetlands in the landscape zone making up 1% of the total area. Significant water bodies include the West Barwon Dam, which provides drinking water for greater Geelong, and Lakes Thurrumbong and Ayrey, which are important for their environmental values.

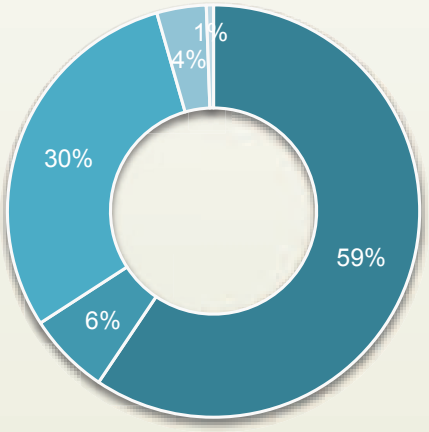
Community and their values

The Upper Barwon Landcare Network is the key network for this area and includes the Irrewarra Farmcare, Birregurra Creek, East Otway, Gerangamete and District, Murroon, Barwon Rivercare, Otway Regen and Wurdale Landcare groups. It also supports the Birregurra Community Group, Friends of Deans Creek and Otway Agroforestry Network. There are also active Waterwatch members in the Upper Barwon area.

During developing this strategy, the Upper Barwon community identified some key values their waterways provide, which include:

- support for biodiversity including many significant species of fish e.g. dwarf galaxias and birds, remnant native vegetation and flagship species including platypus
- numerous opportunities for recreation including walking, swimming, camping, fishing, boating and kayaking
- consistent use of the waterways across the landscape for stock watering and other agricultural activities.

Land use



- Grazing 59%
- Conservation 6%
- Forestry 30%
- Cropping 4%
- Other 1%

High value and priority waterways

High value and priority waterways are shown in Figure 5.15 for the Upper Barwon landscape zone. Fifteen of the 19 assessed river reaches and wetlands within the Upper Barwon landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.28.

Gosling Creek, which has not been mapped under the strategy, has a known population of the nationally endangered dwarf galaxias. Under the strategy, this native fish population will continue to be a focus for protection, and the waterway is a priority for survey in the next round of the Index of Stream Condition.

Values

The waterways in the Upper Barwon landscape zone are largely valued for their economic benefits to the region, as well as environmental condition. Key values identified in the Upper Barwon landscape zone include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- significant fish (migratory and non-migratory) and bird species and habitat
- recreation including camping, fishing, picnicking, sightseeing, walking tracks and game hunting
- urban or rural township water sources
- significant aquatic invertebrate communities.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

The majority of Upper Barwon waterways have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination, which can also impact on potable water supplies within the Barwon Special Water Supply Catchment.

There are a number of threats to the condition of the waterways which include bed instability and degradation; change in flow regime and reduced riparian connectivity; degraded riparian vegetation and reduced vegetation width; and loss of instream woody habitat.

Willows *(Salix spp.)* are a Weed of National Significance[46] and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, reducing aquatic and riparian biodiversity and obstructing access to streams for recreational activities. Willows were identified as a threat in a number of waterways within the Upper Barwon landscape zone.

The red fox *(Vulpes vulpes)* was identified as a threat to significant bird species inhabiting or visiting Lakes Ayrey and Thurrumbong and surrounds.

Full details of the threats to be addressed for priority waterways in the Upper Barwon landscape zone can be found in Part C – regional work program..

[46] *All Salix spp. except S. babylonica, S. X calodendron and S. X reichardtii.*

Recent achievements

In response to The Significant Fish Species Protection under Dry Inflow Conditions Report (Saddlier, Ryan and Woolley, 2009), the Corangamite CMA developed a Significant Fish Project aimed at developing a stronger understanding of significant native fish species distribution and habitat abundance in the region.

As part of this project, a study was undertaken to investigate potential dwarf galaxias wetland habitat in the upper Barwon River catchment in an attempt to find additional populations to those already known. These surveys identified a new site on the Barwon River East Branch.

Dwarf Galaxias. Photo: Corangamite CMA

Table 5.28 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
33~04 – Barwon River	✓	✓	✓					
33~05 – Barwon River		✓	✓					
33~06 – Barwon River West Branch					✓			
33~07 – Barwon River West Branch		✓						
33~21 – Retreat Creek		✓						
33~23 – Penny Royal Creek		✓	✓					
33~24 – Penny Royal Creek		✓	✓					
33~25 – Dewing Creek		✓						
33~26 – Dewing Creek		✓						
33~27 – Barwon River East Branch		✓	✓					
33~28 – Barwon River East Branch	✓	✓						
33~33 – Boundary Creek				✓				
51905 – West Barwon Dam		✓						
52305 – Lake Thurrumbong[47]				✓		✓	✓	
52361 – Unnamed Wetland							✓	
52365 – Lake Ayrey							✓	

[47] *Activities for wetland 52305 – Lake Thurrumbong, although located in the Upper Barwon landscape zone, have been included in the Stony Rises landscape zone summary as the lake forms part of connected wetland complex with the Lough Calverts (see Table 5.25).*

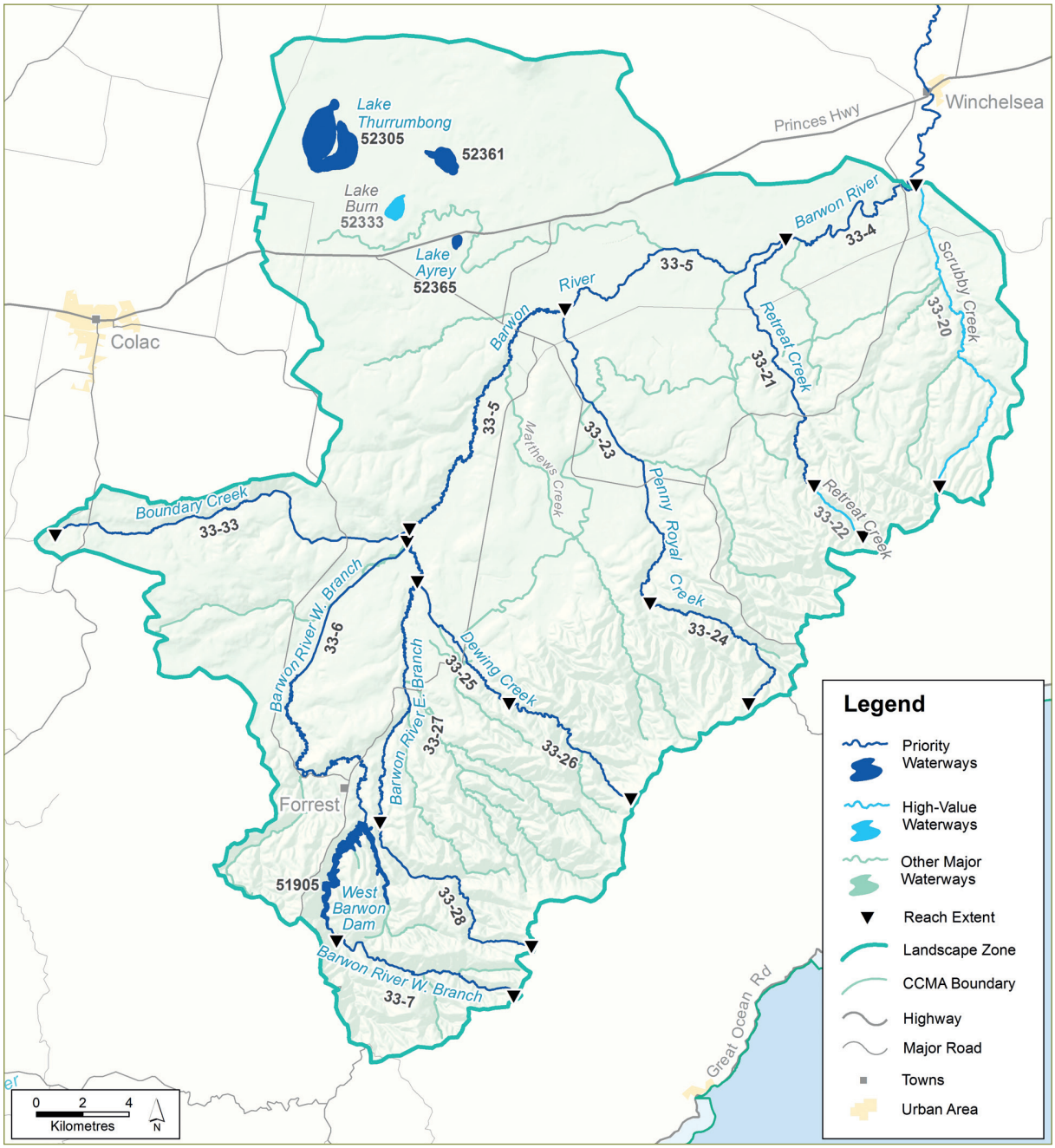


Figure 5.15 – High value and priority waterways in the Upper Barwon landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Upper Barwon landscape zone are shown in Table 5.29. The detailed work program is outlined in Part C of this strategy.

Table 5.29 – Key management activities for waterways in Upper Barwon landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)*	52365 – Lake Ayrey 52361
Establish native indigenous vegetation	33~04, 33~05 – Barwon River 33~21 – Retreat Creek 33~23, 33~24 – Penny Royal Creek 33~25 – Dewing Creek 33~27 – Barwon River East Branch 33~33 – Boundary Creek
Install riparian/wetland fencing	33~04, 33~05 – Barwon River 33~21 – Retreat Creek 33~23, 33~24 – Penny Royal Creek 33~25 – Dewing Creek 33~27 – Barwon River East Branch 33~33 – Boundary Creek
Establish stewardship/management agreement	33~04, 33~05 – Barwon River 33~21 – Retreat Creek 33~23, 33~24 – Penny Royal Creek 33~25 – Dewing Creek 33~27 – Barwon River East Branch 33~33 – Boundary Creek
Establish non-woody and/or woody weed control	33~05 – Barwon River 33~23, 33~24 – Penny Royal Creek 33~28 – Barwon River East Branch 33~33 – Boundary Creek 52361
Undertake an assessment and management of fish barriers in the Barwon and Moorabool catchments*	33~04, 33~05 – Barwon River 33~21 – Retreat Creek 33~23 – Penny Royal Creek 33~27 – Barwon River East Branch 33~33 – Boundary Creek
Establish invasive species assessment and management*	33~27 – Barwon River East Branch
Undertake stabilisation works downstream of Cape Otway Rd	33~21 – Retreat Creek
Implement best management practice on grazing properties*	33~04 – Barwon River
Undertake an assessment of instream habitat (large wood) density*	33~04, 33~05 – Barwon River
Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk*	33~33 – Boundary Creek
Implement the *Central Region Sustainable Waterway Strategy* action for Upper Barwon environmental entitlement including the development of long-term planning for environmental watering of the Barwon Rive (EWMP)*	33~04, 33~05 – Barwon River 33~06 – Barwon River West Branch 33~27 - Barwon River East Branch
Investigate impacts to environmental flows and (where required) identify opportunities to secure and better manage environmental water*	33~23, 33~24 – Penny Royal Creek 33~25 – Dewing Creek 33~27 – Barwon River East Branch
Conduct monitoring and maintenance to ensure that waterway remains in current condition*	33~07 – Barwon River West Branch 33~26 – Dewing Creek

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Table 5.29 – Key management activities for waterways in Upper Barwon landscape zone (continued)

Management Activity	Waterways
Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate*	51905 – West Barwon Dam
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$5,595,700**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

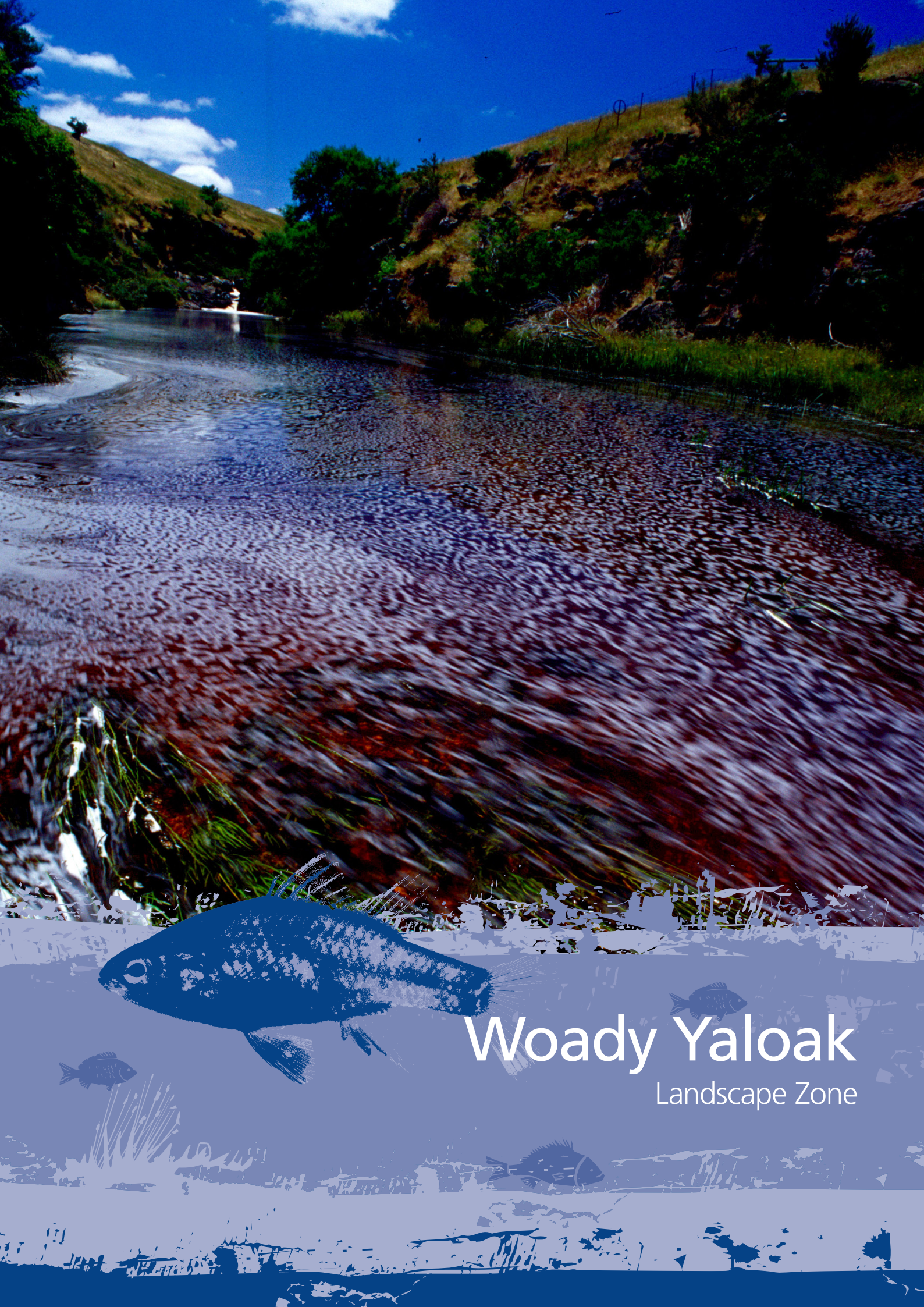
The community identified other waterways such as Williamson, Callahan's, Gosling and Mathews creeks as important during the development of this strategy and fit this category.

Active local communities and groups continue to conduct work on these other waterways. An example includes work by the East Otway Landcare Group who for 20 years have been restoring the Bambra Wetlands, a significant wetland to the local area providing environmental values and social amenity to the Bamabra community.

In addition, in recognition of the environmental and social benefits, the East Otway Landcare Group have completed waterway revegetation along Yan Yan Gurt Creek and Retreat Creek, as well as parts of the Pennyroyal Creek to prevent further bank erosion and to create corridor links between the Otway Ranges and the Barwon River.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

Revegetation work on the Bambra wetlands.
Photo courtesy of the Upper Barwon Landcare Network



Woady Yaloak

Landscape Zone

Overview

This landscape zone is located in the north central part of the catchment. It stretches from Cundare Pool near Cressy in the south, to south western parts of Ballarat in the north-east of the zone.

The main river system is the Woady Yaloak River and its tributaries. The north eastern half of this landscape zone is in the Central Victorian Uplands bioregion, its waterways flow into the south western half of the Victorian Volcanic Plain bioregion.

Catchment basin:
Lake Corangamite

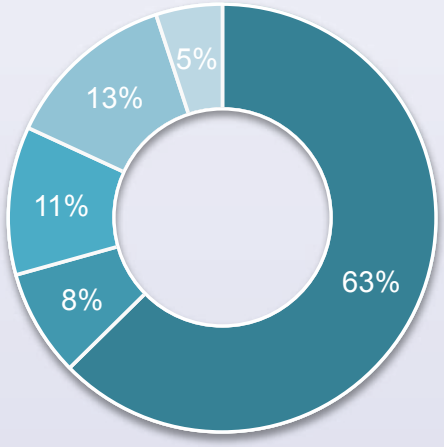
Major towns:
Cressy, Rokewood, Linton

Local municipality:
Golden Plains Shire

Notable features

The Woady Yaloak landscape zone is principally an agricultural area. Grazing for sheep and cattle are most common with over 73,000 ha used for this purpose. Cropping is also growing with over 15,000 ha used for this purpose. Property sizes in this zone are larger than other areas of the Corangamite region, reflecting its predominant agricultural production base.

Land use



- Grazing 63%
- Conservation 8%
- Forestry 11%
- Cropping 13%
- Other 5%

Waterways

There are 2,117 km of rivers and streams in the landscape zone and many of these are minor or impermanent and have not been assessed in developing this strategy. The major waterway for this landscape zone is the Woady Yaloak River, which flows into and terminates in Cundare Pool and ultimately Lake Corangamite, which forms part of the Western District Lakes Ramsar site.

There are 91 wetlands scattered across the landscape zone making up 0.8% of the total area.

Community and their values

The Woady Yaloak Catchment Group is the Landcare network in this zone, which supports the Cardigan-Windemere, Grenville, Haddon, Misery-Moonlight, Pittong-Hoyles Creek, Rokewood, The Dales and Werneth Landcare groups. There are also active Waterwatch members in the Woady Yaloak landscape zone.

During developing this strategy, the Woady Yaloak community identified some of the key values their waterways provide, which include:

- support for biodiversity including many species of fish (e.g. black fish) and significant birds (e.g. eastern great egret).
- numerous opportunities for recreation including picnic sites, swimming holes, sightseeing, game hunting, firewood collection, fishing and the Ballarat Skipton Rail Trail, which is popular for walking, cycling and horse riding

- consistent usage of the waterways across the landscape for stock watering and other agricultural activities.

High value and priority waterways

High value and priority waterways are shown in Figure 5.16 for the Woady Yaloak landscape zone. Four of the 13 assessed river reaches and wetlands within the Woady Yaloak landscape zone have been identified as priorities. The goals that priority waterways align to are shown in Table 5.30.

Recent achievements

The Corangamite CMA recently worked with Parks Victoria to undertake significant erosion control at Illabarook Grasslands Reserve on a tributary of the Woady Yaloak River. Activities were required to stabilise a section of waterway that was subject to severe erosion after a major flood event in January 2011. The Corangamite CMA provided in-kind support which included a stability assessment and structural design and the management of on ground activities.

Woady Yaloak River. Photo: Alison Pouliot

Values

The waterways in the Woady Yaloak landscape zone are largely valued for their economic benefits, as well as providing habitat for the Yarra pygmy perch, a nationally threatened native fish species. Other key values identified within the Woady Yaloak landscape zone include:

- known rare and threatened amphibian species, e.g. growling grass frog.
- significant Ecological Vegetation Classes
- rural water sources for production.

Lake Corangamite, included in the Western District Lakes Ramsar Site, also receives its single largest flow source from the Woady Yaloak River, which terminates in this lake system.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Key threats

Parts of the landscape and its waterways have been subjected to grazing pressures. Livestock access to waterways can erode banks, damage riparian vegetation and reduce water quality through sedimentation and effluent contamination.

Within the river channel of the Woady Yaloak River and its tributaries there are a number of threats to the condition of the waterway, which include bed instability and degradation; change in flow regime and reduced riparian connectivity; degraded riparian vegetation and reduced vegetation width; and loss of instream woody habitat.

Gorse *(Ulex europaeus)* and serrated tussock *(Nassella trichotoma)* are Weeds of National Significance and are known to adversely impact waterways through reducing aquatic and riparian biodiversity and, in the case of gorse, obstruct access to streams for recreational activities. Gorse infestations are heavier in the northern parts of the zone, whilst serrated tussock infestations are present in the south. The European rabbit *(Oryctolagus cuniculus)* is also a threat in the Woady Yaloack landscape zone.

Specific values identified for individual waterways are detailed in Part C – regional work program.

Table 5.30 – Priority waterways against regional goals

Goals	S1. Social	EC1. Economic	ENV1. Native fish	ENV2. Waterway dependant sp.	ENV3. Environmental water	ENV4. Formally recognised	ENV5. Significant wetlands	ENV6. Excellent condition
34~01 – Woady Yaloak		✓	✓					
34~01 – Woady Yaloak		✓						
34~04 – Woady Yaloak		✓	✓					
34~10 – Little Woady Yaloak Creek			✓					

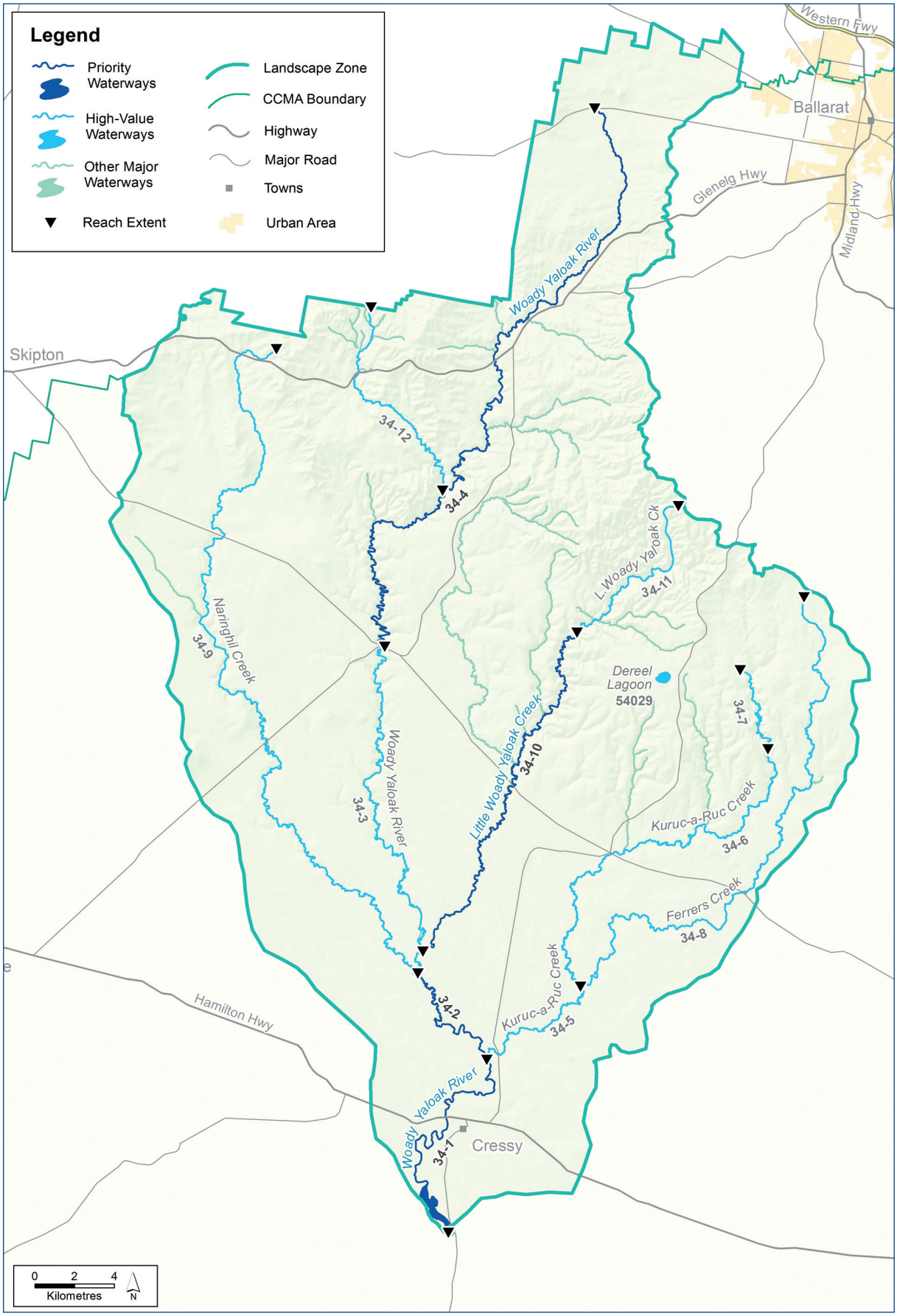


Figure 5.16 – High value and priority waterways in the Woady Yaloak landscape zone

Work program – Key management activities

A summary of key management activities for waterways in the Woady Yaloak landscape zone are shown in Table 5.31. The detailed work program is outlined in Part C of this strategy.

Table 5.31 – Key management activities for waterways in the Woady Yaloak landscape zone

Management Activity	Waterways
Establish terrestrial pest animal control – rabbit control	34~01, 34~02, 34~04 – Woady Yaloak River 34~10 – Little Woady Yaloak Creek
Establish native indigenous vegetation	34~01, 34~02, 34~04 – Woady Yaloak River 34~10 – Little Woady Yaloak Creek
Install riparian fencing	34~01, 34~02, 34~04 – Woady Yaloak River 34~10 – Little Woady Yaloak Creek
Establish stewardship/management agreement	34~01, 34~02, 34~04 – Woady Yaloak River 34~10 – Little Woady Yaloak Creek
Implement best management practice on grazing properties*	34~02 – Woady Yaloak River
Undertake woody weed control	34~04 – Woady Yaloak River
Stabilise gully networks	34~04 – Woady Yaloak River 34~10 – Little Woady Yaloak Creek
Maintain Waterwatch groups collecting baseline data on waterway condition*	All Waterwatch sites
Total estimated cost	**$5,055,500**

**Not included in landscape zone estimated cost (see overall CWS costs, table 5.1)*

Other waterways

The community identified other waterways such as Kuruc-A-Ruc, Ferrers and Naringhil creeks as important during the development of this strategy.

Active local communities and groups continue to conduct work on these other waterways. An example includes work undertaken by the Woady Yaloak Catchment Group focusing on farm productivity and productive catchment management. The group believes that profitable farm businesses underpin the ongoing investment in natural resource management including waterway protection. Focusing on areas such as soil health and salinity, the group has investigated the use of alternative fertilisers, biological products, soil acidity and changes in soil carbon and soil fertility as a means to increase farm productivity and ultimately reduce pressures on the surrounding natural environment and waterways of the region.

Corangamite CMA will continue to support the local management of these waterways by the community in line with VWMS policy outlined in Section 4.7.1 of the CWS.

6. Delivering the strategy

6.1 Delivery approach

The CWS will be delivered in partnership with public and private land managers, agency stakeholders including water corporations and local government and the community (e.g. Landcare networks, Friends groups, Waterwatch and EstuaryWatch, see Section 6.3) under the framework of integrated catchment management.

On-ground activities will comply with regulations and will be undertaken in accordance with best management practice. The CWS will be implemented using the best available science and tools, for example:

- extension and engagement activities
- incentive payments and other market-based instruments
- direct contracted activities
- management agreements
- regulation.

The regional work program is based on what is expected to be achieved in a typical year, however when waterways undergo short or long periods of drought and also periods of high rainfall and floods, a seasonally adaptive approach will be adopted. This is where an event such as a flood, bushfire or drought, causes a change to the condition or risks to the region's waterways. This would result in actions and/or funding being redirected towards the affected areas, and in some cases priorities may need to be reconsidered through further planning. Rather than relying only on emergency management during these extremes of climatic conditions, we need a flexible management approach allowing annual implementation of management activities to be adapted to reflect the prevailing conditions. Recent examples include priority erosion control and repair activities undertaken in Upper Barwon catchment following the 2011 floods and the drought contingency actions (environmental water releases) undertaken to protect critical habitat pools in the Moorabool during the Millennium drought.

6.2 Investment

The implementation of this CWS will be influenced by available funding and resources, level of community support and the impacts of extreme events within the region. Investment proposals to support actions within the strategy will be developed as investment opportunities arise. Project investment proposals will be prepared in conjunction with delivery partners and the community.

It is important to recognise that implementation of other plans and sub-strategies under the Corangamite RCS contribute to waterway health outcomes, and are not directly costed or implemented under this CWS. It is also important to note that the estimated funding requirements and proposed cost shares are indicative. The Corangamite CMA will coordinate and implement waterway management activities on behalf of government, in accordance with government policies. Implementation of waterway management activities is influenced by available funding. The timeline for implementing the CWS targets may need to be amended in line with the funding provided.

6.2.1 Investment sources

Sources of investment to assist delivery of actions within this CWS and to support other waterway management activities may be from both traditional and non-traditional sources.

Traditional sources include the Victorian and Australian governments, regional landholder contributions, local governments and water corporations. In most cases funding from these sources will be directed towards achieving outcomes for priority waterways identified within this CWS.

Non-traditional sources such as industry, corporate and philanthropic investment may assist us to secure funding for projects on both priority and other waterways that are not priorities under the CWS and its regional work program. To increase

corporate and philanthropic investment into the region (and to fund some of these other activities and projects), the Corangamite CMA has developed an Investment Recruitment Strategy, which will be implemented during the life of this CWS.

6.2.2 Cost sharing

While the framework for waterway management outlined in this CWS 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.

Once management activities for priority waterways have been costed and proven to be sound investments, their implementation will be dependent on the cost sharing principles outlined below. These principles are based on the premise that asset protection links directly with the policy of beneficiary pays. Beneficiaries in regard to the outcomes of implementing the regional work program may include:

- direct beneficiaries such as landholders and recreational groups
- local government representing regional economic benefits, e.g. increased tourism from healthy waterways
- the broader community including 'Friends of' and Landcare groups
- owners and managers of public infrastructure
- water corporations, given their dependence on a healthy water resource base and their potential impacts on healthy waterways.

The cost sharing principles outlined below will be applied to all projects undertaken as part of the CWS:

- **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 for public benefit** – 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.

6.3 Engagement and community participation

6.3.1 Engagement plan

An engagement plan (Econnect 2012) has been developed as a core part of implementing the CWS. The plan is based on an analysis of the data collected through a pilot social benchmarking survey (2006) and results from My Victorian Waterway survey (2009). The plan:

- identifies and prioritises target groups and defines objectives for engagement
- describes understanding of the Corangamite community's aspirations, values, knowledge and likely behaviours in relation to waterways (based on analysis of 2009 data and comparison with 2006 data)
- designs communication messages, engagement tactics and actions
- has built-in monitoring and evaluation.

6.3.2 Community participation

As outlined in Chapter 3, the Corangamite CMA aims to review its engagement practices so it can maximise opportunities to partner with the community to improve waterway health. As previously outlined, the Corangamite CMA will do this by:

- encouraging community management of waterways, including those that are not directly listed as priorities in this CWS (further information can be found in Chapter 5)
- supporting community monitoring programs such as Waterwatch and EstuaryWatch through continued support of volunteers, program database maintenance and purchase of equipment
- supporting efforts and providing opportunities to build and share knowledge by hosting capacity building events, knowledge exchange and staff extension and assistance with community-based funding applications
- undertaking awareness raising activities in the community and educating people about waterway management and the need to maintain or improve waterway condition.

6.4 Annual work

The work program will be delivered over the eight-year life of the CWS. Management activities will be prioritised annually and based on the following:

- **The investment streams available –** Different government and other investors are expected to fund actions that contribute to different CWS goals, based on their funding requirements. This will influence the types of work that can be undertaken and the waterways selected in any given year.
- **Capacity and willingness to participate –** Success cannot be achieved without participation of the region's public and private landholders.
- **Cost vs benefit –** Projects that demonstrate good value for money, in terms of the NRM outcomes delivered for the investment. Considerations include the goals of the particular fund source, the level of landholder co-contribution, and the realisation of multiple outcomes.
- **Connectivity –** Where possible projects will be undertaken according to the logical sequence within the catchment to maximise connectivity. For example, the removal of fish barriers may commence downstream to provide in-stream habitat connectivity. Removal of weeds to improve streamside vegetation, such as willow control, is often best to occur from the top of the catchment to minimise downstream reinfestation.
- **An urgent response is required –** Annual work may be directed to locations where an urgent response is required to prevent irreversible damage (for example adoption of the seasonally adaptive approach in the case of an extreme event such as a bushfire, or, where fish deaths occur).
- **Level of risk –** Where there is a high level of risk projects will be delayed until risks are decreased to a satisfactory level. An example may be where large rabbit populations would affect revegetation success. In this situation, a rabbit control program would be needed before the revegetation occurred.
- **Adapting to new information –** As new information is gained by the Corangamite CMA it is expected that current priorities and activities will be revised and in some cases new ones will be set. This could include filling current knowledge gaps (e.g. adjusting required activities based on new or changed threats or new knowledge on values), incorporating climate change information and/or new adopting adaptive management practices for onground activities.

7. Monitoring, evaluation and reporting

7.1 Overview

The management of rivers, estuaries and wetlands in the region is conducted within an adaptive management framework. At the core of adaptive management is the ability to learn from previous experience and update management approaches to reflect the knowledge gained during implementation. Figure 7.1 presents the adaptive management framework of the Victorian Waterway Management Program and the *Corangamite Waterway Strategy*. The framework includes (DEPI, 2013):

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

Community participation, research and innovation occur across all parts of the program. This knowledge and information is crucial for ensuring effective adaptive management and informing associated monitoring, evaluation and reporting processes (DEPI, 2012).

7.1.1 Developing an MER Plan

A detailed monitoring, evaluation and reporting (MER) plan will be developed to support adaptive management from planning to CWS completion. The MER plan will:

- present the program logic underpinning the strategy
- clarify the assumptions associated with the program logic and identify strategies to manage potential risks
- identify the key questions for evaluation and establish processes to monitor progress within the framework of the statewide monitoring program
- clarify the communication and reporting needs and identify the processes required to support these needs
- enable lessons learned from monitoring and evaluation to be gathered and inform improvement.

In addition the MER plan will include site specific MER for the ***Western District Lakes Ramsar Site*** that will:

- monitor and assess Limits of Acceptable Change
- identify how information will be collected and who is responsible
- report against ecological character and meet the needs of the Ramsar rolling review.

The MER plan will be reviewed on an annual basis to ensure it remains current and relevant to informing adaptive management. It will also be linked with the Corangamite RCS MER plan to inform broader catchment outcomes.

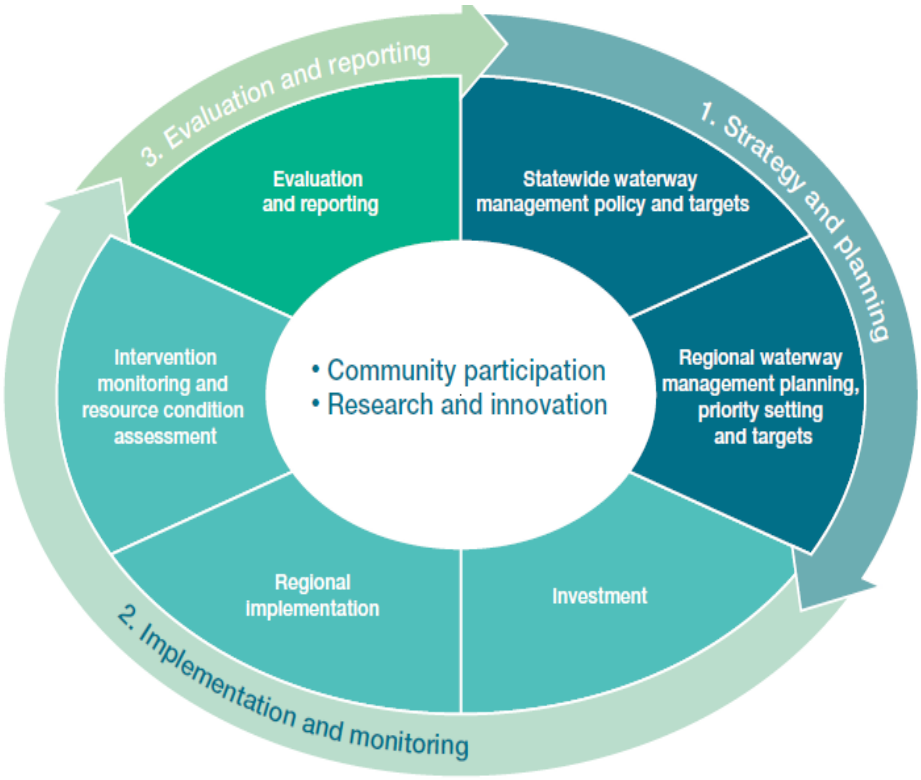


Figure 7.1 – The adaptive management framework of the Victorian Waterway Management Program and the Corangamite Waterway Strategy (Source: DEPI, 2013)

7.2 Monitoring

Monitoring activities will be targeted to inform evaluation and reporting on the strategy's implementation. Monitoring activities will also include the collection of information relating to foundational influences and external influences that impact on the strategy's implementation. Foundational influences include factors such as climatic variability, drought, flood, bushfire and potential impacts of climate change. External influences include factors such as land use change, population growth, government support, economic conditions, community expectations and landholder attitudes.

Monitoring activities will be consistent with the statewide monitoring processes coordinated through the Victorian Waterway Management Program. This program includes targeted resource condition and intervention monitoring to inform both state and regional evaluation and reporting processes.

Monitoring needs for the Western District Lakes Ramsar Site have been recommended in its Ecological Character Description (Hale and Butcher 2011). The focus of the monitoring is an assessment against Limit of Acceptable Change to determine the changes in ecological character (Appendix D).

The recommended monitoring to meet the obligations under the Ramsar Convention and the EPBC Act are provided in Appendix E. This information will be worked into the CWS MER Plan.

7.3 Evaluation

The strategy and planning phase of the adaptive management cycle (Figure 7.1) includes the development of pre-determined key evaluation questions to assess the CWS and gain new knowledge and information. Evaluation questions provide the basis for evaluation design and associated monitoring processes.

Evaluation of the CWS will include an assessment of the extent to which the outcomes have been achieved at each level of the program logic underpinning the strategy. It will also address the assumptions in the program logic and provide direction and improved knowledge for subsequent planning cycles.

The evaluation questions developed for the CWS address the following five categories (DEPI, 2012):

- **Impact -** changes to resource condition, management activities or institutions
- **Appropriateness -** addressing the needs of beneficiaries and against best practice

- **Effectiveness -** achievement of desired management outputs and resource condition objectives
- **Efficiency -** value or return from investment
- **Legacy -** after the activity/program ends.

The scale and frequency of evaluation will vary throughout the life of the CWS, and will include an annual review cycle, a more detailed interim review, as well as a final independent review in the last year of the strategy.

The annual reviews will assess progress towards the planned management activities and outputs, and associated financials. These reviews will consider any new knowledge and information that may require changes to planned management activities and outputs. The CMA will undertake an annual review and will align with regional investment processes.

The interim review will also assess progress towards management activities and outputs, and where possible, review progress towards management outcomes. This review may also provide new knowledge and information that may lead to an update of the CWS to support an adaptive approach.

The final independent review of the CWS will focus on capturing the knowledge gained during implementation of the strategy, and an assessment of achievements and progress against the strategy's targets. This will ensure that there is a clear record of achievements, lessons learned, and an evidence base for updating or changing regional programs and management approaches in the future.

7.4 Reporting

Reporting is an important tool to ensure accountability for the investment of government funds into waterway management activities. Over the long-term, consistent and effective reporting provides evidence to evaluate and communicate the effectiveness of the CWS (DEPI, 2013).

Annual management reporting is a component of the annual review cycle, and includes reporting on the activities and outputs achieved for the year and associated financials. This reporting is delivered through the Corangamite CMA Annual Report, and annual investment reports for existing funding arrangements with the state government. This reporting generally comprises both tabular and spatial information. Financial audits are required to ensure that reported expenditure is accurate and accountable. These audits will be led by DEPI and provide assurance that investment in delivering outputs has been strategic, cost effective and consistent (DEPI, 2013).

Public reporting against the strategy's management outcome targets will occur, at a minimum, following the final review of the CWS. The Corangamite CMA will also support reporting of management outcome targets for the *Victorian Waterway Management Strategy* in 2016 and 2020.

These reporting processes will be informed through the reviews undertaken in in year four and the final year of the strategy.

Resource condition reporting is led through the Victorian Waterway Management Program. This involves the collection, analysis and reporting of information on the condition of Victoria's waterways every eight years, subject to available funding (DEPI, 2013). This reporting, combined with regional knowledge, provides the collective data to assess the condition of waterways over the long term.

The MER plan for the CWS will identify further detail of the key stakeholders at organisational, community, regional, state and Commonwealth levels who should be kept informed on the progress of the strategy or would benefit from the strategy's information. It will also identify what these organisations need to know and how it will be communicated.

The ecological character of the Western District Lakes Ramsar Site will be reported through the Australian Governments triennial national Ramsar site rolling review.

7.5 Knowledge gaps and research

The MER plan for the CWS will specify the key knowledge gaps identified through developing the program logic and evaluation questions. This plan will also identify the strategies for addressing knowledge gaps which may involve collating existing information or proposing areas for further research. To align with the Victorian Waterway Management Program, the CWS 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 low confidence in the relationships between outputs, management outcomes and long-term resource condition outcomes (if significant for waterway management and investment) (DEPI, 2013).

Research will be directed to investigating those 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 the development and testing of these predictions, rather than more general, descriptive research. It is also vital that research is targeted to better understand the effectiveness of management activities in which there is significant Victorian Government investment (for example, riparian revegetation or the effectiveness of fox control programs to protect fauna communities).

New information will be used to review and update priorities and required activities as it becomes available (for example where new communities of the nationally critically endangered seasonal herbaceous wetlands are found).

Recent regional examples of priority knowledge gaps and research have included survey work into threatened native fish species, and ecological investigations and risk assessments underpinning environmental water management.

7.1.2 Value and threat data gaps

In addition to the above, there are knowledge gaps identified for individual values or threats to waterways through AVIRA data collection and the risk assessments (Appendix K – treatment column, 'fill data gap'). For a small number of priority waterways (where a lack of data affected our ability to set management activities) there are specific investigations set through the regional work program. For all other data gaps, our knowledge on these values and threats will need to be improved over time. As new knowledge is gained, data will be updated and current activities and priorities will be revised as required.

7.1.3 Addressing process limitations

As described in Section 4.7.3, a number of process limitations were identified throughout the strategy

development. Ensuring these are addressed will be an important focus during strategy delivery. These include:

- Nominating and negotiating additional waterways for inclusion in the next iteration of ISC and IWC (so they can be included in future regional planning and strategies). One example of waterways that may be suitable for inclusion are those that flow into the Ramsar listed wetlands in the Bellarine, Lismore and Murdeduke landscape zones. These are generally described, but not specifically assessed in this strategy and should be added in future.
- Addressing the significant knowledge gaps on condition of wetlands in the Corangamite region to help direct future investments in wetland management.
- Improving social data and criteria within AVIRA to allow for a more comprehensive assessment of socially important waterways (this should consider gathering data on user or visitor numbers).

CORANGAMITE CMA

PART C
Detailed regional work program

8.1 Overview

This regional work program details management activities for the priority waterways that are identified in each landscape zone summary in Chapter 5 of the CWS.

8.1.3 Developing the regional work program

Management activities (outputs) and Management Outcome Targets (MOTs) were identified for all priority waterways for implementation during an eight-year period.

Conceptual models were used to help select appropriate management activities, based on the best available knowledge. Management Outcome Targets (MOTs) describe the desired change expected as a result of the management activities (i.e., the level of threat reduction required in the eight-year planning cycle) and have been developed for all priority waterways being managed as part of the regional work program.

Based on the identified management activities and outcome targets, an eight-year work program was developed for each priority waterway. The information is presented by landscape zone and includes:

- the Long-term Resource Condition Targets (RCTs)
- the Limits of Acceptable Change (LAC) for wetlands within the Western District Lakes Ramsar Site
- the Management Outcome Targets (MOTs) required to achieve the RCTs
- the key waterway values that link to the regional goals
- a summary of threats addressed through implementing the work program
- details of the management activities to be undertaken (including quantities, lead and partner agencies/groups required to deliver the activities and specific threats addressed by the activities).
- an overall cost estimate for an eight-year work program budget including monitoring and maintenance

Values and threat scores

Both values and threats identified for waterways have been assigned a numerical figure between 1 and 5 based on their level of value or level of threat to a waterway, with 1 being low and 5 being high. In circumstances where information is not available or unknown for a value or threat, a score of -1 has been assigned.

8.1.2 Estimated costs

Costs have been estimated for planned work s for the eight-year life of the CWS. These are based on full cost, and include costs associated with activities of the Corangamite CMA as well as key partners and, where necessary, landholder contributions.

The costs provide an indication of the investment needed to deliver the CWS, however, they are not a commitment to invest by leads or partners. The actual funding and resources available, level of community support and the impacts of extreme events all influence the delivery of this strategy. The Corangamite CMA will develop investment proposals to support activities in the strategy as investment opportunities arise. Where relevant, project investment proposals will be prepared in conjunction with delivery partners and the community. Further information on investment for this CWS can be found in Chapter 6.

8.1.3 Leads and partners

Lead and partner agencies are assigned to the individual activities

- **Leads** have been identified as those who are responsible for carrying out an activity, or, ensuring that it occurs (i.e. facilitate the activity).
- **Partners** are those that have been identified as important to achieving success in delivering an activity. This role may include conducting or supporting on-ground activities, providing advice or project and management support, and, in some cases providing funding.

All delivery partners will continue to prioritise their own works in accordance with their own programs and investment sources.

Land manager

The term '*land manager'* is referred to for some activities where the tenure and land management responsibilities for the parcels of land along a waterway is complex (i.e. there may be multiple land managers for one activity along one particular waterway reach). Land manager refers to the person, people or organisation that is responsible for carrying out land and/or water management activities. This is for both public and/or private land and may include DEPI, PV, local government, Committees of Management, private landholders or others. Relevant land managers will be identified during project planning for CWS delivery. Where 'landholder' is differentiated, this refers to private landholders only. For Ramsar wetlands particular land managers are identified in Table 3.3 (Part A, Section 3.4.3).

A full list of lead and partners referred to throughout Part C is provided in Table 1, below.

Table 1: Lead and partners referenced to throughout the regional work program

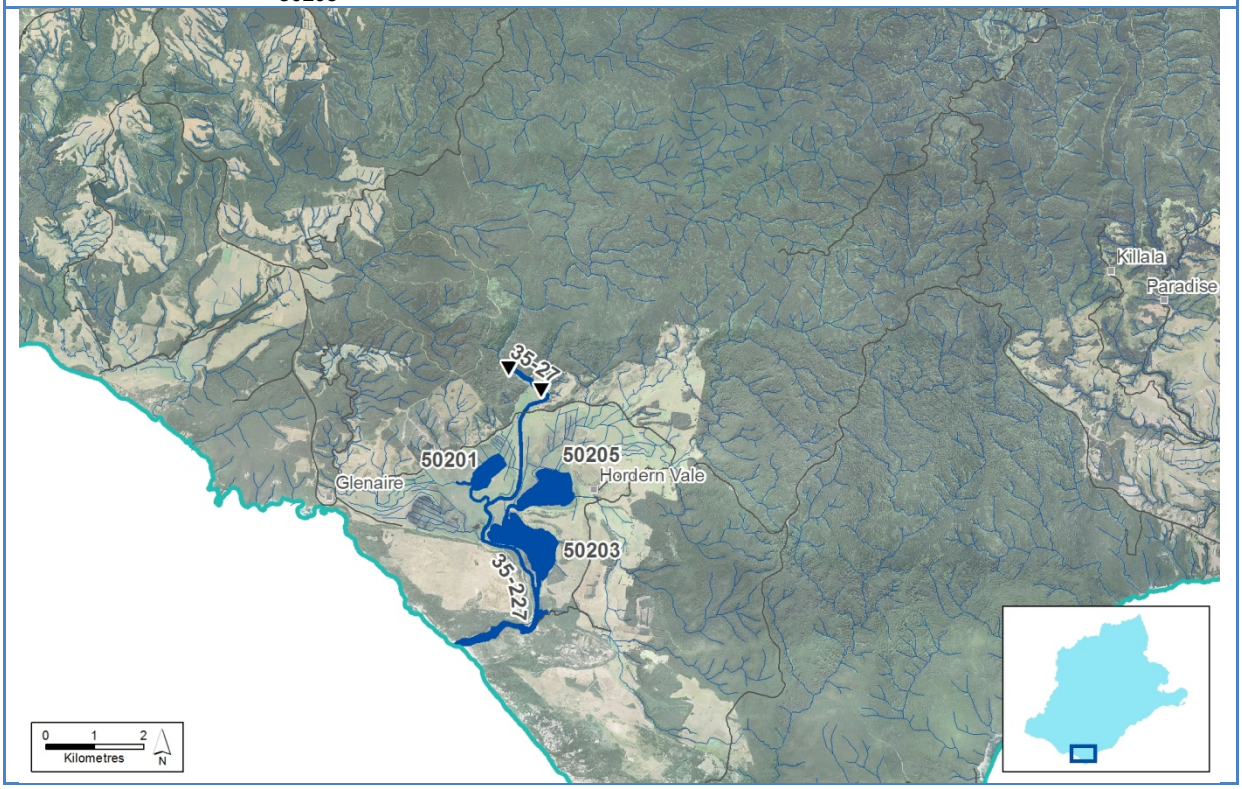
Acronym	Description
ABCL	Adelaide Brighton Cement Limited
AG (DoE)	Australian Government (Department of the Environment)
ATP	Alvie Tree Planters
BCC	Barwon Coast Committee
BLG	Barongarook Landcare Group
BLN	Bellarine Landcare Network
BW	Barwon Water
CCMA	Corangamite CMA
CHW	Central Highlands Water
CoB	City of Ballarat
COGG	City of Greater Geelong
COS	Colac Otway Shire
CS	Corangamite Shire
DEPI	Department of Environment and Primary Industries
DEPI (ARI)	DEPI - Arthur Rylah Institute for Environmental Research
DEPI (Biosecurity)	DEPI- Biosecurity Division (invasive species)
EPA	Environment Protection Authority
GA	Greening Australia
GF&G	Geelong Field and Game
GLN	Geelong Landcare Network
GORCC	Great Ocean Road Coast Committee
GPS	Golden Plains Shire
HDLN	Heytesbury District Landcare Network
Industry Groups	Industry Groups
Land manager	Person, organisation, committee (etc.) that is responsible for carrying out land and/or water management activities on the relevant parcel/s of land. Includes public and/or private land managers. For land managers specific to Ramsar wetlands, refer to Table 3.3 (Part A, Section 3.4.3).
Landcare-Community Groups	Relevant Landcare and Community Groups for that area.
LH	Landholder (private land)
LAWROC	Land and Water Resources Otway Catchment
LCCC	Lake Colac Coordinating Committee
LCG	Leigh Catchment Group
CLLN	Corangamite Lakes Landcare Network
MCLG	Moorabool Catchment Landcare Group
MS	Moyne Shire
OCC	Otway Coast Committee
PV	Parks Victoria
SCIPN	Surf Coast and Inland Plains Network
SCS	Surf Coast Shire
SOLN	Southern Otway Landcare Network
SRW	Southern Rural Water
UBLN	Upper Barwon Landcare Network
VEHW	Victorian Environmental Water Holder
VicRoads	VicRoads
VRFish	Victorian Recreational Fishing Peak Body
WW	Wannon Water
WYAC	Woady Yaloak Advisory Committee
WYCG	Woady Yaloak Catchment Group

8.2 Aire Landscape Zone

Lower Aire River, Lakes Costin, Craven and Horden

The Aire River rises near Beech Forest and flows generally south west. It flows through the Great Otway National Park, is joined by three minor tributaries and enters the coast west of Cape Otway. The Aire River is a Heritage River. The Nationally Important Lower Aire wetlands consist of three shallow freshwater lakes (Lake Horden, Lake Craven and Lake Costin), brackish to saline marshes and an estuary on the Aire River floodplain. The Ford River joins the Aire River on the estuarine floodplain. The estuary is intermittently closed to the sea.

Waterway	Lower Aire River; Lakes Costin, Craven and Horden	Landscape Zone	Aire
Identification No.	35-227, 35-27, 50201, 50203, 50205	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Aire River estuary (35-227) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Aire River (35-27) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Horden (50201) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Craven (50203) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Costin (50205) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formal Significance	Heritage River (35-227, 35-27)	Heritage rivers have outstanding values that require protection for current and future generations. A 35 km reach (or corridor) of the Aire River from Hopetoun Falls Scenic Reserve to the ocean is one of the 17 Heritage rivers identified in Victoria and listed under the *Heritage Rivers Act 1992*. The Land Conservation Council (LCC, 1991) included the Aire River as a Heritage River as it: • drains one of the highest rainfall areas in the State; • contains undisturbed corridors of native vegetation comprising mostly cool temperate rainforest species; • has high scenic landscape value through the gorge and in the estuary; • includes several geomorphological and geological features of State significance, namely: the gorge, a lake created by a landslip, and a structurally controlled meander; • is considered good habitat for trout in the upper reaches with some of the best wild trout waters in the lower reaches; • has an exceptionally large population of platypus; • has a diverse native fish fauna, with 12 species recorded (2 listed as vulnerable, 3 potentially threatened and 1 indeterminate); and • includes a popular scenic drive with good access at points for picnicking and camping.
	Nationally Important Wetland (50201, 50203, 50205)	Lower Aire River Wetlands – meet the following criteria for listing 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or Nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Global bird conservation significance – Otway Ranges
	Significant EVCs	Estuarine Wetland – Status: Endangered; Swamp Scrub – Status: Vulnerable
	Wetland Vegetation Condition	Significant EVCs (Biota Sub-Index Score) – 18 – IWC Biota Sub Index Score
	Native Fish	67 Fish index score statewide Fish Data (Fish Index Scores) 09~10 valid from 1/01/2010
	Rip Veg Condition	The waterway scored 7/10 for the Streamside Zone sub-index in the ISC assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (willows/hawthorn)
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*– Status: Vulnerable (EPBC, Adv list); Australian Mudfish *(Neochanna cleaveri)*– Status: High priority actions in high priority areas (ABC), Critical (Adv List)
	Significant Birds	Intermediate Egret (*Ardea intermedia*) – Status: Critical (Adv List); Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Royal Spoonbill *(Platalea regia)*– Status: Vulnerable (Adv List); Blue-billed Duck *(Oxyura australis)*– Status: Endangered (Adv List); Pied Cormorant *(Phalacrocorax varius)* – Status: Near Threatened (Adv List)
Social	Camping	Serviced campground adjacent to waterway or multiple campsites with basic facilities adjacent to waterway
	Game Hunting	Game hunting is permitted
	Motor Boating	Waterway is popular for motor boating with accessible formal boating facility (i.e. boat ramp and car/trailer parking)
	Non-Motor Boating	Waterway is popular for non-motor boating

	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	This is the most popular recreational activity in the estuary The estuary contains the species such as black bream, mullet, Australian salmon and flounder. Access for boat and bank fishing at the mouth and for bank fishing at the highway bridge.
	Sightseeing	Sightseeing destination with high visitor numbers. The estuary is readily accessible by means of the Great Ocean Road, which skirts its northern edge close to the foot of the Otway hills. From the road the area appears to be a lush green coastal valley, quite different in character to the rugged hills and coastlines of the Otways
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
Economic	Tourism	Traditionally campers have mostly come from surrounding towns, particularly Colac, but more recently greater numbers of campers have come from Melbourne. In addition, environmental educational use of the area is increasing, with school groups visiting in periods of better weather and Outward Bound groups from New South Wales using the eastern camp for canoe access.

Threats

Threat	Details
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal or inland acid sulfate soils and the waterway is at high risk from acid sulfate soils
Intermittently Open Estuaries	>50% of all estuary mouth openings are artificial with non-environmental objectives
Invasive Fauna (Terrestrial)	Invasive terrestrial species directly prey on native species and/or damage native species habitat. Invasive species present
Livestock Access	25-75% of waterway is affected by livestock access
Deg Rip Veg – Large Trees	40-60% difference in proportion of Large Trees expected in the ISC assessment
Loss of Ins Hab (Large Wood)	Marginal Habitat – Moderate visible pieces of instream wood from indigenous species in channel. Abundant pieces of exotic instream wood in channel
Loss of Ins Hab (Sed)	Deposition of sediments above natural levels mainly at bends and/or instream obstructions
Changed Water Regime	20 – IWC Hydrology Sub Index Score – decreased frequency of inundation throughout the wetand system of the lower Aire Valley
Invasive Flora (Wetland)	IWC Presence of Weeds Score- 3 IWC Biota Sub Index Score
Soil Disturbance	IWC Soils Sub-Index – 8 – IWC Soils Properties Sub Index Score
Degraded Buffer	IWC Buffer Assessment Score – 3

Work Program for Aire River estuary

Waterway	Aire River estuary	Identification No.	35-227

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved. 15 - The listed values of heritage rivers are maintained or improved.
Management Outcome Targets (MOTs)	a – The estuarine vegetation has improved from moderate to good condition b – No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period c – All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives d – Invasive fauna species (terrestrial) are contained (they are present but have no significant

	impacts) e – Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Camping (5) Game Hunting (5) Motor Boating (4) Non-Motor Boating (4) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5) Significant Birds (5) Significant Fish Dependent (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3)

Management Activity/Output	**Quantity**	**Lead/** Partners	**Threats addressed by activity**	**MOT link**
Review rural drainage management in line with Government policy	1 no.	**CCMA**/ COS, LH, DEPI	Disturbance of Acid Sulfate Soils (5)	b
Install riparian fence	4 km	**CCMA**/ SOLN, LH	Livestock Access (3)	e
Establish stewardship/management agreement	4 ha	**Land manager**/ CCMA	Degraded Estuarine Vegetation (3) Livestock Access (3)	a, e
Assess options for long term management of land subject to inundation	1 no.	**CCMA**/ COS, LH	Livestock Access (3)	e
Develop a management plan for the Aire estuary that incorporates EEMSS (a risk based approach for estuary openings) – Not costed – refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	1 no.	**CCMA**/ PV, COS, LH	Intermittently Open Estuaries (5), Degraded Estuarine Vegetation (3)	c, a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation	2 ha	**CCMA**/PV, SOLN, LH	Degraded Estuarine Vegetation (3)	a
Investigate options to set up an EstuaryWatch group to collect baseline data on estuary condition. Not costed.	1 no.	**CCMA**/ Community, DEPI	Intermittently Open Estuaries (5)	c

Estimated cost of activities	**$161,000**

Work Program for Aire River (35-27)

Waterway	**Aire River**	**Identification No.**	**35-27**

Long-term Resource Condition Targets	04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 15 - The listed values of heritage rivers are maintained or improved.		
Management Outcome Targets (MOTs)	a – No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b – Livestock have been excluded from over 25% of the waterway frontage c – Loss of in-stream habitat (large wood) threat has reduced from moderate to low d – No increase in the loss of in-stream habitat through sedimentation		
Values linked to regional goals	Native Fish (4) Rip Veg Condition (4) Significant Fish Migratory (5) Recreational Fishing (5) Sightseeing (1)	**Threats addressed by work program**	Deg Rip Veg – Large Trees (3) Livestock Access (5) Loss of Ins Hab (Large Wood) (3) Loss of Ins Hab (Sed) (3)

	Use of Flagship Species (3)		

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation – Upstream of Great Ocean Road	4.5 ha	**CCMA**/ SOLN, LH	Deg Rip Veg – Large Trees (3), Loss of Ins Hab (Large Wood) (3), Loss of Ins Hab (Sed) (3)	a, c, d
Install riparian fence – Flood fencing upstream – Great Ocean Road	1.5 km	**CCMA**/ SOLN, LH	Livestock Access (5), Loss of Ins Hab (Sed) (3)	b, d
Establish stewardship/management agreement	1.5 ha	**Land manager**/ CCMA	Deg Rip Veg – Large Trees (3) Livestock Access (5)	a, b

Estimated cost of activities	**$96,750**

Work Program for Lake Horden

Waterway	**Lake Horden**	**Identification No.**	**50201**

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a – No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period b – Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c – Invasive wetland flora threat has reduced from very high to moderate		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (4) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Develop management plan for the Aire estuary that incorporates EEMSS – Not costed – refer to 35-227	1 no.	**CCMA**/ COS, PV	Disturbance of Acid Sulfate Soils (5), Invasive Flora (Wetland) (5)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b

Estimated cost of activities	**$ -**

Work Program for Lake Craven

Waterway	Lake Craven	Identification No.	50203
Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a – The wetland water regime threat has improved from moderate to low b – The wetland buffer vegetation has improved from poor to moderate condition c – No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period d – Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e – Invasive wetland flora threat has reduced from high to moderate f – IWC soil sub-index score is moderate		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Changed Water Regime (3) Degraded Buffer (4) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (4) Soil Disturbance (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Develop management plan for the Aire estuary that incorporates a risk based approach (and EEMSS) – Not costed – refer to 35-227	1 no.	**CCMA**/ COS, PV, LH	Changed Water Regime (3) Degraded Buffer (4), Disturbance of Acid Sulfate Soils (5), Invasive Flora (Wetland) (4)	a, b, c, e
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5), Soil Disturbance (4)	d, f
Establish native indigenous vegetation	5 ha	**CCMA**/ PV, SOLN, LH	Degraded Buffer (4), Invasive Fauna (Terrestrial) (5)	b, d
Install wetland fence	1 km	**CCMA**/ SOLN, LH	Degraded Buffer (4), Invasive Flora (Wetland) (4), Soil Disturbance (4)	b, e, f
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (4), Invasive Flora (Wetland) (4), Soil Disturbance (4)	b, e, f

Estimated cost of activities	**$83,500**

Work Program for Lake Costin

Waterway	Lake Costin	Identification No.	50205

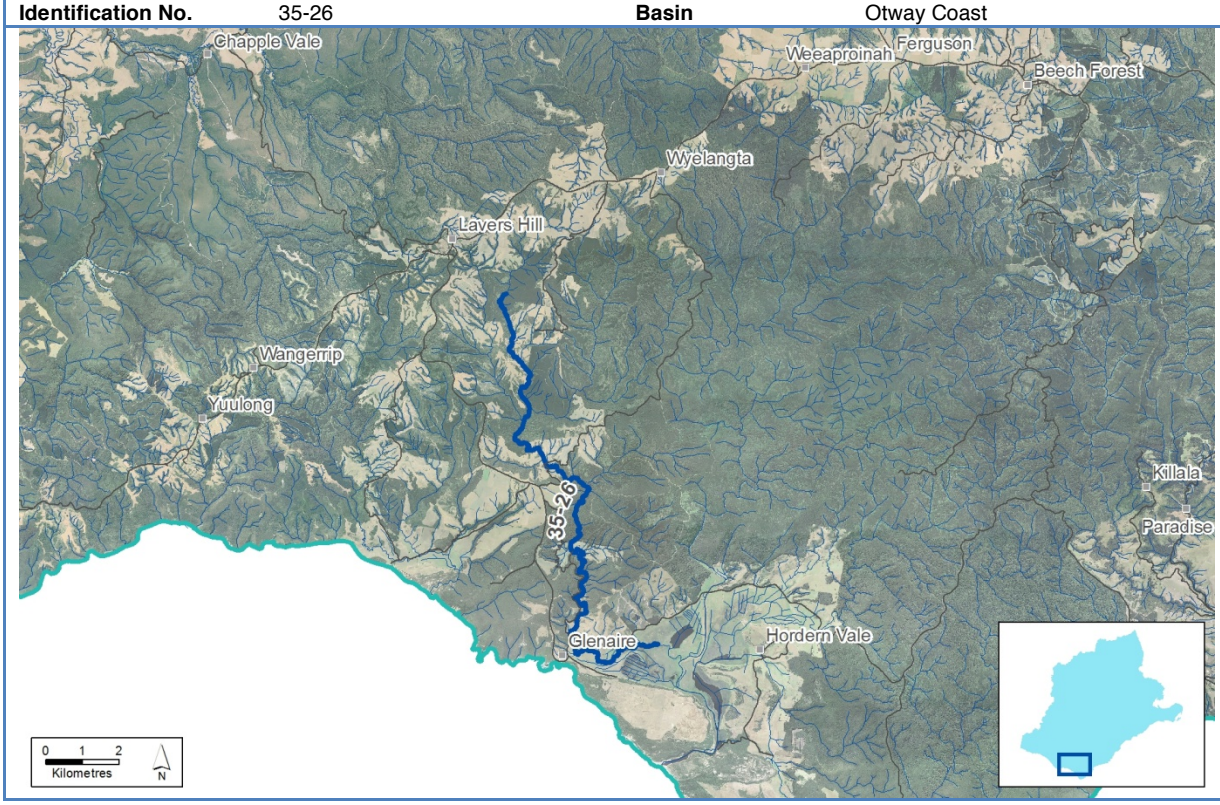
Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a – The wetland water regime threat has improved from moderate to low b – The wetland buffer vegetation has improved from poor to moderate condition c – No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period d – Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e – Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Wetland Vegetation Condition (5)	**Threats addressed by work program**	Changed Water Regime (3) Degraded Buffer (4) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Develop management plan for the Aire estuary that incorporates EEMSS – Not costed – refer to 35-227	1 no.	**CCMA**/ COS, LH	Changed Water Regime (3) Degraded Buffer (4), Disturbance of Acid Sulfate Soils (5), Invasive Flora (Wetland) (3)	a, b, c, e
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation	2 ha	**CCMA**/ PV, SOLN, LH	Degraded Buffer (4)	b
Install wetland fence	1 km	**CCMA**/ SOLN, LH	Degraded Buffer (4), Invasive Flora (Wetland) (3)	b, e
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (4) Invasive Flora (Wetland) (3)	b, e

Estimated cost of activities	**$43,000**

Ford River

Waterway	Ford River	Landscape Zone	Aire
Identification No.	35-26	**Basin**	Otway Coast



Links to regional goals

Due to its values, the Ford River (35-26) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*– Status: Endangered (Adv List)
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list); Australian Mudfish *(Neochanna cleaveri)*- Status: High priority actions in high priority areas (ABC), Critical (Adv List)
Sites of Significance		Lake Horden and Aire Floodplain – Significance: State. The basin between Horden Vale and Glenaire is the in filled former estuary of the lower Aire valley. The Aire River crosses this alluvial plain flanked by narrow and low level banks.

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils

Work Program for Ford River

Waterway	Ford River	Identification No.	35-26

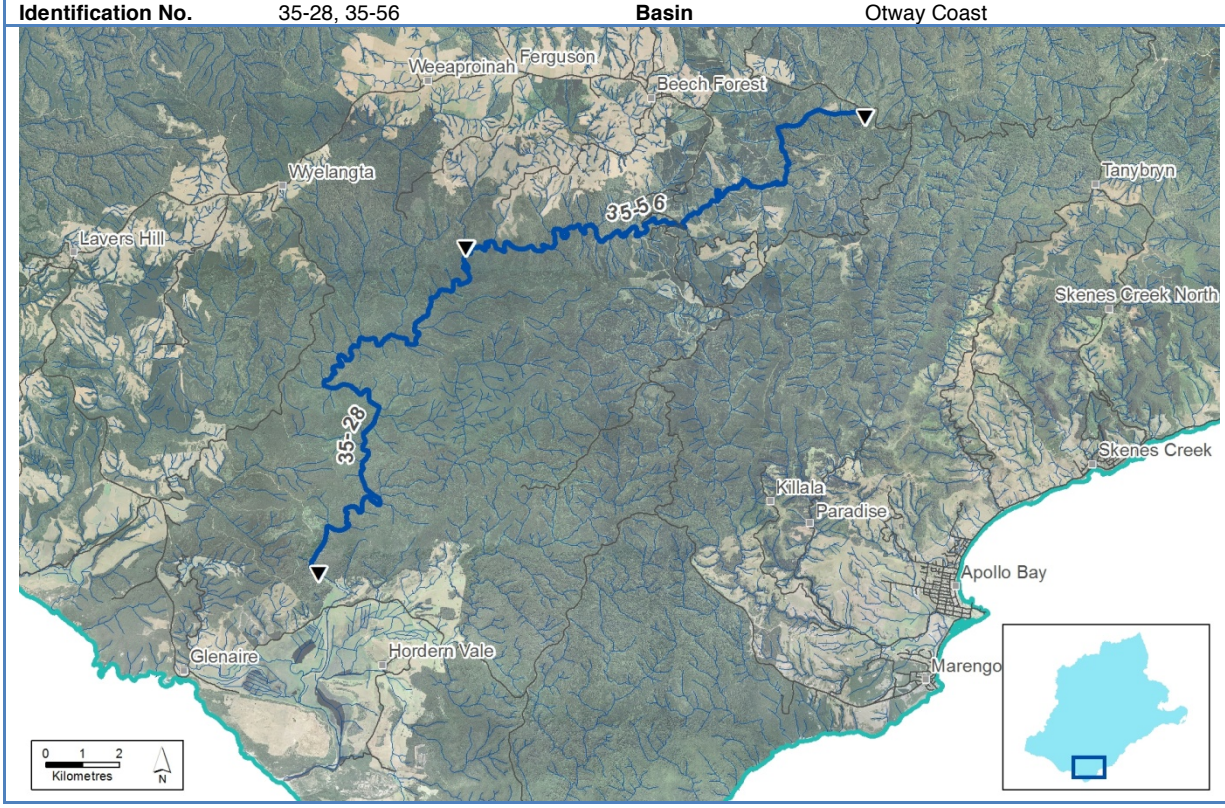
Long-term Resource Condition Targets	04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a – No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period		
Values linked to regional goals	Significant Invertebrates Aquatic (5) Significant Fish Migratory (5)	**Threats addressed by work program**	Disturbance of Acid Sulfate Soils (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Review rural drainage management in line with Government policy – Not costed – refer to 35-227	N/A	**CCMA**/ COS, DEPI, LH	Disturbance of Acid Sulfate Soils (5)	a

Estimated cost of activities	$ -

Aire River

Waterway	Aire River	Landscape Zone	Aire
Identification No.	35-28, 35-56	**Basin**	Otway Coast



Links to regional goals

Due to its values, Aire River (35-28) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV4	Maintain or improve waterways with formally recognised significance
Goal ENV6	Maintain waterways in near natural condition

Due to its values, Aire River (35-56) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formal Significance	Heritage River	Heritage rivers have outstanding values that require protection for current and future generations. A 35 km reach (or corridor) of the Aire River from Hopetoun Falls Scenic Reserve to the ocean is one of the 17 Heritage rivers identified in Victoria and listed under the *Heritage Rivers Act 1992*. The LCC (1991) included the Aire River as a Heritage River as it: • drains one of the highest rainfall areas in the State; • contains undisturbed corridors of native vegetation comprising mostly cool temperate rainforest species; • has high scenic landscape value through the gorge and in the estuary; • includes several geomorphological and geological features of State significance, namely: the gorge, a lake created by a landslip, and a structurally controlled meander; • is considered good habitat for trout in the upper reaches with some of the best wild trout waters in the lower reaches;

		• has an exceptionally large population of platypus; • has a diverse native fish fauna, with 12 species recorded (2 listed as vulnerable, 3 potentially threatened and 1 indeterminate); and • includes a popular scenic drive with good access at points for picnicking and camping.
Environmental	Rip Veg Condition	The waterway scored 9/10 for the Streamside Zone sub-index in the ISC assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (willows/hawthorn)
Social	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Sightseeing	Sightseeing destination with high visitor numbers
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Invasive Flora (Riparian) - Tree Layer	<11% cover of Invasive riparian flora. Willows No high threat weeds present
Deg Rip Veg - Large Trees	40-60% difference in proportion of large trees expected in the ISC assessment

Work Program for Aire River (35-28)

Waterway	**Aire River**	**Identification No.**	**35-28**

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 15 - The listed values of heritage rivers are maintained or improved. 17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - Invasive riparian flora (tree layer) has been maintained at a very low threat level		
Values linked to regional goals	Native Fish (4) Rip Veg Condition (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Invasive Flora (Riparian) - Tree Layer (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Maintain woody weed control - Willow follow-up control	5 ha	**CCMA**/ PV	Invasive Flora (Riparian) - Tree Layer (1)	a

Estimated cost of activities	**$25,000**

Work Program for Aire River (35-56)

Waterway	Aire River	Identification No.	35-56

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 15 - The listed values of heritage rivers are maintained or improved.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period		
Values linked to regional goals	Rip Veg Condition (5) Camping (4) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (3)

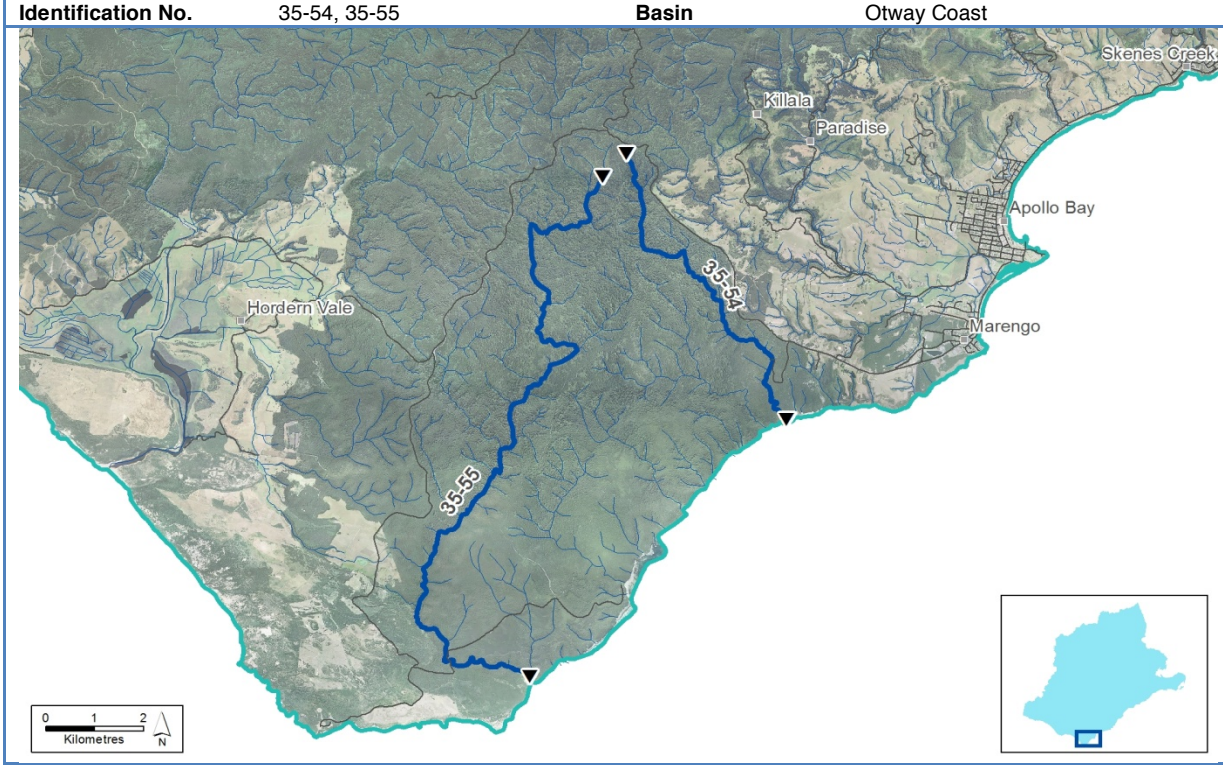
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement riparian land review	1 no.	**CCMA**/ DEPI, COS, Forestry Industry	Deg Rip Veg - Large Trees (3)	a

Estimated cost of activities	**$5,000**

Elliot River and Parker River

The Elliot and Parkers rivers are located between Apollo Bay and Cape Otway. The third Index of Stream Condition assessment indicated that they are both in excellent environmental condition.

Waterway	Elliot River and Parker River	Landscape Zone	Aire
Identification No.	35-54, 35-55	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Elliot River is a priority under the following regional goals	
Goal ENV6	Maintain waterways in near natural condition

Due to its values ,Parker River is a priority under the following regional goals	
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Aqua Invert Community Cond	Meets all biological objectives for rivers and streams
	Native Fish	Statewide Fish Data (Fish Index Scores) 09~10 - 57
	Rip Veg Condition	Riparian Vegetation Condition (Streamside Zone Sub-Index Score) - 9
	Significant Flora Terrestrial	Supports waterway-dependant species listed under the EPBC Act as Vulnerable and listed under the IUCN Red List as Vulnerable. Listed species include: Slender Tree-fern (*Cyathea cunninghamii*) Skirted Tree-fern (*Cyathea X marcescens*) Brooker's Gum (*Eucalyptus brookeriana*) Bristly Shield-fern (*Lastreopsis hispida*)
	Drought Refuges	Modelled drought refuge for one or more significant fish species or Nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Global bird conservation significance – Otway Ranges
	Significant EVCs	Cool Temperate Rainforest (Endangered) Streamside Zone Sub-index Score = 9 – Excellent condition
	Significant Birds Riparian	Lewin's Rail (*Lewinia pectoralis pectoralis*) (VU) – EPBC
	Significant Birds Waterway	Medium priority threatened species are associated with the waterway (as determined by ABC database): White bellied sea eagle (*Haliaeetus leucogaster*) – VU (35-55)
Social	Camping	Campground with basic facilities adjacent to waterway OR Multiple bush camping areas adjacent to waterway

	Picnic and barbeques	Designated picnic/barbecue areas present
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
	Landscape	Covered by a Significant Landscape Overlay

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Invasive species present
Degraded Riparian Vegetation (large Trees)	3ISC Large Trees Value Score: 0 - 2

Work Program for Elliot and Parker Rivers

Waterway	Elliot River Parker River	Identification No.	35-54 35-55

Long-term Resource Condition Targets	17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Aqua Invert Comm Cond (5) Native Fish (3) Rip Veg Condition (5)	**Threats addressed by Work Program**	-

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/Land manager	N/A*	a

Estimated cost of activities	$-

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

8.3 Bellarine Landscape Zone

Lake Connewarre Wetland Complex

The Lake Connewarre complex is located between the Geelong and the Bellarine Peninsula. It forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The Lake Connewarre complex includes Lake Connewarre, Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.

Lake Connewarre

Lake Connewarre forms part of the Lake Connewarre Complex (which includes Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt).

It is predominantly saline due to tidal connections and could be considered estuarine. However, salinity does vary seasonally in Lake Connewarre (higher in summer and lower in winter) ranging from a low of 9 ppt to a high of 28 ppt over the twelve month period March 1986 to March 1987 (Dahlhaus *et al.* 2007). In addition, a gradient in salinity at Lake Connewarre has been observed with lower salinity near Reedy Lake and high salinity closer to the estuary (DCNR 1995).

Hospital Swamp

Hospital swamp is a brackish wetland that is located downstream of the lower tidal barrage of the Barwon River. Its levels are controlled by regulators both upstream and downstream, however water levels are predominantly determined by flows in the Barwon River. Hospital Swamp has a diverse submergent macrophyte community.

Reedy Lake

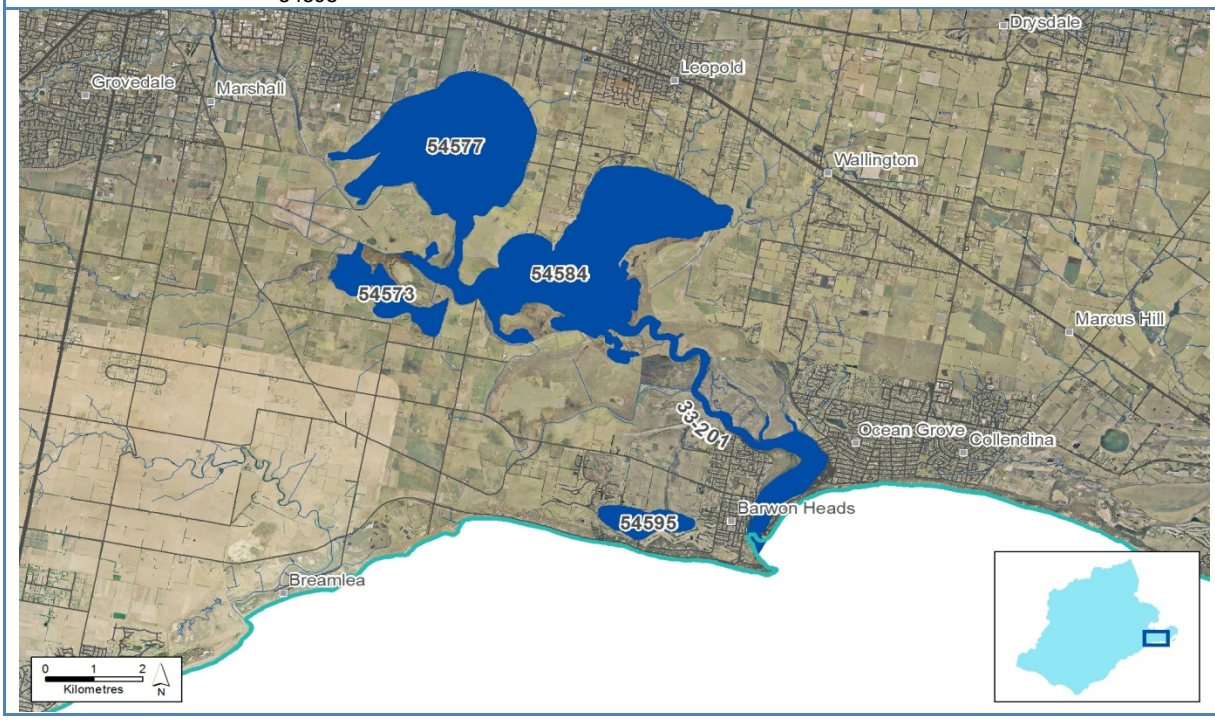
Reedy Lake is situated upstream of a levee system that prevents saline water from the Barwon Estuary and Lake Connewarre from entering the system. As a consequence, this wetland is predominantly fresh and mostly permanent.

Reedy Lake is the most significant example of a permanent freshwater marsh within the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site and is the largest freshwater lake in central Victoria.

Barwon Estuary

The estuarine reach of the Barwon River extends from Lake Connewarre to the river mouth at Barwon Heads.

Waterway	Lake Connewarre Wetland Complex	Landscape Zone	Bellarine
Identification No.	33-201, 54573, 54577, 54584, 54595	**Basin**	Barwon



Waterway	Barwon River Estuary	Landscape Zone	Bellarine
Identification No.	33-201	**Basin**	Barwon

Links to Regional Goals

Due to its values, Barwon River estuary (33-201) meets the following regional goals:	
Goal S1	Maintain or improve waterway condition where it supports high social values.

Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species.
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	The Barwon estuary forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	The Barwon estuary forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the State of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay; • Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	The Barwon estuary forms part of the Lake Connewarre State Wildlife Reserve. The reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. Lake Connewarre State Wildlife Reserve meets the following listing criteria for the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Important bird area Important breeding habitat for colonial nesting birds Important habitat for migratory shorebirds
	Significant Birds	Intermediate Egret (*ardea intermedia*) - Status: Critical (Adv List) Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List) Australasian Bittern (*Botaurus poiciloptilus*)- Endangered (EPBC), Endangered (Adv List) Red Knot *(Calidris canutus)* - Status: Near Threatened (Adv List) Great Knot (*Calidris tenuirostris*) – Status: Endangered (Adv List) Whiskered Tern *(Chlidonias hybrida)* - Status: Near Threatened (Adv List) White-winged Black Tern (*Chlidonias leucopterus*)- Status: Near Threatened (Adv List) Little Egret *(Egretta garzetta)* – Status: Endangered (Adv List) Gull-billed Tern *(Gelochelidon nilotica macrotarsa)*- Status: Endangered (Adv List) Sooty Oystercatcher *(Haematopus fuliginosus)* - Status: Near Threatened (Adv List) Black-tailed Godwit *(Limosa limosa)* - Status: Vulnerable (Adv List) Eastern Curlew (*Numenius madagascariensis*) - Status: Near Threatened (Adv List)

		Royal Spoonbill *(Platalea regia)*- Status: Vulnerable (Adv List) Pacific Golden Plover *(Pluvialis fulva)*- Status: Near Threatened (Adv List) Little Tern *(Sternula albifrons sinensis)* – Status: Vulnerable (Adv List) Fairy Tern *(Sternula nereis nereis)* – Status: Vulnerable (EPBC), Endangered (Adv List) Terek Sandpiper (*Xenus cinereus*) – Status: Endangered (Adv List)
	Significant EVCs	Mangrove Shrubland – Status: Vulnerable
	Significant Fish	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list);
Social	Game Hunting	Game hunting is permitted
	Motor Boating	Motor boats are used primarily for recreational fishing.
	Non-motor Boating	The estuary is popular for water-based activities, particularly kayaking.
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	The Barwon estuary is a very popular recreational fishing water targeting Australian salmon, sand mullet, yellow-eye mullet, flathead, trevally, black bream, whiting and mulloway.
	Sightseeing	The river at Barwon Heads is a popular tourist destination.
	Swimming	Swimming is a popular summer activity in the Barwon estuary at Barwon Heads just upstream from the Barwon Heads bridge.
	Tracks	A number of formal tracks have been developed along the Barwon estuary with shared pathways following the Barwon Heads side of the estuary.

Threats

Threat	Details
Barriers to Estuarine Biota	>25-50% of the estuary length is affected by an artificial barrier that interferes (intermittently or selectively) with the movement of biota (in a typical year)
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Degraded Water Quality	Algal blooms occur every 1 to 2 years (on average) Increased urbanisation in the surrounding area has the potential to result in increased stormwater discharges to the system
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Increase in Low Flow Magnitude	Low Flow Index Score – 0 - Victorian FSR data from 1965 to 1999
Increase in Proportion of Zero Flows	Zero Flow Index Score – 6 - Victorian FSR data from 1965 to 1999
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat Invasive species present
Reduced Estuary Extent	Artificial barrier completely blocks the movement of water (in a typical year) >50% of the estuary is affected by an artificial barrier
Reduced Floodplain and Wetland Connectivity	Wetlands are connected to the estuary but less than natural

Work Program for Barwon River estuary

Waterway	Barwon River estuary	Identification No.	33-201

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - The extent of the invasive aquatic flora is understood and management planning is underway c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - The increase in low flow magnitude threat score has reduced from very high to high f - Instream habitat (large wood) density has been assessed		
Values linked to regional goals	Game Hunting (5) Motor Boating (4) Non-Motor Boating (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Swimming (5) Tracks (5) Significant Fish Dependent (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Disturbance of Acid Sulfate Soils (5) Invasive Flora (Aquatic) (-1) Degraded Water Quality (5) Inc in Low Flow Magnitude (5) Instream habitat (large wood) density (-1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management plan - Estuarine vegetation management plan	1 no.	**CCMA**/ COGG, BCC, PV, BLN, LH	Degraded Estuarine Vegetation (3)	a
Establish non-woody weed control - spartina	20 ha	**PV**/ LH	Invasive Flora (Aquatic) (-1)	b
Assessment of instream habitat (large wood) density	1 no.	**CCMA**/DEPI	Instream habitat (large wood) density (-1)	f
Adopt 'whole of water cycle management'. Not costed	N/A	**Barwon Integrated Water Cycle Management Network**	Degraded Water Quality (5)	c
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – see Community engagement and capacity building (CWS Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Degraded Water Quality (5)	c
Implement the Barwon River Parklands Strategy for management of the lower Barwon River corridor. Not costed	1 no.	**CCMA**/COGG, BCC, PV, BW	-	-
Deliver water to wetland as per current entitlement (refer to work programs for Reedy Lake and Hospital Swamps below)	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	refer to work programs for Reedy Lake and Hospital swamps below	-
Investigate and manage urban stormwater/water quality impacts - Not costed	N/A	**COGG**/ CCMA, PV, DEPI	Degraded Water Quality (5)	c

Estimated cost of activities	**$140,000**

Waterway Identification No.	Hospital Swamp 54573	Landscape Zone Basin	Bellarine Barwon

Links to regional goals

Due to its values, Hospital Swamp (54573) meets the following regional goals:	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV3	Manage water for the environment to improve waterway condition
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	Hospital Swamp forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	Hospital Swamp forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the State of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay; • Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	Hospital Swamp forms part of the Lake Connewarre State Wildlife Reserve. The reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. Lake Connewarre State Wildlife Reserve meets the following listing criteria for the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitat	Hospital Swamp forms part of the Bellarine Wetlands Important Bird Area which consists of a number of wetland sites including the Moolap salt fields, adjacent intertidal mudflats in Corio Bay and Point Henry, Lake Connewarre and Reedy Lake. It is recognised as a wetlands of international importance to migratory waders and has supported internationally significant numbers of Sharp-tailed Sandpipers (*Calidris acuminata*) and nationally-significant numbers of Curlew Sandpipers (*Calidris ferruginea*), Red-necked Stints *(Calidris ruficollis)* and Marsh Sandpipers (*Tringa stagnatilis*).Up to 1,419 Australian Shelduck (*Tadorna tadornoides)*, 1,000 Pacific Black Duck (*Anas superciliosa)*, 3,347 Grey Teal (*A. gibberifrons)* and 1,168 Eurasian Coots (*Fulica atra*) also have occurred here (NRE 1995a).
	Significant EVCs	Significant EVCs (Biota Sub-Index Score) - 15

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species

Degraded Water Quality	IWC Water Properties Score – 0 Increased urbanisation in the surrounding area has the potential to result in increased stormwater discharges to the system
Disturbance of Acid-Sulfate Soils	Hospital Swamp was assessed as being at high risk of developing acid sulfate soils (Dahlhaus *et al.* 2007)
Changed Water Regime	Hospital Swamp was once connected to the main lakes and river, but is now mostly in-filled and isolated (DCNR 1995) In 1983, a regulator was installed at Hospital Swamp to increase the duration of inundation at this wetland (DCNR 1995)

Work Program for Hospital Swamp

Waterway	**Hospital Swamp**	**Identification No.**	**54573**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) b - IWC soil sub-index score is good c - The wetland water regime has improved d - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5)	**Threats addressed by work program**	Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Soil Disturbance (3) Changed Water Regime (1) Degraded Water Quality (5)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Deliver water to wetland as per current entitlement – Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (1)	c
Establish an Environmental Water Management Plan for the lower Barwon Wetlands – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (1)	c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program) – Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network, GF&G,	Invasive Fauna (Terrestrial) (5)	a
Install wetland fence	2 km	**CCMA**/ PV, GF&G, LH	Soil Disturbance (3)	b
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Soil Disturbance (3)	b
Investigate and manage urban stormwater/water quality impacts - Not costed	N/A	**COGG**/ CCMA, PV, DEPI, GF&G,	Degraded Water Quality (5)	d
Fill knowledge gaps relating to impacts of water management at Reedy Lake and Hospital Swamp	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (1), Degraded Water Quality (5)	c, d

Estimated cost of activities	**$32,000**

Waterway	Reedy Lake	Landscape Zone	Bellarine
Identification No.	54577	**Basin**	Barwon

Links to Regional Goals

Due to its values, Reedy Lake meets the following regional goals:	
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV3	Manage water for the environment to improve waterway condition
Goal ENV4	Maintain or improve waterways with formally recognised significance
Goal ENV5	Maintain the extent and condition of other significant wetlands (by type)

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	Reedy Lake forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	Reedy Lake forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the State of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay; • Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	Reedy Lake forms part of the Lake Connewarre State Wildlife Reserve. The reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. Reedy Lake is the largest natural freshwater lake in central Victoria and has outstanding significance due to its large size, floristic richness and structural diversity (Yugovic 1985). Lake Connewarre State Wildlife Reserve meets the following listing criteria for the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs.
	Important Bird Habitat	Reedy Lake forms part of the Bellarine Wetlands Important Bird Area which consists of a number of wetland sites including the Moolap salt fields, adjacent intertidal mudflats in Corio Bay and Point Henry, Hospital Swamp and Lake Connewarre. It has supported internationally-significant numbers of Sharp-tailed Sandpipers (*Calidris acuminata*) and internationally-significant numbers of Marsh Sandpipers (*Tringa stagnatilis*). Reedy Lake is also an important breeding site for the colonial nesting species such as Australian White Ibis (*Threskiornis aethiopica*), Straw-necked Ibis (*Threskiornis spinicollis*) and Royal Spoonbills (*Platalea regia*). Although breeding can be highly irregular, there are reports of large numbers of breeding birds including 10,000 birds in 1,977; 19,000 in 1978 and 10,000 young in 1996 (Mackenzie *et al* 2005). Other notable breeding records include regular breeding of Magpie Goose

	(*Anseranas semipalmata*) and Brolga (*Grus rubicunda*) (MacKenzie *et al* 2005).
Significant Amphibians	The Growling Grass Frog (*Litoria raniformis*), which is listed as vulnerable at the national level, is a resident of Reedy Lake with the DSE flora and fauna database including three records of the species from 1991, 1994 and 1997. Surveys from the 1960s, 1970s and 2007 also recorded four other species of frog at Reedy Lake (DCNR 1995; Billows and Gwyther 2007): • Southern Brown Tree Frog (*Litoria ewingi*); • Eastern Common Froglet (*Crinia signifera*); • Pobblebonk (*Limnodynastes dumerili*); and • Spotted Marsh Frog (*Limnodynastes tasmaniensis*).
Significant Birds	The Australasian Bittern (*Botaurus poiciloptilus*), listed as endangered under the IUCN Red List, has been recorded on numerous occasions at Reedy Lake (Birds Australia unpublished). The Intermediate Egret (*Ardea intermedia*), listed as critically endangered under the List of Threatened Vertebrate Fauna in Victoria, has been recorded at Reedy Lake. The following birds, listed as endangered under the List of Threatened Vertebrate Fauna in Victoria, have been recorded at Reedy Lake: • Blue-billed Duck (*Oxyura australis*) • Fairy Tern (*Sternula nereis nereis*) • Freckled Duck (*Stictonetta naevosa*) • Gull-billed Tern (*Gelochelidon nilotica macrotarsa*) • Little Bittern (*Ixobrychus minutus dubius*) • Little Egret (*Egretta garzetta nigripes*) The following birds, listed as vulnerable under the List of Threatened Vertebrate Fauna in Victoria, have been recorded at Reedy Lake: • Australasian Shoveler (*Anas rhynchotis*) • Baillon's Crake (*Porzana pusilla palustris*) • Black-tailed Godwit (*Limosa limosa*) • Brolga (*Grus rubicund*) • Eastern Great Egret (*Ardea modesta*) • Hardhead (*Aythya australis*) • Little Tern (*Sternula albifrons sinensis*) • Musk Duck (*Biziura lobata*) • Royal Spoonbill (*Platalea regia*) • White-bellied Sea-Eagle (*Haliaeetus leucogaster*) • Wood Sandpiper (*Tringa glareola*)
Significant EVCs	Plains sedgy wetland – Status: Endangered
Significant Fish	Reedy Lake is also an important area for native fish (DCNR 1995), including the nationally listed: • Australian Grayling (*Prototroctes maraena*); and • Yarra Pygmy Perch (*Nannoperca obscura*).
Wetland Vegetation Condition	The freshwater wetland vegetation communities of Reedy Lake (predominantly *Phragmites australis* grasslands) are considered a component of its ecological character. A detailed vegetation survey in 1983 by Yugovic found that Reedy Lake supported extensive freshwater aquatic vegetation with approximately 50 species of freshwater aquatic and semi-aquatic native vascular plants species recorded (DCNR 1995). Ecological Associates (2011) stated that after flap gates (later replaced by drop boards) were installed at the outlet from Reedy Lake in 1970 to exclude saline estuary water and salinities declined, submerged aquatic plants increased. In 1979 the lake supported approximately 25% open water, 25% submerged aquatics and 50% reeds. Yugovic (1985) mapped the vegetation of Reedy Lake in 1983 and found it was dominated by bare areas (open water) (40%) and *Phragmites australis* grassland (29%). Ecological Associates (2012) found that the extent of reeds beds (*Phragmites australis* and *Typha orientalis)* has increased by approximately 50% from 233 to 352.8 ha since it was mapped by Yugovic (1985), although it should be noted that the extent of these reeds has fluctuated over time.

Threats

Threat	Details
Invasive Fauna (Aquatic)	The presence of European carp has been linked to increased turbidity in the system as well as the displacement of reeds at Reedy Lake (Ecological Associates 2006)
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Changed Water Regime	Freshwater flows down the Barwon River are the major source of water for Reedy Lake. Naturally this system would have been intermittent and would have only filled after flood flows occurred in the Barwon River. However, since 1898, changes were made to the lower Barwon River to prevent saline estuary water incursions upstream. The lower breakwater (built in 1898) raised the river level adjacent to Reedy Lake which resulted in more permanent freshwater inundation. The lower breakwater was replaced by a floating gate structure in the 1950s which lowered the river level. An inlet to the lake was constructed and, during the 1967-68 drought, the bank at the outlet to Lake Connewarre was raised. Around 1970 the outlet to Lake Connewarre was regulated to prevent saline estuary water from entering the wetland.
Degraded Water Quality	Reedy Lake has high nutrient concentrations and is considered eutrophic. It is considered to be phosphorus limited e.g. the nutrient concentrations within 1986/87 were: • average total phosphorus concentration of 94g/L; • high concentrations of oxidised nitrogen; and • total nitrogen (up to 1,500g/L). Increased urbanisation in the surrounding area has the potential to result in increased stormwater discharges to the system.
Disturbance of Acid-Sulfate Soils	Reedy Lake was assessed as being at medium risk of developing acid sulfate soils (Dahlhaus *et al* 2007)
Chytrid fungus	This fungus can result in the death of Growling Grass Frogs (and other frog species)

Work Program for Reedy Lake

Waterway	**Reedy Lake**	**Identification No.**	**54577**
Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved. 16 - The condition of freshwater marshes and meadows supporting the seasonal herbaceous wetlands ecological community are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained with no significant impacts e - Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant Amphibians (5) Significant EVCs (5) Significant Birds (5) Significant Fish (4)	**Threats addressed by work program**	Changed Water Regime (5) Degraded Water Quality (4) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Ensure acid sulphate soils are considered in land use planning, works on waterways and water management decisions - Not costed.	N/A	**CCMA**/COGG	Disturbance of Acid Sulfate Soils (5)	c
Deliver water to wetland as per current entitlement - Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (5)	a
Establish an Environmental Water Management Plan for the lower Barwon Wetlands – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (5)	a
Implement best management practice on adjacent grazing properties Not costed - refer to Ag BMP (CWS, Section 5.1.3)	150 ha	**LH**/ CCMA, DEPI	Degraded Water Quality (4)	b
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GF&G, Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**/ CCMA, PV, DEPI	Degraded Water Quality (4)	b
Fill knowledge gaps relating to impacts of water management at Reedy Lake and Hospital Swamp	N/A	**CCMA**/ VEWH, PV, GF&G, DEPI, COGG	Changed Water Regime (5), Degraded Water Quality (4)	a, b
Estimated cost of activities			**$-**	

Waterway	Lake Connewarre	Landscape Zone	Bellarine
Identification No.	54584	**Basin**	Barwon

Links to Regional Goals

Due to its values, Lake Connewarre meets the following regional goals:	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	Lake Connewarre forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	Lake Connewarre forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the state of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay; • Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	Lake Connewarre forms part of the Lake Connewarre State Wildlife Reserve. The reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. Lake Connewarre State Wildlife Reserve meets the following listing criteria for the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought refuge	Lake Connewarre supports significant numbers of waterfowl during the summer months.
	Important Bird Habitat	Lake Connewarre forms part of the Bellarine Wetlands Important Bird Area which consists of a number of wetland sites including the Moolap salt fields, adjacent intertidal mudflats in Corio Bay and Point Henry, Hospital Swamp and Reedy Lake. It is recognised as a wetland of international importance to migratory waders and has supported internationally significant numbers of Curlew Sandpipers (*Calidris ferruginea)* and Sharp-tailed Sandpipers (*Calidris acuminata*).
	Significant Birds	Australian painted snipe (*Rostratula australis*), listed as vulnerable under the EPBC Act, was recorded several times in the late 1970s and mid 1980s at Lake Connewarre. Lake Connewarre has supported 40% of the world population of Orange-bellied Parrots (*Neophema chrysogaster)* (Nationally critically endangered and listed under the Flora and Fauna Guarantee Act); 74 were recorded in 1988 and 64 in 1991 from an estimated total population of 150 in both years. The lake is one of three areas in the Port Phillip Bay region (with The Spit Nature Conservation Reserve and adjacent areas on the western shoreline of Port Phillip Bay and Swan Bay) that the parrots move between depending on seasonal food supplies. The Great Egret (*Egretta alba)* (listed under the Flora and Fauna Guarantee Act), Fairy Tern (*Sterna nereis)* (Nationally vulnerable and listed under the Flora and

		Fauna Guarantee Act), Blue-billed Duck (*Oxyura australis)* (Nationally vulnerable and listed under the Flora and Fauna Guarantee Act) and Australasian Bittern (*Botaurus poiciloptilus)* (Nationally endangered and listed under the Flora and Fauna Guarantee Act) have been recorded at Lake Connewarre (NRE 1995a).
	Significant EVCs	Coastal Saltmarsh - nationally Vulnerable Tropical and Temperate Saltmarsh Ecological Community
	Wetland Vegetation Condition	Lake Connewarre State Game Reserve (which includes Lake Connewarre) is the largest area of native vegetation remaining on the Bellarine Peninsula and includes: • extensive areas of saltmarsh on the surrounding salt flats; and • White Mangroves which line the shores of the Barwon River Estuary and extend up into Lake Connewarre. There is also evidence that seagrass occurs within the Lake Connewarre Complex, with anecdotal records from the bed of Lake Connewarre from various periods in time. It is likely that patches of Zostera or Heterozostera establish following extended periods of low river flow, when salinity in the wetland remains sufficiently high to support the species (Dahlhaus *et al* 2007). Significant EVCs (Biota Sub-Index Score) - 16

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Degraded water quality	Lake Connewarre has high nutrient concentrations and is considered eutrophic with blue-green algal blooms (*Aphanocapsa sp.*) recorded in recent years (2006 to 2008). Lake Connewarre is considered to be nitrogen limited e.g. the nutrient concentrations within 1986 / 87 were: • maximum total phosphorus of 670μg/L; • oxidised nitrogen generally < 15 μg/L; and • total nitrogen of 130 μg/L. Increased urbanisation in the surrounding area has the potential to result in increased stormwater discharges to the system.
Sedimentation	Sediments within Lake Connewarre are predominantly medium and fine sands and deposition rates within the Lake itself are relatively high (in the order of 58 cm / year; Billows and Gwyther 2007). The deposition processes have resulted in the formation of a large tidal delta where the Barwon River exits Lake Connewarre. Sediment within the delta has a higher proportion of fine silts than that of the rest of the wetland complex and the formation contains numerous islands, which are highly mobile, especially during storms and floods. The deposition of sediments within the estuary causes constriction of the connection to the ocean.
Changed Water Regime	Lake Connewarre receives freshwater flows from the Barwon River through Reedy Lake when flows over-top the low bund between the two wetlands. As a consequence, freshwater flows into Connewarre are generally restricted to winter / spring when river discharge is highest (DCNR 1995). Continued and/or any increase in extraction of water (from upstream surface or local groundwater sources) has the potential to affect the ecological character of the Lake Connewarre by impacting: • cues to fish migration (particularly if flow seasonality is reversed); and • sedimentation and alteration to wetland bathymetry, river depth and connections between estuaries and the Bay
Resource Utilisation	People fishing from the shoreline can cause damage to wetland vegetation and this is a particular problem at Lake Connewarre
Drought	Average numbers of waterfowl (in years with complete counts) at Lake Connewarre have dropped from an average around 7,800 at the time of Ramsar listing to less than 3,000 in the 2003 to 2008 year period and they were less than 4,900 in 4 of the 6 years (equivalent to 6.7 years in 10). This is consistent with a decline in waterfowl at natural wetlands across Victoria over this period (R. Loyn, DSE, pers. comm.). However, this decline has been linked to drought and the large number of wetlands that have remained dry for prolonged periods.

Work Program for Lake Connewarre

Waterway	Lake Connewarre	Identification No.	54584

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) b - Invasive wetland flora threat is maintained at a low threat level c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (4) Significant Birds (5)	**Threats addressed by work program**	Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (2) Degraded Water Quality (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control - Spartina	20 ha	**Land manager**/ BLN, CCMA, GF&G,	Invasive Flora (Wetland) (2)	b
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), BLN, GF&G,	Invasive Fauna (Terrestrial) (5)	a
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**/ CCMA, PV, DEPI	Degraded Water Quality (3)	c

Estimated cost of activities	**$60,000**

Waterway	Lake Murtnaghurt	Landscape Zone	Bellarine
Identification No.	54595	**Basin**	Barwon

Links to Regional Goals

Due to its values, Lake Murtnaghurt meets the following regional goals:	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	Lake Murtnaghurt forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	Lake Murtnaghurt forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the State of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay; • Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	Lake Murtnaghurt forms part of the Lake Connewarre State Wildlife Reserve. The reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. Lake Connewarre State Wildlife Reserve meets the following listing criteria for the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Important Bird Habitat	Important breeding habitat for colonial nesting birds Important bird area Important habitat for migratory shorebirds
	Significant Birds	Hooded Plover (*Thinornis rubricollis*) – Vulnerable internationally (IUCN Red List of Threatened Species)
	Significant EVCs	Coastal Saltmarsh - nationally vulnerable Tropical and Temperate Saltmarsh Ecological Community

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Degraded Water Quality	Increased urbanisation in the area surrounding the Lake Connewarre Complex has resulted in increased stormwater discharges to the system. This has had a number of effects including the encroachment of freshwater plant species into saltmarsh areas (e.g. at Lake Murtnaghurt; D. Quinn, Ecology Australia, pers. comm.).
Disturbance of Acid-Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Changed Water Regime	Lake Murtnaghurt would have once received freshwater flows from the Barwon and been influenced by tides in the Barwon Estuary. However, it has become hydrologically isolated through the construction of breakwaters and other structures

Work Program for Lake Murtnaghurt

Waterway	Lake Murtnaghurt	Identification No.	54595

Long-term Resource Condition Targets	13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - IWC soil sub-index score is good		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (5) Significant Birds (4)	**Threats addressed by work program**	Changed Water Regime (1) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Soil Disturbance (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish water assessment – investigate freshwater inflows from adjoining land use	1 no.	**COGG**/ CCMA	Changed Water Regime (1)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	2 km	**CCMA**/ PV, LH	Soil Disturbance (3)	c
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Soil Disturbance (3)	c

Estimated cost of activities	**$47,000**

Lake Victoria

Lake Victoria is located on the Bellarine Peninsula. Lake Victoria is a stable wetland environment, the lagoon never drying out completely and maintaining its salinity even when full. It is surrounded by saltmarsh.

Waterway	Lake Victoria	Landscape Zone	Bellarine
Identification No.	56117	**Basin**	Barwon

Links to Regional Goals

Due to its values, Lake Victoria meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	81 species of waterbirds have been recorded from Lake Victoria. The most numerous species are salt-tolerant waders and dabbling waterfowl, which sometimes occur in thousands. 37 species occur at Lake Victoria in numbers which are significant at global, national, state or regional levels, have special conservation status, or are listed in international treaties. The lake provides habitat for the Orange-bellied Parrots (*Neophema chrysogaster*) which is critically endangered at the national and international levels. The lake attracts significant populations of the nationally vulnerable Hooded Plover (*Thinornis rubricollis*), and the Little Egret *(Egretta garzetta)*, which is listed as critically endangered in Victoria. The lake is important for waders gaining weight before migration, and for over-wintering first-year waders.

Threats

Threat	Details
Degraded Buffer (5)	IWC Buffer Assessment Score – 2, which indicates very poor condition
Degraded Water Quality (1)	Water quality in Lake Victoria is currently in good condition. However, increasing freshwater inflows and stormwater run-off from the increased urban development in Ocean Grove and Point Londsdale could threaten water quality in this system in the future, potentially impacting on shoreline vegetation and fauna due to more permanent higher water levels and reduced salinity.

Work Program for Lake Victoria

Waterway	Lake Victoria	Identification No.	56117

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition		
Values linked to regional goals	Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install wetland fence	2 km	**CCMA**/ PV, LH	Degraded Buffer (5)	a
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a

Estimated cost of activities	**$32,000**

Salt Lagoon

Salt Lagoon at St Leonards on the Bellarine Peninsula is a very shallow, highly-saline lagoon, close to the sea, surrounded by saltmarsh vegetation and with an associated salt meadow. It often dries out completely in summer.

Waterway	Salt Lagoon	Landscape Zone	Bellarine
Identification No.	56131	**Basin**	Barwon

Links to Regional Goals

Due to its values, Salt Lagoon meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant flora and fauna	41 species of waterbirds have been recorded oh the lagoon. The lagoon supports 16 species of waterbirds in numbers which are significant at national, state or regional levels, have special conservation status, or are listed in international treaties. It contains potential habitat for Orange-bellied Parrots (*Neophema chrysogaster*), and is of national significance for Common Greenshanks (*Tringa nebularia*).
	Significant Birds (5)	Lesser Sand Plover (*Charadrius mongolus*)- Endangered

Threats

Threat	Details
Degraded Buffer	IWC Buffer Assessment Score - 3
Invasive Flora (Wetland)	IWC Presence of Weeds Score - 18

Work Program for Salt Lagoon

Waterway	Salt Lagoon	Identification No.	56131

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - Invasive wetland flora threat is maintained at a low threat level b - The wetland buffer vegetation is maintained in poor condition		
Values linked to regional goals	Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (4) Invasive Flora (Wetland) (2)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control	4 ha	**PV**/ BLN, LH	Degraded Buffer (4), Invasive Flora (Wetland) (2)	a, b

Estimated cost of activities	**$8,000**

Notes: Degraded water quality is not currently a threat to Salt Lagoon. However, increasing freshwater inflows and stormwater run-off from the increased urban development in St Leonards could threaten water quality in this system in the future, potentially impacting on shoreline vegetation and fauna due to more permanent higher water levels and reduced salinity.

Barwon River and Waurn Ponds Creek

The mid reaches of the Barwon River flow from Fyansford through Geelong, Lake Connewarre and out through the estuary, which forms just south of Geelong.
Waurn Ponds Creek rises near Mt Moriac and flows through a steep valley towards Waurn Ponds, it then flows through Belmont before joining the Barwon River in Geelong. Waurn Ponds Creek is a highly valued urban waterway.

Waterway	Barwon River, Waurn Ponds Creek	Landscape Zone	Bellarine
Identification No.	33-02, 33-08	**Basin**	Barwon

Waterway	Barwon River	Landscape Zone	Bellarine
Identification No.	33-02	**Basin**	Barwon

Links to Regional Goals

Due to its values, Barwon River (33-02) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV3	Manage water for the environment to improve waterway condition

Key Values

Type	Attribute	Details
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or Nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Important Bird Area – A site of global bird conservation importance and is a priority area for bird conservation
	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC)
	Significant Birds Riparian	Magpie Goose (*Anseranas semipalmata*) - Status: Near Threatened (Adv List); Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Lewin's Rail (*Rallus pectoralis*) - Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Caspian Tern (*Hydroprogne caspia*) - Status: Near Threatened (Adv List); Nankeen Night Heron (Nycticorax caledonicus)- Status: Near Threatened (Adv

		List)
	Significant EVCs	Floodplain Riparian Woodland - Status: Endangered
	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list); Australian Mudfish *(Neochanna cleaveri)*- Status: High priority actions in high priority areas (ABC), Critical (Adv List)
Social	Game Hunting	Game hunting is permitted
	Motor Boating	Water skiing is an established use on the River, principally downstream of the Rowing Mile. The Geelong Water Ski Club is located downstream of the Ovoid Sewer Aqueduct in the vicinity of Wilsons Road. The River in this section is also used for water skiing.
	Non-Motor Boating	The Barwon River (through Geelong) has been used for rowing since the late 1800's and is an integral part of the Barwon River's history. Today the Head of the School Girls Regatta, Victorian Rowing Association All Schools Regatta and on-off events including the Australian Masters Championships are held there. In addition to rowing the river is also used for kayaking and canoeing.
	Picnics and Barbecues	Designated picnic/barbecue areas present through Geelong and highly utilised.
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria. The Barwon River (Geelong area) is considered a popular recreational fishing water for carp, short-finned eel, redfin, brown trout, tench and tupong.
	Tracks	A number of formal passive recreation areas have been developed along the Barwon River in Geelong including an extensive network of existing trails which are regularly used for walking and cycling
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Inc in Low Flow Magnitude **Inc in Prop of Zero Flow**	Average annual stream flows in the Barwon through Geelong are estimated to have been reduced by 13 per cent from natural. This is particularly influenced by the effects of water harvesting, farm dams, land use and licenced and unlicenced extraction in the Moorabool catchment and and Barwon catchments. Environmental Water entitlements for the Moorabool River and water contributed from the Batesford Quarry are contributing to reducing flow impacts.
Invasive Fauna (Terrestrial)	Rabbits and foxes are present and either directly prey on native wildlife or affect habitats
Loss of Ins Hab (Large Wood)	Desnagging, particularly through Geelong and downstream to Lake Connewarre, has significantly altered instream habitats to cater for recreational pursuits, particularly water skiing. Also, through Geelong, streambeds have been altered for rowing by desilting and annual weed cutting.
Riparian Vegetation – Large Trees **Reduced Riparian Connectivity** **Reduced Vegetation Width**	Upstream of Geelong, there is a good overstorey of River redgums, however, stock access is limiting regeneration and the establishment of understorey and groundcover species. Through Geelong, the riparian zone is a mixture of open space lawn and planted indigenous riparian vegetation. Downstream of Geelong, there is only a limited number of redgums with no understorey. This reach is under the greatest threat.

Work Program for the Barwon River

Waterway	Barwon River	Identification No.	33-02

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - The increase in low flow magnitude threat score has reduced from very high to high c - The proportion of zero flow threat score has been maintained at moderate d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)

	e - Livestock have been excluded from over 75% of the waterway frontage f - Loss of in-stream habitat (large wood) threat has reduced from high to low g - Riparian vegetation longitudinal continuity has improved from moderate to good h - Riparian vegetation width has improved from poor to moderate condition i - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Rural Water Sources for Prod (4) Drought Refuges (5) Important Bird Habitats (5) Native Fish (4) Significant Amphibians (5) Significant Birds Riparian (4) Significant Birds Waterway (5) Significant EVCs (5) Significant Fish Migratory (5) Game Hunting (5) Motor Boating (5) Non-Motor Boating (5) Picnics and Barbecues (5) Recreational Fishing (5) Tracks (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (3) Invasive Fauna (Terrestrial) (5) Livestock Access (1) Loss of Ins Hab (Large Wood) (4) Reduced Riparian Connectivity (3) Reduced Vegetation Width (4) Degraded Water Quality (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Assess instream habitat (large wood) density - Downstream of water skiing area	8 ha	**CCMA**/ DEPI(ARI), VRFish	Loss of Ins Hab (Large Wood) (4)	h
Deliver current environmental water entitlement - Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/, ABCL, EPA, VEWH, BW	Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (3)	b, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation - 6ha of reach frontage	6 ha	**CCMA**/ GLN, LH	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (4)	a, g, h
Install riparian fence - 3km (20%) of reach length - 6km frontage	6 km	**CCMA**/ GLN, LH	Livestock Access (1), Degraded Water Quality (5)	e, i
Establish stewardship/management agreement	6 ha	**Land manager**/ CCMA	Livestock Access (1), Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (4)	a, e, g, h
Adopt 'whole of water cycle management' – Not costed.	N/A	**Barwon Integrated Water Cycle Management Network**	Degraded Water Quality (5)	i
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**/ CCMA, PV, DEPI	Degraded Water Quality (5)	i
Investigate and manage tidal barrage structural integrity	1 no.	**CCMA**	Degraded Water Quality (5)	i
Implement the Barwon River Parklands Strategy for management of the lower Barwon River corridor	1 no.	**CCMA**/COGG, PV, BCC, BW, DEPI	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (4) Degraded Water Quality (5)	a, e, g, h, i

Estimated cost of activities	**$187,000**

Waterway	Waurn Ponds Creek	Landscape Zone	Bellarine
Identification No.	33-08	**Basin**	Barwon

Due to its values, Waurn Ponds Creek meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant EVCs	Floodplain Riparian Woodland -Endangered Swampy Riparian Woodland - Endangered Sedgy Riparian Woodland - Depleted
Social	Tracks	Waurn Ponds Creek runs through urban Geelong from Waurn Ponds, Grovedale, Belmont and through the Belmont Common to join the Barwon River. Significant paved tracks are used by the community for dog walking, running, cycling etc.
	Nature Conservation	Revegetation and management of native vegetation along the urban sections of Waurn Ponds Creek is undertaken by local government with assistance from community members.

Threats

Threat	Details
Deg Rip Veg - Large Trees	>80% difference in proportion of Large Trees expected in the ISC assessment
Degraded Water Quality	Fails to meet SIGNAL objective in SEPP (WoV) - EPA SEPP WoV Assessment Data from start 2004 to end 2009 No algal blooms are known to have occurred in the last 10 years No fish deaths resulting from anthropogenic degradation of water quality are known to have occurred in the last 10 years Increased freshwater inflows from urban development
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Livestock Access	25-75% of waterway is affected by livestock access
Loss of Ins Habitat (Sed)	Deposition of sediments above natural levels mainly at bends and/or instream obstructions
Reduced Riparian Connectivity	Vegetation Overhang – 3 Fragmentation of Woody Vegetation - 1
Reduced Vegetation Width	Average Bankfull Width - 2
Invasive riparian flora (ground layer)	Serrated tussock is present along this reach

Work Program for Waurn Ponds Creek

Waterway	Waurn Ponds Creek	Identification No.	33-08

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Livestock have been excluded from over 50% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation e - Riparian vegetation longitudinal continuity has improved from poor to moderate f - Riparian vegetation width has improved from poor to moderate condition g - Invasive riparian flora (ground layer) has reduced to a moderate threat level

Values linked to regional goals	Significant Fish Non Migratory (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (4) Reduced Vegetation Width (4) Invasive Flora (Riparian) – Ground Layer (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 8ha of reach frontage (split between urban and rural areas)	8 ha	**CCMA**/ BLN, GLN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (4) Invasive Flora (Riparian) – Ground Layer (5)	a, b, e, f, g
Install riparian fence - 2km (7.5%) of reach length - 4km of frontage (upstream of Princes Highway)	4 km	**CCMA**/ BLN, GLN, LH	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3)	b, c, d
Establish stewardship/management agreement	8 ha	**Land manager**/ CCMA	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (4)	a, e, f
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**/ CCMA	Degraded Water Quality (5)	b

Estimated cost of activities	**$172,000**

8.4 Curdies Landscape Zone

Curdies River and Inlet

The Curdies River runs through the Heytesbury farming district. Its headwaters are located south of Camperdown at Lake Purrumbete, and it joins the coast at Peterborough.

Waterway	Curdies River and Inlet	Landscape Zone	Curdies
Identification No.	35-201, 35-02	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Curdies Inlet (35-201) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Great Knot *(Calidris tenuirostris)* - Status: Endangered (Adv List); Whiskered Tern *(Chlidonias hybrida)* - Status: Near Threatened (Adv List); Little Egret *(Egretta garzetta)* - Status: Endangered (Adv List); Grey-tailed Tattler (*Tringa brevipes*) - Status: Critical (Adv List); Nankeen Night Heron (*Nycticorax caledonicus*)- Status: Near Threatened (Adv List); Royal Spoonbill *(Platalea regia)*- Status: Vulnerable (Adv List); Pacific Golden Plover *(Pluvialis fulva)*- Status: Near Threatened (Adv List); Little Tern *(Sternula albifrons sinensis)* - Status: Vulnerable (Adv List); Fairy Tern *(Sternula nereis nereis)* - Status: Vulnerable (EPBC), Endangered (Adv List)
	Significant EVCs	Mangrove Shrubland- Vulnerable Estuarine Wetland - Depleted Riparian Forest - Vulnerable Swamp Scrub - Endangered
Social	Game Hunting	Game hunting is permitted
	Motor Boating	Waterway is popular for motor boating with accessible formal boating facility (boat ramp and car/trailer parking) Boating in the Curdies estuary occurs from the 2 public boat ramps at Peterborough and Curdievale. Boating forms include canoeing in the upper estuary, sightseeing

		along the entire length of the estuary and water skiing in the ski run downstream of Curdievale. Most fishing also occurs out of boats due to limited bank access to productive waters.
	Non-Motor Boating	Waterway is popular for non-motor boating
	Picnics and Barbecues	The two major areas for passive recreation are at the major public access points, Peterborough and Curdievale. Activities at Curdievale include walking around the boardwalk/fishing platform and playground. The area is also next to the iconic Boggy Creek Pub, and includes picnic areas. At Peterborough, an informal walk extends from the boat ramp at the Caravan Park to the coastal headland. There are also numerous picnic and playground facilities.
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria Best fishing is in the extensive estuary (16km upstream from Peterborough to Curdievale). Regarded as good black bream fishery with fish to 2kg but also contains other estuary species such as estuary perch, Australian salmon to 300g, luderick, flounder and small trevally.
	Sightseeing	Sightseeing destination with high visitor numbers
	Swimming	Popular swimming location

Threats

Threat	Details
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Degraded Water Quality	Fails to meet two or more EPA Victoria water quality guideline values for estuaries - IEC data 2010-11 Algal blooms occur every 1 to 2 years (on average)
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Intermittently Open Estuaries	>50% of all estuary mouth openings are artificial with non-environmental objectives
Invasive Fauna (Terrestrial)	Invasive terrestrial species directly prey on native species and/or damage native species habitat Invasive species present
Livestock Access	25-75% of waterway is affected by livestock access

Work Program for the Curdies River estuary

Waterway	Curdies Inlet	Identification No.	35-201

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Camping (0) Game Hunting (5) Motor Boating (4) Non-Motor Boating (4) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Swimming (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Assess options for long term management of land subject to inundation	1 no.	**CCMA**/ MS, LH	Livestock Access (3)	e
Continue to adopt a risk based approach to estuary mouth opening. Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ PV, LH	Intermittently Open Estuaries (5) Degraded Estuarine Vegetation (3)	c, a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation - Not costed - refer to activities for 35-02 and 35-04	N/A	**CCMA**/ HDLN, LH, Industry Groups	Degraded Estuarine Vegetation (3), Degraded Water Quality (5)	a, b
Install riparian fence - Not costed - refer to activities for 35-02 and 35-04	N/A	**CCMA**/ HDLN, LH, Industry Groups	Degraded Water Quality (5)	b
Review and update current estuary management plan	1 no.	**CCMA**/MS, PV	Degraded Estuarine Vegetation (3) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3)	a,b,c,d,e
Maintain estuary monitoring station. Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**	Intermittently Open Estuaries (5) Degraded Water Quality (5)	b, c
Maintain EstuaryWatch group collecting baseline data on estuary condition - Not costed – see Community engagement and capacity building (CWS Section 5.1.3)	1 no.	**CCMA**/ Community, DEPI	Intermittently Open Estuaries (5) Degraded Water Quality (5)	b, c

Estimated cost of activities	**$20,000**

Waterway	Curdies River	Landscape Zone	Curdies
Identification No.	35-02	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Curdies River (35-02) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Pied Cormorant *(Phalacrocorax varius)* - Status: Near Threatened (Adv List)
	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*- Status: Endangered (Adv List)
	Significant EVCs	Riparian Forest - Vulnerable Swamp Scrub – Endangered Sedgy Riparian Woodland - Vulnerable
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Deg Rip Veg - Large Trees	>80% difference in proportion of Large Trees expected in the ISC assessment
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	<25% of waterway is affected by livestock access
Reduced Riparian Connectivity	20–40% of streambank length has overhanging vegetation Gaps in woody vegetation cover 60-80% of riparian area
Reduced Vegetation Width	Riparian vegetation forms a narrow strip

Work Program Curdies River

Waterway	Curdies River	Identification No.	35-02

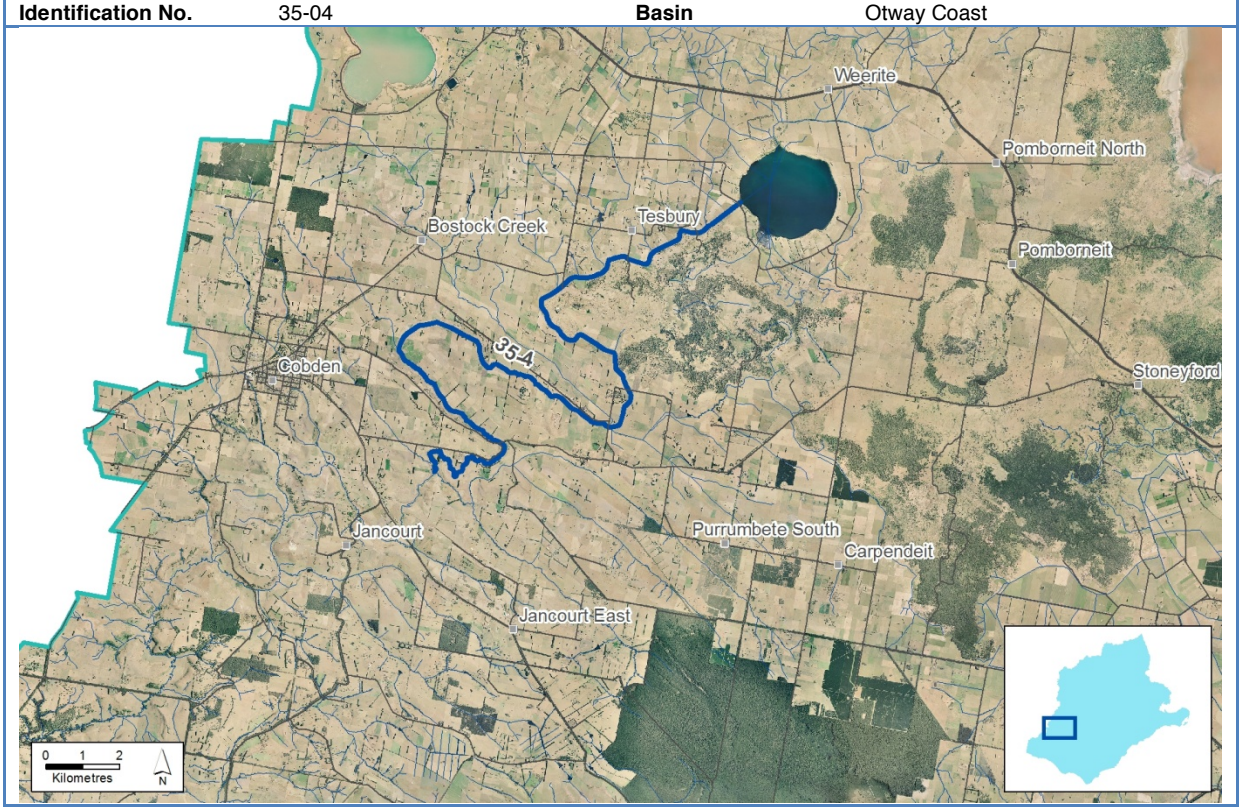
Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Livestock have been excluded from over 75% of the waterway frontage d - Riparian vegetation longitudinal continuity has improved from moderate to good e - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4) Significant Birds Riparian (4) Significant Birds Waterway (4) Significant Fish Non Migratory (5) Significant Invertebrates Aquatic (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Livestock Access (1) Reduced Riparian Connectivity (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 9ha of frontage	9 ha	**CCMA**/ HDLN, LH, Industry Groups	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, d, e
Install riparian fence - 4.5km (25%) of reach length - 9km frontage	9 km	**CCMA**/ HDLN, LH, Industry Groups	Livestock Access (1), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	c, d, e
Establish stewardship/management agreement	9 ha	**Land manager**/ CCMA	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, d, e
Estimated cost of activities			**$266,500**	

Upper Curdies River

The upper reach of the Curdies River runs through the Heytesbury farming district. Its headwaters are located south of Camperdown.

Waterway	Curdies River and Inlet	Landscape Zone	Curdies
Identification No.	35-04	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Curdies River (35-04) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List); Pied Cormorant *(Phalacrocorax varius)* - Status: Near Threatened (Adv List)
	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*- Status: Endangered (Adv List)
	Significant EVCs	Riparian Forest - Vulnerable Swamp Scrub – Endangered Sedgy Riparian Woodland - Vulnerable
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Deg Rip Veg - Large Trees	>80% difference in proportion of Large Trees expected in the ISC assessment
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	<25% of waterway is affected by livestock access

Reduced Riparian Connectivity	20–40% of streambank length has overhanging vegetation Gaps in woody vegetation cover 60-80% of riparian area
Reduced Vegetation Width	Riparian vegetation forms a narrow strip

Work Program Curdies River

Waterway	**Curdies River**	**Identification No.**	**35-04**

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has reduced to a low threat level d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from poor to moderate f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Reduced Riparian Connectivity (4) Reduced Vegetation Width (5)

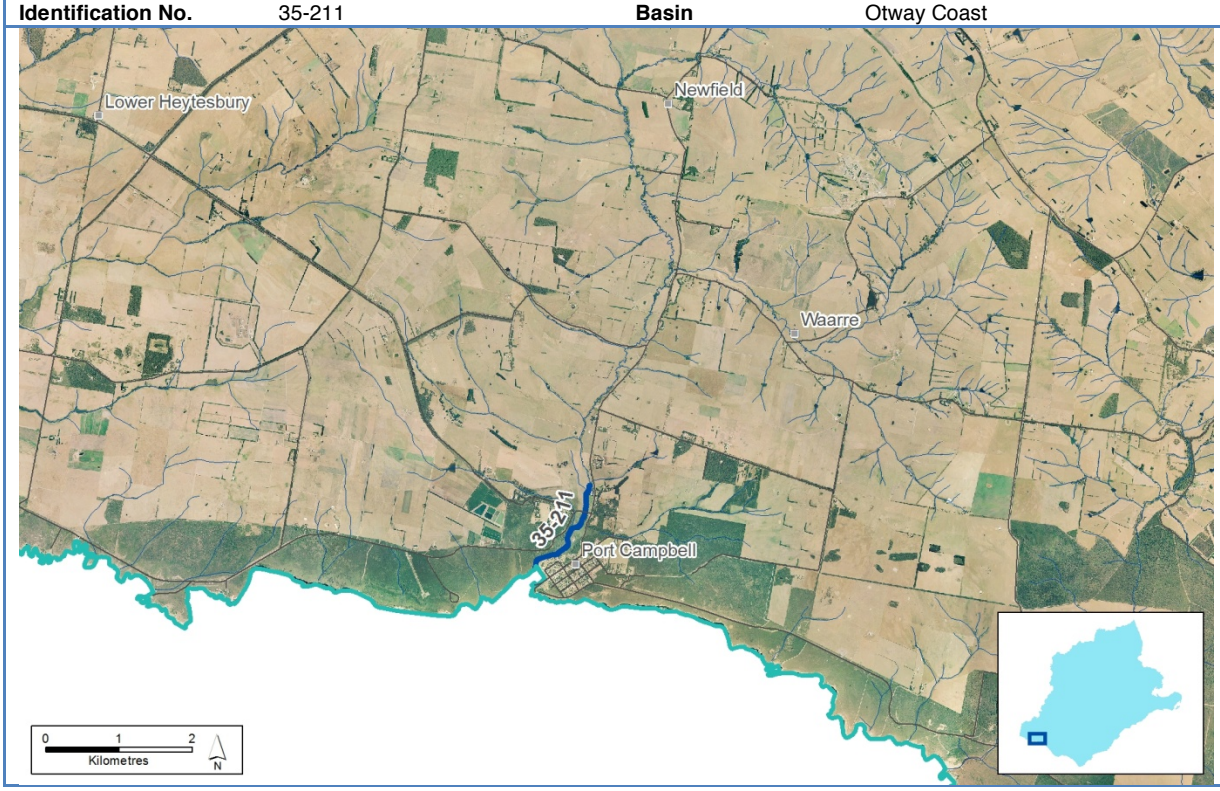
Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish woody weed control - Willow	10 ha	**CCMA**/ HDLN, LH	Invasive Flora (Riparian) - Tree Layer (3)	c
Establish native indigenous vegetation - 16ha of reach frontage	16 ha	**CCMA**/ HDLN, LH, Industry Groups	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (5)	a, e, f
Install riparian fence - 8km (50%) of reach length - 16km frontage	16 km	**CCMA**/ HDLN, LH, Industry Groups	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (4), Reduced Vegetation Width (5)	b, b, d, e, f
Establish stewardship/management agreement	16 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (4), Reduced Vegetation Width (5)	b, b, d, e, f

Estimated cost of activities	**$828,000**

Port Campbell Creek

Port Campbell Creek is a short system that flows through Port Campbell. Its estuary is intermittently open to the sea.

Waterway	Port Campbell Creek Estuary	Landscape Zone	Curdies
Identification No.	35-211	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Intermediate Egret (*Ardea intermedia*) - Status: Critical (Adv List); Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List); Whimbrel (*Numenius phaeopus*) - Status: Vulnerable (Adv List)
	Significant EVCs	Estuarine Wetland - Depleted
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Sightseeing	Sightseeing destination with high visitor numbers
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Water Quality	Urban stormwater runoff has the potential to affect water quality
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils

Work Program for Port Campbell Creek estuary

Waterway	Port Campbell Creek estuary	Identification No.	35-211

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Camping (5) Picnics and Barbecues (5) Sightseeing (5) Tracks (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - Upstream of Great Ocean Road	16 ha	**CCMA**/ HDLN, LH, Industry Groups	Degraded Water Quality (5)	a
Install riparian fence - Upstream of Great Ocean Road	16 km	**CCMA**/ HDLN, LH, Industry Groups	Degraded Water Quality (5)	a
Establish stewardship/management agreement	16 ha	**Land manager**/ CCMA	Degraded Water Quality (5)	a

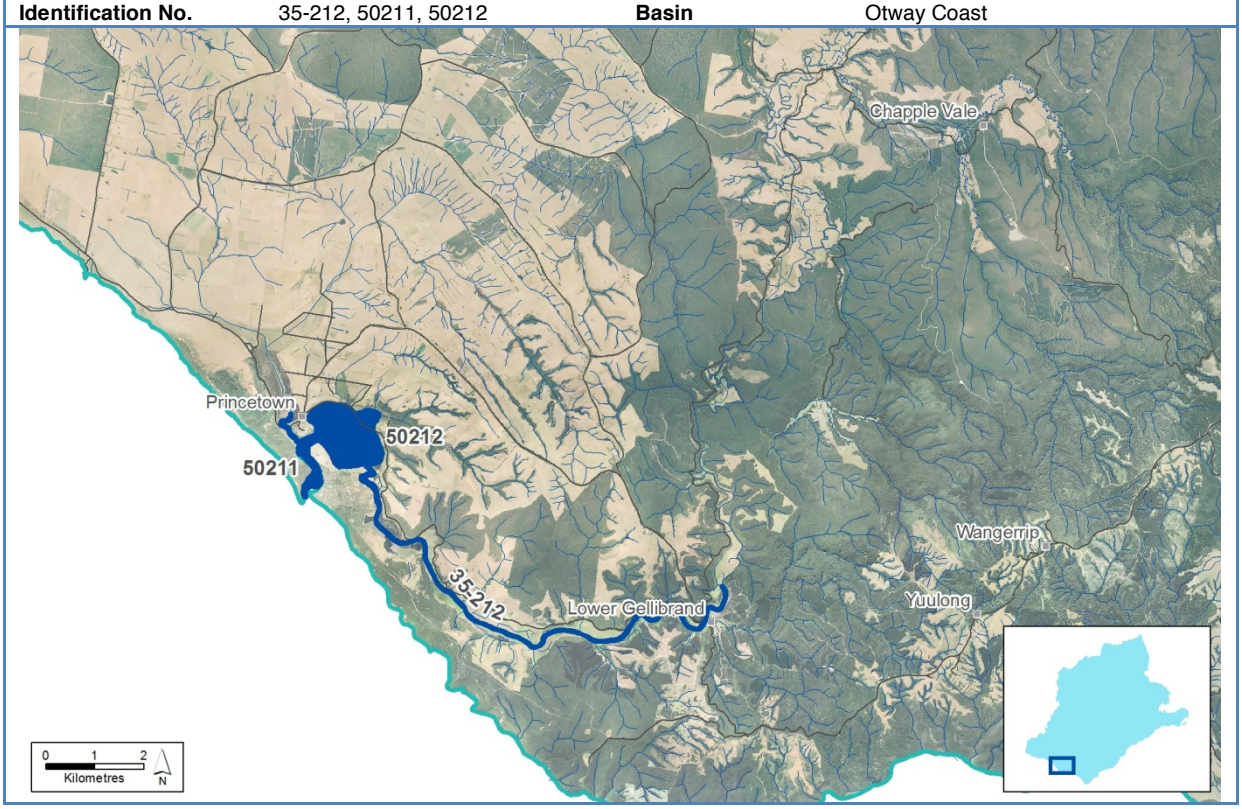
Estimated cost of activities	**$472,000**

8.5 Gellibrand Landscape Zone

Gellibrand River estuary and Princetown wetlands

The Gellibrand River rises in the Otway Ranges, near Kawarren, before flowing south through Gellibrand and Chapple Vale and meeting the coast at Princetown. The Princetown wetlands, which line the estuary are nationally important wetlands The estuary is intermittently closed to the sea. The Gellibrand River system supplies water to the town of Colac, from its upper reaches, and Warrnambool, Terang and Camperdown from its mid and lower reaches.

Waterway	Gellibrand River estuary	Landscape Zone	Gellibrand
Identification No.	35-212, 50211, 50212	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Gellibrand River estuary (35-212) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The Princetown Wetlands – Gellibrand estuary are listed in the Directory of Important Wetlands for Australia. They meet the following criteria for inclusion: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Significant Birds	Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List); Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Little Egret *(Egretta garzetta)* - Status: Endangered (Adv List) Royal Spoonbill *(Platalea regia)*- Status: Vulnerable (Adv List)
	Significant Fish Dependent	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)

	Significant EVCs	Estuarine Wetland – Depleted in the Otway Ranges bioregion Riparian Forest - Vulnerable Swamp Scrub - Endangered
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway Public camping is provided for at the Princetown Recreation Reserve. Facilities include showers and toilets.
	Game Hunting	Game hunting is permitted
	Motor Boating	Waterway is popular for motor boating with accessible formal boating facility boat ramp and car/trailer parking)
	Non-Motor Boating	Waterway is popular for non-motor boating
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Sightseeing	Sightseeing destination with high visitor numbers
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Degraded Estuarine Vegetation	The major issue involves clearance of riparian vegetation, particularly Woolly Tea-tree. The estuarine floodplain is grazed and drained, significantly changing the habitat for estuarine vegetation.
Degraded Water Quality	A number of fish death events have occurred associated with poor water quality in the estuary. During times of low flow through the catchment, anoxic water conditions can occur in the estuarine system, this anoxic water sometimes resulting in fish death events.
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Intermittently Open Estuaries	The river mouth is, on occasion, artificially opened to reduce flooding impacts on infrastructure. Arrangements for the opening of Gellibrand River are set out in a permit issued to Parks Victoria.
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	For most of its length stock have direct access to the estuary. The movement of stock impacts upon the regeneration of native vegetation and directly causes erosion through trampling. Some fencing of the estuary frontage has occurred.
Reduced Floodplain and Wetland Connectivity	Drains to alleviate flooding have modified the floodplain and wetlands

Work Program for Gellibrand River estuary

Waterway	Gellibrand River estuary	Identification No.	35-212

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Livestock have been excluded from over 50% of the waterway frontage f - Wetlands are connected to the estuary but less than natural g - The increase in low flow magnitude threat score has reduced from very high to high (achieved if investigation is successful) h - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Camping (5) Game Hunting (5) Motor Boating (4) Non-Motor Boating (4) Picnics and Barbecues (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (5) Invasive Fauna (Terrestrial) (5)

	Recreational Fishing (5) Sightseeing (5) Tracks (5) Significant Birds (5) Significant Fish Dependent (5)		Livestock Access (3) Reduced Floodplain and Wetland Connectivity (3) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install riparian fence - Not costed - refer to WQ activity in 35-13	N/A	**CCMA**/ LH	Degraded Water Quality (5)	b
Assess options for long term management of land subject to inundation	1 no.	**CCMA**/ CS, LH	Livestock Access (3)	e
Establish Gellibrand estuary management plan - Include estuarine vegetation management and assessments	50 ha	**CCMA**/ PV, CS	Degraded Estuarine Vegetation (3)	a
Continue to adopt a risk based approach to estuary mouth opening Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ PV, LH	Intermittently Open Estuaries (5), Reduced Floodplain and Wetland Connectivity (3) Degraded Estuarine Vegetation (3),	a, c, f
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation - Not costed - refer to WQ activity in 35-13	N/A	**CCMA**/PV, LH	Degraded Water Quality (5)	b
Investigate option to address summer low flow shortfalls – as identified under the Western region SWS - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/WW, SRW, DEPI	Inc in Low Flow Magnitude (5)	g
Investigate and reinstate recreational native fish habitat - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/DEPI, VRFish	Supports RCT 01	RCT 01
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - N ot costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/ BW, SRW	Inc in Low Flow Magnitude (5)	h
Maintain estuary monitoring station - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**	Intermittently Open Estuaries (5) Degraded Water Quality (5)	a, b
Maintain EstuaryWatch group collecting baseline data on estuary condition - Not costed refer to community engagement and capacity building (CWS, Section 5.1.3)	1 no.	**CCMA**/ Community, DEPI	Degraded Water Quality (5) Intermittently Open Estuaries (5)	a, b

Estimated cost of activities	**$70,000**

Waterway	50211 Princetown Wetland	Landscape Zone	Gellibrand
Identification No.	50211	**Basin**	Otway Coast

Links to Regional Goals

Due to its values , 50211 Princetown Wetland meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetlands	Part of the Princetown Wetland Complex. They meet the following criteria for inclusion in the directory: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Important bird area - Australian Wetlands Database
	Significant Birds	Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List)
	Significant EVCs	Estuarine Wetland - Status: Depleted; Swamp Scrub - Status: Endangered
	Wetland Vegetation Condition	Wetland Vegetation Condition (Biota Sub-Index Score) - 17
Social	Sightseeing	Bird watching and sightseeing are popular within the Princetown wetlands
Economic	Tourism	Significant numbers of tourists visit this area, including groups of school children who undertake environmental activities and non-motor boating.

Threats

Threat	Details
Degraded Estuarine Vegetation	The major issue involves clearing of native riparian vegetation, particularly Woolly Tea-tree. The estuarine floodplain is grazed and drained, significantly changing the habitat for estuarine vegetation.
Degraded Water Quality	A number of fish death events have occurred associated with poor water quality following artificial opening of the estuary mouth. During times of low flow, anoxic water conditions can occur in the estuarine wetlands, this anoxic water enters the river channel following estuary mouth opening, sometimes resulting in fish deaths.
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Intermittently Open Estuaries	The river mouth is, on occasion, artificially opened to reduce flooding impacts on infrastructure. Arrangements for the opening of Gellibrand River are set out in a permit issued to Parks Victoria.
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	For most of its length stock have direct access to the wetland. The movement of stock impacts upon the regeneration of native vegetation and directly causes erosion through trampling. Some fencing of the estuary frontage has occurred.
Reduced Floodplain and Wetland Connectivity	Drains to alleviate flooding have modified the floodplain and wetlands

Work Program for Princetown Wetland 50211

Waterway	50211 Princetown Wetland	Identification No.	50211

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - The wetland buffer vegetation has improved from poor to moderate condition c - No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Changed Water Regime (1) Degraded Buffer (4) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to estuary mouth opening - Not costed - refer to 35-212	N/A	**CCMA**/ PV, LH	Changed Water Regime (1), Degraded Buffer (4), Disturbance of Acid Sulfate Soils (5)	a, b, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager/** CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation	5 ha	**CCMA**/ HDLN, LH, WW, Landcare Network, Industry Groups	Degraded Buffer (4)	b
Install wetland fence	2 km	**CCMA**/ HDLN, LH, WW, Landcare Network, Industry Groups	Degraded Buffer (4), Invasive Flora (Wetland) (3)	b, e
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (4), Invasive Flora (Wetland) (3)	b, e

Estimated cost of activities	**$99,500**

Waterway	50212 Princetown Wetland	Landscape Zone	Gellibrand
Identification No.	50212	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, 50212 Princetown Wetland meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetlands	Part of the Princetown Wetland Complex. They meet the following criteria for inclusion in the directory: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Important bird area - Australian Wetlands Database
	Significant Birds	Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Australasian Shoveler (*Anas rhynchotis*) - Status: Vulnerable (Adv List); Cape Barren Goose (*Cereopsis novaehollandiae*)- Status: Near Threatened (Adv List); Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List); Glossy Ibis (Plegadis falcinellus) - Status: Near Threatened (Adv List); Royal Spoonbill *(Platalea regia)*- Status: Vulnerable (Adv List);
	Significant EVCs	Estuarine Wetland - Status: Depleted; Swamp Scrub - Status: Endangered
	Wetland Vegetation Condition	Wetland Vegetation Condition (Biota Sub-Index Score) -
Social	Sightseeing	Bird watching and sightseeing are popular within the Princetown wetlands
Economic	Tourism	Significant numbers of tourists visit this area, including groups of school children who undertake environmental activities and non-motor boating.

Threats

Threat	Details
Degraded Estuarine Vegetation	The major issue involves clearance of riparian vegetation, particularly Woolly Tea-tree. The estuarine floodplain is grazed and drained, significantly changing the habitat for estuarine vegetation.
Degraded Water Quality	A number of fish death events have occurred associated with poor water quality following artificial opening of the estuary mouth. During times of low flow, anoxic water conditions can occur in the estuarine wetlands, this anoxic water enters the river channel following estuary mouth opening, sometimes resulting in fish deaths.
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Intermittently Open Estuaries	The river mouth is, on occasion, artificially opened to reduce flooding impacts on infrastructure. Arrangements for the opening of Gellibrand River are set out in a permit issued to Parks Victoria.
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	For most of its length stock have direct access to the wetland. The movement of stock impacts upon the regeneration of native vegetation and directly causes erosion through trampling. Some fencing of the estuary frontage has occurred.
Reduced Floodplain and Wetland Connectivity	Drains to alleviate flooding have modified the floodplain and wetlands

Work Program for Princetown Wetland 50212

Waterway	50212 Princetown Wetland	Identification No.	50212

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - The wetland buffer vegetation has improved from very poor to moderate condition c - No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Changed Water Regime (1) Degraded Buffer (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

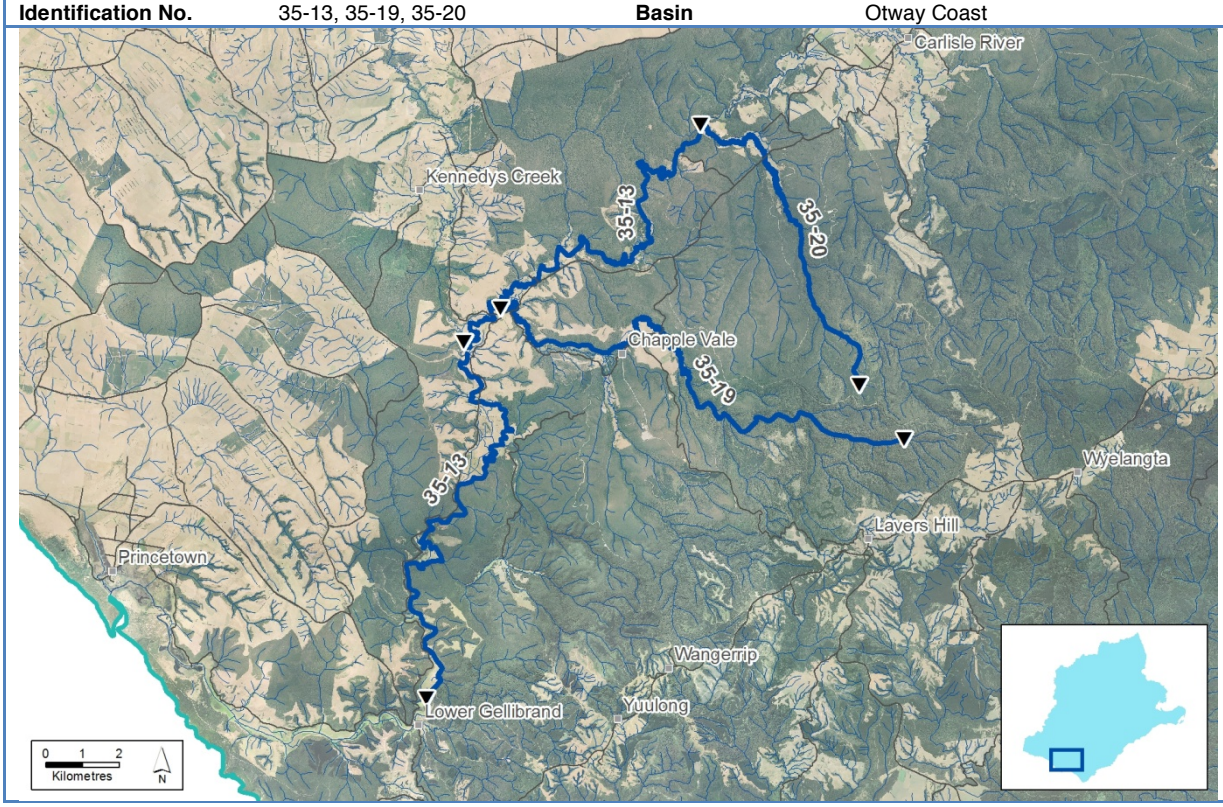
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to estuary mouth opening - - Not costed - refer to 35-212	N/A	**CCMA**/ PV, Landholder	Changed Water Regime (1), Disturbance of Acid Sulfate Soils (5)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation	5 ha	**CCMA**/ HDLN, LH, WW, Landcare Network, Industry Groups	Degraded Buffer (5)	b
Install wetland fence	2.5 km	**CCMA**/ HDLN, LH, WW, Landcare Network, Industry Groups	Degraded Buffer (5), Invasive Flora (Wetland) (3)	b, e
Establish stewardship/management agreement	2.5 ha	**Land manager**/ CCMA	Degraded Buffer (4), Invasive Flora (Wetland) (3)	b, e

Estimated cost of activities	**$107,500**

Gellibrand River, Chapple and Sandy creeks

Chapple and Sandy creeks are a small tributaries of the Gellibrand River. They join the Gellibrand River near Chapple Vale.

Waterway	Gellibrand River	Landscape Zone	Gellibrand
Identification No.	35-13, 35-19, 35-20	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Gellibrand River (35-13) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Riparian Vegetation Continuity	Approximately 80% of the reach has continuous riparian vegetation.
	Significant fish – migratory	Australian Grayling (*Prototroctes maraena*)
	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex -Depleted Riparian Forest - Vulnerable Wet Forest - Least Concern Sedgy Riparian Woodland - Depleted
	Sites of significance	Gellibrand River Confined Floodplain and Gorge – Significance: State. Faulting is a major structural feature of the Otway Ranges area and this site displays clearly the physiographic effects of recent fault movement. Stages in confined floodplain development and the interplay of tectonics, river erosion and deposition may be studied here in some detail. Gellibrand River Meanders – Significance: Regional. The abrupt change in meander patterns illustrates one of the varied characteristics of the longest river in the Otway region. Gellibrand River Valley – Significance: Regional. The Gellibrand River has levee banks at several localities and this has one of the best inland examples.
Social	Recreational fishing	The Gellibrand River is popular for fishing.
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Deg Rip Veg - Large Trees	The majority of poor riparian vegetation resulting from stock access is confined to the Chapple Vale area, from the pump station to the confluence of Atkinson creek. This is intensive dairy country.
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils

Work Program for Gellibrand River (35-13)

Waterway	Gellibrand River	Identification No.	35-13

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Livestock have been excluded from over 75% of the waterway frontage c - No increase in the loss of in-stream habitat through sedimentation d - The increase in low flow magnitude threat score has reduced from very high to high e - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (2) Disturbance of Acid Sulfate Soils (5) Livestock Access (1) Loss of Ins Hab (Sed) (4) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Grazing regime, Exclusion: Establish - Costs covered in fencing	9 ha	**CCMA**/ LH, Landcare Network, WW	Deg Rip Veg - Large Trees (2)	a
Install riparian fence - 4.5km (25%) of reach length - 9km frontage (flood fencing). Other fencing (for sed control) refer to 35-14, 17, 18, 19 and 20	9 km	**CCMA**/ LH, Landcare Network, WW	Livestock Access (1), Loss of Ins Hab (Sed) (4)	b, c
Establish stewardship/management agreement	9 ha	**Land manager**/ CCMA	Livestock Access (1), Loss of Ins Hab (Sed) (4)	b, c
Investigate options to address summer low flow shortfalls – as identified under the Western region SWS - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/WW, SRW, DEPI	Inc in Low Flow Magnitude (5)	d
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/ BW, SRW	Inc in Low Flow Magnitude (5)	e

Estimated cost of activities	**$216,000**

Waterway	Chapple Creek	Landscape Zone	Gellibrand
Identification No.	35-19	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Chapple Creek (35-19) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Significant EVCs	Significant EVCs	Riparian Forest - Vulnerable Wet Forest - Least Concern Cool Temperate Rainforest - Endangered Sedgy Riparian Woodland - Depleted
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures, generally for Dairy.
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment Chapple Creek feeds into the Gellibrand River upstream of the South Otway Pipeline. This pipeline contributes to the Warrnambool and district water supply.

Threats

Threat	Details
Invasive Flora	Willows are present in this reach
Livestock Access	Livestock have access to sections of this reach

Work Program for Chapple Creek

Waterway	Chapple Creek	Identification No.	35-19

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to protect the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - Invasive riparian flora (tree layer) has been maintained at a low threat level c - Livestock have been excluded from over 75% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Loss of Ins Hab (Sed) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows	6 ha	**CCMA**/ Land manager, Landcare Network, WW, Industry Groups	Invasive Flora (Riparian) - Tree Layer (2)	b
Install riparian fence – 6 km (25%) of reach length – 12 km frontage	12 km	**CCMA**/ Land manager, Landcare Network, WW, Industry Groups	Livestock Access (1), Loss of Ins Hab (Sed) (3)	c, d
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Livestock Access (1), Loss of Ins Hab (Sed) (3)	c, d
Establish native indigenous vegetation - 12ha of reach frontage	12 ha	**CCMA**/ Land manager, Landcare Network, WW, Industry Groups	Deg Rip Veg - Large Trees (-1), Loss of Ins Hab (Sed) (3)	a, d

Estimated cost of activities	**$516,000**

Waterway	Sandy Creek	Landscape Zone	Gellibrand
Identification No.	35-20	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Sandy Creek is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment
Environmental	Important Bird Habitat	Important bird area
	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex – Depleted Riparian Forest – Vulnerable
	Aquatic Invertebrate Community Condition	Meets all biological objectives for rivers and streams
	Riparian Vegetation Condition	9 - Streamside Zone Sub-Index Score

Threats

Threat	Details
Invasive Fauna Aquatic	Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program for Sandy Creek

Waterway	Sandy Creek	Identification No.	35-20

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by Work Program**	-

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/Land manager	N/A*	a

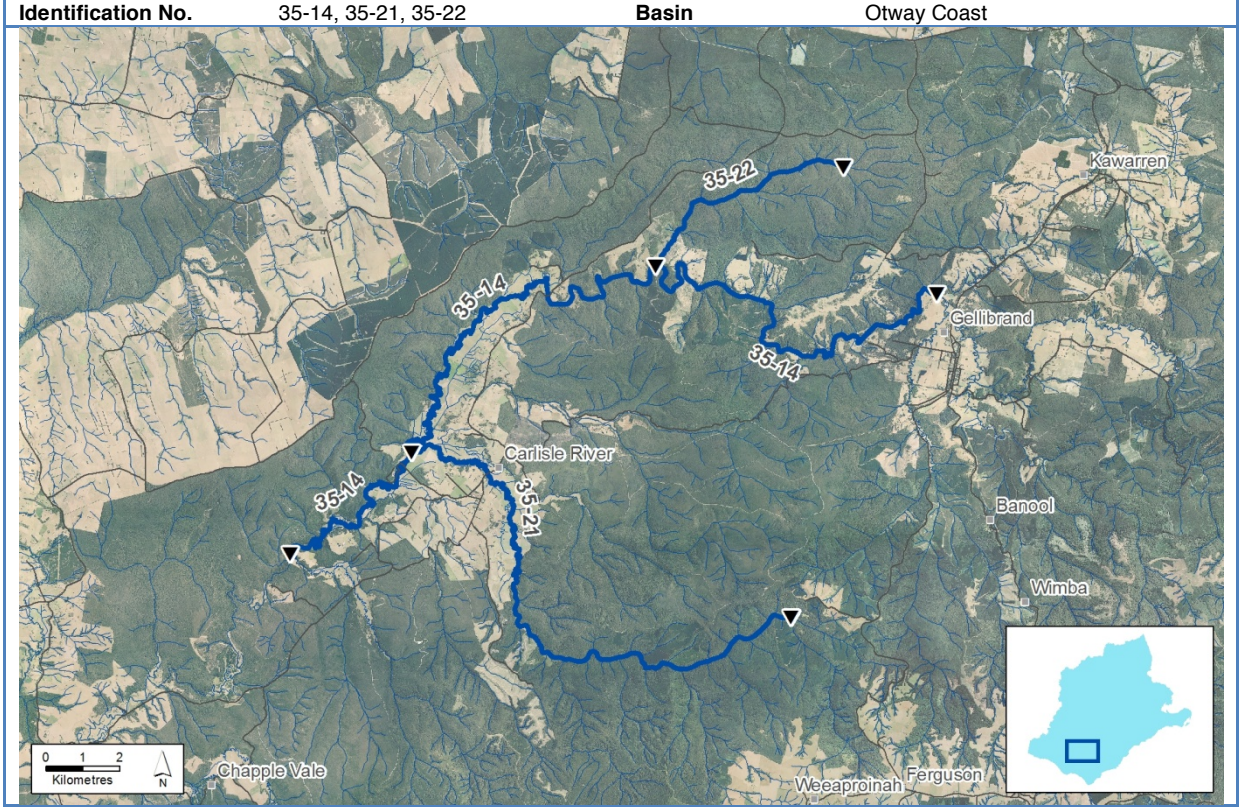
Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Gellibrand and Carlisle rivers, Gum Gully Creek

The tributaries of Carlisle River rise in the Otway Ranges near Wyelangta, from there the river flows north west towards Carlisle River where it joins the Gellibrand River.
Gum Gully Creek is a very small tributary of the Gellibrand River, it joins the Gellibrand River west of Gellibrand.

Waterway	Gellibrand River	Landscape Zone	Gellibrand
Identification No.	35-14, 35-21, 35-22	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Gellibrand River (35-14) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex -Depleted Riparian Forest - Vulnerable Wet Forest - Least Concern Sedgy Riparian Woodland - Vulnerable
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures generally for Dairy
	Urban or Rural Township Water Sources	North Otway Pipeline Wannon Water provides domestic supply to Warrnambool, Camperdown, Terang, Cobden, Koroit, Mortlake, Timboon, Lismore, Derrinallum, Allansford, Peterborough, Port Campbell, Carlisle River, Simpson, other small towns and around 1,000 rural stock and domestic users. Water is drawn from a complex "run-of-the-river" system, with little bulk water storage, and town service basins which only store 8-10 weeks supply.

Work Program for Gellibrand River (35-14)

Waterway	Gellibrand River	Identification No.	35-14

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - Invasive riparian flora (tree layer) has reduced to a low threat level c - Livestock have been excluded from over 75% of the waterway frontage d - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4) Significant Fish Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (1) Inc in Low Flow Magnitude (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 20ha of reach frontage	20 ha	**CCMA**/ LH, WW, LAWROC, Industry Groups	Deg Rip Veg - Large Trees (-1)	a
Install riparian fence - 10km (25%) of reach length - 20km frontage	20 km	**CCMA**/ LH, WW, LAWROC, Industry Groups	Livestock Access (1)	c
Establish stewardship/management agreement	20 ha	**Land manager**/ CCMA	Deg Rip Veg - Large Trees (-1), Livestock Access (1)	a, c
Establish woody weed control - Willows	10 ha	**CCMA**/ LH, WW LAWROC, PV	Invasive Flora (Riparian) - Tree Layer (3)	b
Investigate option to address summer low flow shortfalls – as identified under the Western region SWS - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/WW, SRW, DEPI	Inc in Low Flow Magnitude (3)	d
Investigate and reinstate recreational native fish habitat – Not costed – refer to Investigations planning and advice (CWS Section 5.1.3)	N/A	**CCMA**/DEPI, VRFish	Links to 35-15; 35-16; 35-212	
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/ BW, SRW	Inc in Low Flow Magnitude (5)	d

Estimated cost of activities	**$1,130,000**

Waterway	Carlisle River	Landscape Zone	Gellibrand
Identification No.	35-21	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Carlisle River is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Streamside Zone Sub-Index Score = 9 Riparian Scrub/Swampy Riparian Woodland Complex – Depleted Riparian Forest – Vulnerable
	Riparian Vegetation Condition	Streamside Zone Sub-Index Score = 9
Social	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present – Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna (Terrestrial)	Invasive species present – Invasive terrestrial species directly prey on native species and/or damage native species habitat
Increase in Low Flow Magnitude	Low Flow Index Score of 3

Work Program for Carlisle River

Waterway	Carlisle River	Identification No.	35-21

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by Work Program**	-

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/Land manager	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition

Waterway	Gum Gully Creek	Landscape Zone	Gellibrand
Identification No.	35-22	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Gum Gully Creek is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Aqua Invert Comm Cond	Meets all biological objectives for rivers and streams
	Native Fish	67 Fish index score statewide Fish Data (Fish Index Scores) 09~10 valid from 1/01/2010
	Significant EVCs	Streamside Zone Sub-Index Score = 10 Riparian Scrub/Swampy Riparian Woodland Complex – Depleted Riparian Forest – Vulnerable Sedgy Riparian Woodland – Depleted
	Rip Veg Condition	The waterway scored 10 for the Streamside Zone sub-index in the ISC3 assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (Willows/Hawthorn)
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present – Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna (Terrestrial)	Invasive species present – Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program Gum Gully Creek

Waterway	Gum Gully Creek	Identification No.	35-22

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies. 17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by Work Program**	-

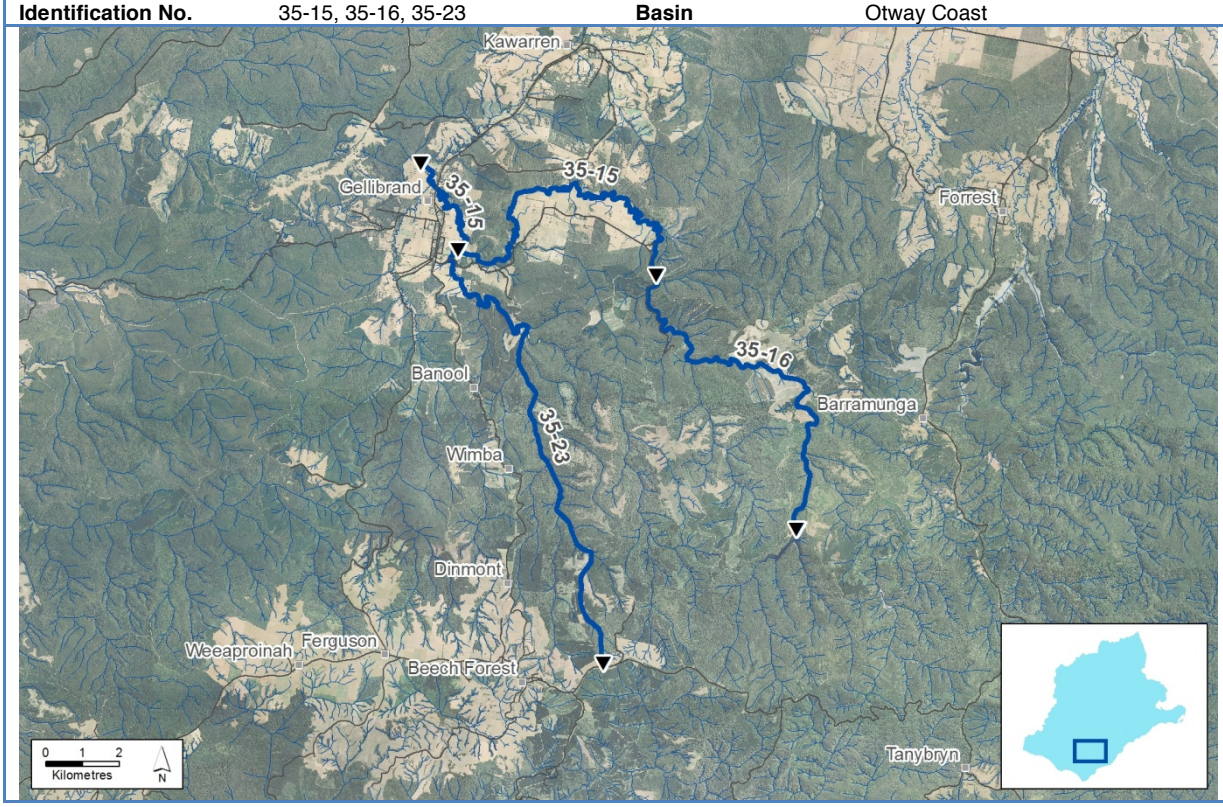
Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**, Land manager	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Gellibrand River and Lardner Creek

Waterway	Gellibrand River	Landscape Zone	Gellibrand
Identification No.	35-15, 35-16, 35-23	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Gellibrand River (35-15) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Fish	River Blackfish (*Gadopsis marmoratus*) of significant size are found in this reach
	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex -Depleted Riparian Forest - Vulnerable
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
	Game Hunting	Game hunting is permitted
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria The Gellibrand River is popular fishing spot for River Blackfish
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Invasive Flora (Riparian) - Shrub Layer	Blackberry is a significant weed in this reach
Invasive Flora (Riparian) - Tree Layer	Willows are found in this reach

Work Program for Gellibrand River (35-15)

Waterway	Gellibrand River	Identification No.	35-15

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive riparian flora (shrub layer) threat has been maintained at low c - Invasive riparian flora (tree layer) has been maintained at a low threat level d - Livestock have been excluded from over 75% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Camping (5) Game Hunting (5) Picnics and Barbecues (5) Recreational Fishing (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (3) Invasive Flora (Riparian) - Shrub Layer (2) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Loss of Ins Hab (Sed) (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows, blackberry	6 ha	**CCMA**/ LH, LAWROC, PV	Invasive Flora (Riparian) - Shrub Layer (2), Invasive Flora (Riparian) - Tree Layer (2)	b, c
Install riparian fence - 2km (10%) of reach length - 4km frontage. 8km of Charleys Creek frontage	12 km	**CCMA**/ LH, LAWROC, Industry Groups, WW	Livestock Access (1), Loss of Ins Hab (Sed) (4)	d, e
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Livestock Access (1), Loss of Ins Hab (Sed) (4)	d, e
Investigate sediment sources and sinks - Upper Gellibrand (including Love and Lardner catchments)	100 ha	**CCMA**/ COS, DEPI	Loss of Ins Hab (Sed) (4)	e
Establish native indigenous vegetation - 4ha of reach frontage. 8ha of Charleys Creek frontage	12 ha	**CCMA**/ LH, LAWROC, Industry Groups, WW	Deg Rip Veg - Large Trees (3), Loss of Ins Hab (Sed) (4)	a, e
Investigate and reinstate recreational native fish habitat - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/DEPI, VRFish	Supports RCT 01	RCT 01

Estimated cost of activities	**$728,000**

Waterway	Gellibrand River	Landscape Zone	Gellibrand
Identification No.	35-16	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Gellibrand River (35-16) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex - Depleted Riparian Forest - Vulnerable Wet Forest - Least Concern Cool Temperate Rainforest - Endangered
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway There are two popular campsites in the Upper Gellibrand catchment: Dando's and Stevenson's Falls. Dandos campground on the Gellibrand River is an ideal base for those wanting a formal campsite amongst the tall Otway forests. The open space at this campsite also appeals to groups and families needing some room to move. Stevensons Falls provides another formal campsite, amongst exotic conifers just downstream from a waterfall. More specifically the following features are associated with the two campsites: • Dando's o Recreation and Tourism Opportunities - Camping, Fishing, Four Wheel Driving, Horse Riding. o Infrastructure - Campsite, fireplace, picnic tables, toilet, water. o Environment/setting – river, forest. • Stevenson's Falls o Recreation and Tourism Opportunities - picnicking, camping, fishing, lookout/scenic viewing, interpretive/short walk. o Infrastructure - picnic tables, toilet, water, tracks/paths. o Environment/setting – river, waterfall. Stevenson's Falls Scenic Reserve has over 50,000 visitors per year
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Sightseeing	Sightseeing destination with high visitor numbers
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Degraded riparian vegetation	The reach has some relatively intact reaches within the forest where willow encroachment is slow. The major altered sites are within the public reserves, especially Stevensons Falls.
Loss of Instream Habitat	The major changes to instream habitat occur from: • Willow encroachment. Rotting willow leaf detritus causes low dissolved oxygen levels which are not adequate for the survival of native fish and aquatic invertebrates • Altered flows. Changes to flow (particularly the reduction in summer flows) have resulted in fewer areas within the stream being available for aquatic organisms.
Exotic flora	The major riparian weeds impacting on the reach are willows and blackberry. These species occur in greater numbers in the more exposed public reserves.

Work Program for Gellibrand River (35-16)

Waterway	Gellibrand River	Identification No.	35-16

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - Invasive riparian flora (shrub layer) threat has been maintained at low c - Invasive riparian flora (tree layer) has been maintained at a low threat level d - Livestock have been excluded from over 75% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Camping (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Invasive Flora (Riparian) - Shrub Layer (2) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Loss of Ins Hab (Sed) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Lower Barramunga Creek	3 ha	**CCMA**/ Land manager, PV, WW	Invasive Flora (Riparian) - Shrub Layer (2), Invasive Flora (Riparian) - Tree Layer (2)	b, c
Install riparian fence - Lower Barramunga Creek	3 km	**CCMA**/ LH, Landcare Network, Industry Groups, WW	Livestock Access (1), Loss of Ins Hab (Sed) (3)	d, e
Establish stewardship/management agreement	3 ha	**Land manager**/ CCMA	Livestock Access (1), Loss of Ins Hab (Sed) (3)	d, e
Establish native indigenous vegetation - Lower Barramunga Creek	3 ha	**CCMA**/ LH, Landcare Network, Industry Groups, WW	Deg Rip Veg - Large Trees (-1)	a
Investigate and reinstate recreational native fish habitat - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/DEPI, VRFish	Supports RCT 01	RCT 01

Estimated cost of activities	**$250,500**

Waterway	Lardner Creek	Landscape Zone	Gellibrand
Identification No.	35-23	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Lardner Creek is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Streamside Zone Sub-Index Score = 9 Riparian Forest – Vulnerable
	Aqua Invert Comm Cond	Meets all biological objectives for rivers and streams
	Rip Veg Condition	The waterway scored 9 for the Streamside Zone sub-index in the ISC3 assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (Willows/Hawthorn)
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present – Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna (Terrestrial)	Invasive species present – Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program for Lardner Creek

Waterway	Lardner Creek	Identification No.	35-23

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by Work Program**	-

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/ Land manager	N/A*	a

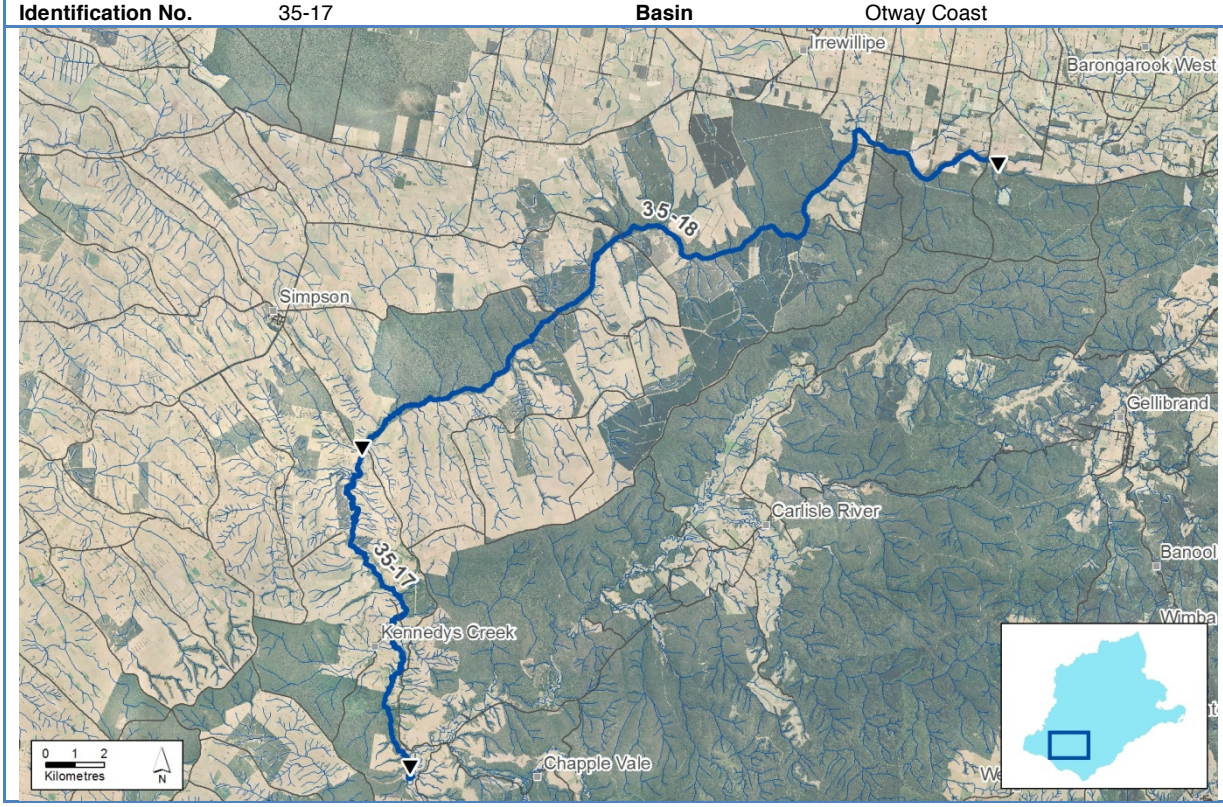
Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Kennedys Creek

The tributaries of Kennedys Creek rise near Irrewillipe and Barongarook West. They join and flow south west towards Kennedys Creek, before joining the Gellibrand River.

Waterway	Kennedys Creek	Landscape Zone	Gellibrand
Identification No.	35-17	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Kennedys Creek (35-17) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Kennedys Creek (35-18) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*- Status: Endangered (Adv List)
	Significant EVCs	Riparian Forest - Vulnerable Sedgy Riparian Woodland - Endangered Riparian Scrub/Swampy Riparian Woodland Complex - Vulnerable
	Important Bird Habitat	Important breeding habitat for colonial nesting birds
	Riparian Vegetation Condition	Streamside Zone Sub-Index Score of 10
	Native Fish	67 Fish index score statewide Fish Data (Fish Index Scores) 09~10 valid from 1/01/2010
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures, generally for Dairy

Threats

Threat	Details
Invasive Flora	Willows are found in this reach
Loss of Habitat	Deposition of sediments above natural levels mainly at bends and/or instream obstructions

(Sedimentation)

Work Program for Kennedys Creek (35-17)

Waterway	Kennedys Creek	Identification No.	35-17

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - Invasive riparian flora (tree layer) has been maintained at a low threat level b - Livestock have been excluded from over 75% of the waterway frontage c - No increase in the loss of in-stream habitat through sedimentation		
Values linked to regional goals	Rural Water Sources for Prod (4) Significant Invertebrates Aquatic (5)	**Threats addressed by work program**	Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Loss of Ins Hab (Sed) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows	4 ha	**CCMA**/ HDLN, SRW, LH, PV	Invasive Flora (Riparian) - Tree Layer (2)	a
Establish native indigenous vegetation - 8ha of reach frontage	8 ha	**CCMA**/ HDLN, LH, SRW, Landcare Network, Industry Groups	Loss of Ins Hab (Sed) (3)	c
Install riparian fence - 4km (15%) of reach length - 8km frontage	8 km	**CCMA**/ HDLN, LH, SRW, Landcare Network, Industry Groups	Livestock Access (1), Loss of Ins Hab (Sed) (3)	b, c
Establish stewardship/management agreement	8 ha	**Land manager**/ CCMA	Livestock Access (1), Loss of Ins Hab (Sed) (3)	b, c

Estimated cost of activities	**$344,000**

Work Program for Kennedys Creek (35-18)

Waterway	Kennedys Creek	Identification No.	35-18

Long-term Resource Condition Targets	11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Significant Invertebrates Aquatic (5)	**Threats addressed by Work Program**	-

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**, Land manager	N/A*	a

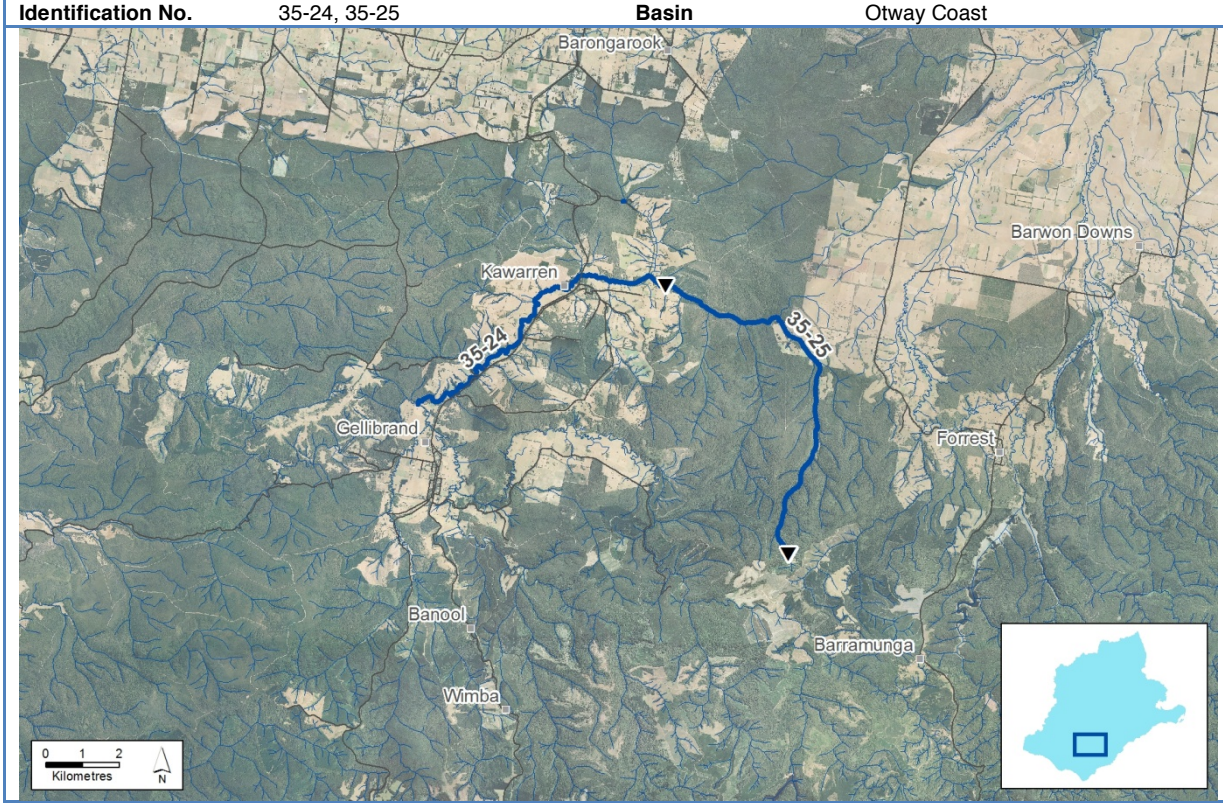
Estimated cost of activities	**$ -**

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Love Creek

Love Creek is a tributary of the Gellibrand River; it is formed when Ten Mile and Porcupine Creek join near Kawarren. Love Creek joins the Gellibrand River just north of Gellibrand.

Waterway	Love Creek	Landscape Zone	Gellibrand
Identification No.	35-24, 35-25	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Love Creek (35-24) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Love Creek (35-25) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*- Status: Endangered (Adv List)
	Significant EVCs	Riparian Forest - Vulnerable Sedgy Riparian Woodland – Depleted Riparian Scrub/Swampy Riparian Woodland Complex - Depleted
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Exotic flora	Willow and blackberry are significant in this reach
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Water Quality	Loves Creek is part of an open water supply catchment. A number of threats addressed by the work program have the potential to impact on water quality. These include – Bank Instability, Degraded Vegetation, Livestock Access and Disturbance of Acid Sulfate Soils.

Work Program Love Creek

Waterway	Love Creek	Identification No.	35-24

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Invasive riparian flora (shrub layer) threat has been maintained at low d - Invasive riparian flora (tree layer) has been maintained at a low threat level e - Livestock have been excluded from over 75% of the waterway frontage f - Maintain the existing riparian vegetation longitudinal continuity in excellent condition g - Maintain the existing riparian vegetation width in excellent condition		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Significant Invertebrates Aquatic (5)	**Threats addressed by work program**	Bank Instability (4) Deg Rip Veg - Large Trees (2) Disturbance of Acid Sulfate Soils (5) Invasive Flora (Riparian) - Shrub Layer (2) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Reduced Riparian Connectivity (1) Reduced Vegetation Width (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows, blackberry	8 ha	**CCMA**/ LH, LAWROC, PV, WW	Invasive Flora (Riparian) - Shrub Layer (2), Invasive Flora (Riparian) - Tree Layer (2)	c, d
Establish native indigenous vegetation - 12ha of reach frontage	12 ha	**CCMA**/ LH, LAWROC, Industry Groups, WW	Bank Instability (4), Deg Rip Veg - Large Trees (2), Reduced Riparian Connectivity (1), Reduced Vegetation Width (1)	a, b, f, g
Install riparian fence - 6km (50%) of reach length - 12km frontage	12 km	**CCMA**/ LH, LAWROC, Industry Groups, WW	Bank Instability (4), Livestock Access (1), Reduced Riparian Connectivity (1), Reduced Vegetation Width (1)	a, e, f, g
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Bank Instability (4), Livestock Access (1), Reduced Riparian Connectivity (1), Reduced Vegetation Width (1)	a, e, f, g

Estimated cost of activities	**$570,000**

Work Program Love Creek

Waterway	Love Creek	Landscape Zone	Gellibrand
Identification No.	35-25	**Basin**	Otway Coast

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has been maintained at a low threat level d - Livestock have been excluded from over 75% of the waterway frontage		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Significant Invertebrates Aquatic (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1)

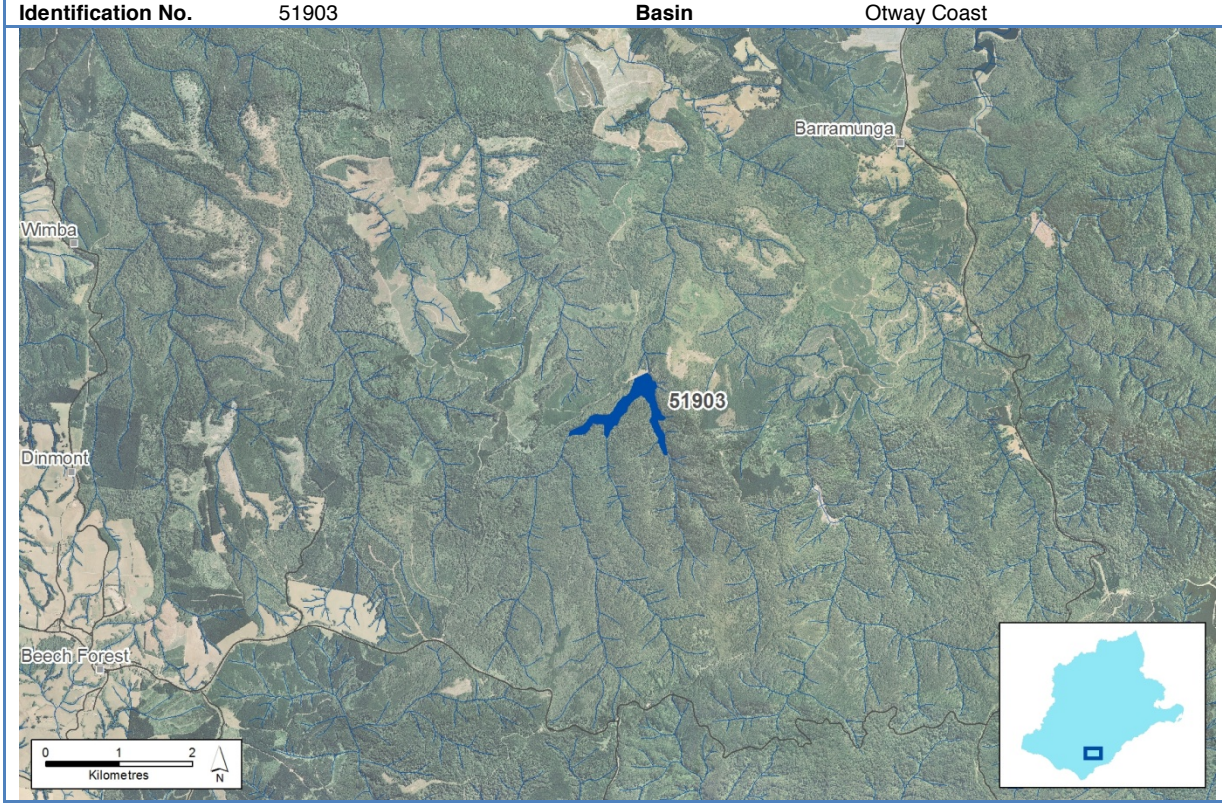
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Yahoo Creek	1 ha	**CCMA**/ LH, LAWROC, WW	Invasive Flora (Riparian) - Tree Layer (2)	c
Establish native indigenous vegetation - Yahoo, Ten Mile and Porcupine Creeks	9 ha	**CCMA**/ LH, LAWROC, Industry Groups, WW	Deg Rip Veg - Large Trees (-1), Degraded Water Quality (5)	a, b
Install riparian fence - Yahoo, Ten Mile and Porcupine Creeks	9 km	**CCMA**/ HDLN, LH, LAWROC, Industry Groups, WW	Degraded Water Quality (5), Livestock Access (1)	b, d
Establish stewardship/management agreement	9 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (1)	b, d

Estimated cost of activities	**$292,500**

West Gellibrand Reservoir

West Gellibrand Reservoir is the largest of Colac's water supply storages. It falls within protected, forested catchment in the Otway Ranges. Water is piped 25 kilometres to a service basin before being treated for Colac's use.

Waterway	West Gellibrand Dam	Landscape Zone	Gellibrand
Identification No.	51903	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, West Gellibrand Reservoir is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Economic	Urban/Rural Township Water Sources	Waterway forms part of a closed State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity <10,000ML)

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present – Invasive aquatic species directly prey on native species and/or damage native species habitat

Work Program for West Gellibrand Reservoir

Waterway	West Gellibrand Reservoir	Identification No.	51903

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (3) Urban/Rural Township Water Sources (5)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead and (Partners)	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans. Not costed	N/A	**BW**	N/A	a

Estimated cost of activities	$ -

8.6 Hovells Landscape Zone

Limeburners Lagoon

Limeburners Lagoon is part of the Point Wilson/Limeburners Bay area (a coastal strip from Point Wilson to Limeburners Bay). It is a shallow, funnel shaped estuary. The entrance is narrow and partially enclosed by a shelly spit. Limeburners Lagoon is considered an excellent example of a complex estuary containing many features of larger estuarine systems.

Waterway	Limeburners Lagoon	Landscape Zone	Hovells
Identification No.	32-215	**Basin**	Moorabool

Links to Regional Goals

Due to its values Limeburners Lagoon (32-215) meets the following regional goals:	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterway with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	East Asian – Australasian Flyway Site	Limeburners Lagoon forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula East Asian – Australasian Flyway Site (site no. EAAF065). The site is important for migratory shorebirds in the East Asian-Australasian Flyway. The majority of birds in the East Asian-Australasian Flyway migrate from breeding grounds in northeast Asia and Alaska to non-breeding grounds in Australia and New Zealand, covering the journey of 10,000 km twice in a single year.
	Ramsar Site	Limeburners Lagoon forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. The site is located in the west of Port Phillip Bay in the State of Victoria and was designated as a wetland of international importance in 1982. It comprises six distinct areas: • Point Cooke / Cheetham; extending from Skeleton Creek to Point Cooke and including parts of the Cheetham wetlands; • Werribee / Avalon: extending from the Werribee River to The Spit and including the Western Treatment Plant; • Point Wilson / Limeburners Bay: coastal strip from Point Wilson to Limeburners Bay;

		• Swan Bay; • Mud Islands; and • Lake Connewarre Complex – including Reedy Lake, Hospital Swamp, Salt Swamp, the Barwon Estuary and part of Lake Murtnaghurt.
	Nationally Important Wetland	Limeburners Lagoon forms part of the Werribee-Avalon Area. This area contains a variety of habitats, including large areas of intertidal mudflat and seagrass beds, extensive areas of saltmarsh, small stands of White Mangrove Avicenna marina, reed beds, salt evaporation lagoons of the Avalon saltworks and the grass filtration paddocks and sewage treatment lagoons of the Werribee Treatment Complex. The Port Phillip Bay Coastal Study identified Limeburners Bay as a site of geomorphological, floral and faunal interest, and The Spit and the Western Treatment Complex as sites of faunal interest (PPA *et al* 1977). Limeburners Bay is listed as a site of special scientific interest for its vegetation (Barson & Calder 1976) and its geology and geomorphology (Bird 1977).
Environmental	Important Bird Habitat	Point Cooke and Point Wilson / Limeburners Bay are the most important locations within the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site for Double-banded Plovers.
	Significant Birds	The following birds, listed as endangered under the List of Threatened Vertebrate Fauna in Victoria, have been recorded at Limeburners Lagoon: • Fairy Tern (*Sternula nereis nereis*) • Little Egret (*Egretta garzetta nigripes*) • The following birds, listed as vulnerable under the List of Threatened Vertebrate Fauna in Victoria, have been recorded at Limeburners Bay: • Eastern Great Egret (*Ardea modesta*) • Royal Spoonbill (*Platalea regia*)
	Significant EVCs	Mangrove Shrubland (140) – vulnerable
Social	Picnics and Barbecues	Designated picnic and barbecue areas present
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
	Motor Boating	Waterway is popular for motor boating with accessible formal boating facility (i.e. boat ramp and car/trailer parking)
	Non-motor Boating	Waterway is popular for non-motor boating

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species. Rabbits are present and damage habitats.
Increase in Low Flow Magnitude	Hovells Creek is the major freshwater influence of Limeburners Bay Estuary. However, no quantitative information on the hydrology of Hovells Creek could be sourced. Index of Stream Condition (ISC) results for Hovells Creek upstream of the estuary indicate that summer flows and seasonality of the creek have been altered (DSE 2008), but it is unknown if this occurred prior or subsequent to the Ramsar Site listing.
Degraded Water Quality	No specific information about the threat to ecological character from stormwater could be sourced for this location. However, the increasing development and corresponding stormwater discharges are a threat to this area.
Disturbance of Acid-sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Recreation	Due to its proximity to large population centres, the waters of Port Phillip Bay in general, and areas specific to the Ramsar Site are popular for recreational fishing (in particular, Swan Bay and Limeburners Bay). Disturbance of waterbirds and other wildlife by people is becoming an increasing problem where urban areas have spread to the edge of wetlands.

Work Program Limeburners Lagoon

Waterway	Limeburners Lagoon	Identification No.	32-215
Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 -The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive riparian flora (ground layer) threat has reduced from high to moderate e - Wetlands are connected to the estuary but less than natural		
Values linked to regional goals	Motor Boating (4) Non-Motor Boating (4) Picnics and Barbecues (5) Tracks (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Ground Layer (4) Reduced Estuary Extent (4)

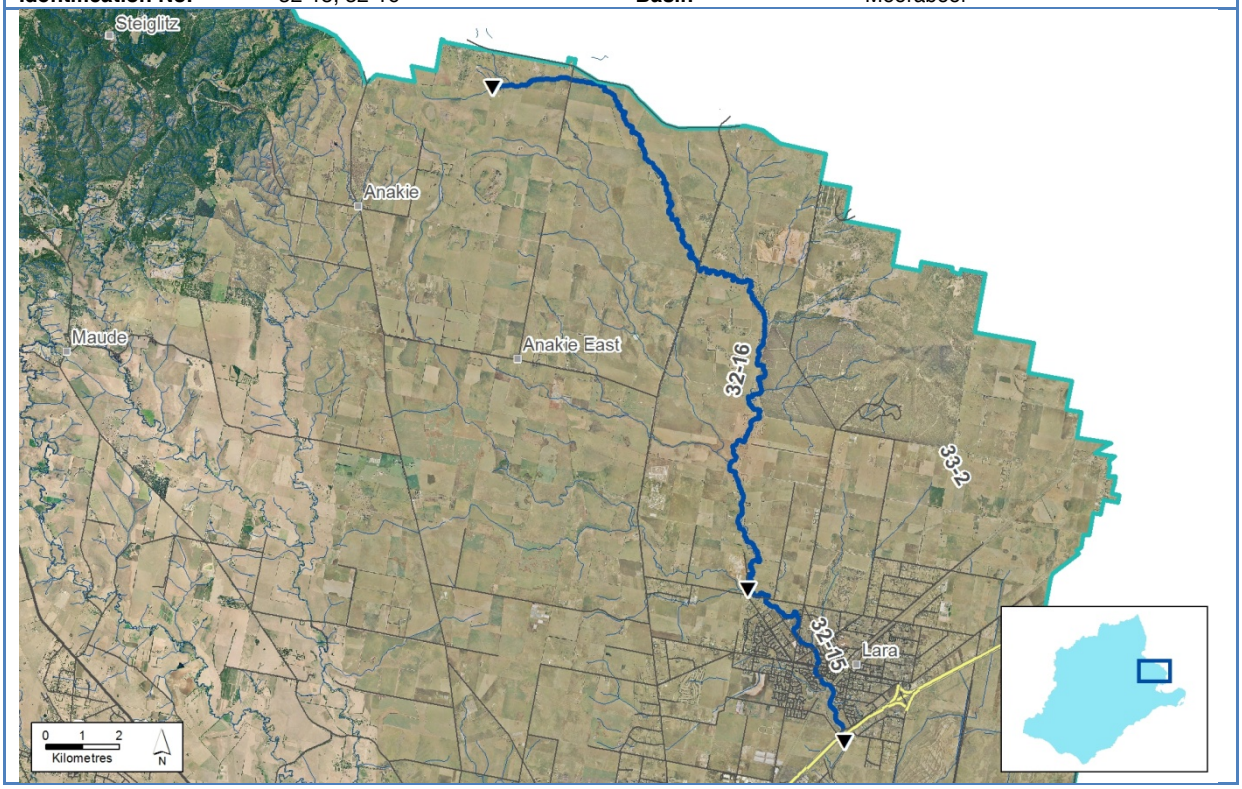
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish non-woody weed control	3 ha	**CCMA**, PV, COGG/ GLN, GA, LH	Invasive Flora (Riparian) - Ground Layer (4)	d
Establish native indigenous vegetation - 3ha d/s of Princes Freeway **Other revegetation (for water quality improvement) refer to 32-15 and 16**	3 ha	**CCMA**, PV, COGG/ GLN, GA, LH	Degraded Water Quality (5), Degraded Estuarine Vegetation (3)	a, b
Install riparian fence **Not costed - refer to fencing (for water quality improvement) in 32-15 and 32-16**	N/A	**CCMA**/ GLN, GA, LH	Degraded Water Quality (5)	b
Modify weir - Old Melbourne Road	1 no.	**CCMA**/ VicRoads, DEPI	Reduced Estuary Extent (4)	e
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**	Degraded Water Quality (5)	b

Estimated cost of activities	$195,500

Hovells Creek

Hovells Creek rises near Balliang and flows through Lara before entering Limeburners Lagoon. The Creek is highly ephemeral through the upper and mid reaches and more permanent in the lower reaches were stormwater from Lara contributes to stream flow.

Waterway	Limeburners Lagoon	Landscape Zone	Hovells
Identification No.	32-15, 32-16	**Basin**	Moorabool



Links to Regional Goals

Due to its values, Hovells Creek (32-15) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Hovells Creek (32-16)meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds Waterway	Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List) (32-15)
	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC) (32-16)
	Significant EVCs	Creekline Grassy Woodland - Endangered
Social	Tracks	The local community use a walking track that follows Hovells Creek in Lara.

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Livestock Access	Livestock access 25-75% of the waterway frontage

Degraded Riparian Vegetation	Riparian vegetation is degraded with few large trees, lack of continuity and reduced width
Degraded Water Quality	Increased urbanisation in the surrounding area has the potential to result in increased stormwater discharges to the system
Invasive Flora (Riparian) – Ground Layer	Serrated tussock has been identified as threats along these reaches

Work program for Hovells Creek

Waterway	**Hovells Creek**	**Identification No.**	**32-15**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation longitudinal continuity has improved from very poor to moderate e - Riparian vegetation width has improved from poor to moderate condition f - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period g - Invasive riparian flora (ground layer) threat has reduced from high to moderate		
Values linked to regional goals	Significant Birds Waterway (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Riparian Connectivity (5) Reduced Vegetation Width (4) Degraded Water Quality (5) Invasive Flora (Riparian) – Ground Layer (4) Invasive Flora (Riparian) – Shrub Layer (2)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager/** CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Establish native indigenous vegetation - 14ha of reach frontage	14 ha	**CCMA**/ GLN, LH	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (5), Reduced Vegetation Width (4) Invasive Flora (Riparian) – Ground Layer (4)	a,d, e, g
Install riparian fence - 3.5km (50%) of reach length - 7km frontage	7 km	**CCMA**/ GLN, LH	Livestock Access (3), Reduced Riparian Connectivity (5), Degraded Water Quality (5)	c, d, f
Establish stewardship/management agreement	7 ha	**Land manager**/ CCMA	Livestock Access (3), Reduced Riparian Connectivity (5), Degraded Water Quality (5)	c, d, f
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**	Degraded Water Quality (5)	f

Estimated cost of activities	**$302,600**

Work Program for Hovells Creek

Waterway	Hovells Creek	Identification No.	32-16

Long-term Resource Condition Targets	10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Livestock have been excluded from over 25% of the waterway frontage d - Riparian vegetation longitudinal continuity has improved from poor to moderate e- Riparian vegetation width has improved from poor to moderate condition f - Invasive riparian flora (ground layer) threat has reduced from high to moderate		
Values linked to regional goals	Significant Amphibians (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Degraded Water Quality (5) Livestock Access (5) Reduced Riparian Connectivity (4) Reduced Vegetation Width (4) Invasive Flora (Riparian) – Ground Layer (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, DEPI	Degraded Water Quality (5)	b
Establish native indigenous vegetation - 5ha of reach frontage	5 ha	**CCMA**/ GLN, LH	Deg Rip Veg - Large Trees (-1), Degraded Water Quality (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (4) Invasive Flora (Riparian) – Ground Layer (5)	a, e, b, d, f
Install riparian fence - 2.5km (10%) of reach length - 5km frontage. 10km of tributary stream frontages	15 km	**CCMA**/ GLN, LH	Degraded Water Quality (5), Livestock Access (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (4)	a, b, c, d
Establish non-woody weed control – serrated tussock	3 ha	**CCMA**/ COGG, GLN, GA, LH	Invasive Flora (Riparian) - Ground Layer (5)	f
Establish stewardship/management agreement	15 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (4)	a, b, c, d
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**	Degraded Water Quality (5)	b

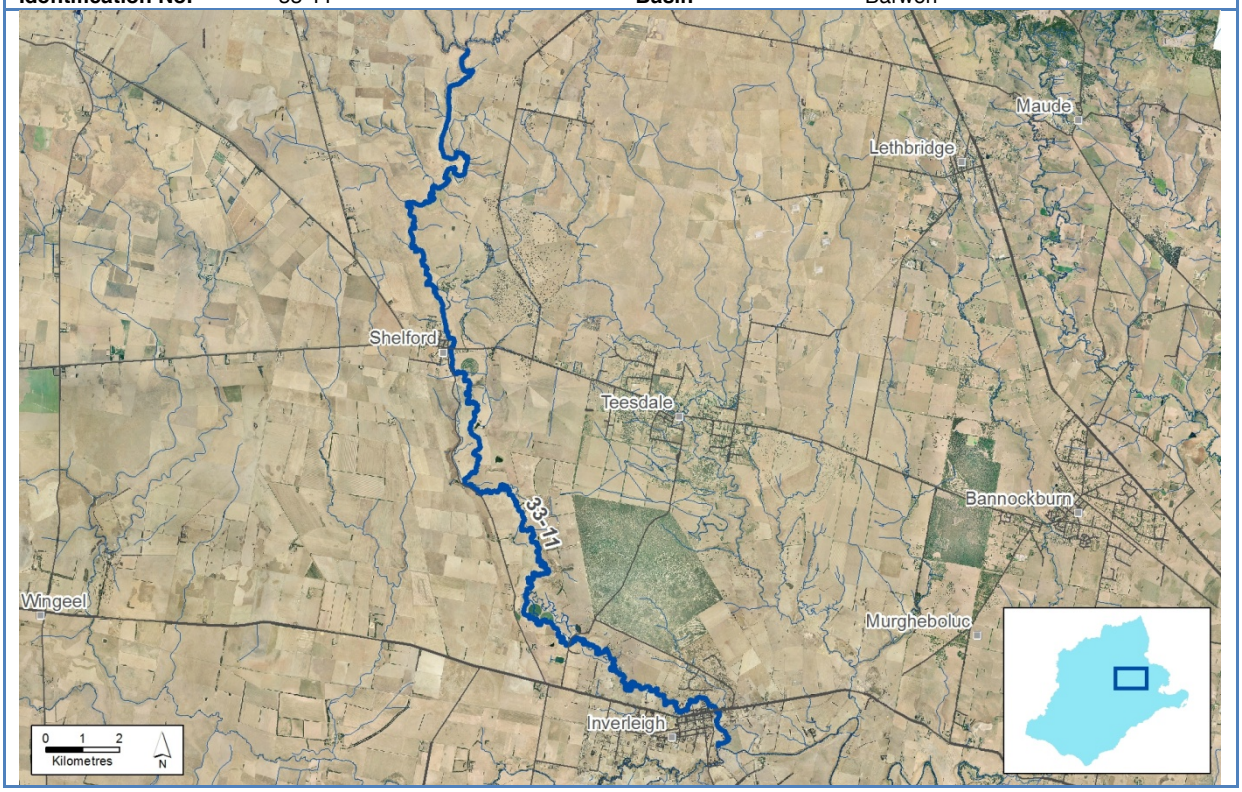
Estimated cost of activities	**$307,500**

8.7 Leigh Landscape Zone

Leigh River and Yarrowee River

The Leigh River rises near Ballarat. In the upper reach it is known as the Yarrowee River. Through Ballarat it is channelised and lined with blue-stone and runs underground in parts, before it returns to a more natural form south of Ballarat. South of Ballarat the Leigh River has been highly affected by historical mining activities and a large deposit of sediment has left large parts of the river bed homogenous. The river flows through the Leigh River gorge, near Mt Mercer before joining the Barwon River at Inverleigh. The Yarrowee and Leigh Rivers are highly valued by the communities along its course.

Waterway	Leigh River	Landscape Zone	Leigh
Identification No.	33-11	**Basin**	Barwon



Links to Regional Goals

Due to its values, Leigh River (33-11) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Floodplain Riparian Woodland - Endangered Stream Bank Shrubland – Endangered Swampy Riparian Woodland - Endangered Creekline Herb-rich Woodland - Vulnerable Sedgy Riparian Woodland - Vulnerable Riparian Woodland - Endangered
	Significant Flora	Clover Glycine (*Glycine latrobeana)* Fragrant Saltbush (*Rhagodia parabolica)* Yarra Gum (*Eucalyptus yarraensis)*
Economic	Rural Water Sources for Prod	Water source is used for horticulture, including vegetation and Lucerne production (33-11)

Threats

Threat	Details
Bank Instability	Greater than 90% of the reach is eroding
Degraded Riparian Vegetation	The riparian vegetation has few large trees and occurs only in a narrow strip
Livestock Access	Livestock access greater than 25% of reach
Loss of Instream Habitat (Sediment)	Deposition of sediments throughout reach

Work Program for Leigh River

Waterway	Leigh River	Identification No.	33-11

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Livestock have been excluded from over 50% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation e - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (5)	**Threats addressed by work program**	Bank Instability (5) Deg Rip Veg - Large Trees (5) Livestock Access (3) Loss of Ins Hab (Sed) (4) Reduced Vegetation Width (3) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 2ha of reach frontage. Other revegetation (for sed control) refer to 33-14 and 33-16	2 ha	**CCMA**/ LCG, LH	Bank Instability (5), Deg Rip Veg - Large Trees (5), Loss of Ins Hab (Sed) (4), Reduced Vegetation Width (3)	a, b, d, e
Install riparian fence - 1km (2.5%) of reach length - 2km frontage. Other fencing (for sed control) refer to 33-14 and 33-16	2 km	**CCMA**/ LCG, LH	Bank Instability (5), Livestock Access (3), Loss of Ins Hab (Sed) (4)	a, c, d
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Bank Instability (5), Livestock Access (3), Loss of Ins Hab (Sed) (4)	a, c, d
Maintain beneficial discharge into the Yarrowee Leigh from South Ballarat Treatment Plant as per the Central Region SWS – Not costed.	N/A	**CHW**/ EPA, CCMA	Degraded Water Quality (5), Inc in Low Flow Magnitude (5)	c

Estimated cost of activities	**$59,000**

Yarrowee River and Williamson Creek

Waterway	Yarrowee River & Williamson Creek	Landscape Zone	Leigh
Identification No.	33-14, 33-16	**Basin**	Barwon

Links to Regional Goals

Due to its values, Yarrowee River (33-14) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Floodplain Riparian Woodland - Endangered Stream Bank Shrubland – Endangered Swampy Riparian Woodland - Endangered Creekline Herb-rich Woodland - Vulnerable Sedgy Riparian Woodland - Vulnerable Riparian Woodland - Endangered
	Significant Flora	Clover Glycine (*Glycine latrobeana)* Fragrant Saltbush (*Rhagodia parabolica)* Yarra Gum (*Eucalyptus yarraensis)*
Economic	Rural Water Sources for Prod	Water source is used for horticulture, including vegetation and Water source is used for irrigated modified pastures (33-14)

Threats

Threat	Details
Bank Instability	Greater than 90% of the reach is eroding
Degraded Riparian Vegetation	The riparian vegetation has few large trees and occurs only in a narrow strip
Livestock Access	Livestock access greater than 25% of reach
Loss of Instream Habitat (Sediment)	Deposition of sediments throughout reach

Work Program for Yarrowee River

Waterway	Yarrowee River	Identification No.	33-14
Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive riparian flora (shrub layer) threat has reduced from moderate to low e - Invasive riparian flora (tree layer) has reduced to a low threat level f - Livestock have been excluded from over 50% of the waterway frontage g - No increase in the loss of in-stream habitat through sedimentation h - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Bank Instability (5) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Flora (Riparian) - Shrub Layer (3) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Vegetation Width (3) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, Landcare-Community Groups, DEPI	Degraded Water Quality (5)	c
Establish woody weed control - Willows, gorse, blackberry	18 ha	**CCMA**/ LH, Landcare-Community Groups	Invasive Flora (Riparian) - Shrub Layer (3), Invasive Flora (Riparian) - Tree Layer (3)	d, e
Establish native indigenous vegetation - 18ha of reach frontage	18 ha	**CCMA**/ LH, Landcare-Community Groups	Bank Instability (5), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (3)	a, b, c, h
Install riparian fence - 9km (25%) of reach length - 18km frontage	18 km	**CCMA**/ LH, Landcare-Community Groups	Bank Instability (5), Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3)	a, c, f, g
Establish stewardship/management agreement	18 ha	**Land manager**/ CCMA	Bank Instability (5), Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3)	a, c, f, g
Adopt whole of water cycle management to stormwater run-off – Not costed.	N/A	**DEPI**/COB, CCMA, CHW	Degraded Water Quality (5)	c
Enhance the upstream reaches through urban Ballarat in line with the Breathing Life back into the Yarrowee Project – Not costed.	N/A	**CCMA**/COB	Bank Instability (5), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (3)	a, b, c, h
Maintain beneficial discharge into the Yarrowee Leigh from South Ballarat Treatment Plant as per the Central Region SWS	N/A	**CHW**/ EPA, CCMA	Degraded Water Quality (5), Inc in Low Flow Magnitude (5)	c

Estimated cost of activities	**$1,503,000**

Due to its values, Williamson Creek (33-16) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Stream Bank Shrubland – Endangered
	Significant Flora	Yarra Gum – *Eucalyptus yarraensis*
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bank Instability	10-50% of the reach is eroding
Degraded Riparian Vegetation	The riparian vegetation has few large trees and occurs only in a narrow strip
Livestock Access	Livestock access greater than 25% of reach
Invasive Flora	Willow, blackberry and gorse are present

Work Program for Williamson Creek

Waterway	Williamson Creek	Identification No.	33-16

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Invasive riparian flora (shrub layer) threat has been maintained at very low d - Invasive riparian flora (tree layer) has been maintained at a low threat level e - Livestock have been excluded from over 50% of the waterway frontage f - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Bank Instability (3) Deg Rip Veg - Large Trees (5) Invasive Flora (Riparian) - Shrub Layer (1) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (3) Reduced Vegetation Width (3)

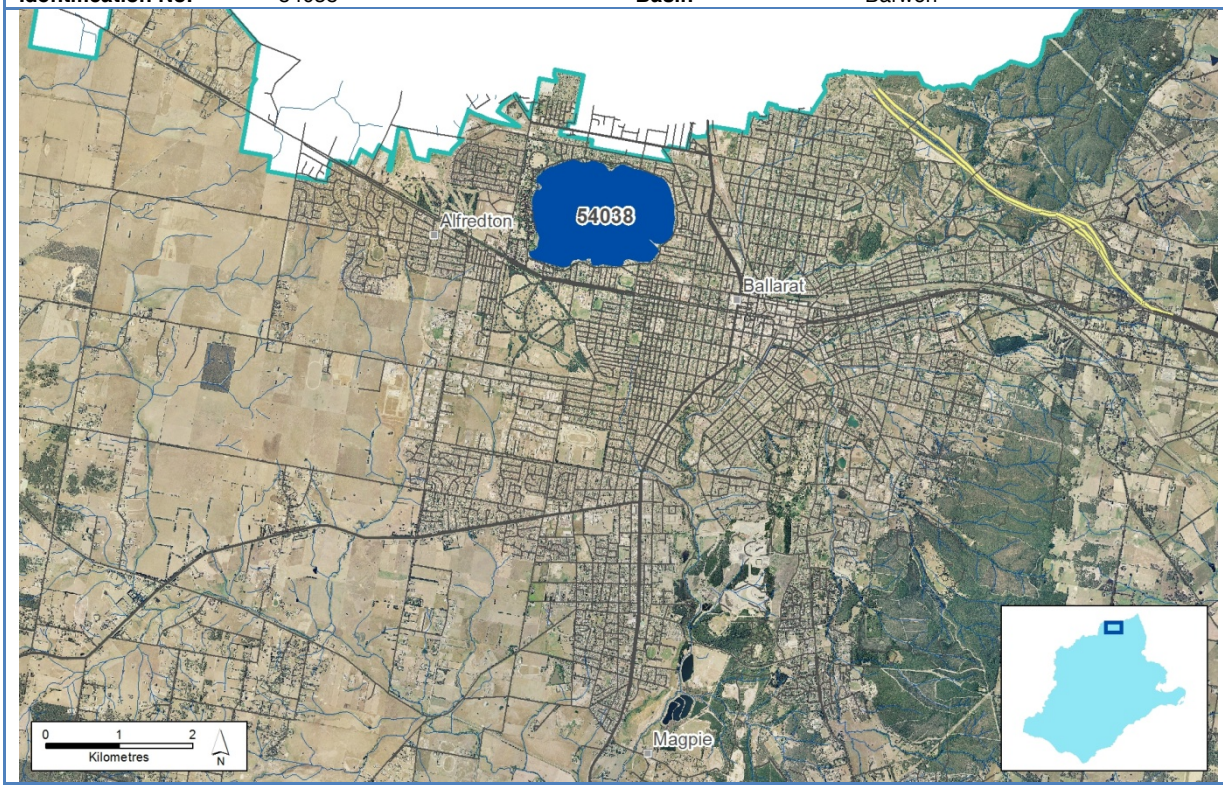
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows, gorse, blackberry	6 ha	**CCMA**/ LCG, LH	Invasive Flora (Riparian) - Shrub Layer (1), Invasive Flora (Riparian) - Tree Layer (2)	c, d
Establish native indigenous vegetation - 6ha of reach frontage	6 ha	**CCMA**/ LCG, LH	Bank Instability (3), Deg Rip Veg - Large Trees (5), Reduced Vegetation Width (3)	a, b, f
Install riparian fence – 3 km (10%) of reach length – 6 km frontage	6 km	**CCMA**/ LCG, LH	Bank Instability (3), Livestock Access (3)	a, e
Establish stewardship/management agreement	18 ha	**Land manager**/ CCMA	Bank Instability (3), Livestock Access (3)	a, e

Estimated cost of activities	**$339,000**

Lake Wendouree

Lake Wendouree is a large deep freshwater marsh with large areas of emergent, floating and submerged native aquatic vegetation, and a fringe of introduced species in a parkland setting.
Lake Wendouree is an artificially-created and maintained shallow urban lake located in Ballarat. Lake Wendouree is one of the smallest of a complex of natural wetlands which includes nearby Lake Burrumbeet and Lake Learmonth (both in the Glenelg Hopkins region) on the plains of the Central Highlands.
The natural swamp was dammed following the Victorian gold rush in 1851 and since the 1860s it has been a popular recreational lake. Lake Wendouree now holds significant historical, environmental and recreational values to the Ballarat community. The lake hosted the rowing and canoeing events during the 1956 Olympic Games. During its history, the shallow lake has dried up during drought conditions, the most recent an extended period between 2006 and 2011.

Waterway	Lake Wendouree	Landscape Zone	Leigh
Identification No.	54038	**Basin**	Barwon



Links to Regional Goals

Due to its values, Lake Wendouree meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally significant wetland	Lake Wendouree is considered nationally important if it meets at least one of the following criteria: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 6. The wetland is of outstanding historical or cultural significance
Environmental	Significant Birds	Eight threatened species, including Little Bittern (*Ixobrychus minutus)* (e), Blue-billed Duck (*Oxyura australis)* (v, FFG) and Lewin's Rail (*Rallus pectoralis)* (e), have been recorded at Lake Wendouree

Social	Non-Motor Boating	Lake Wendouree is regularly used for rowing regattas.
	Picnics and Barbecues	Excellent facilities
	Recreational Fishing	Brown Trout have been released into the Lake since the early 1900s (CoB 1996).
	Sightseeing	Sightseeing destination with high visitor numbers. Bird watching, waterfowl feeding on the Lake, and picnicking, playgrounds, exercising (e.g.. jogging and walking) around the margins
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
Economic	Tourism	Lake Wendouree is a significant asset for Ballarat due to the high number of tourist visits.

Threats

Threat	Details
Degraded Water Quality	Lake Wendouree is located in the Ballarat. It is subject to urban stormwater.
Invasive Flora (Wetland)	Aquatic vegetation is cut seasonally to maintain open water for water sports

Work Program for Lake Wendouree

Waterway	Lake Wendouree	Identification No.	54038

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Invasive wetland flora threat has reduced from very high to moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (4) Non-Motor Boating (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Water Quality (3) Invasive Flora (Wetland) (5)

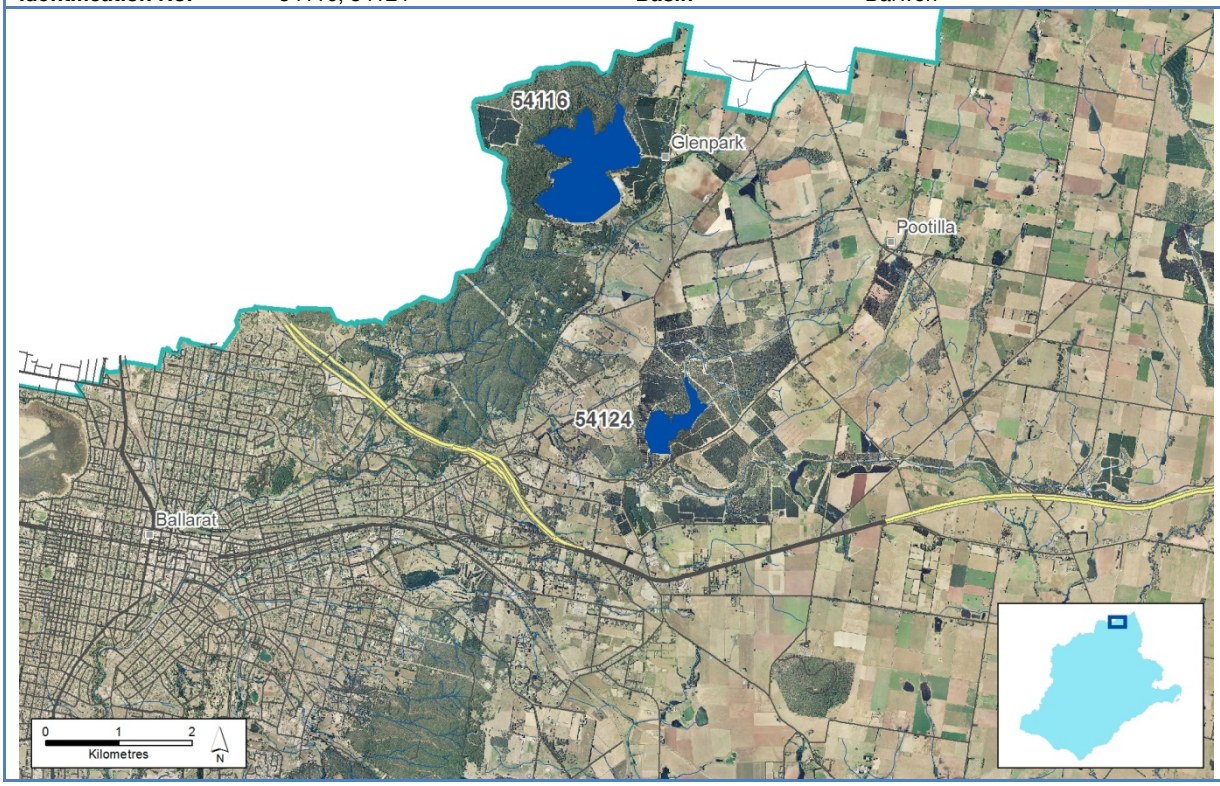
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Maintain non-woody weed control	200 ha	**CCMA**/ CoB, LCG, LH	Invasive Flora (Wetland) (5)	b
Maintain urban wetland	2 no.	**CoB**/ CHW	Degraded Water Quality (3)	a

Estimated cost of activities	**$3,050,000**

Water supply reservoirs in the upper Leigh catchment

White Swan and Gong Gong Reservoirs are operated by Central Highlands Water and supply the Ballarat Water Supply System.

Waterway	White Swan Reservoir, Gong Gong Reservoir	Landscape Zone	Leigh
Identification No.	54116, 54124	**Basin**	Barwon



Links to Regional Goals

Due to its values, White Swan Reservoir is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Due to its values, Gong Gong Reservoir is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Economic	Urban/Rural Township Water Sources	Waterway forms part of a closed State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity 10,000-50,000ML)
Social	Picnics and Barbeques	Designated picnic/barbecue areas present
	Walking Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted (54124)

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present – Invasive aquatic species directly prey on native species and/or damage native species habitat

Work Program for White Swan and Gong Gong Reservoirs

Waterway	White Swan Reservoir Gong Gong Reservoir	Identification No.	54116 54124

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (4, 3) Urban/Rural Township Water Sources (4)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead and (Partners)	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans. Not costed	N/A	**CHW**	N/A	a

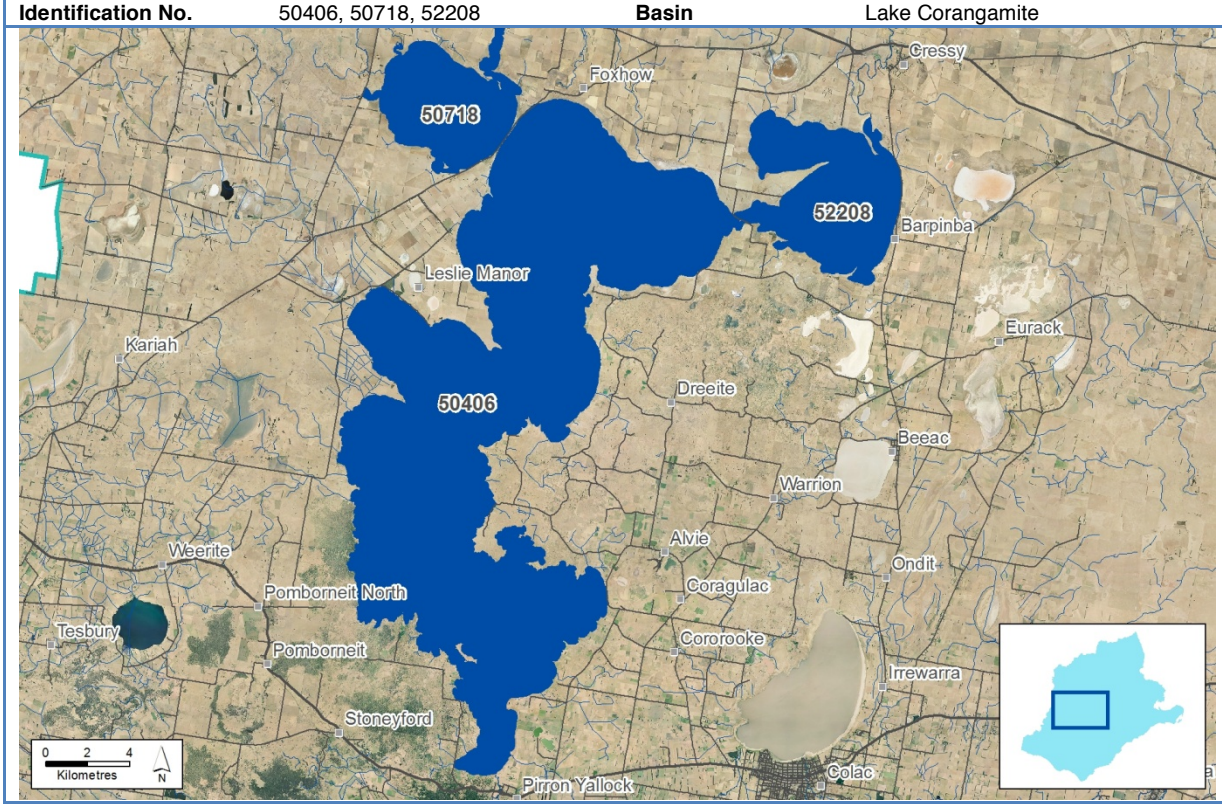
Estimated cost of activities	$ -

8.8 Lismore Landscape Zone

Lakes Corangamite, Gnarpurt and Martin/Cundare Pool

Lake Corangamite – a hypersaline endorheic lake, is located between Colac, Camperdown and Cressy in the Victorian Volcanic Plains. The lake's salinity levels have increased dramatically as the lake level has dropped in recent decades. It is Australia's largest permanent saline lake, covering approximately 230 square kilometres with a circumference of 150 kilometres (93 mi). It forms part of the Ramsar-listed Western District Lakes Ramsar Site.
Lake Gnarpurt – is located south of Lismore. Lake Gnarpurt is one of nine lakes included in the Western District Lakes Ramsar Site.
Cundare Pool/ Lake Martin – is a 3,730 ha saline wetland. It is included, along with the Western District Lakes Ramsar Site as an Important Bird Area. Cundare Pool is an artificial water body created by the ponding of the Woady Yaloak River to allow operation of the Woady Yaloak diversion scheme. This scheme was constructed in the late 1950's to reduce flooding around Lake Corangamite. Cundare Pool is connected to the Woady Yaloak River via the Black Bridge Regulator and Pool and is connected to Lake Corangamite via the Cundare Regulator.

Waterway	Lake Corangamite, Lake Gnarpurt, Lake martin/Cundare Pool	Landscape Zone	Lismore
Identification No.	50406, 50718, 52208	**Basin**	Lake Corangamite



Waterway	Lake Corangamite	Landscape Zone	Lismore
Identification No.	50406	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Corangamite (50406) meets the following regional goals:	
Goal ENV1	Maintain the viability of population of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Corangamite is a very large, permanent, saline lake formed when lava flows blocked the regional drainage. It has high diversity, ranging from fresh tributaries to hypersaline discharge areas and open water.

		The lake is the largest permanent saline lake in Australia and the largest natural lake in Victoria. Lake Corangamite supports large numbers of water birds (fifty waterbird species have been recorded at this wetland) and several rare plant species.
	Nationally Important Wetland	Lake Corangamite was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. • The wetland supports 1% or more of the national populations of any native plant or animal taxa. • The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	The lake acts as a very significant drought refuge due to its size.
	Important Bird Habitat	The waterway is known to support significant numbers of waterbirds with more than 20,000 birds recorded on a number of occasions (Hale and Butcher, in prep). Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided): • Australian Shelduck (*Tadorna tadornoides*) – 32,000 • Sharp-tailed Sandpiper (*Calidris acuminata*) – 2,698 • Banded Stilt (*Cladorhynchus leucocephalus*) – 112,000 • Chestnut Teal (*Anas castanea*) – 4,558 • Musk Duck (*Biziura lobata*) – 1,000 • Hoary-headed Grebe (*Poliocephalus poliocephalus*) – 4,000 • Glossy Ibis (*Plegadis falcinellus*) – 90,000 In addition Lake Corangamite supports waterbirds during critical life stages with 10 species recorded breeding and a number of waterfowl using the site during moult of primary flight feathers (Hale and Butcher, in prep).
	Significant Birds	Six species of migratory shorebirds listed under international agreements have been recorded within Lake Corangamite. However, only three species are regularly observed: • Curlew Sandpiper (*Calidris ferruginea*) • Red-necked Stint (*Calidris ruficollis*) • Sharp-tailed Sandpiper (*Calidris acuminata*) Lake Corangamite also supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered (EN) or Vulnerable (VU): • Australasian Shoveler *(Anas rhynchotis)* (VU). Habitat1: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Blue-billed Duck (*Oxyura australis*) (EN). Habitat2: fresh to saline, deep permanent open wetlands and deep, densely vegetated lakes. • Brolga (*Grus rubicunda*) (VU) • Freckled Duck (*Stictonetta naevosa*) (EN). Habitat3: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis*) (VU). Habitat4: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata*) (VU). Habitat: permanent swamps with dense vegetation.
	Significant EVCs	There are extensive areas of saltmarsh dominated by Beaded Glasswort (*Sarcocornia quinqueflora)* around the edge of Lake Corangamite. Vegetation on the stony rise margins of the lake is dominated by Eucalyptus forest or Tree Violet (*Hymenanthera dentate)*.
	Significant Fish	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant Reptiles (Riparian)	Corangamite Water Skink (*Eulamprus tympanum*) - Status: High priority actions for high priority sites (ABC), Endangered (EPBC), Critical (Adv List)
	Significant Wetland Flora	Salt Lake Tussock-grass (*Poa sallacustris*) and Spiny Peppercress (*Lepidium aschersonii*) occur in Lake Corangamite and are both listed as vulnerable under the EPBC Act 1999.

[1] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[2] http://bird.net.au/bird/index.php?title=Blue-billed_Duck
[3] http://bird.net.au/bird/index.php?title=Freckled_Duck
[4] http://www.birdlife.org.au/bird-profile/hardhead

Social	Indigenous Heritage	Two sites on the shore of Lake Corangamite show evidence of Aboriginal activity. On the southern tip of the lake are the remains of a fish trap, a system of channels and weirs which made use of the rising and falling waters, and incorporated traps which came into operation at different water levels. On the northern edge of the lake is a surface scatter of the discarded shells of shellfish (VAS undated b). There would be many unrecorded aboriginal sites around Lake Corangamite
	Recreational fishing	Fishing is popular. Contains short-finned eel, common galaxias, flathead gudgeon and smallmouth hardyhead.
	Hunting	Duck hunting is popular at Lake Corangamite.
Economic	Commercial Fishing	Lake Corangamite is stocked with short-finned eels and used for commercial production of this species. (Currently too saline to support any fish species)

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species. Rabbits are present and can damage habitats.
Invasive Flora (Wetland)	Tall Wheat-grass, phalaris and vernal sweet-grass dominant the shoreline and are a threat to the saltmarsh communities adjoining the lake
Changed Water Regime	Water resource development (drainage, diversion and/or extraction) occurs at this site. This can lead to reduced water levels leading to increased salinity levels through evaporation and concentration effects (Hale and Butcher 2011). Drainage has been occurring within the Western District Lakes since the 1800s and to a certain extent forms part of the ecological character of the site. In addition The Warrion Water Supply Protection Area covers the surficial, unconfined aquifer that supplies part of the water for Lake Corangamite to the west and Lake Beeac to the east. The status of the water aquifer has been defined as declining, with current licensed entitlements equivalent to the PCV (permissible consumptive volume). Continued extraction at current license limits into the future (considering the likely impacts of climate change) could result in further decreased inflows to the lakes of the Ramsar Site (Hale and Butcher 2011). Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).
Degraded Buffer	Stock accessing the buffer can trample vegetation affecting the height and density of wetland vegetation and overgrazing can reduce primary productivity in wetlands and lead to increased water turbidity and areas devoid of vegetation (Hale and Butcher 2011)
Livestock Access to Buffer	Approximately 90% of the lake margins within the Western District Ramsar Site are grazed and livestock access has been implicated in increasing the susceptibility of the lake margins to erosion (Hale and Butcher 2011). See also degraded buffer.
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Resource Utilisation	At the time of listing, duck hunting occurred and continues to occur on Lake Corangamite; however the impact of the activity has not been assessed. The main types of impacts from hunting, aside from taking of ducks, include accidental shooting of protected species and disturbance to the habitat and fauna.

Work Program Lake Corangamite

Waterway	Lake Corangamite	Identification No.	50406

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology - permanent wetlands not drying for more than two months in any five year period. LAC2 – Salinity - saline (5 to 50 parts per thousand). LAC3 – Vegetation - Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds - Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved (also addresses LAC1, LAC2 and LAC4) b - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3) c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC3) d - Invasive wetland flora threat has reduced from moderate to low (also addresses LAC3) e - Livestock have been excluded from over 50% of the waterway frontage (also addresses LAC3)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Reptiles Riparian (5) Significant Birds (5) Significant Flora Wetland (5) Wetland Vegetation Condition (3) Significant Fish (4)	**Threats addressed by work program**	Changed Water Regime (1) Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish Management Plan - Review operating rules for the Woady Yaloak Diversion Scheme – Not costed – refer to CWS Section 5.1.3)	1 no.	**CCMA**/ WYAC, LH	Changed Water Regime (1)	a
Establish non-woody weed control - tall wheatgrass	80 ha	**Land manager**, CCMA/ GA, CLLN	Invasive Flora (Wetland) (3)	d
Modify sill	1 no.	**CCMA**/ CS	Changed Water Regime (1)	a
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3), Degraded Buffer (5)	b, d, e
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network, GA	Invasive Fauna (Terrestrial) (5)	b, c
Establish native indigenous vegetation	80 ha	**CCMA**/ Land manager, GA, CLLN	Degraded Buffer (5)	b, c,
Install wetland fence	40 km	**CCMA**/ Land manager, GA, CLLN	Livestock Access to Buffer (3), Invasive Flora (Wetland) (3), Degraded Buffer (5)	b, d, e,
Establish stewardship/management agreement	40 ha	**Land manager**/ CCMA	Livestock Access to Buffer (3), Invasive Flora (Wetland) (3), Degraded Buffer (5)	b, d, e,

Estimated cost of activities	**$1,965,000**

Waterway	Lake Gnarpurt	Landscape Zone	Lismore
Identification No.	50718	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Gnarpurt (50718) meets the following regional goals:	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterway with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Gnarpurt is a permanent saline lake created by a larval collapse. It receives water through natural drainage lines and drains from the north including Mundy Gully and Haunted Gully. Lake Gnarpurt is of high value for its avifauna.
	Nationally Important Wetland	Lake Gnarpurt was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuge	
	Important Bird Habitat	Twenty-two waterbird species have been recorded at this wetland. The waterway is known to occasionally support significant numbers of waterbirds with more than 20,000 birds recorded (Hale and Butcher, in prep). Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided): • Banded Stilt (*Cladorhynchus leucocephalus*) – 8,000 • Chestnut Teal (*Anas castanea*) – 2,770
	Significant Birds	Lake Gnarpurt supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered (EN) or Vulnerable (VU): • Australasian Shoveler (*Anas rhynchotis*) (VU). Habitat[5]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Brolga (*Grus rubicunda*) (VU) • Freckled Duck (*Stictonetta naevosa*) (EN). Habitat[6]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[7]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata)* (VU). Habitat: permanent swamps with dense vegetation.
	Significant EVCs	Extensive areas of Beaded Glasswort (*Sarcocornia quinqeflora)* and other chenopod species such as Goosefoot (*Chenopodium sp.*) occur around the lake edge
Social	Recreational fishing	Fishing is popular at Lake Gnarpurt. Carries short-finned eel and common galaxias. In very wet years rainbow trout has been known to enter the northwest corner of the lake via the channel that takes the overflow from Lake Tooliorook.
	Hunting	Duck hunting is popular at Lake Gnarpurt.

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Invasive Flora (Wetland)	Terrestrial - Tall Wheat-grass is a potential threat to saltmarsh
Changed Water Regime	Water resource development (drainage, diversion and/or extraction) occurs at this site. This can lead to reduced water levels leading to increased salinity levels through evaporation and concentration effects (Hale and Butcher 2011). Brackish or saline streamflow into the lake may be increasing in its salinity.

[5] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[6] http://bird.net.au/bird/index.php?title=Freckled_Duck
[7] http://www.birdlife.org.au/bird-profile/hardhead

	Unnatural hydrology since the outlet to Lake Corangamite is much lower than the natural floodway. Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Livestock Access to Buffer	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. Livestock access can potentially increase the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011)
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Resource Utilisation	At the time of listing, duck hunting occurred and continues to occur on Lake Gnarpurt; however the impact of the activity has not been assessed. The main types of impacts from hunting, aside from taking of ducks, include accidental shooting of protected species and disturbance to the habitat and fauna.

Work Program Lake Gnarpurt

Waterway	**Lake Gnarpurt**	**Identification No.**	**50718**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – permanent wetlands not drying for more than two months in any five year period (unable to be addressed through this work program) LAC2 – Salinity – saline (5 to 50 parts per thousand) (not feasible to address through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	b - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3 and LAC4) c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) d - Invasive wetland flora threat has reduced from moderate to low (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish management agreement – controlled grazing regime	10 ha	**CCMA**/ Land manager, DEPI	Invasive Flora (Wetland) (3), Degraded Buffer (5)	b, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, CLLN	Invasive Fauna (Terrestrial) (5)	c
Install wetland fence	12 km	**CCMA**/ LH, GA, CLLN	Invasive Flora (Wetland) (3), Degraded Buffer (5)	b, d
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Invasive Flora (Wetland) (3), Degraded Buffer (5)	b, d

Estimated cost of activities	**$209,500**

Waterway	Lake Martin/Cundare Pool	Landscape Zone	Lismore
Identification No.	52208	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Cundare Pool/ Lake Martin (52208) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The Criteria for listing the Cundare Pool/ Lake Martin as a Nationally Important Wetland are: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa.
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Numbers: Up to 1,000 Hoary-headed Grebe (*Poliocephalus poliocephalus)*, 247 Australian Pelicans (*Pelecanus conspicillatus*), 8,300 Straw-necked Ibis (*Threskiornis spinicollis)*, 14,000 Black Swans (*Cygnus atratus)*, 60 Freckled Duck (*Stictonetta naevosa)*, 10,200 Australian Shelduck (*Tadorna tadornoides*), 6,550 Grey Teal (*Anas gibberifrons)*, 7,060 Australasian Shoveler (*A. rhynchotis)*, 18,000 Pink-eared Duck (*Malacorhynchus membranaceus)*, 2000 Hardhead (*Aythya australis*), 24,500 Eurasian Coot (*Fulica atra*), 5,000 Banded Stilts (*Cladorhynchus leucocephalus)* (an internationally-significant number- Watkins 1993), 10,000 Sharp-tailed Sandpipers (*Calidris acuminate)*, 2,500 Red-necked Stints (*Calidris ruficollis)*, 3,000 Silver Gulls (*Larus novaehollandiae)*, 1,300 Whiskered Terns (*Chlidonias hybrid)*, 50 Gull-billed Terns (*Gelochelidon nilotica)* and 100 Caspian Terns (*Hydroprogne caspia)* have been recorded
	Significant Birds	Freckled Duck (*Stictonetta naevosa)* (Nr and listed under the Flora and Fauna Guarantee Act), Blue-billed Duck (*Oxyura australis)* (Sr) and listed under the Flora and Fauna Guarantee Act), Cape Barren Goose (*Cereopsis novaehollandiae)* (Sr), Brolga (*Grus rubicundus)* (Sr and listed under the Flora and Fauna Guarantee Act) and Great Egret (*Egretta alba)* (listed under the Flora and Fauna Guarantee Act) have been recorded at this wetland.
	Significant Flora Wetland	Large areas of Beaded Glasswort (*Sarcocornia quinqueflora)* - dominated saltmarsh occur.
Social	Game Hunting	Both parts of Cundare Pool/Lake Martin are very popular for duck hunting
Economic	Commercial Fishing	Commercial eel fishing

Threats

Threat	Details
Degraded Buffer **Livestock Access to Buffer**	Grazing of edge vegetation. The Index of Wetland Condition indicates that the wetland buffer is in very poor condition.
Invasive Fauna (Aquatic)	European Carp
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Invasive Flora (Terrestrial)	Boxthorn and Tall Wheatgrass are impacting native vegetation

Work Program for Cundare Pool/ Lake Martin

Waterway	Cundare Pool/ Lake Martin	Identification No.	52208

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (aquatic) are contained (they are present but have no significant impacts) c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from high to moderate e - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant Amphibians (5) Significant EVCs (5) Significant Birds (5) Significant Flora Wetland (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Aquatic) (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (4) Livestock Access to Buffer (3)

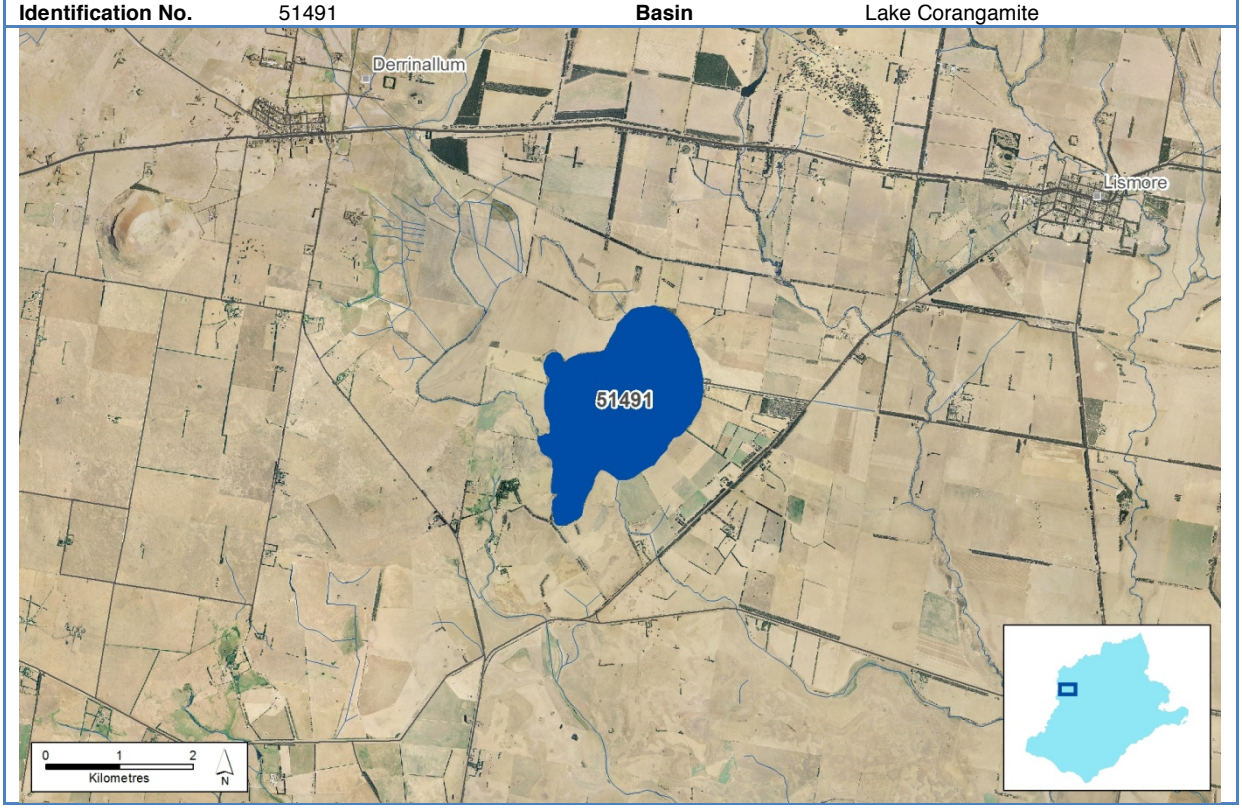
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control - Boxthorn, tall wheatgrass	30 ha	**CCMA**/ Public land manager, CLLN, LH	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, d
Establish management plan - review operating rules for Woady Yaloak Diversion Scheme - Not costed.	1 no.	**CCMA**	Invasive Fauna (Aquatic) (5)	b
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Install wetland fence	30 km	**CCMA**/ Public land manager, CLLN, LH	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, d, e
Establish stewardship/management agreement	30 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, d, e
Investigate options for Ramsar listing of Cundare Pool/Lake Martin	N/A	**CCMA**/DEPI, AG(DoE)	N/A	N/A

Estimated cost of activities	**$658,000**

Lake Tooliorook

Lake Tooliorook is located south-east of Lismore and is a popular fishing and camping location

Waterway	Lake Tooliorook	Landscape Zone	Lismore
Identification No.	51491	**Basin**	Lake Corangamite



Waterway	Lake Tooliorook	Landscape Zone	Lismore
Identification No.	51491	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Tooliorook (51491) meets the following regional goals:	
Goal S1	Maintain or improve waterway condition where it supports high social values

Key Values

Type	Attribute	Details
Social	Camping	There is a serviced campground located on the eastern side of the lake– the Lake Tooliorook Campground
	Game Hunting	Duck hunting is popular at Lake Tooliorook
	Picnics and Barbeques	Designated picnic/barbecue areas are present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria. The Lismore Angling Club is active in the area and has members based out of the Lake Tooliorook Campground. A very popular waterway with locals and becoming increasingly popular with touring anglers. Contains redfin, brown trout and rainbow trout, short-finned eel, Australian smelt and flathead gudgeon.
	Motor Boating	Motor boating is permitted on Lake Tooliorook and is associated with recreational fishing. There is a designated boat ramp and trailer parking.

Threats

Threat	Details
Invasive Flora (Wetland)	No data. Methodology to identify invasive flora has not been applied (fill data gap/investigate)
Invasive Fauna (Terrestrial)	Foxes are present, but considered to have no significant impact
Degraded Water Quality	No data available on water quality (fill data gap/investigate)
Changed Water Regime	Degree of water regime change considered low based on 06/07 IWC baseline data
Degraded Buffer	No data. IWC methodology to has not been applied (fill data gap/investigate).

Work Program Lake Tooliorook

Waterway	Lake Tooliorook	Identification No.	51491

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained.		
Management Outcome Targets (MOTs)	a – Investigation complete and management interventions have been determined		
Values linked to regional goals	Camping (5) Game Hunting (5) Picnics and Barbeques (5) Recreational Fishing (5)	**Threats addressed by work program**	Invasive Flora (Wetland) (-1) Degraded Water Quality (-1) Degraded Buffer (-1)

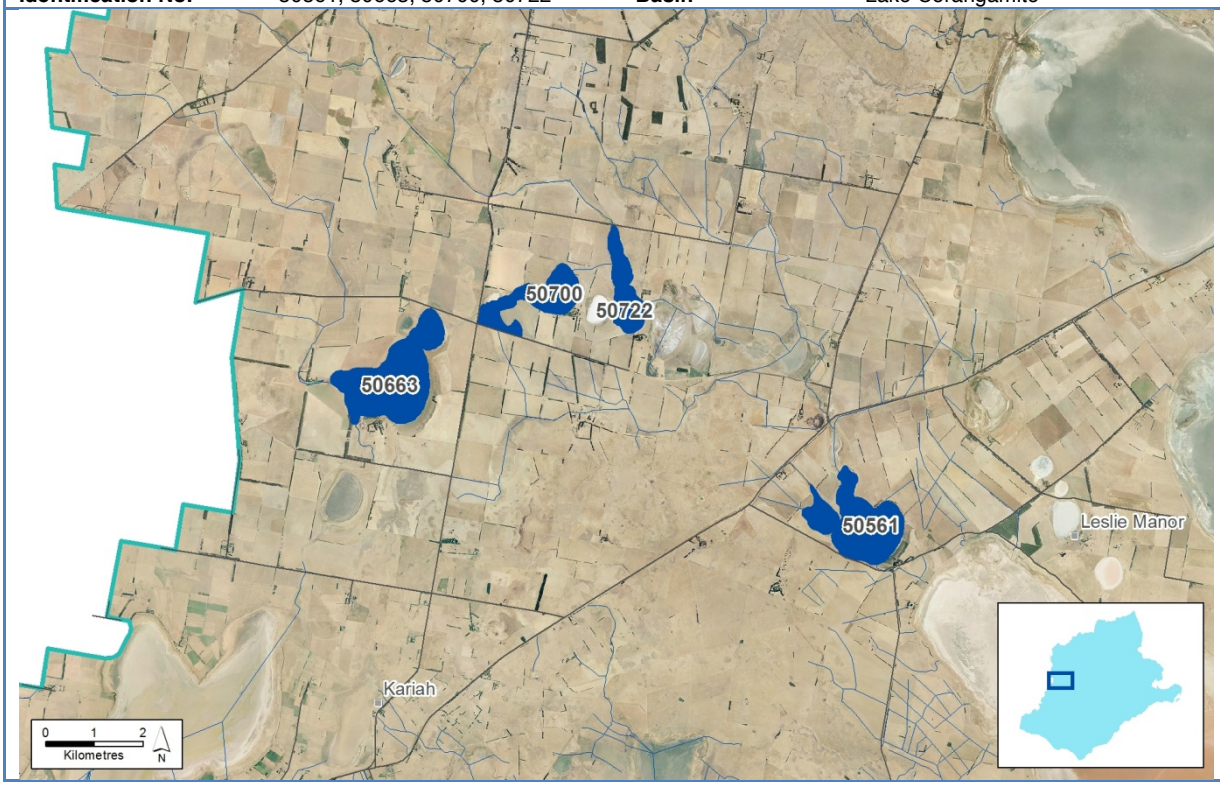
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct investigation to update threat data and determine the management interventions required. Not costed.	N/A	**CCMA**	Invasive Flora (Wetland) (-1) Degraded Water Quality (-1) Degraded Buffer (-1)	a

Estimated cost of activities	$ -

Lakes Terangpom, Milangil and the Kooraweera Lakes

Lake Terangpom – is located north-east of Camperdown. It is 208 ha in size and is considered a freshwater system. It is one of nine lakes with in the Western District Lakes Ramsar Site.
Lake Milangil – is situated north of Camperdown. Lake Milangil is one of nine lakes that are included in the Western District Lakes Ramsar Site.
Kooraweera Lakes – range from permanent freshwater and permanent saline to seasonally fresh to brackish and are known locally as the 'Sweet Lakes'. The Kooraweera Lakes drain the surrounding plains and flow to Lake Terangpom and subsequently Lake Corangamite.

Waterway	Lake Terangpom, Lake Milangil, Kooraweera Lakes	Landscape Zone	Lismore
Identification No.	50561, 50663, 50700, 50722	**Basin**	Lake Corangamite



Waterway	Lake Terangpom	Landscape Zone	Lismore
Identification No.	50561	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Terangpom (50561) meets the following regional goals:	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Terangpom is a permanent, shallow, brackish-freshwater wetland in area of mainly saline wetlands. It is a high value wetland for its avifauna and supports large numbers of water birds (with more than 10,000 birds recorded on occasion) due to its aquatic vegetation.
	Nationally Important Wetland	Lake Terangpom was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuge	The lake acts as a drought refuge for waterbirds.

Important Bird Habitat	Twenty-six waterbird species have been recorded Lake Terangpom. Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided): • Blue-billed Duck (*Oxyura australis*) – 100 • Eurasian Coot (*Fulica atra*) – 10,000
Significant Birds	Two species of migratory shorebirds listed under international agreements have been recorded within Lake Terangpom: • Curlew Sandpiper (*Calidris ferruginea*) • Red-necked Stint (*Calidris ruficollis*) Lake Terangpom also supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered (EN) or Vulnerable (VU): • Australasian Shoveler (*Anas rhynchotis*) (VU). Habitat[8]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Blue-billed Duck (*Oxyura australis)* (EN). Habitat[9]: fresh to saline, deep permanent open wetlands and deep, densely vegetated lakes. • Freckled Duck (*Stictonetta naevosa*) (EN). Habitat[10]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[11]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata*) (VU). Habitat: permanent swamps with dense vegetation.
Significant EVCs	Lake Terangpom is fringed by a narrow band of saline herbfield and Sharp Club-sedge (*Schoenoplectus pungens)*.
Significant Wetland Flora	Extensive growths of Hooded Milfoil (*Myriophyllum muelleri*) and Sea Tassell (*Ruppia* sp.) occur on the lake. The Hooded Milfoil can form extensive mats covering a large area of the lake's surface.

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Invasive Flora (Wetland)	Exotic pasture grasses around fringe including Tall Wheat-grass
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition.
Livestock Access to Buffer	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. Livestock access can potentially increase the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011)
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Changed water regime	Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).

Work Program Lake Terangpom

Waterway	**Lake Terangpom**	**Identification No.**	**50561**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – permanent wetlands not drying for more than two months in any five year period (not feasible to address through this work program) LAC2 – Salinity – fresh / brackish (less than three parts per thousand) (not feasible to address through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year

[8] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[9] http://bird.net.au/bird/index.php?title=Blue-billed_Duck
[10] http://bird.net.au/bird/index.php?title=Freckled_Duck
[11] http://www.birdlife.org.au/bird-profile/hardhead

	period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3 and LAC4) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Invasive wetland flora threat has reduced from moderate to low (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5) Significant Flora Wetland (4) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT
Establish non-woody weed control - tall wheatgrass	20 ha	**PV**/ CCMA, LH, GA	Invasive Flora (Wetland) (3)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	5 km	**CCMA**/ LH, CLLN, GA	Invasive Flora (Wetland) (3), Degraded Buffer (5)	a, c
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Invasive Flora (Wetland) (3), Degraded Buffer (5)	a, c

Estimated cost of activities	**$120,000**

Waterway	Lake Milangil	Landscape Zone	Lismore
Identification No.	50663	**Basin**	Lake Corangamite

Links to regional goals

Due to its values Lake Milangil (50663) meets the following regional goals:	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Milangil is a permanent brackish to saline lake. It is fed by some intermittent drainage lines and drains as well as local runoff. The lake may overflow to Kooraweera Lakes, Lake Terangpom and ultimately Lake Corangamite. Lake Milangil is a high value wetland for the number of birds and birds species it supports. Thirty-three waterbird species have been recorded at this wetland. It is known to occasionally support large numbers of waterbirds with more than 10,000 birds recorded on occasion (Hale and Butcher, in prep).
	Nationally Important Wetland	Lake Milangil was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. • The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	Lake Milangil is rarely dry, acts as a drought refuge and supports a high diversity of waterbirds.
	Important Bird Habitat	Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided): • Australasian Shoveler (*Anas rhynchotis*) – 2057 • Blue-billed Duck (*Oxyura australis*) – 1560 • Chestnut Teal (*Anas castanea*) – 1256 • Eurasian Coot (*Fulica atra*) – 15 509 Lake Milangil supports waterbirds during critical life stages with six species recorded breeding (Hale and Butcher, in prep).
	Significant Birds	Three species of migratory shorebirds listed under international agreements have been recorded within Lake Milangil: • Double-banded Plover (*Charadrius bicinctus*) • Curlew Sandpiper (*Calidris ferruginea*) • Red-necked Stint (*Calidris ruficollis*) Lake Milangil also supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered (EN) or Vulnerable (VU): • Australasian Shoveler (*Anas rhynchotis)* (VU). Habitat[12]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Blue-billed Duck (*Oxyura australis)* (EN). Habitat[13]: fresh to saline, deep permanent open wetlands and deep, densely vegetated lakes. • Freckled Duck (*Stictonetta naevosa*) (EN). Habitat[14]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[15]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata)* (VU). Habitat: permanent swamps with dense vegetation.
	Wetland Vegetation Condition	The wetland vegetation is in excellent condition.

[12] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[13] http://bird.net.au/bird/index.php?title=Blue-billed_Duck
[14] http://bird.net.au/bird/index.php?title=Freckled_Duck
[15] http://www.birdlife.org.au/bird-profile/hardhead

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Livestock Access to Buffer	Approximately 90% of the lake margins within the Western District Ramsar Site are grazed and livestock access has been implicated in increasing the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011).
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Changed water regime	Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).

Work Program Lake Milangil

Waterway	Lake Milangil	Identification No.	50663

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – permanent wetlands not drying for more than two months in any five year period (not feasible to address through this work program). LAC2 – Salinity – saline (5 to 50 parts per thousand) (not feasible to address through this work program). LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3 and LAC4) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Invasive wetland flora threat has reduced from moderate to low (also addresses LAC3 and LAC4) d - Livestock have been excluded from over 50% of the waterway frontage (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant Birds (5) Wetland Vegetation Condition (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Invasive Flora (Wetland) (3), Degraded Buffer (5)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), CLLN, GA	Invasive Fauna (Terrestrial) (5)	b
Establish native indigenous vegetation	4 ha	**CCMA**/ PV, GA, CLLN	Degraded Buffer (5)	a
Install wetland fence	4 km	**CCMA**/ LH, CLLN, GA	Livestock Access to Buffer (3), Invasive Flora (Wetland) (3), Degraded Buffer (5)	a, c, d
Establish stewardship/management agreement	4 ha	**Land manager**/ CCMA	Livestock Access to Buffer (3), Invasive Flora (Wetland) (3), Degraded Buffer (5)	a, c, d

Estimated cost of activities	$125,000

Waterway	Kooraweera Lakes	Landscape Zone	Lismore
Identification No.	50700 & 50722	**Basin**	Lake Corangamite

Links to regional goals

Due to its values, Kooraweera Lakes (50700) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50722) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The criteria for determining Kooraweera Lakes' eligibility for inclusion in the Directory of Important Wetlands are; 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
Environmental	Fauna	A total of 36 waterbird species have been recorded in this system including large numbers of migratory wading birds. The lakes has supported five species listed under JAMBA and CAMBA (Greenshank (*Tringa nebularia)*, Marsh Sandpiper (*T. stagnatilis)*, Sharp-tailed Sandpiper (*Calidris acuminate)*, Red-necked Stint (*C. ruficollis)* and Curlew Sandpiper (*C. ferruginea*)) and two species listed only under CAMBA (Glossy Ibis (*Plegadis falcinellus)* and Caspian Tern (*Hydroprogne caspia*)).
	Flora	The wetlands are fringed by a diversity of chenopod forb species such as Beaded Glasswort (*Sarcocornia quinqueflora)*, Rounded Wilsonia (*Wilsonia rotundifolia)*, Shiny Swamp-mat (*Selliera radicans)* and Salt (*Pratia Pratia platycalyx)*. Some wetlands are fringed by Spiny Flat-sedge (*Cyperus gymnocaulos)* and Coast Saw-sedge (*Gahnia filum)* which is the important habitat for the Altona Skipper Butterfly at one marsh. Sea Tassell (*Ruppia spp.*) occurs in many of the open water areas.

Threats

Threat	Details
Changed water regime	Interruption of natural hydrology through channel construction and alteration of natural channels
Water Quality	Increasing salinity
Degraded Buffer	Livestock grazing
Invasive Wetland Flora	weed infestations
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species

Work Program for Kooraweera Lakes

Waterway	Kooraweera Lakes	Identification No.	50700

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from high to moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (4) Significant Birds (5) Significant Flora Wetland (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control	2 ha	**CCMA**/ Land manager, CLLN, GA	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	2 km	**CCMA**/ Land manager, CLLN, GA	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, c
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, c

Estimated cost of activities	**$36,000**

Work Program Unnamed wetland (50722)

Waterway	Unnamed wetland (50722)	Identification No.	50722

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Important Bird Habitats (5) Significant Birds (5) Significant Flora Wetland (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5)

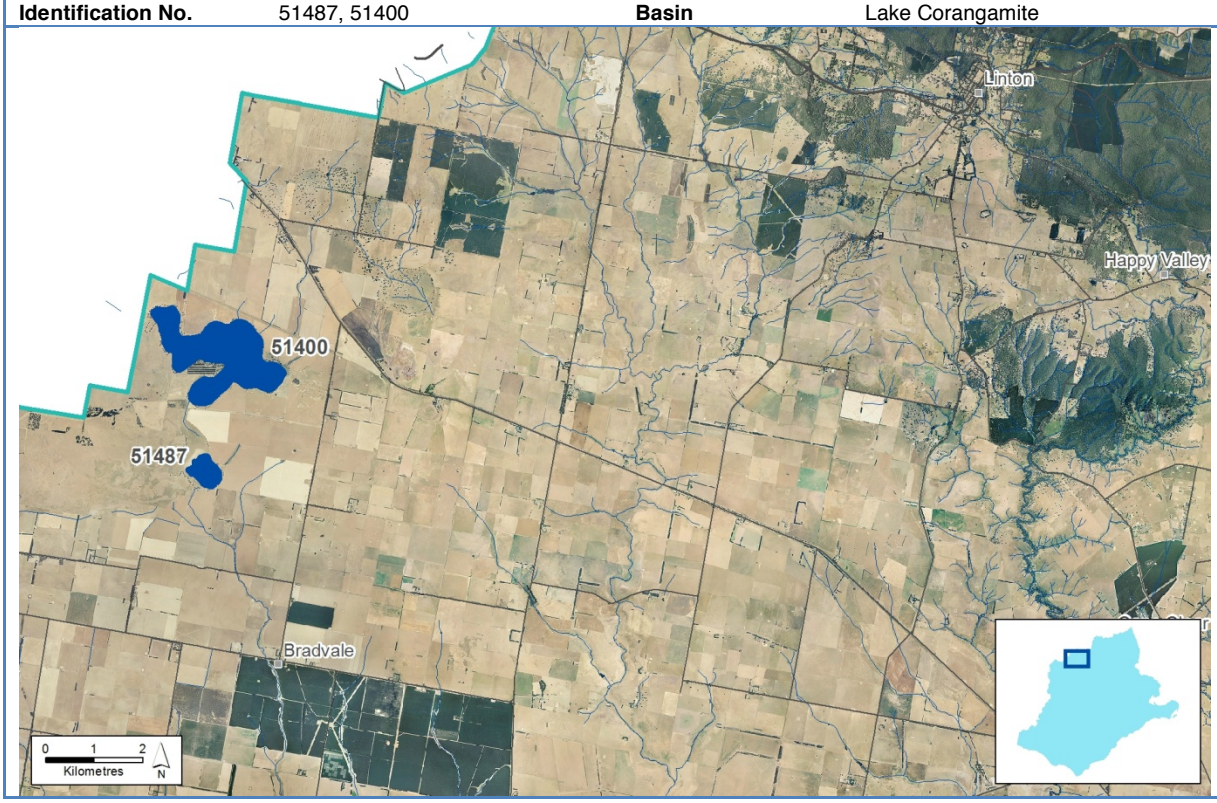
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	3 km	**CCMA**/ Land manager, CLLN	Degraded Buffer (5)	a
Establish stewardship/management agreement	3 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a

Estimated cost of activities	**$48,000**

Widderin Swamps

The Widderin Wetlands are a string of two deep freshwater marshes and one freshwater meadow that drain in the sequence North Widderin Swamp-Lake, and Widderin-East Hill Wetland. This last site drains into Mundy Gully which eventually flows to Lake Gnarpurt (30 km to the south). The wetland network supports a diversity of waterbirds.

Waterway	Widderin Swamps	Landscape Zone	Lismore
Identification No.	51487, 51400	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Unnamed wetland (51487) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Widderin (51400) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The criteria for determining the Widderin Swamps' eligibility for inclusion in the Directory of Important Wetlands are; 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa. 6. The wetland is of outstanding historical or cultural significance.
Environmental	Fauna	Thirty-three waterbird species and the Common Froglet (*Crinia signifera*) have been recorded at the Widderin Swamps. The Brolga (*Grus rubicunda*) has been noted as breeding on three of the wetlands.
	Flora	Two of the wetlands are fringed with mature River Red Gums (*Eucalyptus camaldulensis*).
Economic	Commercial Fishery	These lakes have supported a commercial eel fishery

Threats

Threat	Details
Degraded Buffer **Livestock Access to Buffer**	Livestock access is impacting wetland vegetation and between 25 and 75% of the lake frontage is affected The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species

Work Program Unnamed wetland (51487)

Waterway	Unnamed wetland (51487)	Identification No.	51487

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Important Bird Habitats (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	1 km	**CCMA**/ Land manager, CLLN	Degraded Buffer (5), Livestock Access to Buffer (3)	a, c

Estimated cost of activities	$19,500

Work Program Lake Widderin

Waterway	Lake Widderin	Identification No.	51400

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Important Bird Habitats (5) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	3 km	**CCMA**/ LH, CLLN	Degraded Buffer (5)	a
Establish stewardship/management agreement	3 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a

Estimated cost of activities	$48,000

Deep Lake and Lake Logan

Lake Logan is a permanent open freshwater lake that flows into Deep Lake. Deep Lake is also permanent open freshwater and is relatively small covering approximately 85 ha when full with an average depth of 3.5m and is a popular recreational fishery.

Waterway	Lake Logan	Landscape Zone	Lismore
Identification No.	51439	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Deep Lake is a priority under the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other significant waterway dependent species

Due to its values, Lake Logan (51439) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Fauna	Corangamite Water Skink (*Eulamprus tympanum*) have been observed at Deep Lake. Deep Lake is also important for Blue-billed ducks.
	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) have been observed at Deep Lake.
Social	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Game Hunting	Game hunting is permitted
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
Economic	Commercial Fishery	A commercial Eel fishery licence exists for Deep Lake

Threats

Threat	Details
Degraded Water Quality	The Index of Wetland Condition indicates very poor buffer condition (51439)
Degraded Buffer	The Index of Wetland Condition indicates poor water quality (51439)
Invasive fauna (terrestrial)	Invasive fauna species are present with no significance impact (51432)
Changed Water Regime, Degraded Buffer, Degraded Water Quality, Reduced Wetland Area, Soil Disturbance	There is currently no data on these threats for Deep Lake (51432), investigation is required

Work Program Deep Lake

Waterway	**Deep Lake**	**Identification No.**	**51432**

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - Investigation complete and management interventions have been determined		
Values linked to regional goals	Significant Amphibians (5) Significant Reptiles Riparian (5) Camping (5) Game Hunting (5) Picnics and Barbecues (5) Recreational Fishing (5)	**Threats addressed by Work Program**	Changed Water Regime (-1), Degraded Buffer (-1), Degraded Water Quality(-1), Reduced Wetland Area(-1), Soil Disturbance (-1)

Management Activity/Output	**Quantity**	**Lead /Partners**	**Threats addressed by activity**	**MOT link**
Conduct investigation to update threat data and determine if management interventions are required. Not costed.	N/A	**CCMA**	Changed Water Regime (-1), Degraded Buffer (-1), Degraded Water Quality (-1), Reduced Wetland Area (-1), Soil Disturbance (-1)	a

Estimated cost of activities	**$ -**

Work Program for Lake Logan

Waterway	**Lake Logan**	**Identification No.**	**51439**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 10 - All extant populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Significant Amphibians (5)	**Threats addressed by work program**	Degraded Water Quality (4)

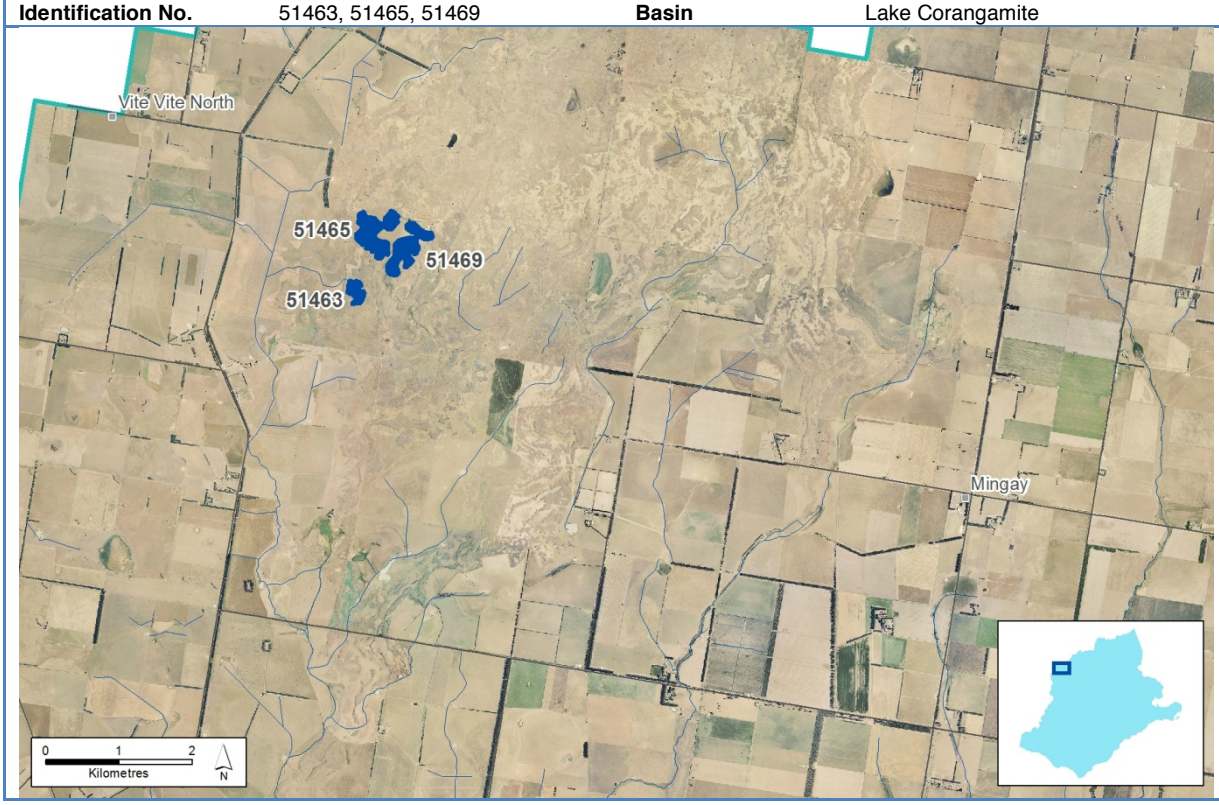
Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Implement best management practice on grazing properties - Not costed – refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, CLLN, DEPI	Degraded Water Quality (4)	a

Estimated cost of activities	**$ -**

Banongill network of wetlands

The wetlands are an unusual network of shallow freshwater marshes (herb-dominated and less than 0.5m deep) occurring between a 'stony rises' basalt flow from Mount Widderin and a basalt sheet flow from Mount Vite. They cover 59 hectares.

Waterway	Banongill Network	Landscape Zone	Lismore
Identification No.	51463, 51465, 51469	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Unnamed wetland (51463) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (51465) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (51469) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The criteria for determining the Banongill Networks' eligibility for inclusion in the Directory of Important Wetlands are; 1. It is a good example of a wetland type occurring within a biogeographic region in Australia
Environmental	Fauna	Brolgas (*Grus rubicundus*) (Listed under the Flora and Fauna Guarantee Act) have been recorded around the wetlands. Latham's Snipe (*Gallinago hardwickii)*, Sharp-tailed Sandpiper (*Calidris acuminate)* and Greenshank (*Tringa nebularia)* - listed under both JAMBA and CAMBA have been recorded within these wetlands.
	Significant Reptiles	Corangamite Water Skink (*Eulamprus tympanum marnieae*)

	Riparian	
	Significant EVCs	Plains Sedgy Woodland - Endangered

Threats

Threat	Details
Degraded Buffer	Trampling of edge vegetation by livestock is a major threat. The Index of Wetland Condition indicates that the wetland buffer is in very poor condition.
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Invasive Flora (Wetland)	>50% cover of weeds with high threat weeds present

Work Program Unnamed wetland (51463)

Waterway	Unnamed wetland (51463)	Identification No.	51463

Long-term Resource Condition Targets	09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from very high to moderate		
Values linked to regional goals	Significant EVCs (4) Significant Reptiles Riparian (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	5 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Invasive Flora (Wetland) (5)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	1 km	**CCMA**/ LH, CLLN	Degraded Buffer (5), Invasive Flora (Wetland) (5)	a, c
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (5)	a, c

Estimated cost of activities	**$19,500**

Work Program Unnamed wetland (51465)

Waterway	Unnamed wetland (51465)	Identification No.	51465

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - IWC soil sub-index score is moderate		
Values linked to regional goals	Significant EVCs (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Soil Disturbance (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	Land manager/ CCMA, DEPI (Biosecurity), CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	2 km	CCMA/ LH, CLLN	Degraded Buffer (5), Soil Disturbance (4)	a, c
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5), Soil Disturbance (4)	a, c

Estimated cost of activities	**$32,000**

Work Program Unnamed wetland (51469)

Waterway	Unnamed wetland (51469)	Identification No.	51469

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Significant EVCs (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), CLLN	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	3 km	**CCMA**/ LH, CLLN	Degraded Buffer (5), Invasive Flora (Wetland) (3)	a, c
Establish stewardship/management agreement	3 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (3)	a, c

Estimated cost of activities	**$48,000**

8.9 Mid Barwon Landscape Zone

Barwon River

The mid reaches of the Barwon River flow between Inverleigh and the confluence of the Moorabool River near Fyansford.

Waterway	Barwon River	Landscape Zone	Mid Barwon
Identification No.	33-03	**Basin**	Barwon

Links to Regional Goals

Due to its values, Barwon River (33-03) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Important Bird Area – A site of global bird conservation importance and is a priority area for bird conservation
	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC)
	Significant Birds Riparian	Magpie Goose (*Anseranas semipalmata*) - Status: Near Threatened (Adv List); Eastern Great Egret (*Ardea modesta*)- Status: Vulnerable (Adv List); Lewin's Rail (*Rallus pectoralis*) - Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Australasian Bittern (*Botaurus poiciloptilus*)- Status: Endangered (IUCN, Adv List); Caspian Tern (*Hydroprogne caspia*) - Status: Near Threatened (Adv List); Nankeen Night Heron (*Nycticorax caledonicus*)- Status: Near Threatened (Adv List)
	Significant EVCs	Floodplain Riparian Woodland - Status: Endangered
	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant Fish	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list);

	Migratory	Australian Mudfish *(Neochanna cleaveri)*- Status: High priority actions in high priority areas (ABC), Critical (Adv List)
Social	Game Hunting	Game hunting is permitted
	Motor Boating	Water skiing is an established use on the River, principally downstream of the Rowing Mile. The Geelong Water Ski Club is located downstream of the Ovoid Sewer Aqueduct in the vicinity of Wilsons Road. The River in this section is also used for water skiing.
	Non-Motor Boating	The Barwon River (through Geelong) has been used for rowing since the late 1800's and is an integral part of the Barwon River's history. Today the Head of the School Girls Regatta, Victorian Rowing Association All Schools Regatta and on-off events including the Australian Masters Championships are held there. In addition to rowing the river is also used for kayaking and canoeing.
	Picnics and Barbecues	Designated picnic/barbecue areas present through Geelong and highly utilised.
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria. The Barwon River (Geelong area) is considered a popular recreational fishing water for carp, short-finned eel, redfin, brown trout, tench and tupong.
	Tracks	A number of formal passive recreation areas have been developed along the Barwon River in Geelong including an extensive network of existing trails which are regularly used for walking and cycling
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Inc in Low Flow Magnitude **Inc in Prop of Zero Flow**	Average annual stream flows in the Barwon through Geelong are estimated to have been reduced by 13 per cent from natural. This is particularly influenced by the effects of of water harvesting, farm dams, land use and licenced and unlicenced extraction in the Barwon catchment.
Invasive Fauna (Terrestrial)	Rabbits and foxes are present and either directly prey on native wildlife or affect habitats
Loss of Ins Hab (Large Wood)	Desnagging, particularly through Geelong and downstream to Lake Connewarre, has significantly altered instream habitats to cater for recreational pursuits, particularly water skiing. Also, through Geelong, streambeds have been altered for rowing by desilting and annual weed cutting.
Riparian Vegetation – Large Trees	Upstream of Geelong, there is a good overstorey of River Red Gums, however, stock access is limiting regeneration and the establishment of understorey and groundcover species
Reduced Riparian Connectivity	Through Geelong, the riparian zone is a mixture of open space lawn and planted indigenous riparian vegetation
Reduced Vegetation Width	Downstream of Geelong, there is only a limited number of redgums with no understorey. This reach is under the greatest threat.

Work Program for the Barwon River

Waterway	Barwon River	Identification No.	33-03

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.
Management Outcome Targets (MOTs)	a - No artificial barrier to fish migration exists b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Livestock have been excluded from over 50% of the waterway frontage f - Loss of in-stream habitat (large wood) threat has reduced from high to low g - No increase in the loss of in-stream habitat through sedimentation

	h - Riparian vegetation width has improved from poor to moderate condition i - Invasive riparian flora (ground layer) has reduced to a moderate threat level		
Values linked to regional goals	Rural Water Sources for Prod (4) Native Fish (4) Game Hunting (5) Picnics and Barbecues (5) Recreational Fishing (5) Tracks (5) Use of Flagship Species (5) Landscape (3) Significant Fish Migratory (4) Significant Fish Non Migratory (4)	**Threats addressed by work program**	Barriers to Fish Migration (5) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Loss of Ins Hab (Large Wood) (4) Loss of Ins Hab (Sed) (3) Reduced Vegetation Width (4) Invasive Flora (Riparian) – Gorund Layer (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, GLN, DEPI	Degraded Water Quality (5)	c
Assess and manage fish barriers - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ DEPI (ARI)	Barriers to Fish Migration (5)	a
Assess and if necessary manage instream habitat (large wood) density	40 ha	**CCMA**/ DEPI(ARI), VRFish	Loss of Ins Hab (Large Wood) (4)	f
Establish terrestrial pest animal control - Rabbit control	20 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation - 20ha of reach frontage. 5ha of Bruce Creek frontage. Other revegetation (for WQ) refer to 33-10	25 ha	**CCMA**/ GLN, LH, COGG	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (4) Invasive Flora (Riparian) – Gorund Layer (5)	b, c, d, i
Install riparian fence - 10km (25%) of reach length - 20km frontage. 5km of Bruce Creek frontage. Other fencing (for WQ) refer to 33-10	25 km	**CCMA**/ GLN, LH	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (4)	b, c, e, g, h
Establish stewardship/management agreement	25 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (4)	b, c, e, g, h
Investigate and manage urban stormwater/water quality impacts - Not costed	N/A	**COGG**/ CCMA	Degraded Water Quality (5)	c
Implement the Barwon through Geelong Management Plan and Barwon River Parklands Strategy	N/A	**CCMA**/COGG		

Estimated cost of activities	$837,500

Native Hut Creek

Native Hut Creek rises near Meredith and joins Sandy Creek near Inverleigh.

Waterway	Native Hut Creek	Landscape Zone	Mid Barwon
Identification No.	33-10	**Basin**	Barwon

Links to Regional Goals

Due to its values, Native Hut Creek meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Creekline Grassy Woodland – Endangered Stream Bank Shrubland – Endangered
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bed Instability (Degradation)	Active stream bed degradation. Channel deepening occurring with major knick points, no significant channel widening
Livestock Access	Livestock access between 25 and 75% of the waterway frontage
Reduced Riparian Connectivity & **Reduced Vegetation Width**	Native vegetation is significantly disconnected and the riparian zone is very narrow

Work Program for Native Hut Creek

Waterway	Native Hut Creek	Identification No.	33-10

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bed instability has improved from poor to good b - The data gap on riparian large trees in this reach has been investigated and managing planning is underway c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation longitudinal continuity has improved from very poor to moderate e - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Bed Instability (Degradation) (4) Deg Rip Veg - Large Trees (-1) Livestock Access (3) Reduced Riparian Connectivity (5) Reduced Vegetation Width (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Investigate stream instabilities	60 ha	**CCMA**	Bed Instability (Degradation) (4)	a
Establish native indigenous vegetation - 4ha of reach frontage	4 ha	**CCMA**/ GLN, LH	Deg Rip Veg - Large Trees (-1), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e
Install riparian fence - 2km (4%) of reach length - 4km frontage	4 km	**CCMA**/ GLN, LH	Livestock Access (3)	c
Establish stewardship/management agreement	4 ha	**Land manager**/ CCMA	Livestock Access (3)	c

Estimated cost of activities	**$133,000**

Wurdiboluc Reservoir

Wurdiboluc Reservoir is Geelong's largest water storage. It has a surface area of 564ha when full and a maximum of 11 metres depth. It is home to a significant trout fishery, along with Redfin and Eels. Fishing is allowed, and there are facilities for picnicking. The reservoir is about 37 kilometres from Geelong, near Winchelsea.

Waterway	Wurdiboluc Reservoir	Landscape Zone	Mid Barwon
Identification No.	54643	**Basin**	Barwon

Links to Regional Goals

Due to its values, Wurdiboluc Reservoir is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Supports waterway dependent species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Vulnerable. Significant species include: Australasian Shoveler (*Anas rhynchotis*) - VU Brolga (*Grus rubicunda*) - VU Caspian Tern (*Hydroprogne caspia*) - NT Eastern Great Egret (*Ardea modesta*) - VU Hardhead (*Aythya australis*) - VU Musk Duck (*Biziura lobata*) - VU Pied Cormorant (*Phalacrocorax varius*) - NT
Social	Picnics and Barbeques	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Walking Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
Economic	Urban/Rural Township Water Sources	Waterway is used to source water for urban/rural township water supply purposes but does not form part of a State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity 10,000-50,000ML)

Threats

Threat	Details
Invasive Fauna (Aquatic)	Invasive species present - Invasive aquatic species directly prey on native species and/or damage native species habitat

Work Program for Wurdiboluc Reservoir

Waterway	Wurdiboluc Reservoir	Identification No.	54643

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (4) Significant Birds (4) Urban/Rural Township Water Sources (3)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead / Partners	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans. Not costed	N/A	**BW**	N/A	a

Estimated cost of activities	**$ -**

8.10 Moorabool Landscape Zone

Lower Moorabool River and Sutherland Creek West Branch

The Moorabool River rises east of Ballarat and flow south through towns such as Lal Lal, Maude, Batesford and Fyansford before joining the Barwon River. The Moorabool River is a major source of Ballarat's water supply as well as one of the sources supplying the Geelong water system and also supports significant irrigation areas along its length.

The west branch of Sutherlands Creek rises near Steiglitz with a forested area, while the east branch of the Sutherlands Creek rises near Anakie. Sutherlands Creek is an ephemeral waterway that joins the Moorabool River north of Gheringhap.

Waterway	Moorabool River, Sutherland Creek West Branch	Landscape Zone	Moorabool
Identification No.	32-01, 32-02, 32-07	**Basin**	Moorabool

Waterway	Moorabool River	Landscape Zone	Moorabool
Identification No.	32-01, 32-02	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Moorabool River (32-01) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV3	Manage water for the environment to improve waterway condition

Due to its values, Moorabool River (32-02) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV3	Manage water for the environment to improve waterway condition

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Eastern Great Egret (*Ardea modesta*) (Vulnerable, Adv list)
	Significant EVCs	Creekline Herb-rich Woodland - Status: Endangered; Floodplain Riparian Woodland - Status: Endangered; Riparian Woodland - Status: Endangered; Stream Bank Shrubland - Status: Endangered
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
Social	Swimming	Popular swimming spots occur along the Moorabool River at She Oaks and Coopers Crossing
	Picnics and Barbeques	There are a number of popular locations along the Moorabool
Economic	Rural Water Sources for Prod	Water source is used for horticulture including vegetables, wine grapes and olives, as well as irrigation of crops such as Lucerne.

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Bank Erosion	Unstable stream banks in the catchment are generally the result of uncontrolled stock access and subsequent lack of riparian vegetation
Degraded Riparian Vegetation	Significant reaches of the river meanders through bush (either freehold or state forest). Where sections have been cleared, exotic vegetation (particularly willows, gorse and blackberry) dominate.
Stock Access	Approximately 50% of the river frontage has uncontrolled stock access
Inc in Low Flow Magnitude **Inc in Prop of Zero Flow**	Stream flows in the Moorabool River are heavily impacted by farm dams, land use, licenced and unlicenced extaction and harvesting for urban water supply. An environmental entitlement in the Moorabool River, from Lal Lal Reservoir aims to reduce the impact on low flows.
Livestock Access	In some reaches greater than 75% of the waterway frontage is affected by stock access

Work Program Moorabool River 32-01

Waterway	Moorabool River	Identification No.	32-01

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - No artificial barrier to fish migration exists c - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period d - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period e - The increase in low flow magnitude threat score has reduced from very high to high f - The proportion of zero flow threat score has been reduced to moderate g - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) h - Livestock have been excluded from over 25% of the waterway frontage i - The reduction in high flow magnitude threat has been maintained at moderate threat level j - Riparian vegetation width has been maintained in moderate condition k - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (5) Significant Fish Migratory (4)	**Threats addressed by work program**	Bank Instability (5) Barriers to Fish Migration (5) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5)

	Native Fish (3) Significant EVCs (5)		Disturbance of Acid Sulfate Soils (5) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (5) Invasive Fauna (Terrestrial) (5) Livestock Access (5) Red in High Flow Magnitude (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - Rabbit control	20 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	f
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, GLN, DEPI	Degraded Water Quality (5)	d
Assess and manage fish barriers - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ DEPI (ARI), VRFish	Barriers to Fish Migration (5)	b
Deliver current environmental water entitlement. **Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required.** **Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, ABCL, EPA, SRW, CHW, BW	Degraded Water Quality (5), Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (5), Red in High Flow Magnitude (3)	d, e, f, i, k
Establish an Environmental Water Management Plan for the Moorabool River – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, ABCL, EPA, SRW, CHW, BW	Degraded Water Quality (5), Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (5), Red in High Flow Magnitude (3)	d, e, f, i, k
Maintain the discharge into the Moorabool River from the Batesford Quarry as a beneficial environmental use – as per the Central Region Sustainable Water Strategy. Not costed.	N/A	**CHW**/ CCMA	Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (5), Red in High Flow Magnitude (3)	e, f, i, k
Establish native indigenous vegetation - 20ha of reach frontage	20 ha	**CCMA**/ GLN, LH, COGG	Bank Instability (5), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (3)	a, c, d, j
Investigate and manage urban stormwater/water quality impacts - Not costed.	N/A	**COGG**/ CCMA, PV, DEPI	Degraded Water Quality (5)	c
Install riparian fence - 10km (50%) of reach length - 20km frontage. Other fencing (for WQ) refer to 32-07 and 32-02	20 km	**CCMA**/ GLN, LH	Bank Instability (5), Degraded Water Quality (5), Livestock Access (5), Reduced Vegetation Width (3)	a, d, h, j
Establish stewardship/management agreement	20 ha	**Land manager**/ CCMA	Bank Instability (5), Degraded Water Quality (5), Livestock Access (5), Reduced Vegetation Width (3)	a, d, h, j

Estimated cost of activities	**$670,000**

Work Program Moorabool River 32-02

Waterway	Moorabool River	Identification No.	32-02

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - No artificial barrier to fish migration exists c - There is no increase in the change in monthly streamflow variation d - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period e - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period f - The increase in low flow magnitude threat score has reduced from very high to high g - The proportion of zero flow threat score has been reduced to moderate h - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) i - Livestock have been excluded from over 25% of the waterway frontage j - Loss of in-stream habitat (large wood) threat has been maintained at moderate threat level k - The reduction in high flow magnitude threat has been maintained at moderate threat level l - Riparian vegetation width has been maintained in moderate condition m - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (5) Native Fish (3) Significant EVCs (5)	**Threats addressed by work program**	Bank Instability (5) Barriers to Fish Migration (5) Chng in Mon Streamflow Var (3) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Invasive Fauna (Terrestrial) (5) Livestock Access (5) Loss of Ins Hab (Large Wood) (3) Red in High Flow Magnitude (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - Rabbit control	20 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	h
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, GLN, DEPI	Degraded Water Quality (5)	e
Assess and manage fish barriers - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ DEPI (ARI), VRFish	Barriers to Fish Migration (5)	b
Assess instream habitat (large wood) density	40 ha	**CCMA**/ DEPI (ARI), VRFish	Loss of Ins Hab (Large Wood) (3)	j
Deliver current environmental water entitlement. Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required. Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, ABCL, EPA, SRW, BW, CHW	Chng in Mon Streamflow Var (3), Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (4), Red in High Flow Magnitude (3)	c, f, g, k m
Establish an Environmental Water Management Plan for the Moorabool River – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, ABCL, EPA, SRW, CHW, BW	Chng in Mon Streamflow Var (3), Inc in Low Flow Magnitude (5), Inc in Prop of Zero Flow (4), Red in High Flow Magnitude (3)	c, f, g, k
Establish native indigenous vegetation - 20ha of reach frontage. Other revegetation (for WQ) refer to	20 ha	**CCMA**/ GLN, LH	Bank Instability (5), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5),	a, d, e, l

32-03			Reduced Vegetation Width (3)	
Install riparian fence - 10km (25%) of reach length - 20km frontage	20 km	**CCMA**/ GLN, LH	Bank Instability (5), Degraded Water Quality (5), Livestock Access (5), Reduced Vegetation Width (3)	a, e, i, l
Establish stewardship/management agreement	20 ha	**Land manager**/ CCMA	Bank Instability (5), Degraded Water Quality (5), Livestock Access (5), Reduced Vegetation Width (3)	a, e, i, l

Estimated cost of activities	**$690,000**

Waterway	Sutherland Creek West Branch	Landscape Zone	Moorabool
Identification No.	32-07	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Sutherland Creek West Branch (32-07) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant EVCs	Floodplain Riparian Woodland -Endangered Stream Bank Shrubland - Endangered
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bank Instability	Greater than 90% of the reach is eroding
Degraded riparian vegetation	The riparian zone is narrow and disconnected. With only large trees remaining.
Degraded water quality	Fails to meeting SIGNAL objective in SEPP
Invasive Fauna (Terrestrial)	Rabbits are present and directly impact habitats
Livestock Access	Livestock access between 25 and 75% of the waterway frontage

Work Program Sutherlands Creek West Branch

Waterway	Sutherlands Creek West Branch	Identification No.	32-07

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - The data gap on riparian large trees in this reach has been investigated and managing planning is underway c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Livestock have been excluded from over 50% of the waterway frontage f - No increase in the loss of in-stream habitat through sedimentation g - Riparian vegetation longitudinal continuity has improved from moderate to good h- Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4) Significant Fish Non Migratory (4)	**Threats addressed by work program**	Bank Instability (5) Deg Rip Veg - Large Trees (-1) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - Rabbit control	16 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, MCLG, GLN, DEPI	Degraded Water Quality (5)	c
Investigate stream instabilities	60 ha	**CCMA**	Bank Instability (5)	a
Establish native indigenous vegetation - 8 ha of reach frontage. 8ha of reach 32-08 frontage	16 ha	**CCMA**/ MCLG, GLN, LH	Deg Rip Veg - Large Trees (-1), Degraded Water Quality (5), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (3), Reduced Vegetation Width (4)	b, c, f, g, h
Install riparian fence - 4km (13%) of reach length - 8km frontage. 8km of reach 32-08 frontage	16 km	**CCMA**/ MCLG, GLN, LH	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3)	c, e, f
Establish stewardship/management agreement	16 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3)	c, e, f

Estimated cost of activities	**$551,000**

Mid-Moorabool River reaches

The Moorabool River rises east of Ballarat and flow south through towns such as Lal Lal, Maude, Batesford and Fyansford before joining the Barwon River. The Moorabool River is a major source of Ballarat's water supply and also supports significant irrigation areas along its length.

Waterway	Moorabool River	Landscape Zone	Moorabool
Identification No.	32-03, 32-04	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Moorabool River (32-03) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV3	Manage water for the environment to improve waterway condition

Due to its values, Moorabool River (32-04) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV3	Manage water for the environment to improve waterway condition

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Eastern Great Egret (*Ardea modesta*) - (Vulnerable, Adv list)
	Significant EVCs	Creekline Herb-rich Woodland - Status: Endangered; Floodplain Riparian Woodland - Status: Endangered; Riparian Woodland - Status: Endangered; Stream Bank Shrubland - Status: Endangered
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Aqua Invert Comm Cond	32-04 meets all biological objectives for rivers and streams
Social	Swimming	Popular swimming spots occur along the Moorabool River at She Oaks and Coopers Crossing
	Sightseeing	
	Picnics and Barbeques	There are a number of popular locations along the Moorabool

Economic	Rural Water Sources for Prod	Water source is used for horticulture including vegetables, wine grapes and olives, as well as irrigation of crops such as Lucerne.
	Water Carriers	In the West Moorabool system, water is released from Lal Lal Reservoir into the Moorabool River and travels 32 kilometres to a weir at She Oaks. There it is mixed with water from the East Moorabool system and treated at the adjoining water treatment plant.
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils or inland waterway is at high risk from acid sulfate soils
Bank Erosion	Unstable stream banks in the catchment are generally the result of uncontrolled stock access and subsequent lack of riparian vegetation
Degraded Riparian Vegetation	Significant reaches of the river meanders through bush (either freehold or state forest). Where sections have been cleared, exotic vegetation (particularly willows, gorse and blackberry) dominate.
Stock Access	Approximately 50% of the river frontage has uncontrolled stock access
Inc in Low Flow Magnitude **Inc in Prop of Zero Flow**	Stream flows in the Moorabool River are heavily impacted by farm dams, and use, licenced and unlicenced extaction and harvesting for urban water supply. An environmental entitlement in the Moorabool River, from Lal Lal Reservoir aims to reduce the impact on low flows.
Livestock Access	In some reaches greater than 75% of the waterway frontage is affected by stock access

Work Program for Moorabool River 32-03

Waterway	Moorabool River	Identification No.	32-03

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive riparian flora (shrub layer) threat has been maintained at very low e - Invasive riparian flora (tree layer) has been maintained at a low threat level f - Livestock have been excluded from over 50% of the waterway frontage g - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Rural Water Sources for Prod (5) Native Fish (3) Significant EVCs (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Shrub Layer (1) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (3) Inc in Low Flow Mag (5) Inc in Prop of Zero Flow (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willow, gorse, blackberry in Tea Tree Creek	8 ha	**CCMA**/ MCLG, GLN, LH	Invasive Flora (Riparian) - Shrub Layer (1), Invasive Flora (Riparian) - Tree Layer (2)	d, e

Develop land and gully stabilisation plan for the Eclipse Creek catchment	1 no.	**CCMA**/ GPS	Degraded Water Quality (5)	b
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, MCLG, DEPI	Degraded Water Quality (5)	b
Establish terrestrial pest animal control - Rabbit control Moorabool and Tea Tree	26 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation - 18ha of reach frontage. 8ha of Tea Tree Creek	26 ha	**CCMA**/ MCLG, GLN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5)	a, b
Install riparian fence - 9km (25%) of reach length - 18km frontage. 8km frontage - Tea Tree Creek	26 km	**CCMA**/ MCLG, GLN, LH	Degraded Water Quality (5), Livestock Access (3)	b, f
Establish stewardship/management agreement	26 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3)	b, f
Deliver current environmental water entitlement **Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required.** **Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, CHW, ABCL, EPA	Links to 32-01 & 02 Inc in Low Flow Mag (5) Inc in Prop of Zero Flow (5)	g
Establish an Environmental Water Management Plan for the Moorabool River – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, CHW, ABCL, EPA, BW	Links to 32-01 & 02 Inc in Low Flow Mag (5) Inc in Prop of Zero Flow (5)	g

Estimated cost of activities	**$1,157,000**

Work Program for Moorabool River 32-04

Waterway	Moorabool River	Identification No.	32-04

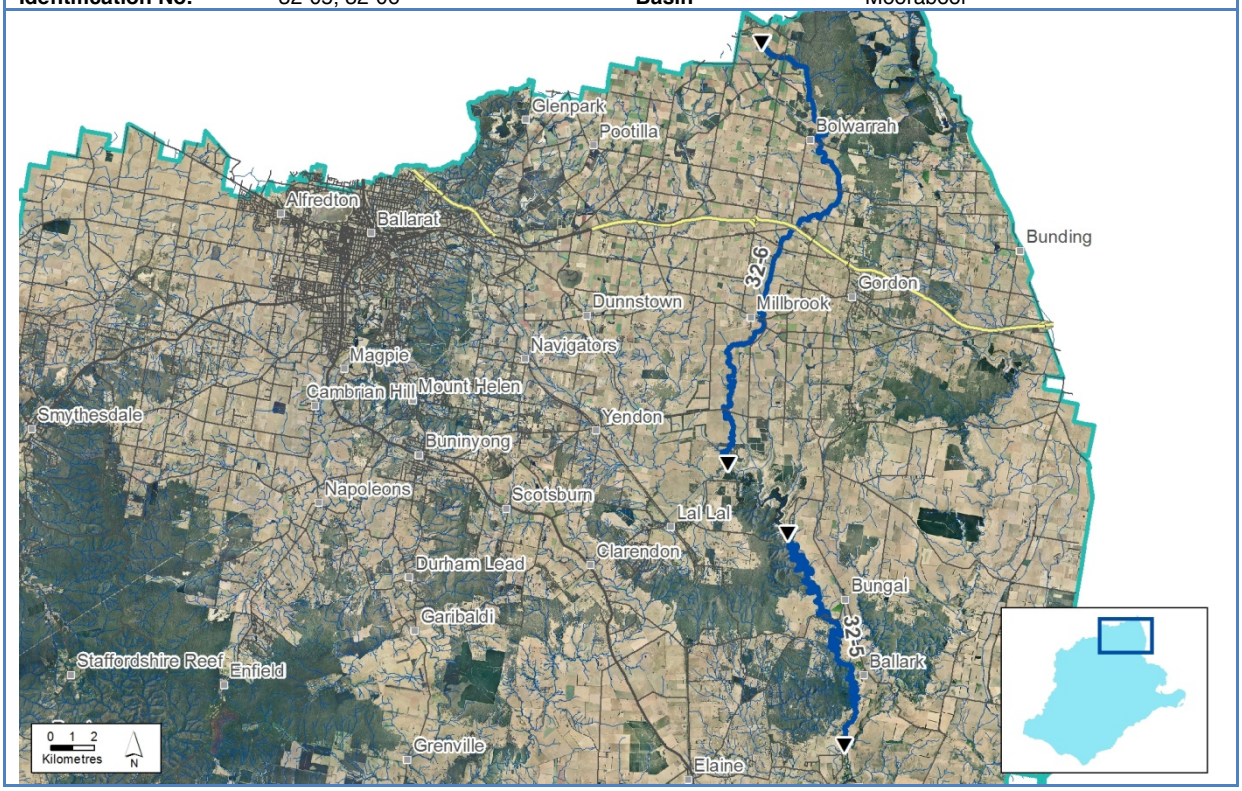
Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive riparian flora (shrub layer) threat has reduced from moderate to low d - Invasive riparian flora (tree layer) has reduced to a low threat level e - Livestock have been excluded from over 50% of the waterway frontage f - Loss of in-stream habitat (large wood) threat has reduced from moderate to low g - Riparian vegetation width has been maintained in moderate condition h - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Water Carriers (5) Aqua Invert Comm Cond (5) Native Fish (3) Significant EVCs (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Shrub Layer (3) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Loss of Ins Hab (Large Wood) (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Assess instream habitat (large wood) density	10 ha	**CCMA**/ DEPI (ARI), VRFish	Loss of Ins Hab (Large Wood) (3)	f
Establish terrestrial pest animal control - Rabbit control	5 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Establish woody weed control - Willows, gorse, blackberry	7 ha	**CCMA**/ MCLG, LH	Invasive Flora (Riparian) - Shrub Layer (3), Invasive Flora (Riparian) - Tree Layer (3)	c, d
Establish native indigenous vegetation - 5ha of reach frontage	5 ha	**CCMA**/ MCLG, LH, BW	Deg Rip Veg - Large Trees (-1)	a
Install riparian fence - 2.5km (25%) of reach length - 5km frontage	5 km	**CCMA**/ MCLG, LH, BW	Livestock Access (3), Reduced Vegetation Width (3)	e, g
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Livestock Access (3), Reduced Vegetation Width (3)	e, g
Deliver current environmental water entitlement **Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required.** **Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, CHW, ABCL, EPA	Links to 32-01 & 02 Inc in Low Flow Mag (5) Inc in Prop of Zero Flow (5)	h
Establish an Environmental Water Management Plan for the Moorabool River – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, CHW, ABCL, EPA	Links to 32-01 & 02 Inc in Low Flow Mag (5) Inc in Prop of Zero Flow (5)	h

Estimated cost of activities	**$361,500**

Moorabool River West Branch

Waterway	Moorabool River	Landscape Zone	Moorabool
Identification No.	32-05, 32-06	**Basin**	Moorabool



Links to Regional Goals

Due to its values, Moorabool River West Branch (32-05) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV3	Manage water for the environment to improve waterway condition

Due to its values, Moorabool River West Branch (32-06) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environment	Significant EVCs	Creekline Herb-rich Woodland - Status: Endangered; Riparian Woodland - Status: Endangered; Stream Bank Shrubland - Status: Endangered
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment
	Water Carriers	Natural waterway used as a carrier

Work Program Moorabool River West Branch 32-05

Waterway	Moorabool River West Branch	Identification No.	32-05

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - The increase in low flow magnitude threat score has reduced from very high to high c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive riparian flora (tree layer) has been maintained at a low threat level e - Livestock have been excluded from over 50% of the waterway frontage f - The reduction in high flow magnitude threat has been maintained at moderate threat level g - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Water Carriers (5) Native Fish (3) Significant EVCs (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (0) Inc in Low Flow Magnitude (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (3) Red in High Flow Magnitude (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - Rabbit control	15 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish woody weed control - Willows, blackberry	5 ha	**CCMA**/ MCLG, LH, BW	Invasive Flora (Riparian) - Tree Layer (2)	d
Establish native indigenous vegetation - 5ha of reach frontage	5 ha	**CCMA**/ MCLG, LH	Deg Rip Veg - Large Trees (0), Livestock Access (3)	a
Establish stewardship/management agreement	15 ha	**Land manager**/ CCMA	Deg Rip Veg - Large Trees (0)	a, e
Deliver current environmental water entitlement. **Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required.** **Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, SRW, CHW, BW	Inc in Low Flow Magnitude (5), Red in High Flow Magnitude (3)	b, f g
Establish an Environmental Water Management Plan for the Moorabool River – not costed refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ VEWH, SRW, CHW, BW	Inc in Low Flow Magnitude (5), Red in High Flow Magnitude (3)	b, f
Install riparian fence - 7.5km (30%) of reach length - 15km frontage	15 km	**CCMA**/ MCLG, LH, BW	Livestock Access (3)	e

Estimated cost of activities	**$502,500**

Work Program for Moorabool River West Branch 32-06

Waterway	Moorabool River West Branch	Identification No.	32-06

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Invasive riparian flora (tree layer) has reduced to a low threat level c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation width has been maintained in moderate condition e - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Degraded Water Quality (5) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Reduced Vegetation Width (3) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, MCLG, DEPI	Degraded Water Quality (5)	a
Establish woody weed control - willow	16 ha	**CCMA**/ MCLG, LH, CHW	Invasive Flora (Riparian) - Tree Layer (3)	b
Establish native indigenous vegetation - 16ha of reach frontage	16 ha	**CCMA**/ MCLG, LH, CHW	Degraded Water Quality (5)	a
Install riparian fence - 8km (25%) of reach length - 16km frontage	16 km	**CCMA**/ MCLG, LH, CHW	Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, c, d
Establish stewardship/management agreement	16 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, c, d
Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required. **- Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, SRW, CHW	Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)	e

Estimated cost of activities	**$904,000**

Moorabool River East Branch

Waterway	Moorabool River East Branch	Landscape Zone	Moorabool
Identification No.	32-10, 32-11, 32-12	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Moorabool River East Branch (32-10, 32-11 and 32-12) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Creekline Herb-rich Woodland- Endangered (32-10, 32-12) Riparian Woodland –Endangered (32-10, 32-11) Stream Bank Shrubland –Endangered (32-10, 32-11, 32-12)
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Bank Instability	50-90% of the reach is eroding
Degraded Large Trees	Large trees are significantly reduced from the riparian zone
Livestock Access	Livestock access 25-75% of the waterway frontage
Invasive Flora (Shrubs and Trees)	Spiny rush is prevalent in these reaches Willows , Blackberry and Gorse

Work Program for Moorabool River East Branch 32-10

Waterway	Moorabool River East Branch	Identification No.	32-10

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Invasive riparian flora (shrub layer) threat has been maintained at low d - Invasive riparian flora (tree layer) has been maintained at a low threat level e - Livestock have been excluded from over 50% of the waterway frontage f - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Bank Instability (4) Deg Rip Veg - Large Trees (5) Invasive Flora (Riparian) - Shrub Layer (2) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (3) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows, blackberry, gorse	10 ha	**CCMA**/ MCLG, LH, BW	Invasive Flora (Riparian) - Shrub Layer (2), Invasive Flora (Riparian) - Tree Layer (2)	c, d
Establish native indigenous vegetation - 10ha of reach frontage	10 ha	**CCMA**/ MCLG, LH, BW	Bank Instability (4), Deg Rip Veg - Large Trees (5)	a, b
Install riparian fence - 5km (30%) of reach length - 10km frontage	10 km	**CCMA**/ MCLG, LH, BW	Bank Instability (4), Livestock Access (3)	a, e
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Bank Instability (4), Livestock Access (3)	a, e
Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required. **- Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, SRW, BW	Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)	f

Estimated cost of activities	**$565,000**

Work Program for Moorabool River East Branch 32-11

Waterway	Moorabool River East Branch	Identification No.	32-11

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has been maintained at a low threat level d - Livestock have been excluded from over 50% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation f - Riparian vegetation width has been maintained in moderate condition g - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Bank Instability (4) Deg Rip Veg - Large Trees (5) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Vegetation Width (3) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - Willows	10 ha	**CCMA**/ MCLG, LH, BW	Invasive Flora (Riparian) - Tree Layer (2)	c
Establish native indigenous vegetation - 10ha of reach frontage	10 ha	**CCMA**/ MCLG, LH, BW	Bank Instability (4), Deg Rip Veg - Large Trees (5)	a, b
Install riparian fence - 5km (50%) of reach length - 10km frontage	10 km	**CCMA**/ MCLG, LH, BW	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	a, e, b, d
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	a, e, b, d
Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required. **- Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, SRW, BW	Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)	g

Estimated cost of activities	**$565,000**

Work Program for Moorabool River East Branch 32-12

Waterway	Moorabool River East Branch	Identification No.	32-12

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Degraded Water Quality (5) Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, MCLG, DEPI	Degraded Water Quality (5)	a
Establish native indigenous vegetation - 10ha of reach frontage	10 ha	**CCMA**/ MCLG, LH, BW	Degraded Water Quality (5)	a
Install riparian fence - 5km (30%) of reach length - 10km frontage	10 km	**CCMA**/ MCLG, LH, BW	Degraded Water Quality (5)	a
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Degraded Water Quality (5)	a
Investigate impacts to environmental flows throughout the broader Moorabool catchment to secure and better manage environmental water where required. **- Not costed - refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ VEWH, SRW, BW	Inc in Low Flow Magnitude (5) Inc in Prop of Zero Flow (4) Red in High Flow Magnitude (4)	b

Estimated cost of activities	**$295,000**

Spring and Lal Lal creeks

Waterway	Spring Creek, Lal Lal Creek	Landscape Zone	Moorabool
Identification No.	32-13, 32-14	**Basin**	Moorabool

Waterway	Spring Creek	Landscape Zone	Moorabool
Identification No.	32-13	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Spring Creek meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Swampy Riparian Woodland- - Endangered Stream Bank Shrubland -Endangered
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Invasive Flora Trees	Willows and hawthorn are present
Livestock Access	Livestock access 50% of the waterway frontage
Degraded Riparian zone	The riparian zone is missing Large Trees and is narrow and disconnected
Loss of Instream Habitat (Sediment)	Deposition of sediments above natural levels mainly at bends and/or instream obstructions

Work Program for Spring Creek

Waterway	Spring Creek	Identification No.	32-13

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive riparian flora (tree layer) has reduced to a low threat level c - Livestock have been excluded from over 25% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation e - Riparian vegetation longitudinal continuity has improved from poor to moderate f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (5) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (4) Reduced Vegetation Width (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Investigate stream instabilities	20 ha	**CCMA**	Loss of Ins Hab (Sed) (3)	d
Establish woody weed control - willows	2 ha	**CCMA**/ MCLG, LH, CHW	Invasive Flora (Riparian) - Tree Layer (3)	b
Establish native indigenous vegetation - 8ha of reach frontage	8 ha	**CCMA**/ MCLG, LH, CHW	Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (4), Reduced Vegetation Width (5)	a, e,f
Install riparian fence - 4km (50%) of reach length - 8km frontage	8 km	**CCMA**/ MCLG, LH, CHW	Livestock Access (5)	c
Establish stewardship/management agreement	8 ha	**Land manager**/ CCMA	Livestock Access (5)	c

Estimated cost of activities	**$295,000**

Waterway	Lal Lal Creek	Landscape Zone	Moorabool
Identification No.	32-14	**Basin**	Moorabool

Links to Regional Goals

Due to its values, Lal Lal Creek meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Creekline Herb-rich Woodland- Endangered Stream Bank Shrubland - Endangered
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Livestock Access	Livestock access over 25% of the reach
Invasive Flora Trees	Willows are present
Livestock Access	Livestock access 50% of the waterway frontage
Degraded Riparian zone	The riparian zone is missing Large Trees and is narrow and disconnected
Degraded water quality	Fails to meet SIGNAL objective

Work Program for Lal Lal Creek

Waterway	Lal Lal Creek	Identification No.	32-14

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - The data gap on riparian large trees in this reach has been investigated and managing planning is underway b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has reduced to a low threat level d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from moderate to good f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (-1) Degraded Water Quality (5) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, MCLG, DEPI	Degraded Water Quality (5)	b
Establish woody weed control - willow	4 ha	**CCMA**/ MCLG, LH, CHW	Invasive Flora (Riparian) - Tree Layer (3)	c
Establish native indigenous vegetation - 12ha of reach frontage	12 ha	**CCMA**/ MCLG, LH, CHW	Deg Rip Veg - Large Trees (-1), Degraded Water Quality (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (4)	a, b, e, f
Install riparian fence - 6km (25%) of reach length - 12km frontage	12 km	**CCMA**/ MCLG, LH, CHW	Degraded Water Quality (5), Livestock Access (3)	b, f, d
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3)	b, f, d

Estimated cost of activities	**$462,000**

Upper Moorabool water supply reservoirs

A number of water supply reservoirs are located in the upper Moorabool catchment. **Wilson Reservoir** supplies water to the Ballarat system. **Lal Lal Reservoir** supplies water for both Geelong and Ballarat, whilst Bostock and Korweinguboora are linked to the Geelong region water supply system.

Bostock Reservoir

Bostock Reservoir is 100 ha in size and holds approximately 7,500 ML. It supports a trout fishery and anglers often target other introduced species such as tench and redfin. It is surrounded by farmland and pine plantations.

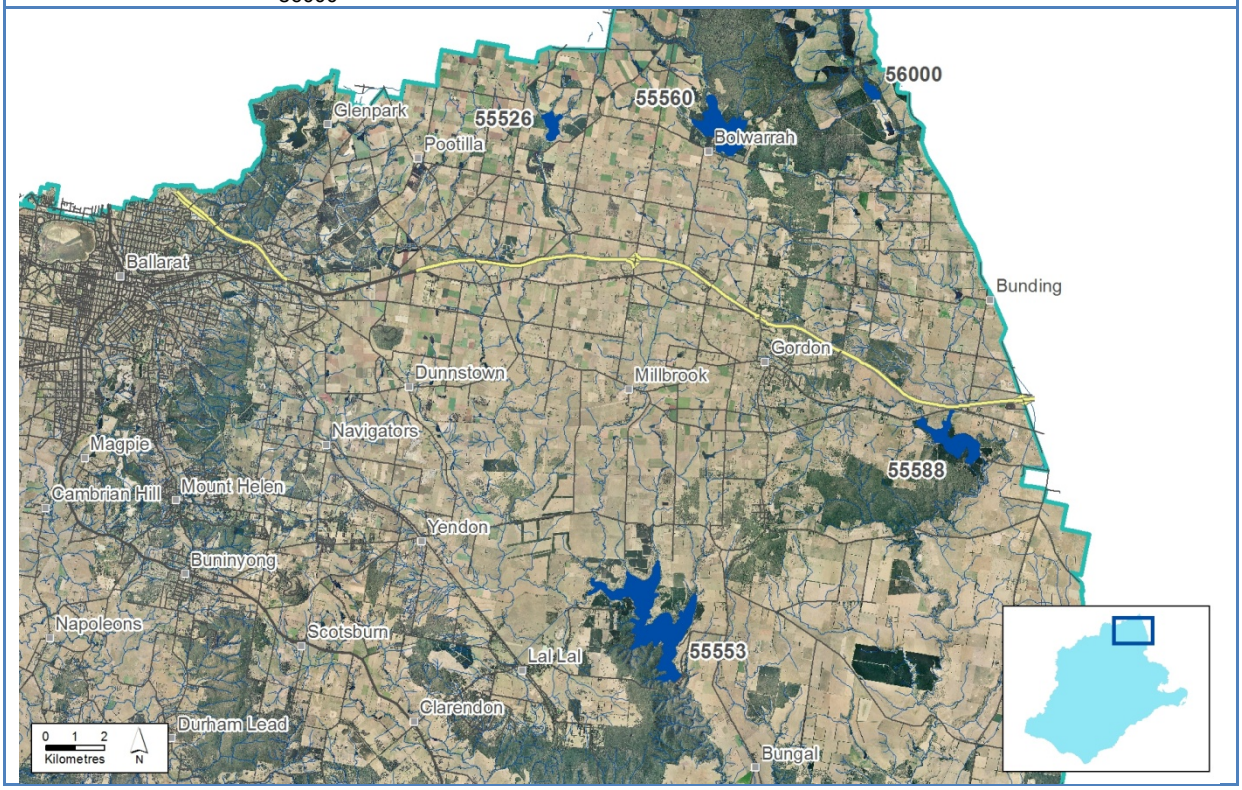
Lal Lal Reservoir

Lal Lal Reservoir supplies water for both Geelong and Ballarat. It is 355 ha in size and holds approximately 60,000 ML. It has no public access.

Korweinguboora Reservoir

Located near Ballan, the reservoir contributes to Geelong's water supply and is 61 ha in size.

Waterway	Upper Moorabool Water Supply Reservoirs – Wilson Reservoir, Lal Lal Reservoir, Moorabool Reservoir, Bostock Reservoir, Korweinguboora Reservoir,	Landscape Zone	Moorabool
Identification No.	55526, 55553, 55560, 55588, 56000	**Basin**	Moorabool



Links to the Regional Goals

Due to their values, Wilson and Moorabool Reservoirs are a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to their values, Lal Lal, Bostock and Korweinguboora Reservoirs are a priority under the following regional goal	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Supports waterway dependent species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered. Significant species include Australasian Shoveler (*Anas rhynchotis*) - VU Blue-billed Duck (*Oxyura australis*) - EN

		Hardhead (*Aythya australis*) - VU Musk Duck (*Biziura lobata*) – VU Eastern Great Egret (*Ardea modesta*) – VU (55553)
	Significant EVCs	Known to contain EVCs with conservation status of Endangered (Swampy Riparian Woodland) (55588)
Social	Picnics and Barbeques	Designated picnic/barbecue areas present (55560 & 55588)
	Walking Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted (55560)
Economic	Urban/Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity <10,000ML and >50,000ML (55553))

Threats

Threat	Details
Invasive Fauna (terrestrial)	Invasive species are present but have no significant impact (55526 & 55588)

Work Program for Wilson and Moorabool Reservoirs

Waterway	**Wilson Reservoir** **Moorabool Reservoir**	**Identification No.**	**55526** **55560**

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (3) Significant Birds (5) Urban/Rural Township Water Sources (4)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans. Not costed	N/A	**CHW**	N/A	a

Estimated cost of activities	**$ -**

Work Program Lal Lal, Bostock and Korweinguboora Reservoirs

Waterway	Lal Lal Reservoir Bostock Reservoir Korweinguboora Reservoir	Identification No.	55553

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (5, 3, 3) Urban/Rural Township Water Sources (4, 3, 3)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead /Partners	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans (Lal Lal). Not costed	N/A	**CHW** / BW*	N/A	a
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans (Bostock, Korweinguboora). Not costed	N/A	**BW**	N/A	a

Estimated cost of activities	$ -

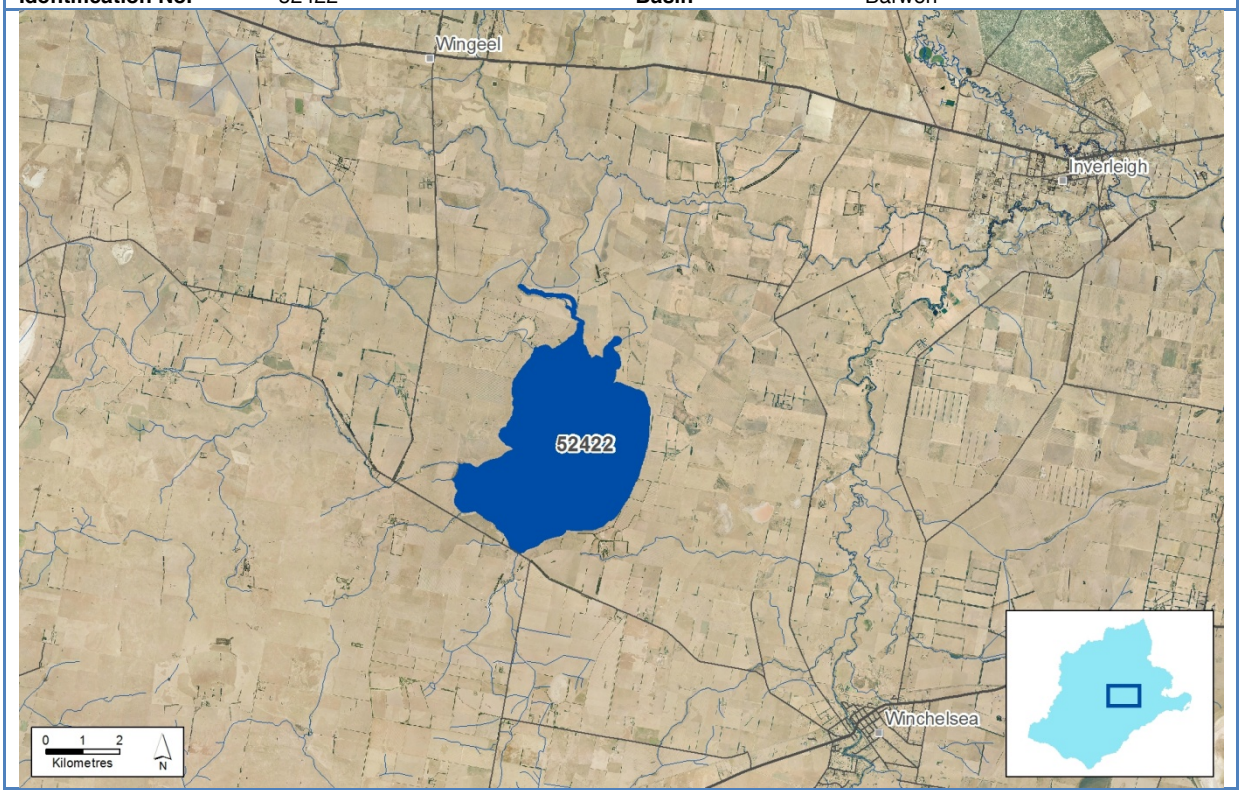
*Lal Lal is managed by Central Highlands Water, however Barwon Water have a share.

8.11 Murdeduke Landscape Zone

Lake Murdeduke

Lake Murdeduke is situated north-west of Winchelsea. It is one of nine lakes included in the Western District Lakes Ramsar Site. It is 1,550 ha in size and is classified as a saline wetland.

Waterway	Lake Murdeduke	Landscape Zone	Murdeduke
Identification No.	52422	**Basin**	Barwon



Links to Regional Goals

Due to its values, Lake Murdeduke meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Murdeduke is one of nine wetlands that form the Western District Lakes Ramsar Site. It is a permanent brackish to saline lake, fed by local runoff, direct precipitation and inlet streams (including Mia Mia Creek and some drains). Lake Murdeduke is a high value wetland for the abundance and diversity of birds it supports. It supports large numbers of migratory shorebirds and there is evidence that waterfowl such as Hardhead and Australian Shelduck (Tadorna tadornoides), use the large expanses of open water at Lake Murdeduke during times of moult. It is also a drought refuge for waterbirds. At the time of listing Lake Murdeduke was popular for recreational fishing. It is also a game reserve used for duck hunting.
	Nationally Important Wetland	Lake Murdeduke was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuge	Lake Murdeduke is a high value wetland for the abundance and diversity of birds it supports. It is also a drought refuge for waterbirds. (Australian Wetlands Database,

		http://www.environment.gov.au/water/topics/wetlands/database/index.html)
	Important Bird Habitat	Fifty-two waterbird species have been recorded at this wetland, including several vagrants. The waterway is known to support significant numbers of waterbirds with more than 20,000 birds recorded on occasion (Hale and Butcher, in prep). Internationally significant numbers (i.e. > 1% of the relevant population) have been recorded for the following species (maximum count provided): • Eurasian Coot (*Fulica atra*) – 20,000 • Black Swan (*Cygnus atratus*) – 10,000 • Sharp-tailed Sandpiper (*Calidris acuminata*) – 4,500 • Red-necked Stint (*Calidris ruficollis*) – 3,200 • Banded Stilt (*Cladorhynchus leucocephalus*) – 3,100 • Curlew Sandpiper (*Calidris ferruginea*) – 2,100 • Freckled Duck (*Stictonetta naevosa*) – 730 • Great Crested Grebe (*Podiceps cristatus*) – 254 In addition, Lake Murdeduke supports waterbirds during critical life stages with 11 species recorded breeding and a number of waterfowl using the site during moult of primary flight feathers (Hale and Butcher, in prep).
	Significant Birds	There is a single record of an Australian Painted Snipe (*Rostratula benghalensis australis*) from Lake Murdeduke. This species is listed as Vulnerable under the EPBC Act and Critically Endangered under the Advisory List of Threatened Vertebrate Fauna in Victoria. It is not known if the site is important for this species. Eleven species of migratory shorebirds listed under international agreements have been recorded within Lake Murdeduke. However, only three species are regularly observed: • Curlew Sandpiper (*Calidris ferruginea*) • Red-necked Stint (*Calidris ruficollis*) • Sharp-tailed Sandpiper (*Calidris acuminata*) Lake Murdeduke also supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered (EN) or Vulnerable (VU) in Victoria : • Australasian Shoveler (*Anas rhynchotis*) (VU). Habitat[16]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Blue-billed Duck (*Oxyura australis)* (EN). Habitat[17]: fresh to saline, deep permanent open wetlands and deep, densely vegetated lakes. • Brolga (*Grus rubicunda*) (VU) • Freckled Duck (*Stictonetta naevosa)* (EN). Habitat[18]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[19]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata)* (VU). Habitat: permanent swamps with dense vegetation.
	Significant EVCs	Wetland EVCs • Brackish Sedgeland (20%) - conservation status: Endangered (Victorian Volcanic Plains Bioregion) • Plains saltmarsh (50%) - conservation status: Endangered (Victorian Volcanic Plains Bioregion) • Brackish Herbland (30%) - conservation status: Endangered (Victorian Volcanic Plains Bioregion) Terrestrial EVCs • Swamp Scrub – conservation status: Endangered (Victorian Volcanic Plains Bioregion) • Plains Grassy woodland conservation status: Endangered (Victorian Volcanic Plains Bioregion)
Social	Recreational fishing	Lake Murdeduke was a popular Salmonid fishery, prior to the prolonged drought conditions from 2001/2002, during which time the Lake dried out. The Lake currently experiences salinity too high to sustain a fishery.
	Hunting	Lake Murdeduke is a popular location for duck hunting.

Threats

Threat	Details
Changed Water Regime	Water resource development (drainage, diversion and/or extraction) occurs at this site. Most of the water supplying the lake is from the north-west and west. The lake was also fed from the Lough Calvert catchment when this overflowed. However, the current

[16] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[17] http://bird.net.au/bird/index.php?title=Blue-billed_Duck
[18] http://bird.net.au/bird/index.php?title=Freckled_Duck
[19] http://www.birdlife.org.au/bird-profile/hardhead

	drainage scheme prevents this from occurring. (DCE 1992). There is a long-term trend of lowering water levels from 1900 to 2009 which was exacerbated by the 1996-2009 drought. A trend of rising salinity from <20 ppm in 1993 to over 100 ppm in 2009, attributed in the ECD to changed water regimes. Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). The modelling results indicate that there is likely to be a further decline in water levels and permanence with a greater incidence of dry period. For example the modelled hydrology for Lake Murdeduke with climate change (2030 scenario of lower rainfall and increased temperatures) illustrate the dramatic nature of predicted impacts. Baseline conditions at Lake Murdeduke indicate there have been no incidents of complete drying in at least 100 years. However, under climate change scenarios, the reduced inflows from rainfall and overland flow, together with increased evaporation from predicted warmer temperatures, results in an increase net loss of water. As a result it is predicted that the lake would be dry 24 per cent of the time, with 100 dry spells in 100 years averaging a month long, with a maximum dry period of 130 days.
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Invasive Fauna (Terrestrial)	Foxes occur along the lake margins impacting bird populations through predation of eggs and juveniles birds
Invasive Flora (Wetland)	Tall Wheat-grass. For example, Brackish Herbland EVC in the Victorian Volcanic Plains Bioregion is under increased threat, especially due to Tall Wheat-grass invasion.
Degraded Wetland Buffer	Grazing has caused major changes to the vegetation surrounding the lake, including a significant reduction in native grassland, woodland and saltmarsh communities. The Index of Wetland Condition indicates that the wetland buffer is in poor condition.
Livestock Access to Buffer	At least 50% of the lake edge is open to stock, particularly in the southern half. Livestock access can potentially increase the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011).
Resource Utilisation	At the time of listing, duck hunting occurred and continues to occur on Lake Murdeduke; however the impact of the activity has not been assessed. The main types of impacts from hunting, aside from taking of ducks, include accidental shooting of protected species and disturbance to the habitat and fauna.

Work Program Lake Murdeduke

Waterway	**Lake Murdeduke**	**Identification No.**	**52422**

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – permanent wetlands not drying for more than two months in any five year period (not feasible to address through this work program) LAC2 – Salinity – saline (5 to 50 parts per thousand) (not feasible to address through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from poor to moderate condition (also addresses LAC3 and LAC4) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Invasive wetland flora threat has reduced from moderate to low (also addresses LAC3 and LAC4) d - Livestock have been excluded from over 50% of the waterway frontage (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (4) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (3)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish non-woody weed control	10 ha	**Land manager**/GA, CCMA	Degraded Buffer (4), Invasive Flora (Wetland) (3)	a, c

Exclude grazing - Cost included in fence installation	10 ha	**CCMA**/ LH, GA	Degraded Buffer (4), Invasive Flora (Wetland) (3)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	10 km	**CCMA**/ LH, GA	Degraded Buffer (4), Invasive Flora (Wetland) (3), Livestock Access to Buffer (3)	a, c, d
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Degraded Buffer (4), Invasive Flora (Wetland) (3), Livestock Access to Buffer (3)	a, c, d

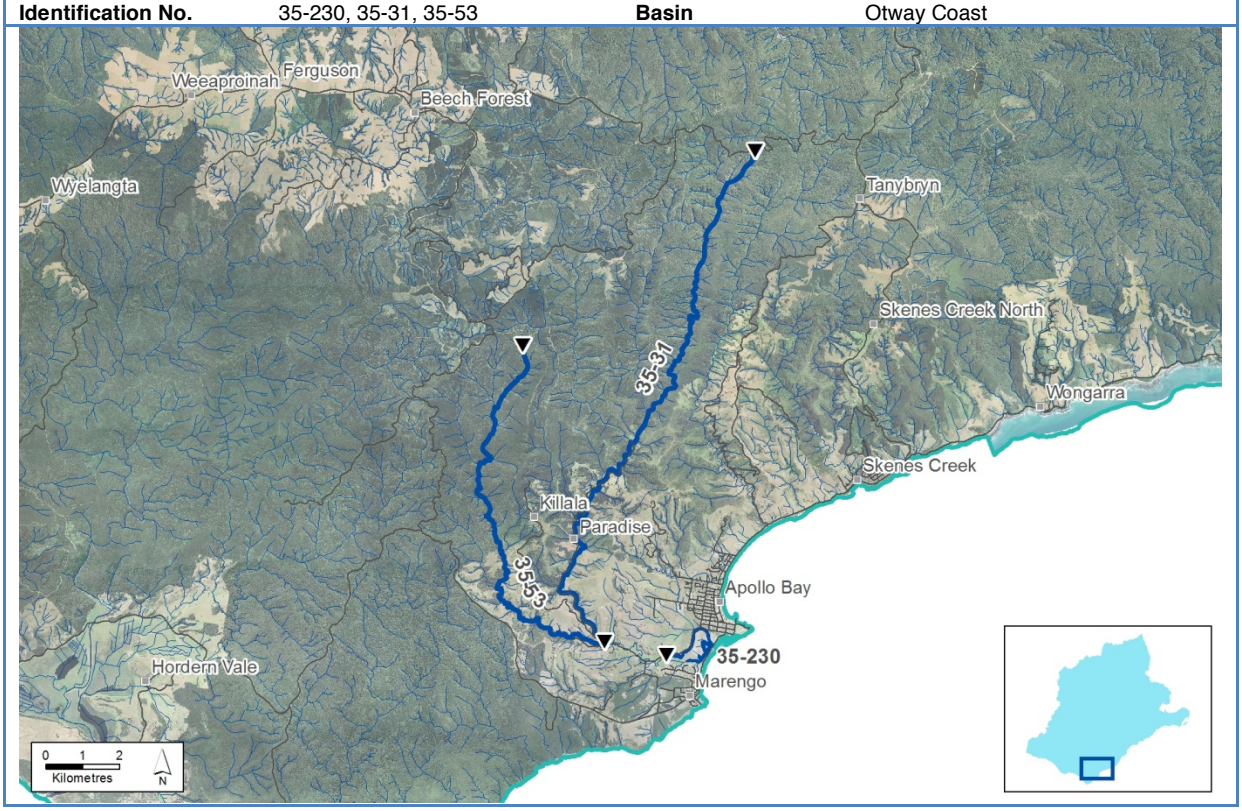
Estimated cost of activities	**$180,000**

8.12 Otway Coast Landscape Zone

Barham River

The Barham River rises as the west branch of the river in the Otway Ranges near Mariner Ridge and flows generally south then east before reaching its confluence with the east branch of the river near the locality of Paradise, and then flows directly east towards the town of Apollo Bay where the estuary forms, north of Cape Otway. The Barham River is approximately 16 km long. The Barham River is the water supply for Apollo Bay, Marengo and Skenes Creek.

Waterway	Barham River estuary, Barham River East Branch, Barham River West Branch	Landscape Zone	Otway Coast
Identification No.	35-230, 35-31, 35-53	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, the Barham River estuary (35-230) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Barham River East Branch (35-31) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Barham River East Branch (35-53) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List); Whiskered Tern *(Chlidonias hybrida)* - Status: Near Threatened (Adv List); Fairy Tern *(Sternula nereis nereis)* - Status: Vulnerable (EPBC), Endangered (Adv List)
	Significant Fish Dependent/ Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list) (35-230, 35-31)
	Significant EVCs	Riparian Forest- Least Concern Wet Forest- Least Concern Cool Temperate Rainforest -Endangered Swamp Scrub - Endangered
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
	Game Hunting	Game hunting is permitted
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
	Sightseeing	Sightseeing destination with high visitor numbers
Economic	Urban or Rural Township Water Sources	The Barham River supplies water to Apollo Bay.

Threats

Threat	Details
Degraded Estuarine Vegetation	Estuarine vegetation is highly modified from natural
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Intermittently Open Estuary	The estuary is artificially opened from time to time to prevent flooding of assets
Livestock Access	Livestock access is still present in over 25% of the reach
Barriers to Fish Migration	Significant progress has been made on addressing barriers to fish migration in the Barham River. However, a fish barrier downstream of a bridge needs addressing.
Invasive Flora	Willow and Blackberry are present
Water Quality	As identified in the Otway Barham Catchment Management Framework (2011-2013) there is the potential for water quality issues resulting from: • Runoff from urban and agricultural land • Excessive extraction • Infrastructure – Septic soakage from domestic waste water production and runoff from unsealed roads.

Work Program for Barham River estuary

Waterway	Barham River estuary	Identification No.	35-230

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from very poor to poor condition b - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives c - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Camping (5) Game Hunting (5) Picnics and Barbecues (5) Sightseeing (5) Significant Birds (5) Significant Fish Dependent (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (5) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (3) Livestock Access (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to Barham estuary mouth opening - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ OCC	Intermittently Open Estuaries (3)	b
Establish native indigenous vegetation	2 ha	**CCMA**/ Land manager, SOLN	Degraded Estuarine Vegetation (5)	a
Install riparian fence	2 km	**CCMA**/ Land manager, SOLN	Livestock Access (3)	c
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Livestock Access (3)	c
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – refer to Community engagement and capacity building (CWS, Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Intermittently Open Estuaries (3)	b

Estimated cost of activities	**$59,000**

Work Program Barham River East Branch

Waterway	Barham River East Branch	Identification No.	35-31

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No artificial barrier to fish migration exists b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Invasive riparian flora (tree layer) has been maintained at a low threat level f - Livestock have been excluded from over 75% of the waterway frontage		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Significant Fish Migratory (4) Camping (4) Picnics and Barbecues (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Barriers to Fish Migration (3) Deg Rip Veg - Large Trees (4) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 22ha of reach frontage	22 ha	**CCMA**/ SOLN, Land manager, BW	Degraded Water Quality (5)	c
Establish woody weed control - Willows, blackberry	11 ha	**CCMA**/ SOLN, Land manager, BW	Invasive Flora (Riparian) - Tree Layer (2)	e
Install riparian fence - 5.5km (25%) of reach length - 11km frontage	11 km	**CCMA**/ SOLN, Land manager, BW	Livestock Access (1)	f
Establish stewardship/management agreement	11 ha	**Land manager**/ CCMA	Livestock Access (1)	f
Modify outlet waterway structure - Rock ramp drop downstream of bridge	1 no.	**CCMA**/ Land manager, DEPI	Barriers to Fish Migration (3)	a
Exclude grazing from gullies - Fence gullies	40 ha	**CCMA**/ SOLN, LH	Deg Rip Veg - Large Trees (4)	b
Remove fish barrier – Replace existing crossing with clear span bridge	1 no.	**CCMA**/ Land manager, DEPI	Barriers to Fish Migration (3)	a

Estimated cost of activities	**$1,113,000**

Work Program Barham River West Branch

Waterway	**Barham River West Branch**	**Identification No.**	**35-53**

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Degraded Water Quality (5)

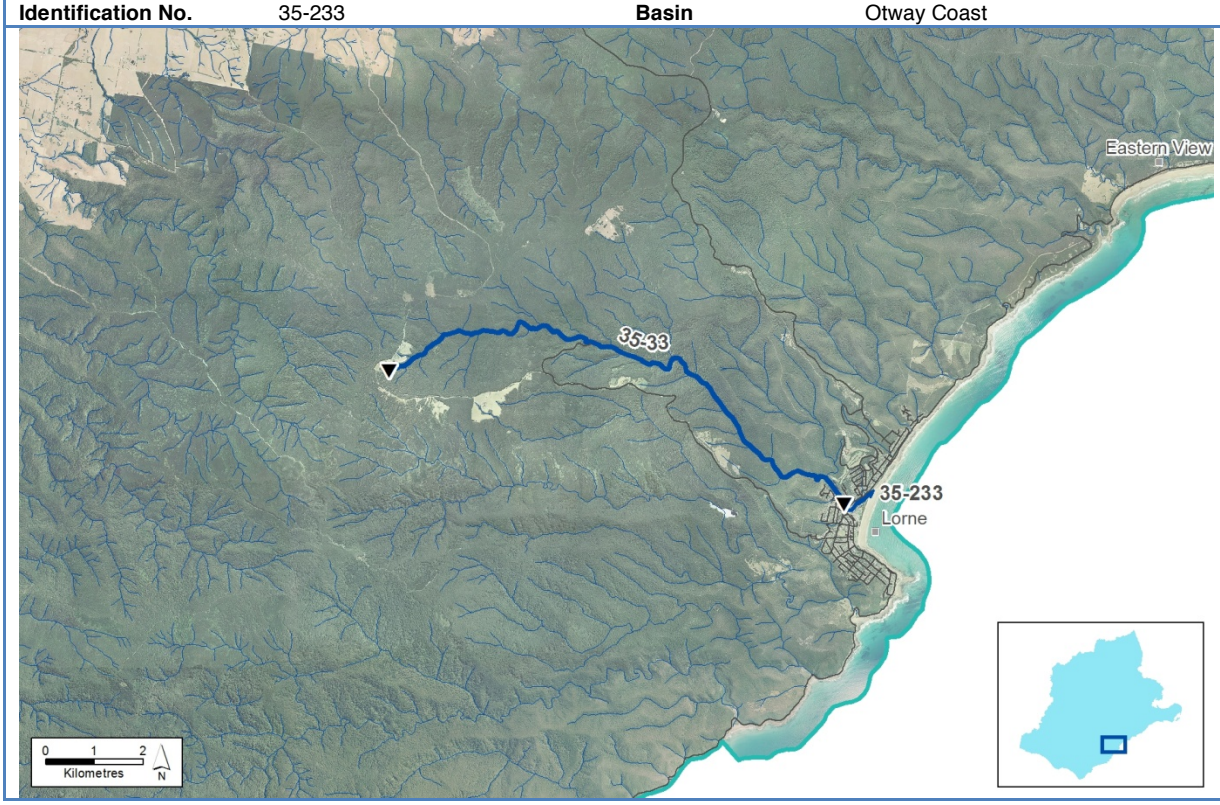
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation	10 ha	**CCMA**/SOLN, LH, BW	Degraded Water Quality (5)	a
Install riparian fence	5 km	**CCMA**/SOLN, LH, BW	Degraded Water Quality (5)	a
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Degraded Water Quality (5)	a

Estimated cost of activities	**$ 215,500**

Erskine River

The Erskine River rises in the Otway Ranges near Mt Sabine. It flows generally south before entering Bass Strait at Lorne. The Erskine River and its estuary is a popular destination for tourists and local visitors.

Waterway	Erskine River estuary	Landscape Zone	Otway Coast
Identification No.	35-233	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, the Erskine River estuary meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, the Erskine River meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Dependent	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Estuarine Wetland - Endangered Wet Forest -Least Concern
	Draught Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitat	Identified as an Important Bird Area
	Riparian Vegetation Condition	Streamside Zone Sub-Index Score of 10
Social	Camping	Two popular camping grounds exist adjacent to the Erskine River, namely: • the Erskine River Caravan Park; • the Ocean Road Caravan Park.
	Non-Motor Boating	Waterway is popular for canoeing.

	Picnics and Barbecues	Designated picnic/barbecue areas present
	Tracks & Sightseeing	The Erskine River trail is a popular circuit walk for both locals and tourists at Lorne. The walk and interpretive experience around the lower reaches of Erskine River encompasses trails and boardwalks between the Swing Bridge at the mouth of Erskine River and the pedestrian bridge beside the Great Ocean Road.

Threats

Threat	Details
Bank Instability	50 – 90% of the reach is eroding
Degraded Water Quality	Fails to meeting SIGNAL objective in SEPP
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Intermittently Open Estuaries	The estuary is artificially opened from time to time to protect infrastructure at the caravan park

Work Program for the Erskine River estuary

Waterway	Erskine River estuary	Identification No.	35-233

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - The estuarine vegetation has improved from moderate to good condition c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives		
Values linked to regional goals	Camping (5) Non-Motor Boating (4) Picnics and Barbecues (5) Sightseeing (5) Tracks (5) Significant Fish Dependent (4)	**Threats addressed by work program**	Bank Instability (4) Degraded Estuarine Vegetation (3) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to Erskine estuary mouth opening - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ GORCC	Intermittently Open Estuaries (3)	d
Investigate and manage urban stormwater/water quality impacts - Not costed	N/A	**SCS**/ CCMA, GORCC, BW,	Degraded Water Quality (5)	c
Establish native indigenous vegetation	1 ha	**CCMA**/ Land manager, SOLN	Bank Instability (4), Degraded Estuarine Vegetation (3)	a, b
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Bank Instability (4), Degraded Estuarine Vegetation (3)	a, b
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – see Community engagement and capacity building (CWS, Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Degraded Water Quality (5) Intermittently Open Estuaries (3)	c, d

Estimated cost of activities	$13,500

Work Program for Erskine River

Waterway	Erskine River	Identification No.	35-33

Long-term Resource Condition Targets	17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Significant Fish Migratory (4) Camping (5) Non-Motor Boating (4) Picnics and Barbecues (5) Sightseeing (5) Tracks (5)	**Threats addressed by Work Program**	N/A

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/Land manager	N/A*	a

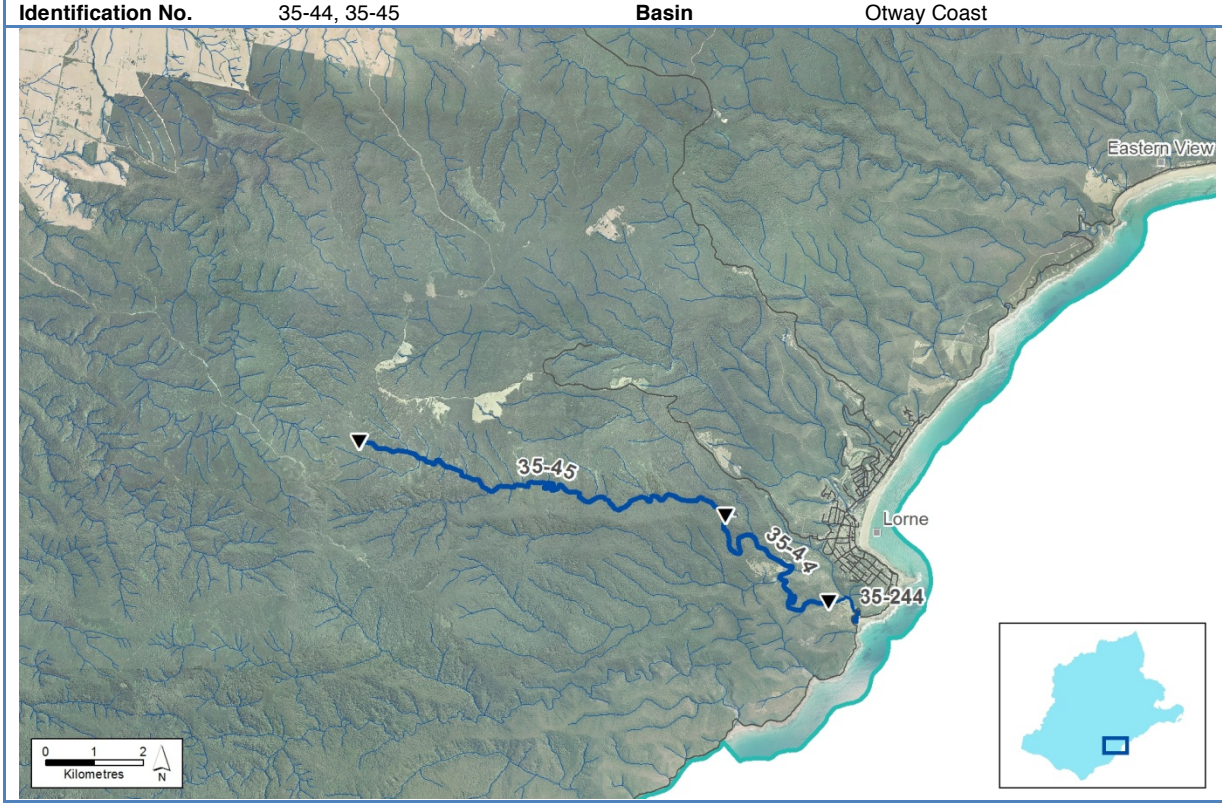
Estimated cost of activities	**$ -**

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

St George River

The St George River rises in the Otway Ranges near Mt Cowley. It flows generally east before entering Bass Strait northeast of Cape Otway and south of Lorne. The St George River is approximately 14 km long.

Waterway	St George River	Landscape Zone	Otway Coast
Identification No.	35-44, 35-45	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, St George River estuary meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values

Due to its values, St George River (35-44) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Due to its values, St George River (35-45) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Riparian Forest - Least Concern Wet Forest- Least Concern Cool Temperate Rainforest-Endangered
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Sightseeing	Sightseeing destination with high visitor numbers
	Swimming	Popular swimming location

	Tracks	The St George catchment contains many interesting walks and attractions including: Phantom Falls; Hendersons Falls; The Canyon; Cumberland Falls; and Cora Lynn Cascades
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Fish Barrier	A fish barrier exists at the foot bridge
Bank Instability	50 – 90% of the reach is eroding
Degraded Water Quality	Fails to meeting SIGNAL objective in SEPP
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Degraded Estuarine Vegetation	Estuarine vegetation is largely modified from natural

Work Program for the St George River estuary 35-244

Waterway	**St George River estuary**	**Identification No.**	**35-244**

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - The estuarine vegetation has improved from moderate to good condition c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Picnics and Barbecues (5) Sightseeing (5) Swimming (5) Tracks (5)	**Threats addressed by Work Program**	Disturbance of Acid Sulfate Soils (5) Degraded Water Quality (5) Bank instability (3) Degraded estuarine veg (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation	1 ha	**GORCC/** CCMA	Degraded Water Quality (5), Bank instability (3), Degraded estuarine veg (3)	a, b, c
Establish woody weed control	1 ha	**GORCC/** CCMA	Degraded Water Quality (5), Bank instability (3), Degraded estuarine veg (3)	a, b, c
Establish stewardship/management agreement	1 ha	**Land manager/** CCMA	Degraded Water Quality (5), Bank instability (3), Degraded estuarine veg (3)	a, b, c

Estimated cost of activities	**$60,000**

Work Program for St George River 35-44

Waterway	St George River	Identification No.	35-44

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No artificial barrier to fish migration exists b - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Significant Fish Migratory (4) Camping (5) Picnics and Barbecues (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Barriers to Fish Migration (3) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Remove fish barrier – Replace existing crossing with clear span bridge	1 no.	**CCMA**/ PV, GORCC, DEPI	Barriers to Fish Migration (3)	a
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - Not costed – refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ BW, SRW	Inc in Low Flow Magnitude (5)	

Estimated cost of activities	**$70,000**

Work Program St George River 35-45

Waterway	St George River	Identification No.	35-45

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a – Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - Not costed – refer to Environmental Water management program (CWS Section 5.1.3)	N/A	**CCMA**/ SRW, BW	Inc in Low Flow Magnitude (5)	a

Estimated cost of activities	**$ -**

Wye River

Wye River is located approximately 15 km west of Lorne. It has a short steep catchment and relatively short estuary.

Waterway	Wye River estuary and Wye River	Landscape Zone	Otway Coast
Identification No.	35-246, 35-46	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, Wye River and estuary are a priority under the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Dependent/Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Aqua Invert Community Cond	Meets all biological objectives for rivers and streams indicating excellent water quality
	Significant EVCs	Estuarine Wetland - Endangered Riparian Forest - Least Concern Wet Forest - Least Concern Cool Temperate Rainforest - Endangered
	Significant birds	Azure Kingfisher (*Alcedo azurea)* NT
Social	Swimming	The Wye River estuary is popular for swimming/ paddling.
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Sightseeing	High numbers of tourists visit the Wye River estuary.
Economic	Tourism	A caravan park is located adjacent to the Wye River estuary. High visitor numbers occur throughout the year.

Threats

Threat	Details
Bank Instability	10-50% of the reach is eroding
Degraded	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes

estuarine vegetation	present, with some EVCs modified from benchmark)
Disturbance of acid sulfate soils	Adjacent land has the potential to contain coastal acid sulfate soils

Work Program for Wye River estuary

Waterway	**Wye River estuary**	**Identification No.**	**35-246**

Long-term Resource Condition Targets	04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - The estuarine vegetation has improved from moderate to good condition c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Significant Fish Dependent (5)	**Threats addressed by work program**	Bank Instability (3) Degraded Estuarine Vegetation (3) Disturbance of Acid Sulfate Soils (5) Degraded Water Quality (5)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish native indigenous vegetation	2 ha	**CCMA**/ Land manager, SOLN	Bank Instability (3), Degraded Estuarine Vegetation (3), Degraded Water Quality (5)	a, b
Establish woody weed control	2 ha	**CCMA**/ Land manager, SOLN	Degraded Estuarine Vegetation (3)	b
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Estuarine Vegetation (3)	b
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – see Community engagement and capacity building (CWS, Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Degraded Water Quality (5)	c

Estimated cost of activities	**$134,600**

Work Program for Wye River

Waterway	**Wye River**	**Identification No.**	**35-46**

Long-term Resource Condition Targets	04 - Known populations and habitat of Australian Mudfish are maintained and improved. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period		
Values linked to regional goals	Aqua Invert Comm Cond (5) Native Fish (3) Rip Veg Condition (5) Significant Fish Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (4)

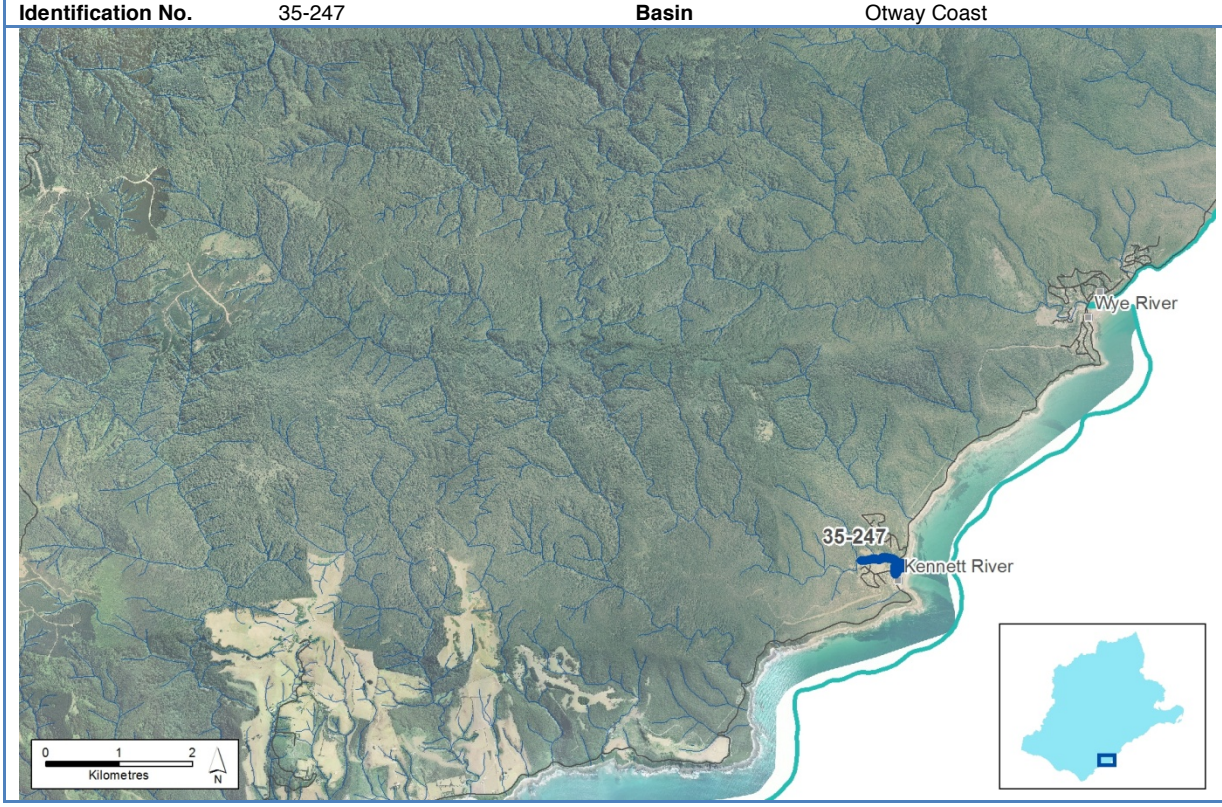
Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish native indigenous vegetation - Urban planting concept	2 ha	**CCMA**/ Land manager, SOLN	Deg Rip Veg - Large Trees (4)	a

Estimated cost of activities	**$27,000**

Kennett River

Kennett River is located approximately 27 km west of Lorne. It has a short steep catchment and relatively short estuary.

Waterway	Kennett River estuary	Landscape Zone	Otway Coast
Identification No.	35-247	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Kennett River estuary meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Dependent	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Riparian Forest - Least Concern Wet Forest - Least Concern Cool Temperate Rainforest -Endangered
Social	Swimming	The Kennett River estuary is popular for swimming/ paddling.
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Sightseeing	High numbers of tourists visit the Kennett River estuary.
Economic	Tourism	A caravan park is located adjacent to the Kennett River estuary. High visitor numbers occur throughout the year.

Threats

Threat	Details
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils

Work Program for Kennett River estuary

Waterway	Kennett River estuary	Identification No.	35-247

Long-term Resource Condition Targets	07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition		
Values linked to regional goals	Significant Fish Dependent (4)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Disturbance of Acid Sulfate Soils (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation	2 ha	**CCMA**/ SOLN, Land manager	Degraded Estuarine Vegetation (3)	a
Establish woody weed control	2 ha	**CCMA**/ SOLN, Land manager	Degraded Estuarine Vegetation (3)	a
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Estuarine Vegetation (3)	a

Estimated cost of activities	**$134,600**

Cumberland River

The Cumberland River rises below Mount Defiance in the Otway Ranges and flows generally east towards the locality of The Brothers where the river reaches its mouth and empties into Bass Strait, northeast of Cape Otway and to the south of Lorne.

Waterway	Cumberland River	Landscape Zone	Otway Coast
Identification No.	35-32	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, the Cumberland River meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Aqua Invert Community Condition	Meets all biological objectives for rivers and streams indicating excellent water quality
	Rip Veg Condition	The riparian vegetation is in excellent condition.
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Streamside Zone Sub-Index Score of 9 with known endangered EVC present: Cool Temperate Rainforest
Social	Camping	A caravan park is located adjacent to the Cumberland River estuary.
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Sightseeing	Sightseeing destination with high visitor numbers
	Swimming	Popular swimming location
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Barriers to Fish Migration	A fishway has been constructed within the culvert crossing near the Great Ocean Road. Some modifications to this fishway are required.
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils

Work Program for Cumberland River

Waterway	Cumberland River	Identification No.	35-32

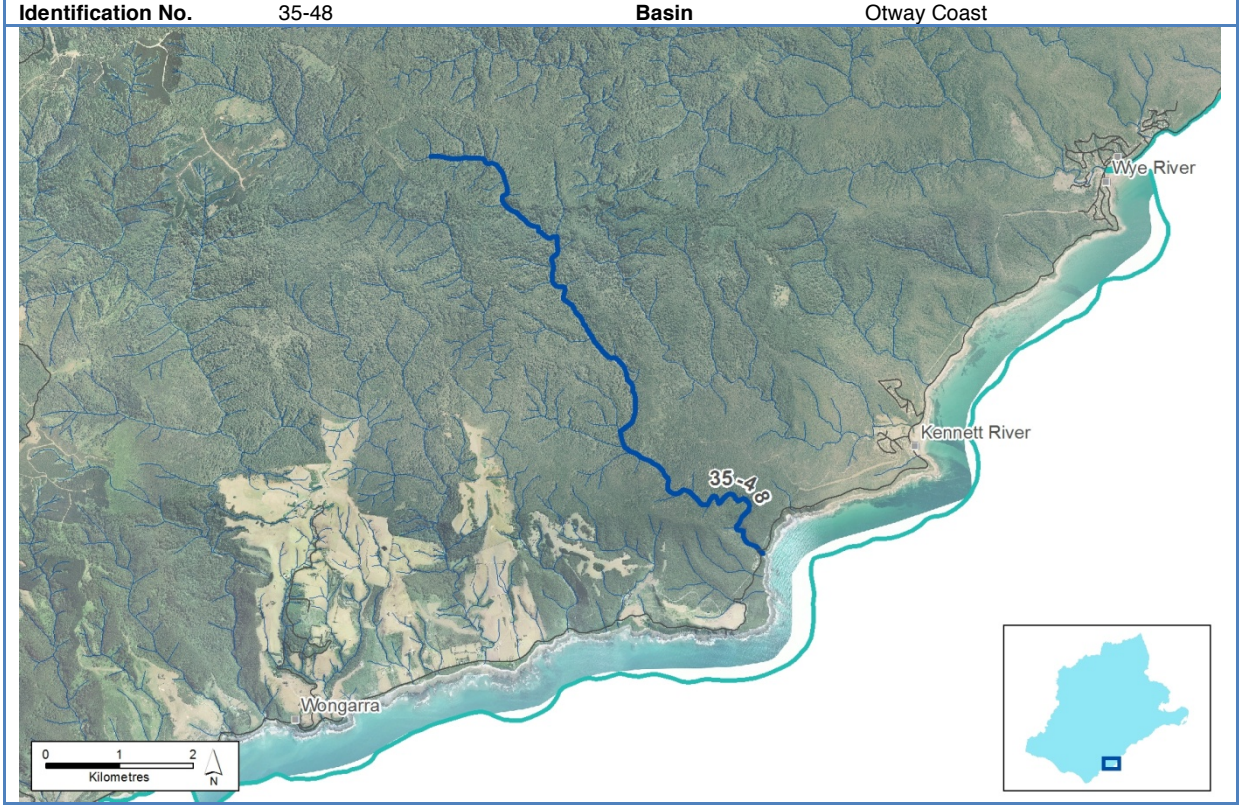
Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 07 - The probability that important Australian Grayling populations become self-sustaining is increased. 17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No artificial barrier to fish migration exists		
Values linked to regional goals	Aqua Invert Comm Cond (5) Native Fish (3) Rip Veg Condition (5) Significant Fish Migratory (4) Camping (5) Picnics and Barbecues (5) Sightseeing (5) Swimming (5) Tracks (5)	**Threats addressed by work program**	Barriers to Fish Migration (0) Disturbance of Acid Sulfate Soils (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Modify culvert crossing - Modify baffles in fishway	1 no.	**CCMA**	Barriers to Fish Migration (0)	a

Estimated cost of activities	$5,000

Grey River

Waterway	Grey River	Landscape Zone	Otway Coast
Identification No.	35-48	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Grey River is a priority under the following regional goals	
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Native Fish	41 Fish index score Statewide Fish Data (Fish Index Scores) 09~10 valid from 1/01/2021
	Rip Veg Condition	The waterway scored 9/10 for the Streamside Zone sub-index in the ISC3 assessment. This sub-index has the following seven indicators: vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (willows/hawthorn)
	Drought Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitat	Known to be an important bird area through Birds Australia
	Significant EVCs	Streamside Zone Sub-Index Score of 9 with known endangered EVC present: Cool Temperate Rainforest
Social	Picnics and Barbeques	Designated picnic/barbecue areas present

Threats

Threat	Details
Invasive Fauna Aquatic	Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program for Grey River

Waterway	Grey River	Identification No.	35-48

Long-term Resource Condition Targets	17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Native Fish (3) Rip Veg Condition (5)	**Threats addressed by Work Program**	N/A

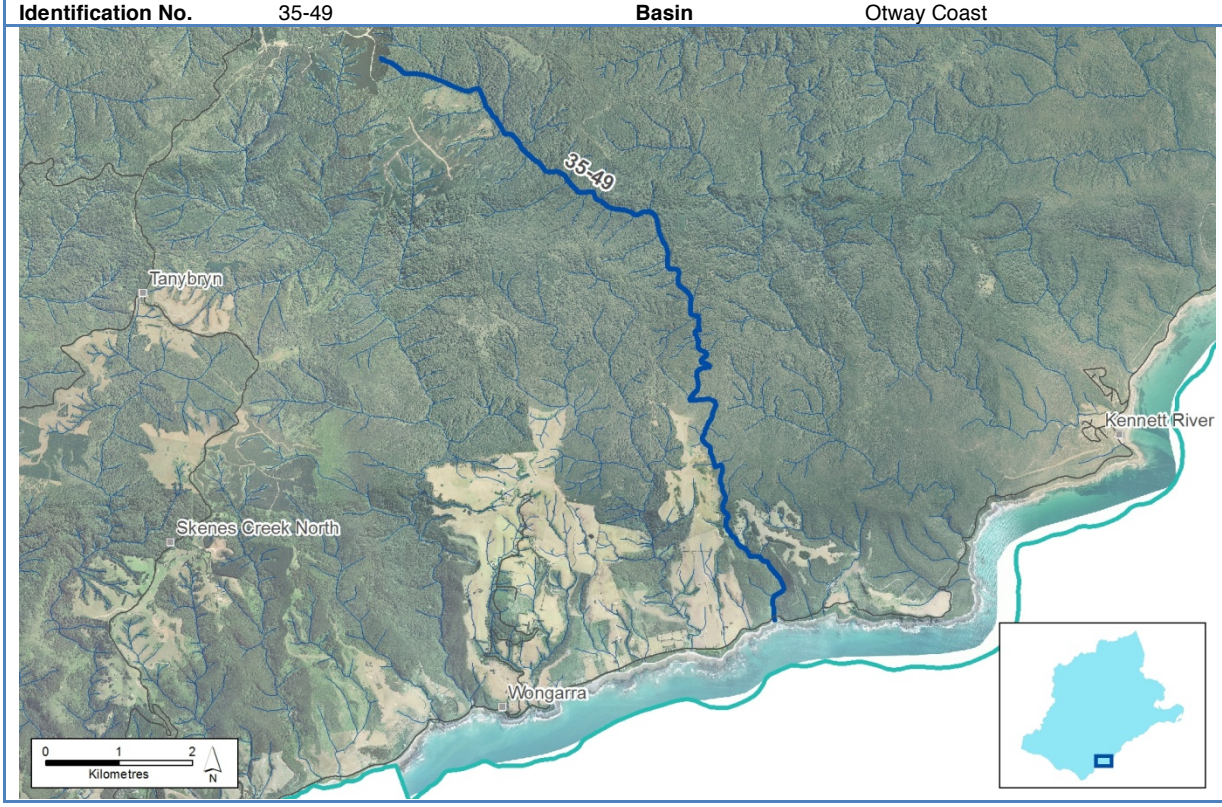
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/ Land manager	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Carisbrook Creek

Waterway	Carisbrook Creek	Landscape Zone	Otway Coast
Identification No.	35-49	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Carisbrook Creek is a priority under the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Rip Veg Condition	The waterway scored 9/10 for the Streamside Zone sub-index in the ISC3 assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (willows/hawthorn)
	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Drought Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitat	Known to be an important bird area through Birds Australia
	Significant EVCs	Streamside Zone Sub-Index Score of 9 with known endangered EVC present: Cool Temperate Rainforest
Social	Walking Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Invasive Fauna Aquatic	Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program for Carisbrook Creek

Waterway	Carisbrook Creek	Identification No.	35-49

Long-term Resource Condition Targets	17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Rip Veg Condition (5) Significant Fish Migratory (4)	**Threats addressed by Work Program**	N/A

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/ Land manager	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Smythes Creek

Waterway	Smythes Creek	Landscape Zone	Otway Coast
Identification No.	35-50	**Basin**	Otway Coast

Links to Regional Goals

Due to its values, is a priority under the following regional goals	
Goal ENV6	Maintain waterways in near natural condition

Key Values

Type	Attribute	Details
Environmental	Aqua Invert Comm Cond	Fails to meet 1 objective where 4 indicators are used for rivers and streams
	Native Fish	60 Fish index score Statewide Fish Data (Fish Index Scores) 09~10 valid from 1/01/2022
	Rip Veg Condition	The waterway scored 9/10 for the Streamside Zone sub-index in the ISC3 assessment. This sub-index has the following seven indicators: Vegetation width, fragmentation, vegetation overhang, large trees, tree and shrub cover, structure and weeds (willows/hawthorn)
	Important Bird Habitat	Known to be an important bird area through Birds Australia
	Significant EVCs	Streamside Zone Sub-Index Score of 9 with known endangered EVC present: Cool Temperate Rainforest

Threats

Threat	Details
Invasive Fauna Aquatic	Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat

Work Program for Smythes Creek

Waterway	Smythes Creek	Identification No.	35-50

Long-term Resource Condition Targets	17 - All environmental values of near natural rivers and estuaries are maintained.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Aqua Invert Comm Cond (4) Native Fish (4) Rip Veg Condition (5)	**Threats addressed by Work Program**	N/A

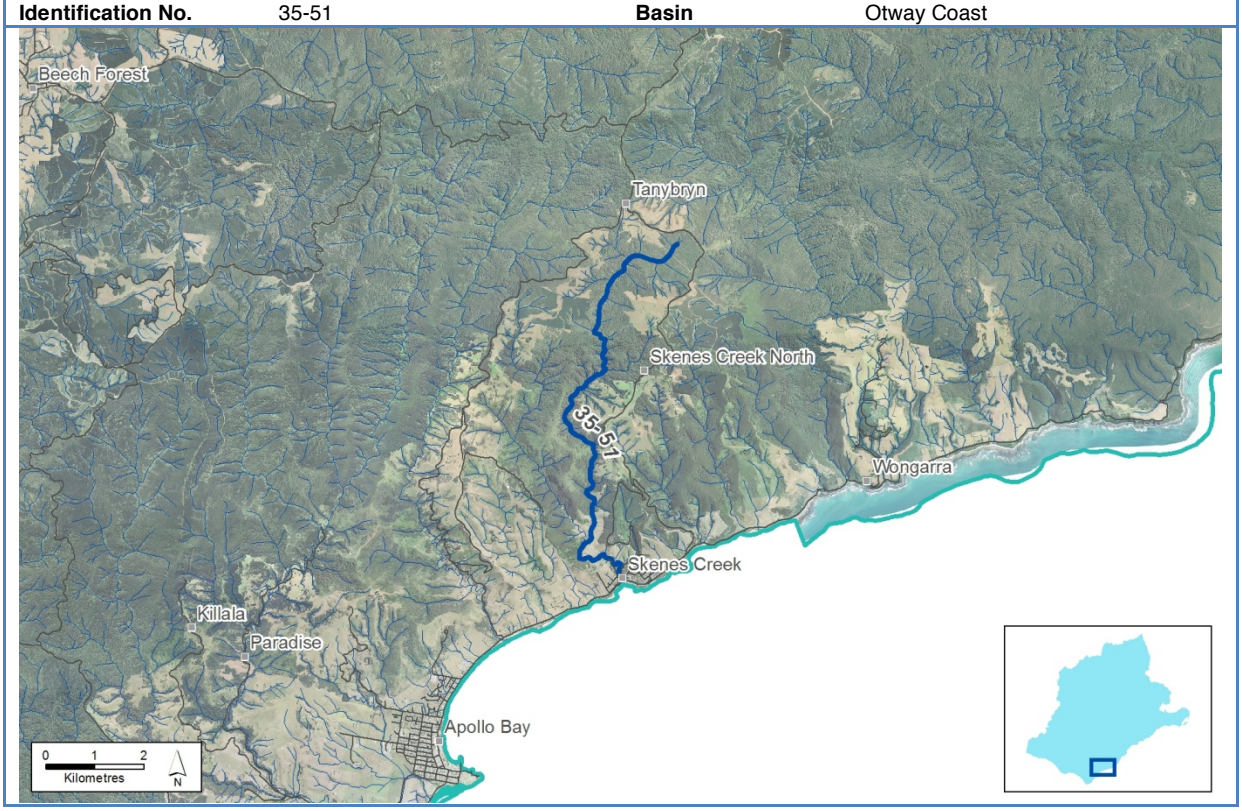
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/Land manager	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention through this strategy. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Skenes Creek

Waterway	Skenes Creek	Landscape Zone	Otway Coast
Identification No.	35-51	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Skenes Creek meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Riparian Forest - Least Concern Wet Forest - Least Concern Cool Temperate Rainforest - Endangered
Social	Tourism	Proximity to the ocean and waterways is an important value of Skenes Creek. Similarly, from a tourism perspective this coastal settlement is synonymous with seaside holidays and lifestyle. It is easily accessible from the Great Ocean Road which is a national tourism resource.

Threats

Threat	Details
Degraded Water Quality	Potential water quality issues identified include: • septic tank and stormwater runoff at Skenes Creek township; and • agricultural runoff. The Colac Otway Shire Stormwater Management Plan identified the following key threats to water quality in Skenes Creek : • unstable waterways and septic discharge – very high threats; and • building site runoff – high threat.
Livestock Access	Livestock access less than 25% of the waterway frontage

Work Program for Skenes Creek

Waterway	Skenes Creek	Identification No.	35-51

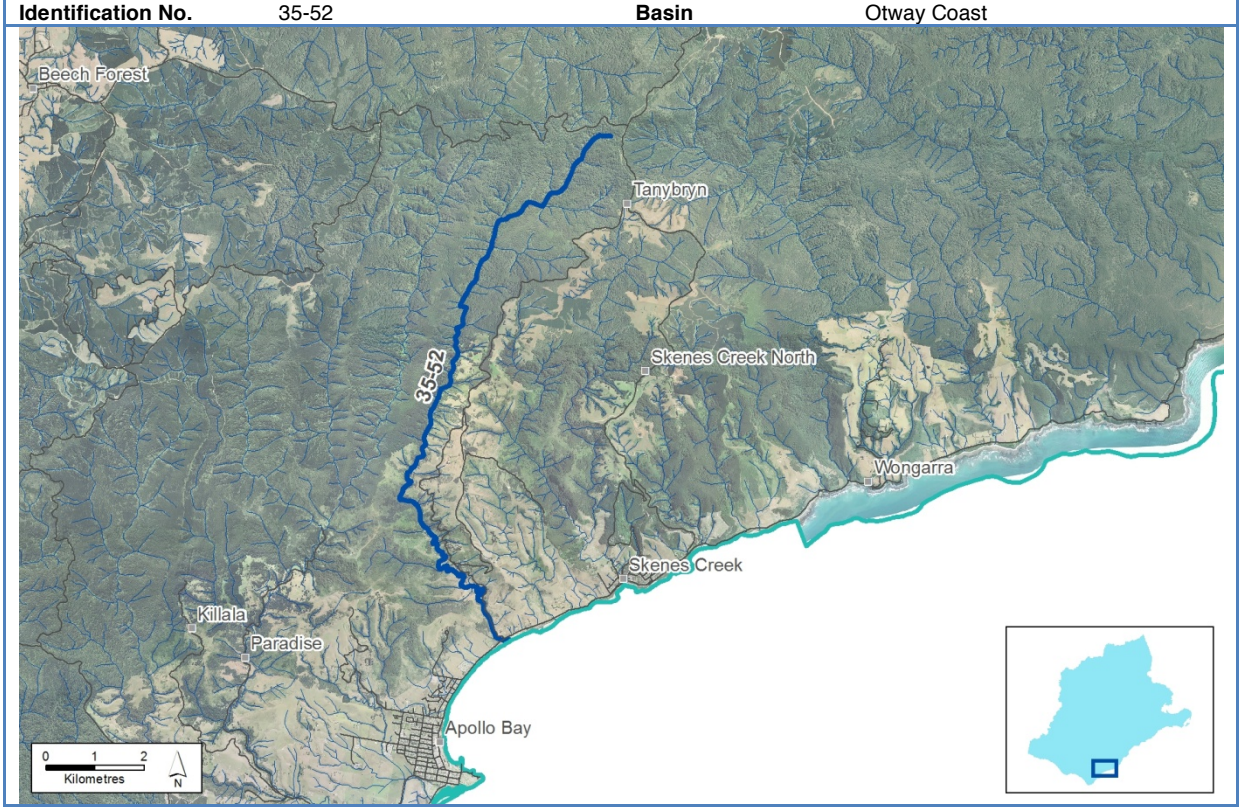
Long-term Resource Condition Targets	07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Livestock have been excluded from over 75% of the waterway frontage		
Values linked to regional goals	Significant Fish Migratory (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Livestock Access (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 4ha of reach frontage (d/s of National Park)	4 ha	**CCMA**/ Land manager, SOLN, OCC	Deg Rip Veg - Large Trees (5)	a
Install riparian fence - 2km (15%) of reach length - 4km frontage	4 km	**CCMA**/ LH, SOLN, OCC	Degraded Water Quality (5), Livestock Access (1)	b, c
Establish stewardship/management agreement	4 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (1)	b, c

Estimated cost of activities	**$118,000**

Wild Dog Creek

Waterway	Wild Dog Creek	Landscape Zone	Otway Coast
Identification No.	35-52	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Wild Dog Creek meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant EVCs	Riparian Forest - Least Concern Wet Forest - Least Concern Cool Temperate Rainforest - Endangered
Social	Sites of Significance	Wild Dog Creek Gorge - Significance: Regional. The geological structures and the physiography of the area are clear examples of the tectonic and erosional processes that have shaped much of the Otways coast.

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Degraded Large Trees	There are very few large trees in the lower parts of the Wild Dog Creek
Livestock Access	Livestock access less than 25% of the waterway frontage, and this is within the lower reach

Work Program for Wild Dog Creek

Waterway	Wild Dog Creek	Identification No.	35-52

Long-term Resource Condition Targets	07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Livestock have been excluded from over 75% of the waterway frontage		
Values linked to regional goals	Significant Fish Migratory (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Livestock Access (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 5ha of reach frontage (d/s of National Park)	5 ha	**CCMA**/ Land manager, SOLN, OCC	Deg Rip Veg - Large Trees (5)	a
Install riparian fence - 2.5km (15%) of reach length - 5km frontage (flood fencing)	5 km	**CCMA**/ LH, SOLN, OCC	Livestock Access (1)	b
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Livestock Access (1)	b

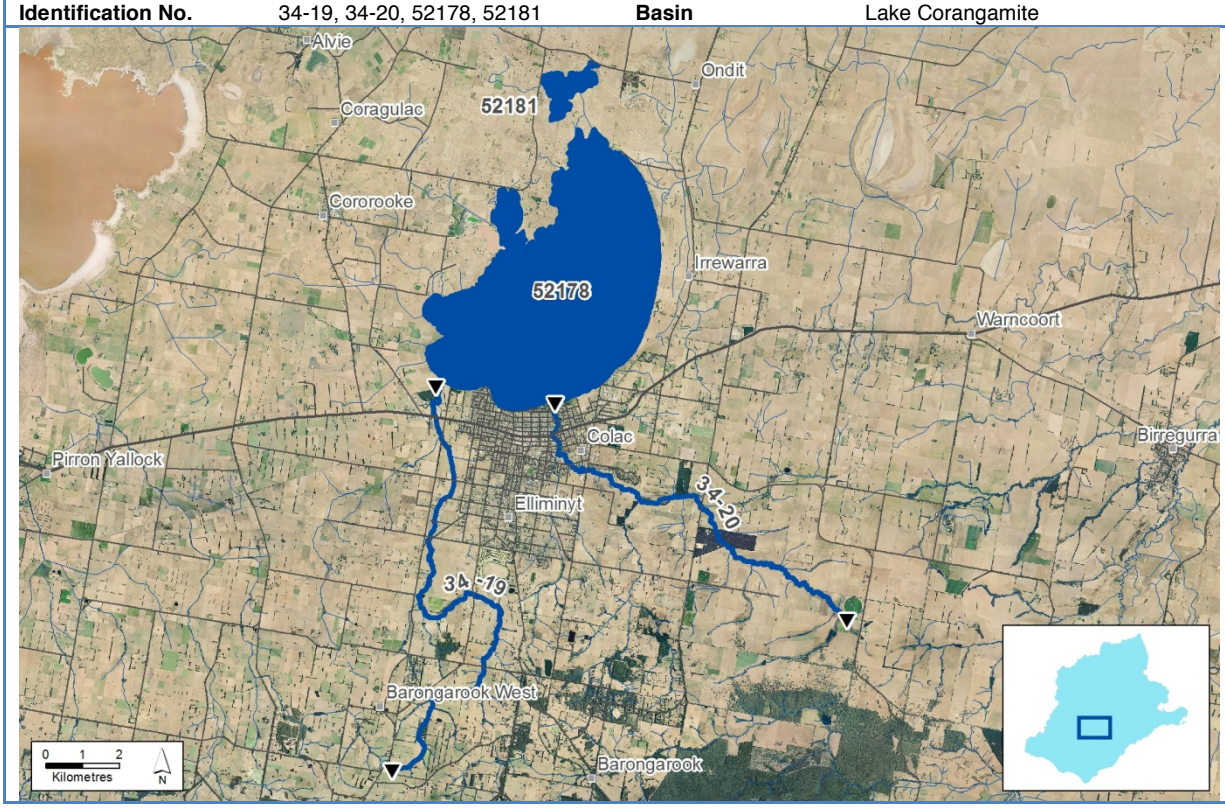
Estimated cost of activities	**$187,500**

8.13 Stony Rises Landscape Zone

Lake Colac, its tributaries and Lake Ondit

Lake Colac is a freshwater lake, located north of the township of Colac. It is a popular destination for recreation including rowing, fishing and sightseeing; although recent times of prolonged drought mean that the Lake is substantially shallower than it has been in the past. .
Two major tributaries flow into Lake Colac from the south, Deans Creek and Barongarook Creek. Barongarook Creek runs through Colac and is valued highly by the local community.
Lake Ondit is a naturally occurring semi-permanent saline lake.

Waterway	Lake Colac, Lake Ondit, Deans Creek, Barongarook Creek	Landscape Zone	Stony Rises
Identification No.	34-19, 34-20, 52178, 52181	**Basin**	Lake Corangamite



Waterway	Deans Creek	Landscape Zone	Stony Rises
Identification No.	34-19	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Dean Creek meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC)
	Significant Birds Riparian	Australasian Shoveler (*Anas rhynchotis*) - Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List)
	Significant EVCs	Riparian Forest - Vulnerable Swamp Scrub - Endangered

Threats

Threat	Details
Degraded Riparian Vegetation	There is an absence of large trees from the riparian zone and the riparian zone is a narrow strip.

Invasive Fauna (Terrestrial)	Foxes are present and actively prey on wildlife
Livestock Access	Livestock access between 25 and 75% of the waterway.

Work Program for Deans Creek

Waterway	**Deans Creek**	**Identification No.**	**34-19**

Long-term Resource Condition Targets	10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Significant Amphibians (5) Significant Birds Riparian (4) Significant Birds Waterway (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Vegetation Width (3)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Establish native indigenous vegetation - 10ha of reach frontage	10 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Deg Rip Veg - Large Trees (5)	a
Install riparian fence - 5km (25%) of reach length - 10km frontage	10 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Livestock Access (3), Reduced Vegetation Width (3)	c, d
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Livestock Access (3), Reduced Vegetation Width (3)	c, d
Establish management plan – Finalise and implement Colac Integrated Water Cycle Management Plan – Not costed.	1 no.	**COS**/ DEPI, CCMA, BW, LCCC	(see 52178 - Lake Colac)	

Estimated cost of activities	**$181,000**

Waterway	Barongarook Creek	Landscape Zone	Stony Rises
Identification No.	34-20	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Barongarook Creek meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Magpie Goose (*Anseranas semipalmata*) - Status: Near Threatened (Adv List); Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List)
	Significant EVCs	Swamp Scrub - Endangered Swampy Riparian Woodland - Endangered
Social	Tracks	A formed path through Colac, lines Barongarook Creek to Lake Colac
	Picnics and Barbeques	There are a number of formal areas for picnics and barbeques along the Barongarook Creek in Colac.

Threats

Threat	Details
Degraded Riparian Vegetation	The riparian zone is patchy with limited large trees and areas of native vegetation with low connectivity
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain coastal acid sulfate soils
Increase in Proportion of Zero Flow	Stream flows in the catchment are affected by the farm dams
Invasive Fauna Terrestrial	Foxes are present and actively prey on wildlife
Livestock Access	Livestock access between 25 and 75% of the waterway frontage

Work Program for Barongarook Creek

Waterway	Barongarook Creek	Identification No.	34-20

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - The proportion of zero flow threat score has been maintained at moderate d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Invasive riparian flora (shrub layer) threat has reduced from moderate to low f - Livestock have been excluded from over 50% of the waterway frontage g - Riparian vegetation longitudinal continuity has improved from poor to moderate		
Values linked to regional goals	Significant Birds Riparian (4) Significant Birds Waterway (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Inc in Prop of Zero Flow (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Shrub Layer (3) Livestock Access (3) Reduced Riparian Connectivity (4

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Assess streamflow - Finalise and implement Colac Integrated Water Cycle Management Plan – Not costed.	N/A	**COS**/ DEPI, CCMA, BW, LCCC	Inc in Prop of Zero Flow (3)	c

Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	d
Establish woody weed control - gorse, blackberry	10 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Invasive Flora (Riparian) - Shrub Layer (3)	e
Establish native indigenous vegetation - 10ha of frontage	10 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Bank Instability (3), Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (4)	a, b, g
Install riparian fence - 5km (33%) of reach length - 10km frontage	10 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Bank Instability (3), Livestock Access (3), Reduced Riparian Connectivity (4)	a, f, g
Establish stewardship/management agreement	10 ha	**Land manager**/ CCMA	Bank Instability (3), Livestock Access (3), Reduced Riparian Connectivity (4)	a, f, g

Estimated cost of activities	**$566,000**

Waterway	Lake Colac	Landscape Zone	Stony Rises
Identification No.	52178	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Colac meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Freckled Duck (*Stictonetta naevosa*) - Endangered
	Significant Reptiles Riparian	Corangamite Water Skink (*Eulamprus tympanum*) - Endangered
Social	Camping	Serviced campground adjacent to waterway* or multiple campsites with basic facilities adjacent to waterway
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Sightseeing	Sightseeing destination with high visitor numbers
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
Economic	Wastewater Discharge	Water is discharged into Lake Colac from industry and from the sewerage treatment plant.

Threats

Threat	Details
Changed Water Regime	Lake Colac is impacted by drainage through the Lough Calvert Drainage Scheme

Work Program for Lake Colac

Waterway	Lake Colac	Identification No.	52178

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - The wetland buffer vegetation has been investigated and management planning is underway c - Invasive wetland flora threat has reduced from moderate to low		
Values linked to regional goals	Significant Reptiles Riparian (5) Camping (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Tracks (5) Significant Birds (5)	Threats addressed by work program	Changed Water Regime (3) Degraded Buffer (-1) Invasive Flora (Wetland) (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation	2 ha	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (-1)	b
Establish management plan – Finalise and implement Colac Integrated Water Cycle Management Plan	1 no.	**COS**/ DEPI, CCMA, BW, LCCC	Changed Water Regime (3)	a
Install wetland fence	2 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (-1), Invasive Flora (Wetland) (3)	b, c
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (-1), Invasive Flora (Wetland) (3)	b, c

Estimated cost of activities	**$109,000**

Waterway	Lake Ondit	Landscape Zone	Stony Rises
Identification No.	52181	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Ondit meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Fauna	Corangamite Water Skink (*Eulamprus tympanum*) have been observed at Lake Ondit.
Social	Landscape	The site is covered by a significant landscape overlay

Threats

Threat	Details
Degraded Buffer	The Index of Wetland Condition indicates very poor buffer condition
Degraded Water Quality	The Index of Wetland Condition indicates moderate water quality
Invasive Fauna Terrestrial	Foxes are present with no significant impacts
Livestock Access to Buffer	25 to 75% of waterway is affected by livestock access

Work Program for Lake Ondit

Waterway	Lake Ondit	Identification No.	52181

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Significant Reptiles Riparian (5)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (2) Livestock Access to Buffer (3)

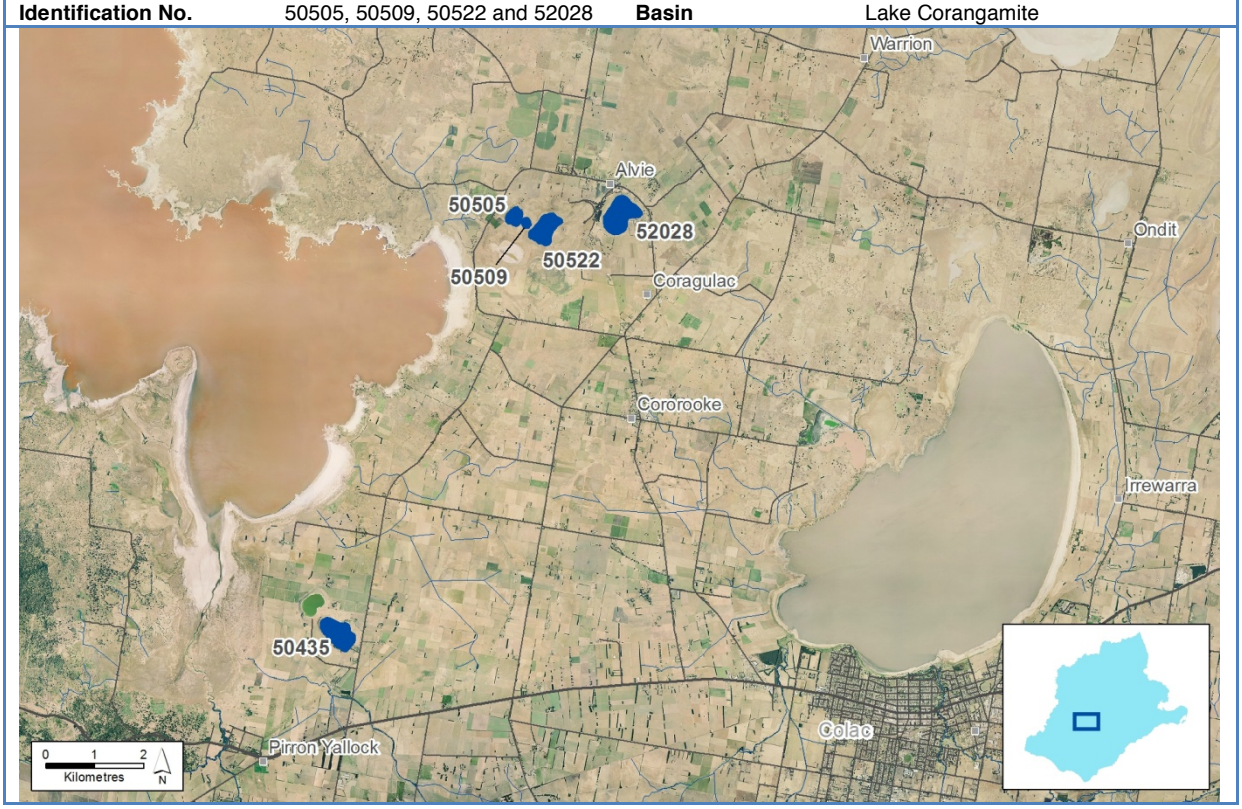
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Fauna (Terrestrial) (2)	a, c
Establish native indigenous vegetation	3 ha	**CCMA**, **Land manager/**GA, Landcare-Community Groups	Degraded Water Quality (3)	b
Install wetland fence	3 km	**CCMA**/ LH, GA, Landcare-Community Groups GA/COS	Degraded Buffer (5), Degraded Water Quality (3), Livestock Access to Buffer (3)	a, b, d
Establish stewardship/management agreement	3 ha	**Land manager**/ CCMA	Degraded Buffer (5), Degraded Water Quality (3), Livestock Access to Buffer (3)	a, b, d

Estimated cost of activities	**$58,500**

Red Rock Lakes and the Basins

Lakes Coragulac, Purdiguluc, Gnalinegurk and Werowrap, one unnamed lake and The Basins consist of two groups of volcanic lakes of varying size and depth which lie in adjacent volcanic complexes known respectively as the Red Rock Lakes and The Basins. With the exception of Lake Coragulac and one small freshwater meadow, these wetlands are saline. All of these wetlands are fed by groundwater discharge and have internal drainage thus having no flood effects.

Waterway	Red Rock Lakes and The Basins	Landscape Zone	Stony Rises
Identification No.	50505, 50509, 50522 and 52028	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Unnamed wetland (50505) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50509) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Werowrap meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Lake Coragulac meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values of Red Rock Lakes and the Basins

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	The criteria for determining Red Rock Lakes and The Basins' eligibility for inclusion in the Directory of Important Wetlands are; • It is a good example of a wetland type occurring within a biogeographic region in Australia. • The wetland is of outstanding historical or cultural significance

Environmental	Significant Reptiles Riparian	Corangamite Water Skink (*Eulamprus tympanum*) have been observed at the Red Rock Lakes
	Significant Birds	Up to 520 Hoary-headed Grebes (*Poliocephalus poliocephalus)* have been recorded at The Basins (East) and up to 510 Black Swans (*Cygnus atratus)* and 660 Eurasian Coots (*Fulica atra)* have been recorded at Lake Coragulac. Breeding: There is an occasionally active Silver Gull nesting colony at Lake Werowrap
	Drought Refuge	Permanent water supplies in these wetlands provide drought refuges for wildlife.
Social	Picnics and barbeques	The Red Rock Lakes complex is overlooked by a tourist lookout at Red Rock with associated car park and tourist information
	Aboriginal heritage	Aboriginal heritage values are very high

Threats

Threat	Details
Invasive Fauna (Terrestrial)	Invasive fauna species are present and directly prey on native species or damage habitat
Degraded Buffer	Grazing around lake edges, Scoria mine workings at Lakes Coragulac and Purdiguluc
Degraded Water Quality	Pollution from a tip site at Lake Coragulac

Work Program for Unnamed wetland (50505)

Waterway	Unnamed wetland (50505)	Identification No.	50505

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Significant EVCs (4) Significant Reptiles Riparian (5) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (4) Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	c
Implement best management practice on grazing properties - Not costed – refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, Landcare-Community Groups, DEPI	Degraded Water Quality (4)	b
Establish management agreement – controlled grazing regime	2 ha	**CCMA**/ LH, Landcare-Community Groups	Degraded Buffer (5)	a
Establish native indigenous vegetation	1 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (4)	a, b
Install wetland fence	0.5 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (5)	a
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a

Estimated cost of activities	$25,000

Work Program for Unnamed wetland (50509)

Waterway	Unnamed wetland (50509)	Identification No.	50509

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 14 - The condition of values of nationally important wetlands are maintained or improved		
Management Outcome Targets (MOTs)	d - The wetland buffer vegetation has improved from very poor to moderate condition e - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period f - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) g - Invasive wetland flora threat has reduced from very high to moderate h - Livestock have been excluded from over 50% of the waterway frontage i - IWC soil sub-index score is moderate		
Values linked to regional goals	Significant EVCs (4) Significant Reptiles Riparian (5) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (4) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5) Livestock Access to Buffer (3) Soil Disturbance (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed – refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ LH, Landcare-Community Groups, DEPI	Degraded Water Quality (4)	e
Establish management agreement – controlled grazing regime	0.5 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Invasive Flora (Wetland) (5), Soil Disturbance (5)	d, g, i
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	f
Establish native indigenous vegetation	2 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (4)	d, e
Install wetland fence	0.5 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3), Soil Disturbance (5)	d, g, h, i
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3), Soil Disturbance (5)	d, g, h, i

Estimated cost of activities	**$42,000**

Work Program for Lake Werowrap

Waterway	Lake Werowrap	Identification No.	50522

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from very high to moderate e - IWC soil sub-index score is moderate		
Values linked to regional goals	Significant EVCs (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (4) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5) Soil Disturbance (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	5 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Degraded Water Quality (4), Invasive Flora (Wetland) (5), Soil Disturbance (5)	a, a, b, d, e
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Fauna (Terrestrial) (5)	a, c
Establish native indigenous vegetation	4 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (4), Invasive Fauna (Terrestrial) (5)	a, b, c
Install wetland fence	2 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (4), Invasive Flora (Wetland) (5), Soil Disturbance (5)	a, b, d, e
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5), Degraded Water Quality (4), Invasive Flora (Wetland) (5), Soil Disturbance (5)	a, b, d, e

Estimated cost of activities	**$93,000**

Work Program for Lake Coragulac

Waterway	Lake Coragulac	Identification No.	52028

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period		
Values linked to regional goals	Significant Reptiles Riparian (5)	**Threats addressed by work program**	Degraded Water Quality (5)

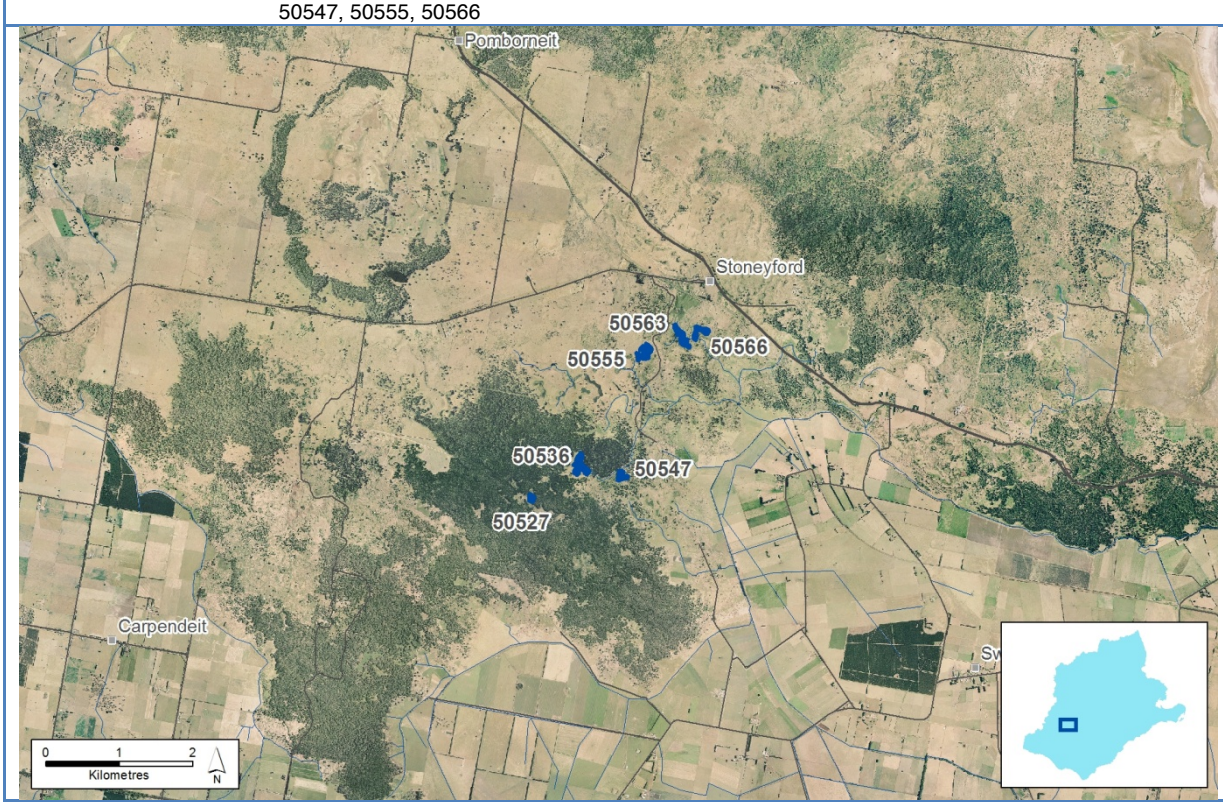
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation	6 ha	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Water Quality (5)	a
Establish stewardship/management agreement	6 ha	**Land manager**/ CCMA	Degraded Water Quality (5)	a

Estimated cost of activities	**$81,000**

Stonyford-Bungador wetlands

A relatively undisturbed system containing sinuous swamps and drainage lines, wide basins, hollows and perched swamps within a diverse geological landscape known as the "Stony Rises". There is an assortment of freshwater meadows and shallow freshwater marshes along natural drainage lines, in wide basins and steep hollows due to varied topography of stony rise formations of the newer volcanics. This network of wetlands is largely contained on private land with the exception of the Bungador Flora and Fauna Reserve. The system is important for water storage and contains mainly closed basins with only a few artificially and naturally connected wetlands.

Waterway	Stonyford-Bungador wetlands	Landscape Zone	Stony Rises
Identification No.	50527, 50563, 50536, 50547, 50555, 50566	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Unnamed wetland (50527) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50536) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50547) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50555) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50563) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (50566) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	Criteria for listing as a Nationally Important Wetland: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia.
Environmental	Significant Birds	Some bird species associated with this system include Baillon's Crake (*Porzana pusilla)* (Si) and relatively large numbers of Marsh Harrier (*Circus aeruginosus*). The Australasian Bittern (*Botaurus poiciloptilus)* (Si) has been recently recorded in this system.
	Important Bird Habitats	Important Bird Area.
	Wetland Vegetation Condition	The system has an unusual number of intact wetlands in mainly uncleared forest including Swamp Gum (*Eucalyptus ovate)* forest over mainly Tree Everlasting (*Helichrysum dendroideum)*. It has a diverse remnant flora and fauna.
	Flora	This system contains a diverse wetland flora including a high number of sedge species (*Cyperaceae*), grasses and rushes (Juncaceae). Some wetlands are fringed by Swamp Gum (*Eucalyptus ovate*) with Tree Everlasting (*Helichrysum dendroideum*) or Woolly Tea-tree (*Leptospermum lanigerum*).
Social	Hunting	These wetland are used for duck hunting
	Nature conservation	Many of these wetlands are being managed by private landholders for their conservation values.

Threats

Threat	Details
Degraded Buffer	Livestock grazing
Invasive Fauna (Terrestrial)	Pest animals – including feral goats and pigs

Work Program for Unnamed wetland (50527)

Waterway	Unnamed wetland (50527)	Identification No.	50527

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has been maintained in excellent condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Important Bird Habitats (5)	**Threats addressed by work program**	Degraded Buffer (1) Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install wetland fence	0.5 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (1)	a
Establish stewardship/management agreement	0.5 ha	**Land manager**/ CCMA	Degraded Buffer (1)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI(Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b

Estimated cost of activities	**$8,000**

Work Program Unnamed wetland (50536)

Waterway	Unnamed wetland (50536)	Identification No.	50536

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Significant EVCs (5) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (4) Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	2 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (4)	a
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (4)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI(Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	0.5 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (4)	a

Estimated cost of activities	**$11,500**

Work Program Unnamed wetland (50547)

Waterway	Unnamed wetland (50547)	Identification No.	50547

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - IWC soil sub-index score is moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (5) Wetland Vegetation Condition (5)	**Threats addressed by work program**	Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Soil Disturbance (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install wetland fence	0.5 km	**CCMA**/Land manager	Degraded Water Quality (3)	a
Establish stewardship/management agreement	0.5 ha	**Land manager**/ CCMA	Degraded Buffer (1)	a
Establish management agreement – controlled grazing regime	1 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (1)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b

Estimated cost of activities	**$11,500**

Work Program Unnamed wetland (50555)

Waterway	Unnamed wetland (50555)	Identification No.	50555

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from moderate to low e - Livestock have been excluded from over 25% of the waterway frontage f - IWC soil sub-index score is moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (5) Soil Disturbance (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	2 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Soil Disturbance (5), Livestock Access to Buffer (5)	a, b, d, e, f
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	c
Install wetland fence	1 km	**CCMA**/ Land manager, GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Livestock Access to Buffer (5), Soil Disturbance (5)	a, b, d, e, f

Estimated cost of activities	**$19,500**

Work Program Unnamed wetland (50563)

Waterway	Unnamed wetland (50563)	Identification No.	50563

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from moderate to low e - Livestock have been excluded from over 25% of the waterway frontage f - IWC soil sub-index score is moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (5) Soil Disturbance (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	2 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Soil Disturbance (5)	a, b, d, f
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation	1 ha	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3)	a, b
Install wetland fence	0.5 km	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Livestock Access to Buffer (5), Soil Disturbance (5)	a, b, d, e, f

Estimated cost of activities	$25,000

Work Program Unnamed wetland (50566)

Waterway	Unnamed wetland (50566)	Identification No.	50566

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from moderate to good condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from moderate to low e - Livestock have been excluded from over 25% of the waterway frontage f - IWC soil sub-index score is moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (5) Wetland Vegetation Condition (4)	**Threats addressed by work program**	Degraded Buffer (3) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (3) Livestock Access to Buffer (5) Soil Disturbance (5)

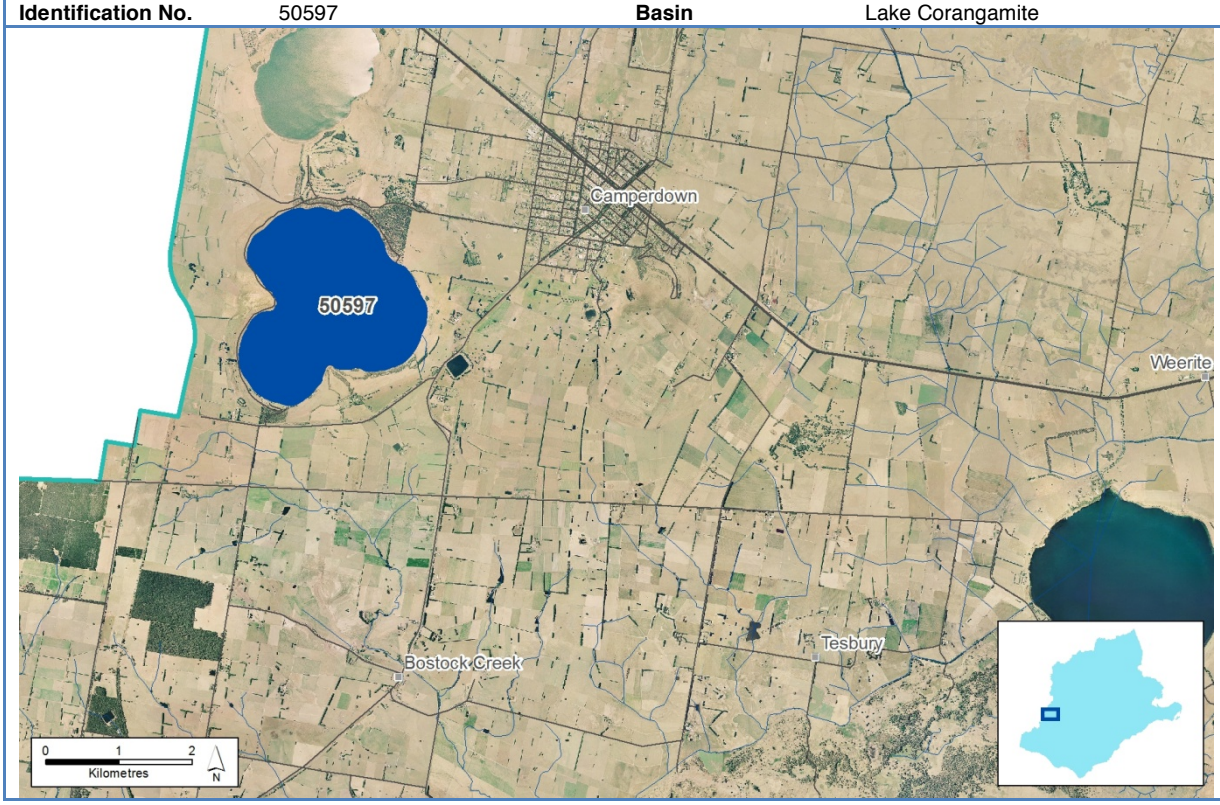
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	2 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (3), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Soil Disturbance (5)	a, b, d, f
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	c
Install wetland fence	1 km	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (3), Degraded Water Quality (3), Invasive Flora (Wetland) (3), Livestock Access to Buffer (5), Soil Disturbance (5)	a, b, d, e, f

Estimated cost of activities	**$19,500**

Lake Bullen Merri

Lake Bulleen Merri is a brackish crater lake located south of Camperdown. The Lake has a maximum depth of 66 metres. The Lake is a very popular destination for fishing and boating.

Waterway	Lake Bullen Merri	Landscape Zone	Stony Rises
Identification No.	50597	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Lake Bullen Merri meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values

Key Values

Type	Attribute	Details
Social	Camping	There is a caravan park on the lake foreshore
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Sightseeing	Sightseeing destination with high visitor numbers
	Motor Boating	Popular for water skiing and fishing

Threats

Threat	Details
Degraded Water Quality	Algal Blooms occur every 1 to 2 years on average
Invasive Fauna (Terrestrial)	Foxes are present and prey on native wildlif
Soil Disturbance	The Index of Wetland Condition Soil Disturbance rating indicates poor condition

Work Program for Lake Bullen Merri

Waterway	Lake Bullen Merri	Identification No.	50597

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - IWC soil sub-index score is moderate		
Values linked to regional goals	Camping (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5)	**Threats addressed by work program**	Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Soil Disturbance (4)

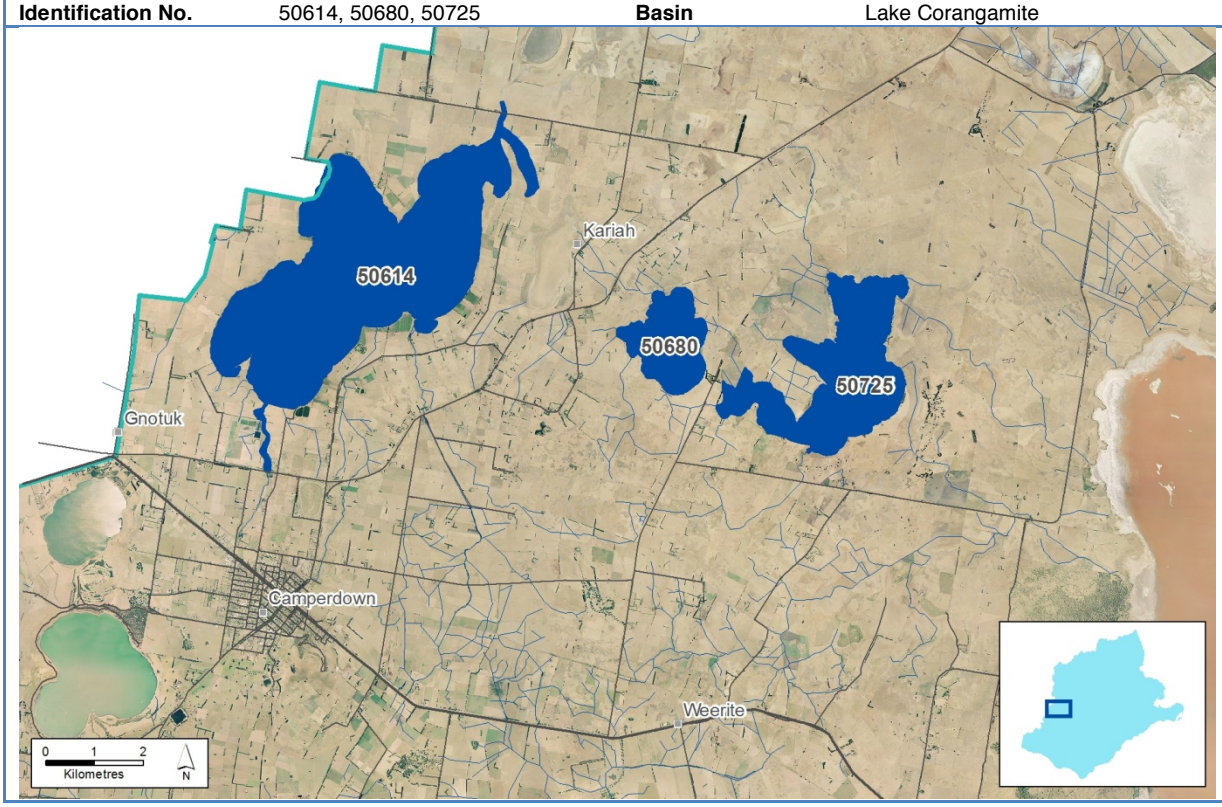
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install wetland fence	2 km	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Soil Disturbance (4)	c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Establish native indigenous vegetation	10 ha	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Degraded Water Quality (5), Soil Disturbance (4)	a, c
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Soil Disturbance (4)	a, c

Estimated cost of activities	**$167,000**

Lakes Colongulac, Koreetnung and Weeranganuk

Lake Colongulac is situated north of Camperdown. It is 1,460 ha in size and is considered to be a saline lake. It is one of nine lakes included within the Western District Lakes Ramsar Site.
Lakes Koreetnung and Weeranganuk are found on the western side of Lake Corangamite and consist of both permanent and semi-permanent saline wetlands.

Waterway	Lake Colongulac, Lake Koreetnung and Lake Weeranganuk	Landscape Zone	Stony Rises
Identification No.	50614, 50680, 50725	**Basin**	Lake Corangamite



Waterway	Lake Colongulac	Landscape Zone	Stony Rises
Identification No.	50614	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Colongulac is one of nine wetlands that form the Western District Lakes Ramsar Site. It is a permanent brackish-saline lake, part of a closed drainage system formed in a shallow depression between larval flows on the basalt plains.
	Nationally Important Wetland	Lake Colongulac was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Drought Refuge	As a permanent brackish-saline lake, Lake Colongulac is considered to be a high value wetland for avifauna.
	Important Bird Habitat	Twenty-five waterbird species have been recorded at this wetland.

		Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided): • Australasian Shoveler (*Anas rhynchotis*) – 2,055 • Great Crested Grebe (*Podiceps cristatus*) – 2,000
	Significant Birds	Lake Colongulac supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as endangered (EN) or vulnerable (VU): • Australasian Shoveler (*Anas rhynchotis)* (VU). Habitat[20]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Eastern Great Egret (*Ardea modesta*) (VU). Habitat[21]: a wide range of wetland habitats (e.g. swamps and marshes; margins of rivers and lakes; damp or flooded grasslands). The species usually frequents shallow waters. • Freckled Duck (*Stictonetta naevosa*) (EN). Habitat[22]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[23]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata*) (VU). Habitat: permanent swamps with dense vegetation.
	Significant Reptiles (Riparian)	Corangamite Water Skink (*Eulamprus tympanum marnieae*)
Social	Recreational fishing	Fishing is popular at Lake Colongulac. Contains short-finned eel and common galaxias. Surveys in 2000 failed to catch any brown trout and rainbow trout from earlier releases.
	Hunting	Duck hunting is popular at Lake Colongulac

Threats

Threat	Details
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Invasive Flora (Wetland)	Tall Wheat-grass is present
Livestock Access to Buffer	Approximately 90% of the lake margins within the Western District Ramsar Site are grazed and livestock access has been implicated in increasing the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011)
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Changed Water Regime	Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).
Resource Utilisation	At the time of listing, duck hunting occurred and continues to occur on Lake Colongulac; however the impact of the activity has not been assessed. The main types of impacts from hunting, aside from taking of ducks, include accidental shooting of protected species and disturbance to the habitat and fauna.

[20] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[21] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1004#habitat
[22] http://bird.net.au/bird/index.php?title=Freckled_Duck
[23] http://www.birdlife.org.au/bird-profile/hardhead

Work Program for Lake Colongulac

Waterway	Lake Colongulac	Identification No.	50614

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation. 13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – near permanent wetland drying for no more than twelve months in any five year period (not feasible to address through this work program) LAC2 – Salinity – saline (5 to 50 parts per thousand) (not feasible to address through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3 and LAC4) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Invasive wetland flora threat has reduced from high to moderate (also addresses LAC3) d - Livestock have been excluded from over 50% of the waterway frontage (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Reptiles Riparian (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (4) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control	12 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, c
Establish native indigenous vegetation	12 ha	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	12 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, c, d
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, c, d

Estimated cost of activities	**$378,000**

Waterway	Lakes Koreetnung and Weeranganuk	Landscape Zone	Stony Rises
Identification No.	50680 and 50725	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Lake Koreetnung meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Lake Weeranganuk meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Fauna	Corangamite Water Skink (*Eulamprus tympanum marnieae*) have been observed at Lakes Weeranganuk, and Koreetnung.
	Important Bird Area	A site of global bird conservation importance and is a priority area for bird conservation.
	Significant Birds	Musk Duck (*Biziura lobata*)- Vulnerable
Social	Game Hunting	Game Hunting is permitted

Threats

Threat	Details
Invasive Fauna Terrestrial	Foxes are present and actively prey on wildlife
Degraded Buffer	Not scored in AVIRA
Invasive Flora (Wetland)	Not scored in AVIRA

Work Program for Lakes Koreetnung

Waterway	Lakes Koreetnung	Identification No.	50680

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has been investigated and management planning is underway b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - The extent of the invasive wetland flora threat is understood and management planning is underway		
Values linked to regional goals	Significant Reptiles Riparian (5)	**Threats addressed by work program**	Degraded Buffer (-1) Invasive Fauna (Terrestrial) (2) Invasive Flora (Wetland) (-1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/CCMA, DEPI (Biosecurity), Landcare-Community Groups	Degraded Buffer (-1), Invasive Fauna (Terrestrial) (2)	a, b
Establish non-woody weed control	14 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Degraded Buffer (-1), Invasive Flora (Wetland) (-1)	a, c

Estimated cost of activities	**$28,000**

Work Program for Lake Weeranganuk

Waterway	Lake Weeranganuk	Identification No.	50725

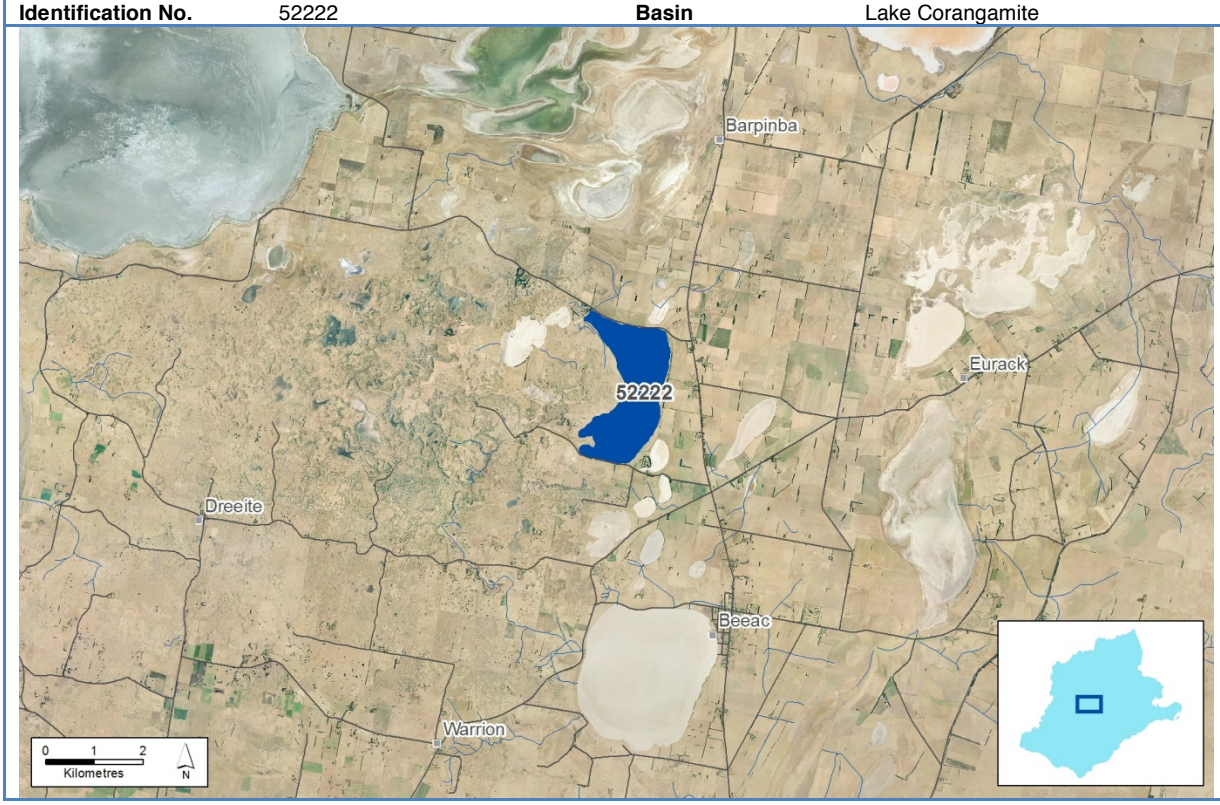
Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 09 - All extant populations of the Corangamite Water Skink are maintained in systems of reserves and/or areas managed specifically for their conservation.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat is maintained at a very low threat level e - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Significant Reptiles Riparian (5)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (2) Invasive Flora (Wetland) (1) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (2)	c
Establish non-woody weed control	14 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (1)	a, d
Install wetland fence	7 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3), Livestock Access to Buffer (3)	a, b, e
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Degraded Buffer (5), Degraded Water Quality (3), Livestock Access to Buffer (3)	a, b, e

Estimated cost of activities	**$140,000**

Horseshoe Lake (Lake Cundare)

Waterway	Horseshoe Lake	Landscape Zone	Stony Rises
Identification No.	52222	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Horseshoe Lake meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Significant Wetland	Horseshoe Lake is part of the Lake Cundare system.
	Ramsar	Western District Lakes Ramsar Site (listed as Lake Cundare).
Environmental	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	A site of global bird conservation importance and is a priority area for bird conservation.
	Significant Birds	Australasian Shoveler (*Anas rhynchotis*) – Vulnerable Whiskered Tern *(Chlidonias hybrida)* – Near Threatened
	Significant EVCs	
	Significant Flora Wetland	Spiny Peppercress *(Lepidium aschersonii*) is listed nationally as vulnerable

Threats

Threat	Details
Degraded Buffer	The wetland buffer is in very poor condition.
Invasive Fauna Terrestrial	Foxes are present and directly prey on native species.
Livestock Access to Buffer	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. Livestock access can potentially increase the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011).

Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.
Changed Water Regime	Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).

Work Program for Horseshoe Lake

Waterway	**Horseshoe Lake**	**Identification No.**	**52222**

Long-term Resource Condition Targets	13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – intermittent wetlands drying seasonally but having water for at least a few months of each year (not feasible to address through this work program) LAC2 – Salinity – hypersaline, greater than 50 parts per thousand (not feasible to address through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Invasive wetland flora threat is maintained at a very low threat level (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (4) Significant Birds (4) Significant Flora Wetland (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (1)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish non-woody weed control	10 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (1)	a, c
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	1 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5)	a
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5)	a

Estimated cost of activities	**$43,000**

Lake Beeac

Lake Beeac is situated south-west of Beeac. It is a 662 ha, hyper saline lake. It is one of the nine lakes included in the Western District Lakes Ramsar Site.

Waterway	Lake Beeac	Landscape Zone	Stony Rises
Identification No.	52225	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Beeac is a high value wetland for its ecological and educational features. It is a shallow lake with a high production of brine shrimps and ostracods, a food source which has supported internationally significant numbers of Banded Stilt (*Cladorhynchus leucocephalus*). The Spiny Peppercress (*Lepidium aschersonii*) (a perennial herb listed as endangered in Victoria and across Australia) grows on the margins of the lake.
	Nationally Important Wetland	Lake Beeac was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: • It is a good example of a wetland type occurring within a biogeographic region in Australia. • It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. • The wetland supports 1% or more of the national populations of any native plant or animal taxa. • The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitat	Nineteen waterbird species have been recorded at this wetland. The waterway is known to occasionally support large numbers of waterbirds with more than 20,000 birds recorded on occasion (Hale and Butcher, in prep). Internationally significant numbers (> 1% of the relevant population have been recorded for Banded Stilt (*Cladorhynchus leucocephalus*) with a maximum count of 50,000

		birds on two occasions.
	Significant Birds	No birds listed under international migratory agreements or threatened waterbird species have been recorded at Lake Beeac.
	Significant Wetland Flora	The Spiny Peppercress (*Lepidium aschersonii*) (listed as vulnerable under the *EPBC Act 1999* and listed under the *Flora and Fauna Guarantee Act*) has been recorded.
Social	Sightseeing	Lake Beeac is part of the Lakes and Craters tourist trail.

Threats

Threat	Details
Degraded Buffer	The wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Changed Water Regime	This is currently considered a low threat, there is however potential for future threats. Warrion Water Supply Protection Area covers the surficial, unconfined aquifer that supplies part of the water for Lake Corangamite to the west and Lake Beeac to the east. The status of the water aquifer has been defined as declining, with current licensed entitlements equivalent to the PCV (permissible consumptive volume). Continued extraction at current license limits into the future (considering the likely impacts of climate change) could result in further decreased inflows to the lakes of the Ramsar Site (Hale and Butcher 2011). Climate change can potentially alter the water regime of the Ramsar Site. Modelling suggests that there is likely to be lower water levels leading to increased salinity (Hale and Butcher 2011). A decrease in the number and area of permanent and seasonal wetlands and an increase in the number and area of intermittent wetlands (DEPI 2013d).
Livestock Access to Buffer	Approximately 90% of the lake margins within the Western District Ramsar Site are grazed and livestock access has been implicated in increasing the susceptibility of the lake margins to erosion and can degrade the buffer vegetation (Hale and Butcher 2011)
Degraded Water Quality	Identified as a low threat at current, but monitoring is required to ensure the threat does not increase. The lake is a terminal system and is a sink for pollutants, there is potential for input of pollutants from urbanisation and agriculture. Algal blooms can occur.

Work Program for Lake Beeac

Waterway	Lake Beeac	Identification No.	52225

Long-term Resource Condition Targets	13 - The ecological character of Ramsar wetlands is maintained or improved. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology – intermittent wetlands drying seasonally but having water for at least a few months of each year (not feasible to address through this work program) LAC2 – Salinity – hypersaline, greater than 50 parts per thousand. (unable to be addressed through this work program) LAC3 – Vegetation – Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds – Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition (also addresses LAC3) b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) (also addresses LAC4) c - Livestock have been excluded from over 50% of the waterway frontage (also addresses LAC3 and LAC4)		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (4) Significant Birds (4) Significant Flora Wetland (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Livestock Access to Buffer (3)

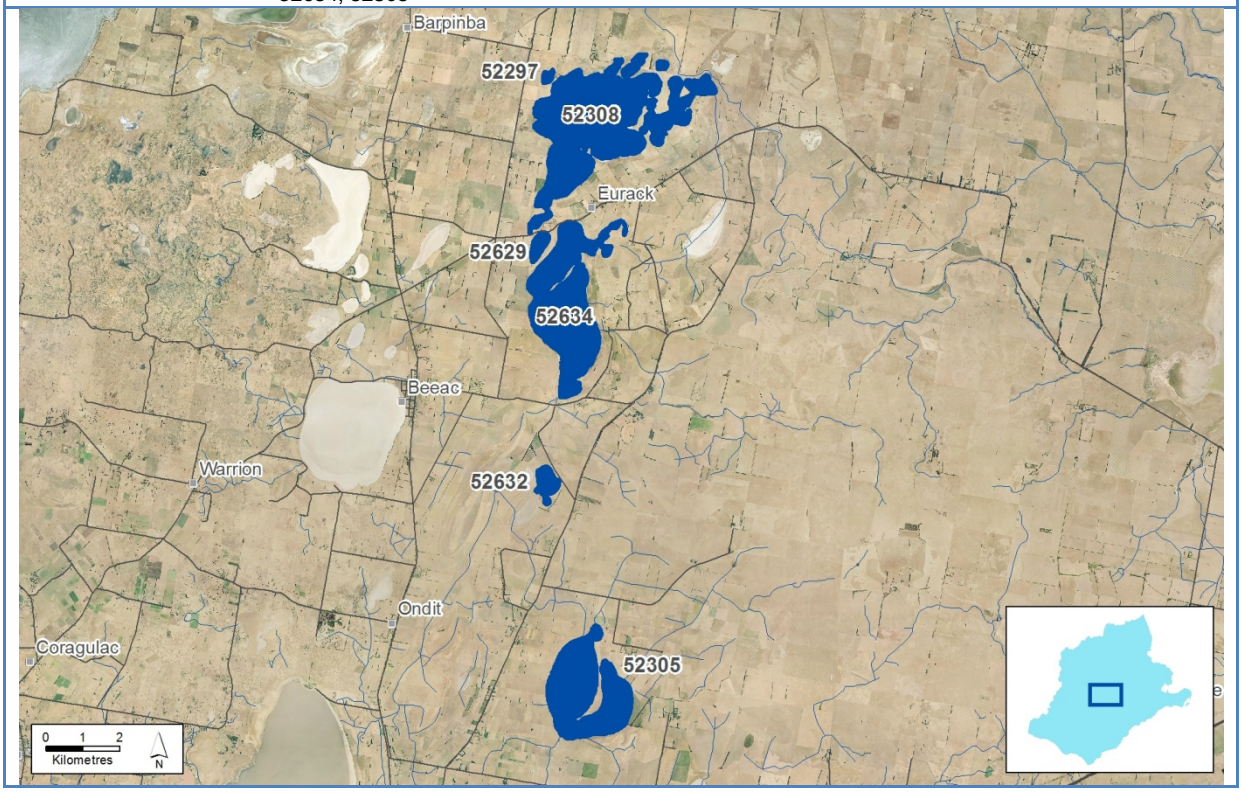
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	5 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Livestock Access to Buffer (3)	a, c
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Degraded Buffer (5), Livestock Access to Buffer (3)	a, c

Estimated cost of activities	**$80,000**

Upper, Middle and Lower Lough Calverts and Lake Thurrumbong

Upper Lough Calvert (Eurack Swamp) consists of a diverse network of saline wetlands which form the northern section of the floodplain known locally as Lough Calvert. This network contains significant areas of saltmarsh and is fed primarily by groundwater discharge and surface runoff. This system consists of saline depressions with bare mud, turbid grey water and saltmarsh hummocks. There are three large permanent playas with accompanying lunettes.

Waterway	Unnamed wetland, Lough Calverts, Lake Thurrumbong	Landscape Zone	Stony Rises
Identification No.	52297, 52308, 52629, 52632, 52634, 52305	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Unnamed wetland (52297) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Eurack Swamp/Upper Lough Calvert (52308) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (52629) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Unnamed wetland (52632) meets the following regional goals	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Due to its values, Middle Lough Calvert (52634) meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance

Key Values

Type	Attribute	Details
Formally Recognised Significance	Nationally Important Wetland	Lough Calvert and Lake Thurrumbong meet the following criteria for being recognised in the Directory of Important Wetlands: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
Environmental	Significant Birds	Greater than 34+ waterbird species have been recorded in these wetlands. The Straw-necked Ibis (*Threskiornis spinicollis)*, Australian White Ibis (*T. aethiopica)*, Glossy Ibis (*Plegadis falcinellus)*, Black Swan (*Cygnus atratus)*, Red-capped Plover (*Charadrius ruficapillus)*, Eurasian Coot (*Fulica atra)*, Silver Gull (*Larus novaehollandiae)* and Gull-billed Tern (*Gelochelidon nilotica)* have been recorded breeding in the past. This mainly occurs on a complex of spits and islands.
	Drought Refuges	Modelled drought refuge for one or more significant fish species or nominated drought refuge for significant fauna and/or significant EVCs
	Important Bird Habitats	Site of global bird conservation importance and priority area for bird conservation, Important site for migratory shore birds, Important breeding habitat for colonial nesting birds.
	Significant EVCs	These wetlands are of high value for flora and fauna. There are extensive flats of Beaded Glasswort (*Sarcocornia quinqueflora*), Round-leaf Wilsonia (*Wilsonia rotundifolia*), Salt Pratia (*Pratia platycalyx*), Shiny Swamp-mat (*Selliera radicans*) and Creeping Brookweed (*Samolus repens*) around the wetland margins. The Upper Lough Calvert includes an unusual inland Grey Glasswort (*Halosarcia halocnemoides*) community.
Social	Hunting	Duck hunting

Threats

Threat	Details
Livestock Access	Grazing through the Loughs is an issue, although grazing of sheep is thought to create suitable habitat for Double-banded plovers (C. Minton pers. comm)
Rubbish	Illegal dumping of rubbish occurs at Upper Lough Calvert
Changed Water Regime	Upper Lough Calvert is subject to diversion of floodwater and run-off from road embankments and the Lough Calvert Drainage Scheme Middle Lough Calvert has an artificial water regime associated with the drainage scheme Lower Lough Calvert has reduced frequency of inundation due to the drainage scheme Lake Thurrumbong has increased salinity due to the operation of the Lake Colac drainage scheme

Work Program 52297

Waterway	Unnamed wetland (52297)	Identification No.	52297

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland water regime has improved b - The wetland buffer vegetation has improved from very poor to moderate condition c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Invasive wetland flora threat has reduced from very high to moderate f - Livestock have been excluded from over 50% of the waterway frontage g - Wetland area has been reinstated to 75% of original		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5)	**Threats addressed by work program**	Changed Water Regime (3) Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5) Livestock Access to Buffer (3) Reduced Wetland Area (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	4 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3) Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5)	b, c, e, f
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation	1 ha	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Degraded Water Quality (3)	c
Install wetland fence	1 km	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3)	b, c, e, f
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3)	b, c, e, f
Remove channel	1 no.	**CCMA**/ Land manager	Changed Water Regime (3), Reduced Wetland Area (3)	a, g

Estimated cost of activities	**$36,500**

Work Program for Upper Lough Calvert (Eurack Swamp)

Waterway	Upper Lough Calvert (Eurack Swamp)	Identification No.	52308

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from very high to moderate d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant EVCs (5) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3), Degraded Buffer (5), Invasive Flora (Wetland) (5)	a, c, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	20 km	**CCMA**, **Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3)	a, c, d
Establish stewardship/management agreement	20 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3)	a, c, d

Estimated cost of activities	**$337,500**

Work Program Unnamed wetland (52629)

Waterway	Unnamed wetland (52629)	Identification No.	52629

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from high to moderate d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (4) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	5 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3), Degraded Buffer (5), Invasive Flora (Wetland) (4)	a, c, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	1 km	**CCMA**, Land manager/ GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, c, d
Establish stewardship/management agreement	1 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, c, d

Estimated cost of activities	**$19,500**

Work Program Unnamed wetland (52632)

Waterway	Unnamed wetland (52632)	Identification No.	52632

Long-term Resource Condition Targets	14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat has reduced from very high to moderate d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	5 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3), Degraded Buffer (5), Invasive Flora (Wetland) (5)	a, c, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare-Community Groups	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	2 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (5), Livestock Access to Buffer (3)	a, c, d
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (4), Livestock Access to Buffer (3)	a, c, d

Estimated cost of activities	**$39,000**

Work Program for Middle Lough Calvert

Waterway	Middle Lough Calvert	Identification No.	52634

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat is maintained a low threat level d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Drought Refuges (5) Important Bird Habitats (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (2) Livestock Access to Buffer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Livestock Access to Buffer (3), Degraded Buffer (5)	a, d
Establish non-woody weed control	15 ha	**Land manager**/ CCMA, GA, Landcare-Community Groups	Degraded Buffer (5), Invasive Flora (Wetland) (2)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Install wetland fence	8 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Livestock Access to Buffer (3)	a, d
Establish stewardship/management agreement	8 ha	**Land manager**/ CCMA	Degraded Buffer (5), Livestock Access to Buffer (3)	a, d

Estimated cost of activities	**$172,000**

Waterway	Lake Thurrumbong	Landscape Zone	Upper Barwon
Identification No.	52305	**Basin**	Barwon

Links to Regional Goals

Due to its values, Lake Thurrumbong meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species
Goal ENV4	Maintain or improve waterways with formally recognised significance
Goal ENV5	Maintain the extent and condition of other significant wetlands (by type)

Key Values

Type	Attribute	Details
Environmental	Important Bird Habitats	Important breeding habitat for colonial nesting waterbirds and migratory shore birds
	Significant Birds	Australasian Shoveler (*Anas rhynchotis*) – Vulnerable Brolga (*Grus rubicunda*) – Vulnerable Hardhead – Vulnerable
	Significant EVCs	Swamp Scrub – Endangered Plains Sedgy Wetland – Endangered

Threats

Threat	Details
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species
Degraded Water Quality	The Index of Wetland Condition indicates that the wetland has very poor water quality, or very highly changed water properties
Invasive Flora (Wetland)	Phalaris is present and outcompeting indigenous wetland species

Work Program Lake Thurrumbong

Waterway	Lake Thurrumbong	Identification No.	52305

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation. 14 - The condition of values of nationally important wetlands are maintained or improved. 16 - The condition of freshwater marshes and meadows supporting the seasonal herbaceous wetlands ecological community are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive wetland flora threat has reduced from very high to moderate		
Values linked to regional goals	Important Bird Habitats (5) Significant EVCs (4) Significant Birds (4)	**Threats addressed by work program**	Degraded Buffer (5) Degraded Water Quality (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish management agreement – controlled grazing regime	20 ha	**CCMA**/ Land manager, DEPI	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5)	a, b, d
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), GA, Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Install wetland fence	7 km	**CCMA, Land manager**/ GA, Landcare-Community Groups	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5)	a, b, d
Establish stewardship/management agreement	7 ha	**Land manager**/ CCMA	Degraded Buffer (5), Degraded Water Quality (3), Invasive Flora (Wetland) (5)	a, b, d

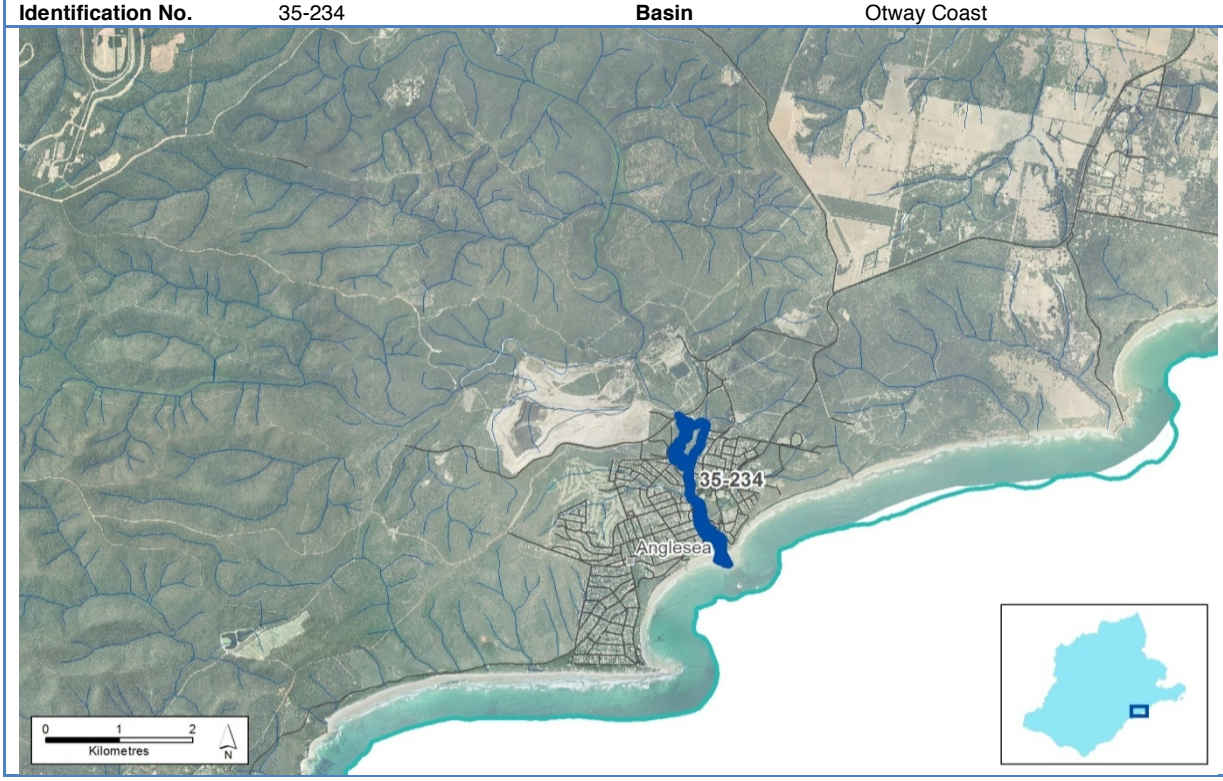
Estimated cost of activities	**$122,500**

8.14 Thompsons Landscape Zone

Anglesea River

The Anglesea River rises in the Otway Ranges south of Winchelsea, and flows generally south east before flowing through the township of Anglesea. The estuary is intermittently closed to the sea.

Waterway	Anglesea River estuary	Landscape Zone	Thompsons
Identification No.	35-234	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, the Anglesea River estuary meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Estuarine Wetland (Endangered)
	Significant Birds	Eastern Great Egret (*Ardea modesta*) - Vulnerable Nankeen Night Heron (*Nycticorax caledonicus*)– Near Threatened
Social	Camping	The Anglesea Beachfront Family Holiday Park is situated adjacent to the Anglesea River downstream of the Great Ocean Road. It has over 16 hectares of campsites (including cabins) and is open all year
	Non-Motor Boating	The Anglesea Estuary is used for ecotourism and education events using canoes.
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	The estuary provides some good fishing for black bream with other species including estuary perch, trevally and luderick. There is only limited value for fishing the upstream freshwaters.
	Sightseeing	The Anglesea River is a popular place for many recreational activities such as walking, swimming and just relaxing. The estuary is valued and visited by locals, as well as visitors from the surrounding region, and beyond. The bush reserve of Coogoorah park, with its jetties, walking tracks and bridges, is also highly valued by the community.
	Swimming	Popular swimming location
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land has acid sulfate soils and the estuary is impacted by acid sulfate soils on a regular basis
Degraded Estuarine Vegetation	Significant wetlands and fringing vegetation has been lost along the west bank of the Anglesea River estuary to create open space
Intermittently Open Estuaries	The estuary is artificially opened regularly to avoid the impacts of flooding on Coogoorah Park and the Great Ocean Road

Work Program Anglesea River estuary

Waterway	Anglesea River estuary	Identification No.	35-234

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives c - Wetlands are connected to the estuary but less than natural d - No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period		
Values linked to regional goals	Camping (5) Non-Motor Boating (5) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Swimming (5) Tracks (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Intermittently Open Estuaries (5) Reduced Floodplain and Wetland Connectivity (5) Acid Sulfate Soils (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to estuary mouth opening - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**, SCS/ GORCC	Intermittently Open Estuaries (5), Reduced Floodplain and Wetland Connectivity (5)	b, c
Establish native indigenous vegetation	2 ha	**CCMA**/ SCIPN, LH, ANGAIR	Degraded Estuarine Vegetation (3)	a
Continue to implement the Anglesea Estuary Management Plan. Not costed[24]	N/A	**CCMA**/SCS, DEPI, GORCC, ANGAIR		
Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk – Not costed	N/A	**BW, CCMA, SRW, DEPI, SCS**	Acid Sulfate Soils (5)	d
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – refer to Community engagement and capacity building (CWS Section 5.1.3)	1 no.	**CCMA**/Community , DEPI	Intermittently Open Estuaries (3)	b

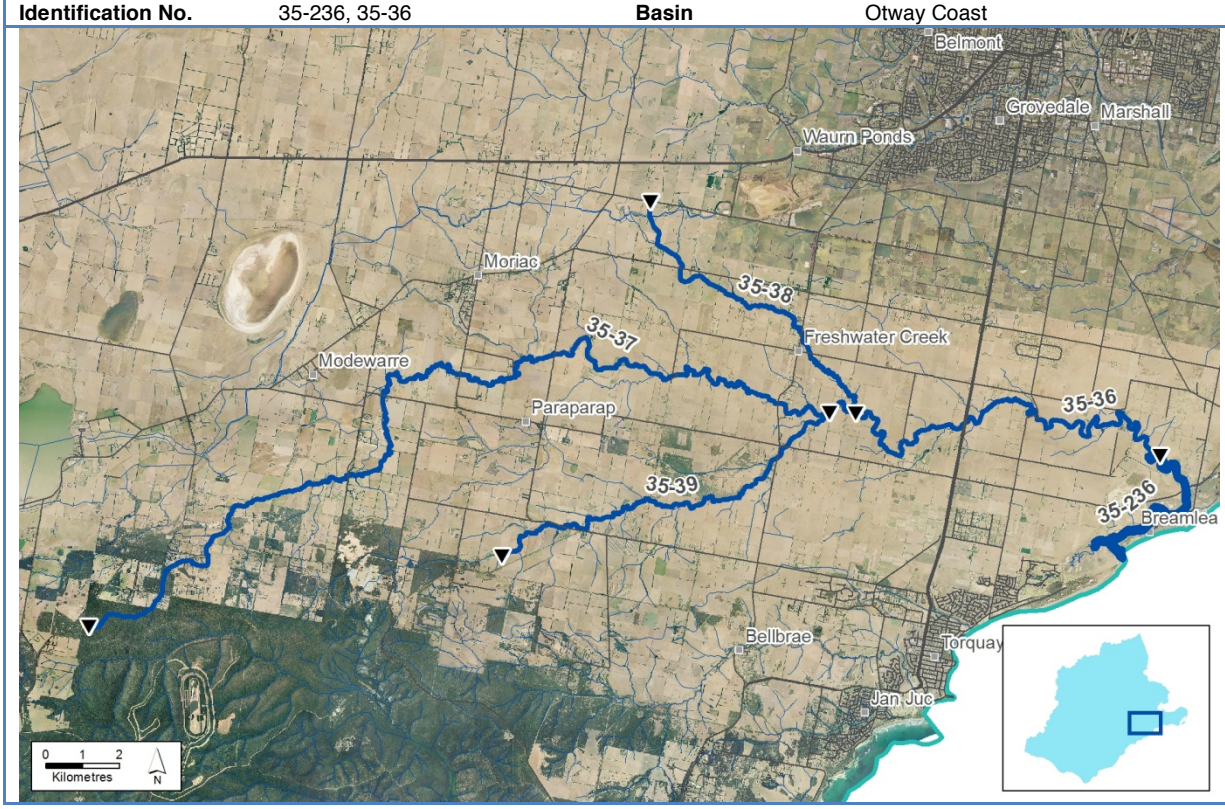
Estimated cost of activities	**$27,000**

[24] There is a significant amount of activity that will be carried out through implementation of the Anglesea Estuary Management Plan. These activities will add considerable additional cost to the estimated cost provided above.

Thompson, Merrijig and Duneed creeks

Thompson Creek rises near Mt Moriac, before travelling east through Freshwater Creek and entering the sea at Breamlea. The upper and mid reaches are ephemeral. The estuary reach is surrounded by significant areas of coastal saltmarsh, and the estuary mouth is intermittently closed to the sea.

Waterway	Thompson Creek and Thompson Creek estuary	Landscape Zone	Thompsons
Identification No.	35-236, 35-36	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Thompson Creek estuary meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Due to its values, Thompson Creek (35-36) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Thompson Creek (35-37) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Duneed Creek (35-38) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Merrijig Creek (35-39) meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Birds	Eastern Great Egret (*Ardea modesta*) - Vulnerable
	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant EVCs	Coastal Saltmarsh – Endangered (Estuary Reach) Swamp Scrub – Vulnerable

		Floodplain Riparian Woodland – Endangered Swampy Riparian Woodland – Endangered
	Drought refuge	Modelled drought refuge for Yarra Pygmy Perch (*Nannoperca obscura*)
	Important Bird Area	The estuary is an important breeding habitat for colonial waterbirds and an important habitat for migratory shore birds.
Social	Non-Motor Boating	The estuary is used for canoeing
	Picnics and Barbeques	Are located at Breamlea adjacent to the estuary
	Recreational Fishing	Bream are targeted by anglers
	Game Hunting	Game hunting is permitted on reach 35-37

Threats

Threat	Details
Intermittently Open Estuaries	The estuary is opened artificially to mitigate flooding at Breamlea
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Invasive Fauna (Terrestrial)	Foxes are present and actively prey on wildlife
Livestock Access	Livestock Access between 25-75% of the waterway frontage
Invasive Flora (Riparian) – ground layer	High threat weeds are present – with an estimated 41-60% cover of invasive riparian flora
Degraded Riparian Vegetation – Large Trees	3ISC Large Trees Value Score: 0 - 2
Degraded Water Quality	Fails to meet SIGNAL objective in SEPP (WoV)
Disturbance of Acid Sulfate Soils	Adjacent land has the potential to contain Coastal Acid Sulfate Soils or inland waterway is at high risk from acid sulfate soils
Reduced Riparian Connectivity	0-39% of streambank has overhanging vegetation with 80-100% of vegetated area being gaps
Reduced Vegetation Width	Small Streams bankfull width of <5m
Barriers to Fish Migration	Artificial barrier exists in the floodplain or estuary reach

Work Program for Thompson Creek estuary

Waterway	Thompson Creek estuary	Identification No.	35-236

Long-term Resource Condition Targets	08 - Known habitat and breeding sites for populations of threatened wetland dependent bird species are secured from further environmental degradation.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Invasive riparian flora (ground layer) threat has reduced from high to moderate e - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Significant Birds (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Intermittently Open Estuaries (3) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Ground Layer (4) Livestock Access (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to estuary mouth opening - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA, COGG** / GORCC	Intermittently Open Estuaries (3)	b
Exclude grazing - Cost included in fencing	2 ha	**CCMA**/LH /SCIPN	Degraded Estuarine Vegetation (3)	a
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish non-woody weed control	2 ha	**CCMA, PV, COGG, LH**/ SCIPN	Invasive Flora (Riparian) - Ground Layer (4)	d
Install riparian fence	2 km	**CCMA**/LH, SCIPN	Livestock Access (3)	e
Establish stewardship/management agreement	2 ha	**Land manager**/ CCMA	Livestock Access (3)	e
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – refer to Community engagement and capacity building (CWS Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Intermittently Open Estuaries (3)	b

Estimated cost of activities	**$36,000**

Work Program for Thompson Creek (35-36)

Waterway	Thompson Creek	Identification No.	35-36

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from very poor to moderate f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Significant Fish Non Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Disturbance of Acid Sulfate Soils (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Riparian Connectivity (5) Reduced Vegetation Width (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - rabbit control	15 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation	8 ha	**CCMA**/ SCIPN/LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	a, b, e, f
Install riparian fence – 4 km (25%) of reach length – 8 km frontage (incl. rabbit netting).	8 km	**CCMA**/ SCIPN/LH	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f
Establish stewardship/management agreement	8 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f

Estimated cost of activities	**$352,000**

Work Program for Thompson Creek (35-37)

Waterway	Thompson Creek	Identification No.	35-36

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from very poor to moderate f - Riparian vegetation width has improved from poor to moderate condition g - No artificial barrier to fish migration exists		
Values linked to regional goals	Significant Fish Non Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Riparian Connectivity (5) Reduced Vegetation Width (5) Barriers to Fish Migration (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - rabbit control	20 ha	**Land manager**/ CCMA, DEPI (Biosecurity), SCIPN	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation	12 ha	**CCMA**/ SCIPN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	a, b, e, f
Install riparian fence – 6 km of reach length – 12 km frontage (incl. rabbit netting).	12 km	**CCMA**/ SCIPN, LH	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f
Assessment and management of fish barriers- Not costed — refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/Land Managers	Barriers to Fish Migration (5)	g

Estimated cost of activities	**$506,000**

Work Program for Duneed Creek (35-38)

Waterway	Duneed Creek	Identification No.	35-38

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from very poor to moderate f - Riparian vegetation width has improved from poor to moderate condition g – Invasive flora (Riparian) – ground layer threat has reduced to low		
Values linked to regional goals	Significant Fish Non Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Riparian Connectivity (5) Reduced Vegetation Width (5) Invasive Flora (Riparian) - ground Layer (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - rabbit control	5 ha	**Land manager**/ CCMA, DEPI (Biosecurity), SCIPN	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation	5 ha	**CCMA**/ SCIPN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	a, b, e, f
Install riparian fence – 2.5km of reach length - 5km frontage (incl. rabbit netting).	5 km	**CCMA**/ SCIPN, LH	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f
Establish woody weed control - gorse	5 ha	**LH** /CCMA, SCIPN	Invasive Flora (Riparian) - ground Layer (3)	g
Establish stewardship/management agreement	5 ha	**Land manager**/ CCMA	Invasive Flora (Riparian) - ground Layer (3)	g

Estimated cost of activities	**$365,500**

Work Program for Merrijig Creek (35-39)

Waterway	Merrijig Creek	Identification No.	35-39

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 50% of the waterway frontage e - Riparian vegetation longitudinal continuity has improved from very poor to moderate f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Significant Fish Non Migratory (5)	**Threats addressed by work program**	

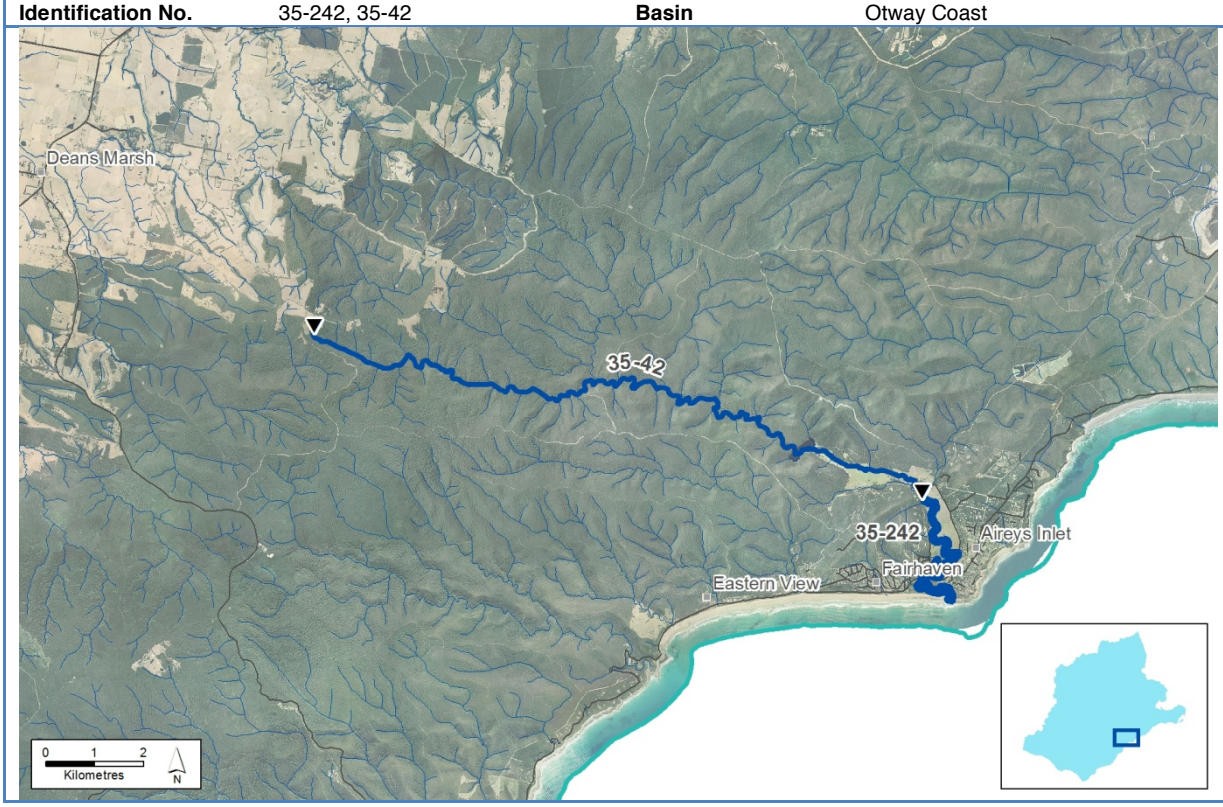
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - rabbit control	5 ha	**Land manager**/ CCMA, DEPI (Biosecurity), SCIPN	Invasive Fauna (Terrestrial) (5)	c
Establish native indigenous vegetation	5 ha	**CCMA**/ SCIPN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	a, b, e, f
Install riparian fence – 2.5km of reach length - 5km frontage (incl. rabbit netting).	12 km	**CCMA**/ SCIPN, LH	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f
Establish stewardship/management agreement	12 ha	**Land manager**/ CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Riparian Connectivity (5), Reduced Vegetation Width (5)	b, d, e, f

Estimated cost of activities	**$211,500**

Painkalac Creek

Painkalac Creek rises at an elevation of 430 m in the deeply-dissected rolling hills at the north-eastern end of the Otway Ranges, and flows in a generally easterly direction for about 20 km where it enters Bass Strait on the western side of the township of Aireys Inlet. In 1981 Painkalac Reservoir was constructed in the upper reaches of the catchment to supply the townships of Aireys Inlet and Fairhaven. The Painkalac Creek estuary is intermittently open to the sea.

Waterway	Painkalac Creek estuary and Painkalac Creek	Landscape Zone	Thompsons
Identification No.	35-242, 35-42	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Painkalac Creek estuary meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values

Due to its values, Painkalac Creek meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Important Bird Area	The estuary is important breeding habitat for colonial waterbirds The river reach is of global importance for bird conservation
	Significant Birds	Eastern Great Egret (*Ardea modesta*) – Vulnerable Nankeen Night Heron (*Nycticorax caledonicus*)– Near Threatened Royal Spoonbill *(Platalea regia)*- Vulnerable
	Significant EVCs	Riparian Forest – Vulnerable Swampy Riparian Woodland – Endangered Riparian Scrub/ Swampy Riparian Woodland Complex – Depleted Sedgy Riparian Woodland - Depleted
	Riparian Vegetation Condition	Riparian vegetation condition is excellent in Reach 35-42

Social	Non-Motor Boating	Waterway is popular for non-motor boating
	Picnics and Barbecues	Designated picnic/barbecue areas present
	Recreational Fishing	Fishing is a popular pastime in the estuary with catches of estuary perch, black bream, mullet, flounder and luderick at times. The freshwater reach is not considered an angling stream.
	Sightseeing	Sightseeing destination with high visitor numbers
	Swimming	Popular swimming location
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Degraded Estuarine Vegetation	Vegetation mapping undertaken in 2010 classified the vegetation as 'modified' (fringing macrophytes present, with some EVCs modified from benchmark)
Disturbance of Acid Sulfate Soils	Potential Acid Sulfate Soils are present
Intermittently Open Estuaries	The estuary is intermittently opened to mitigate flooding in Aireys Inlet, including the Great Ocean Road
Invasive Fauna (Terrestrial)	Foxes are present and actively prey on wildlife

Work Program Painkalac Creek

Waterway	Painkalac Creek	Identification No.	35-242

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained.		
Management Outcome Targets (MOTs)	a - The estuarine vegetation has improved from moderate to good condition b - All artificial estuary mouth openings have been undertaken using a risk-based approach considering multiple objectives c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period e - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Non-Motor Boating (4) Picnics and Barbecues (5) Recreational Fishing (5) Sightseeing (5) Swimming (5)	**Threats addressed by work program**	Degraded Estuarine Vegetation (3) Disturbance of Acid Sulfate Soils (5) Intermittently Open Estuaries (5) Invasive Fauna (Terrestrial) (5) Degraded Water Quality (5) Inc in Low Flow Magnitude (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Continue to adopt a risk based approach to estuary mouth opening - Not costed - refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA, SCS**/ GORCC	Intermittently Open Estuaries (5)	b
Establish native indigenous vegetation	2 ha	**CCMA**/ LH, SCIPN, ANGAIR	Degraded Estuarine Vegetation (3) Degraded Water Quality (5)	a, d
Establish stewardship/management agreement	2 ha	**Land Manager /** CCMA	Degraded Estuarine Vegetation (3) Degraded Water Quality (5)	a, d
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required - Not costed – refer to Environmental Water management program (CWS, Section 5.1.3)	N/A	**CCMA**/ BW, SRW	Degraded Water Quality (5) Inc in Low Flow Magnitude (5)	e
Maintain EstuaryWatch group collecting baseline data on waterway condition - Not costed – refer to Community engagement and capacity building (CWS Section 5.1.3)	1 no.	**CCMA**/Community, DEPI	Intermittently Open Estuaries (5), Degraded Water Quality (5)	b, d

Estimated cost of activities	**$27,000**

Work Program for Painkalac Creek

Waterway	Painkalac Creek	Identification No.	35-42

Long-term Resource Condition Targets	02 - Waterways within Special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - Bed instability has improved from poor to moderate b - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Disturbance of Acid Sulfate Soils (5) Bed instability (Degradation) (4) Inc in Low Flow Magnitude (5)

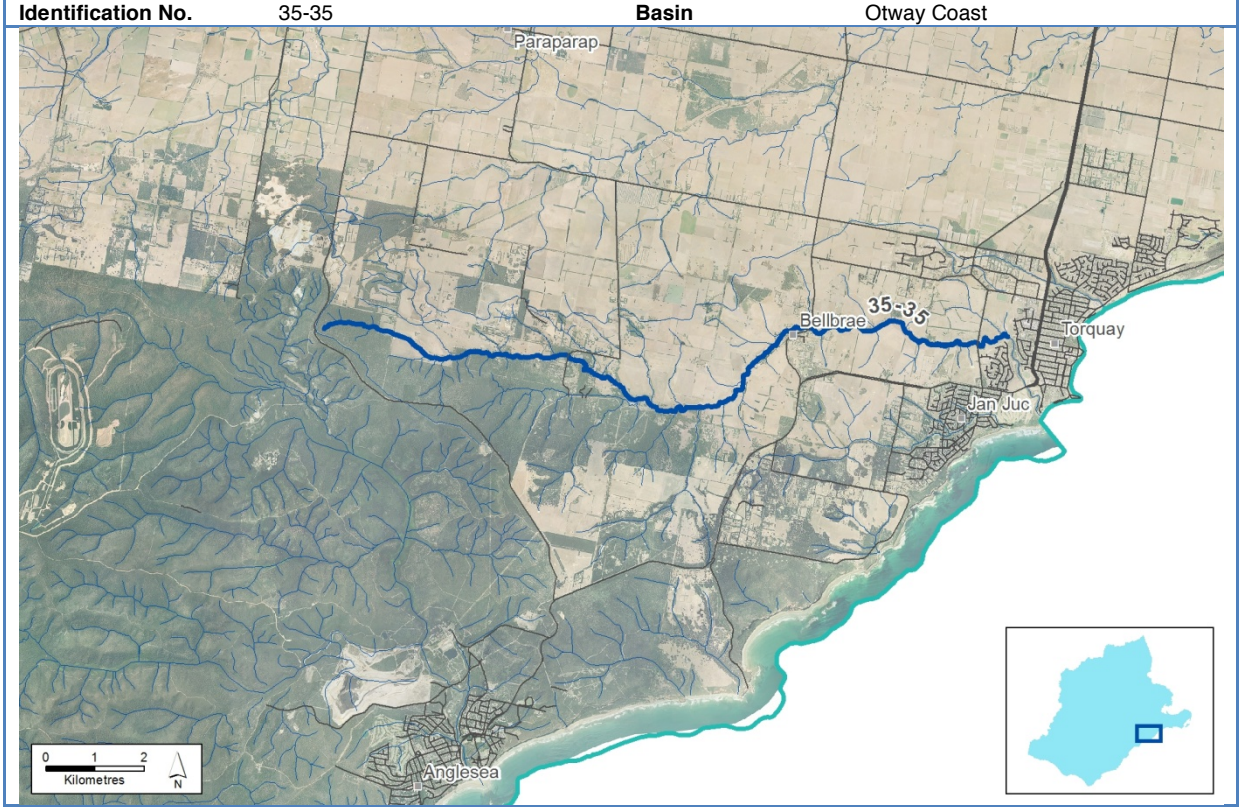
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Investigate stream bed instabilities – Not costed – refer to Waterway investigations, planning and advice (CWS Section 5.1.3)	N/A	**CCMA**	Bed instability (Degradation) (4)	a
Investigate impacts to environmental flows throughout the broader Otway Coast catchment to secure and better manage environmental water where required. **Not costed – refer to Environmental Water management program (CWS, Section 5.1.3)**	N/A	**CCMA**/ BW, SRW	Inc in Low Flow Magnitude (5)	b

Estimated cost of activities	$ -

Spring Creek

Spring Creek is located near Torquay. The estuary is intermittently open to the sea.

Waterway	Spring Creek	Landscape Zone	Thompsons
Identification No.	35-35	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Spring Creek meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC)
	Significant EVCs	Riparian Scrub/ Swampy Riparian Woodland Complex – Depleted Swampy Riparian Woodland – Endangered Sedgy Riparian Woodland – Depleted
	Significant Flora Terrestrial	Bellarine Yellow Gum (*Eucalyptus leucoxylon bellarinensis*) – Threatened (FFG)
Social	Picnics and Barbeques	Facilities are provided.

Threats

Threat	Details
Degraded Riparian Vegetation – Large Trees	Large trees in the riparian zone are largely absent
Disturbance of Acid Sulfate Soils	Potential Acid Sulfate Soils are present
Livestock Access	Livestock access between 25 and 75% of the waterway
Invasive Flora (Ground Cover)	Serrated tussock (eastern side) and gorse have been identified as threats along this reach

Work Program for Spring Creek

Waterway	Spring Creek	Identification No.	35-35

Long-term Resource Condition Targets	10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Livestock have been excluded from over 50% of the waterway frontage c – The invasive flora (ground cover) and invasive flora (shrub cover) threat scores have reduced from moderate to low		
Values linked to regional goals	Significant Amphibians (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Disturbance of Acid Sulfate Soils (5) Livestock Access (3) Invasive Flora (Ground Cover) (3) Invasive Flora (Shrub Cover) (2)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation – U/s of Duffields Rd	3 ha	**CCMA**/ SCIPN/LH	Deg Rip Veg – Large Trees (5)	a
Install riparian fence – U/s of Duffields Rd	1.5 km	**CCMA**/ SCIPN/LH	Livestock Access (3)	b
Establish stewardship/management agreement	3 ha	**Land Manager /** CCMA	Livestock Access (3)	b
Non-woody weed control – serrated tussock	3 ha	**CCMA**/ SCIPN/LH	Invasive Flora (Ground Cover) (3)	c
Woody weed control - gorse	3 ha	**CCMA**/ SCIPN/LH	Invasive Flora (Shrub Cover) (2)	c

Estimated cost of activities	**$189,500**

8.15 Upper Barwon Landscape Zone

Barwon River

The Upper Barwon River rises in the Otway Ranges above forest before flowing generally north east towards Winchelsea, and through to Inverleigh, where it is joined by the Leigh River. The Upper Barwon River, and its tributaries, supplies much of the Geelong Region's water supply.

Waterway	Barwon River	Landscape Zone	Upper Barwon
Identification No.	33-04	**Basin**	Barwon

Links to Regional Goals

Due to its values, the Barwon River meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Migratory	Australian Grayling *(Prototroctes maraena)*- Status: Vulnerable (EPBC, Adv list)
	Significant Fish Non Migratory	Dwarf Galaxias (*Galaxiella pusilla*) (High priority actions in high priority areas (ABC), Vulnerable (IUCN, EPBC, Adv List); Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Drought refuge	A modelled drought refuge for significant fish
	Significant EVCs	Creekline Herb-rich Woodland - Endangered Stream Bank Shrubland - Endangered
Social	Camping	Campground with basic facilities adjacent to waterway or multiple bush camping areas adjacent to waterway
	Game Hunting	Game hunting is permitted
	Landscape	Listed as scenic landscape in a report other than a Significant Landscape Overlay
	Picnics and Barbecues	Designated picnic/barbecue areas present

	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
	Tracks	Sealed or formed tracks follow waterway and are mapped or sign-posted
	Use of Flagship Species	Waterway known to support waterway-dependent flagship species
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bank Instability	Greater than 90% of the reach is eroding
Barriers to Fish Migration	Artificial barrier exists in the floodplain or estuary reach
Degraded Water Quality	Fails to meet SIGNAL objective in SEPP (WoV)
Livestock Access	Livestock access between 25 and 75% of the waterway frontage
Loss of Instream Habitat – Large Wood	Marginal Habitat – Moderate visible pieces of instream wood from indigenous species in channel. Abundant pieces of exotic instream wood in channel. Moderate impact of desnagging. Streamside vegetation clearing evident.
Degraded Riparian Vegetation – Large Tree and Riparian Width	Large trees are largely absent from the riparian zone and the riparian zone is narrow for the size of the stream
Increase in Low Flow Magnitude	Low flow index score of 5
Invasive Flora (Riparian) – Ground Layer	Serrated tussock is present along this reach
Invasive Flora (Riparian) – Shrub Layer	Gorse is present along this reach

Work Program for Barwon River

Waterway	Barwon River	Identification No.	33-04

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 06 - The probability that important Dwarf Galaxias populations become self-sustaining is increased. 07 - The probability that important Australian Grayling populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from very poor to moderate b - No artificial barrier to fish migration exists c - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period d - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period e - Livestock have been excluded from over 50% of the waterway frontage f - Loss of in-stream habitat (large wood) threat has reduced from moderate to low g- Riparian vegetation width has been maintained in moderate condition h - The increase in low flow magnitude threat score has reduced from moderate to low i - Invasive riparian flora (ground layer) has reduced to a moderate threat level		
Values linked to regional goals	Rural Water Sources for Prod (4) Native Fish (4) Camping (4) Game Hunting (5) Picnics and Barbecues (5) Recreational Fishing (5) Tracks (5) Use of Flagship Species (5) Landscape (3) Significant Fish Migratory (5) Significant Fish Non Migratory (5)	**Threats addressed by work program**	Bank Instability (5) Barriers to Fish Migration (5) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Livestock Access (3) Loss of Ins Hab (Large Wood) (3) Reduced Vegetation Width (3) Inc in Low Flow Magnitude (3) Invasive Flora (Riparian) – Ground Layer (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Assessment and management of fish barriers in the Barwon and Moorabool catchments - Not costed — refer to Waterway investigations, planning and advice (CWS, Section 5.1.3)	N/A	**CCMA**/ ARI	Barriers to Fish Migration (5)	b
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ UBLN, LH	Degraded Water Quality (5)	d
Investigate instream habitat (large wood) density	50 ha	**CCMA**/ ARI	Loss of Ins Hab (Large Wood) (3)	f
Establish native indigenous vegetation - 20ha of reach frontage. 9ha of Warrambine Creek frontage. Other revegetation (for WQ) refer to 33-5, 11, 14, 16 and 21.	29 ha	**CCMA**/ UBLN, LH	Bank Instability (5), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (3) Invasive Flora (Riparian) – Ground Layer (5)	a, c, g, d, i
Install riparian fence - 10km (20%) of reach length - 20km frontage. 9km of Warrambine Creek frontage. Other fencing (for WQ) refer to 33-5, 11, 14, 16 and 21.	29 km	**CCMA**/ UBLN, LH	Bank Instability (5), Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, e, c, g, d
Establish stewardship/management agreement	29 ha	**Land Manager /** CCMA	Bank Instability (5), Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, e, c, g, d
Implement Central Region Sustainable Waterway Strategy action for Upper Barwon environmental entitlement – Not costed.	N/A	**CCMA**/ VEWH, DEPI, BW	Degraded Water Quality (5), Inc in Low Flow Magnitude (3)	d, h

Estimated cost of activities	**$880,500**

Barwon River

Waterway	Barwon River	Landscape Zone	Upper Barwon
Identification No.	33-05	**Basin**	Barwon

Links to Regional Goals

Due to its values, the Barwon River meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Drought Refuge	Is a modelled drought refuge for the Yarra Pygmy Perch (*Nannoperca obscura*)
	Significant EVCs	Floodplain Riparian Woodland – Endangered Swampy Riparian Woodland – Endangered
	Aquatic Invertebrate Community Condition	Meets all biological objectives for rivers and streams, indicating excellent water quality
Social	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bank Instability	50-90% of the reach is eroding
Degraded Riparian Vegetation – Large Trees, Reduced Riparian Connectivity and Reduced Vegetation Width	Large trees are largely absent from the riparian zone The riparian zone is patchy and narrow for the size of the stream

Loss of Instream Habitat – Large Wood and Sedimentation	Poor habitat – Few visible pieces of instream wood in channel Deposition of sediments above natural levels mainly at bends and-or instream obstructions
Livestock Access	Livestock access between 25-75% of the waterway frontage
Increase in Low Flow Magnitude	Low flow index score of 5

Work Program for Barwon River (33-05)

Waterway	**Barwon River**	**Identification No.**	**33-05**

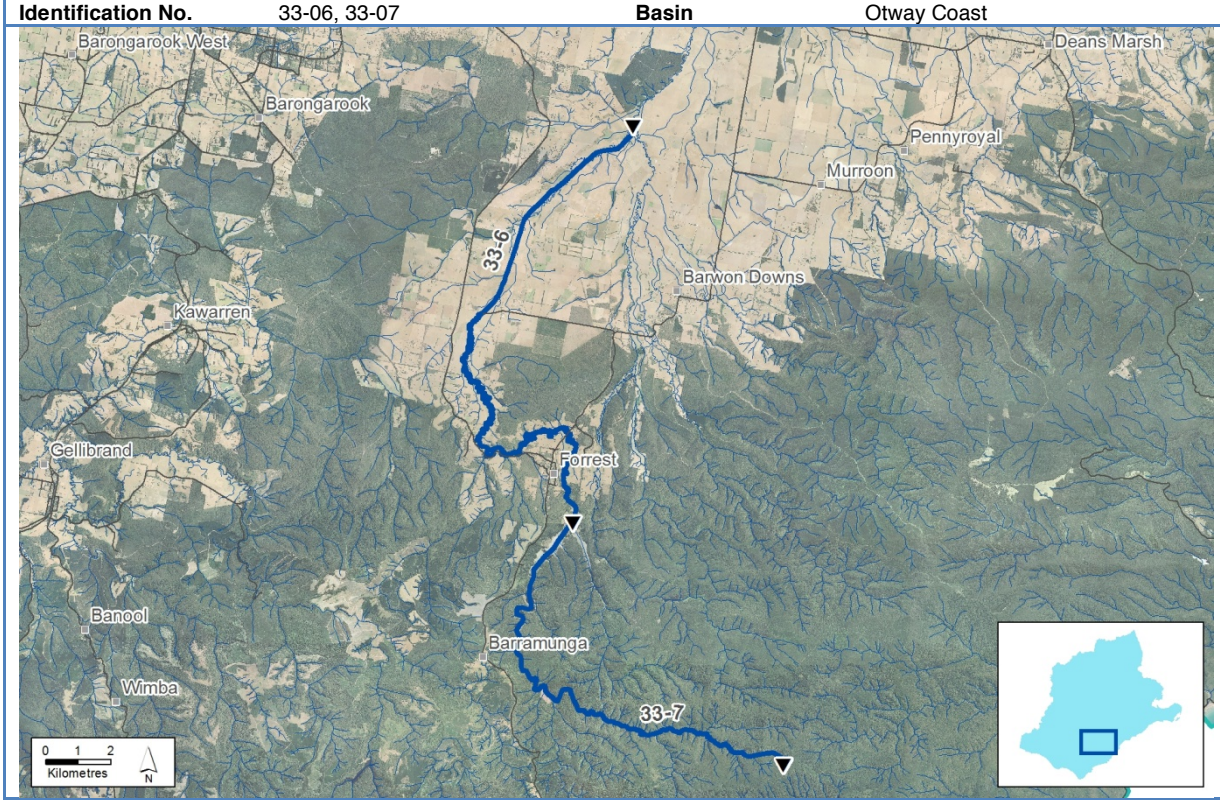
Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has reduced to a low threat level d - Livestock have been excluded from over 50% of the waterway frontage e - Loss of in-stream habitat (large wood) threat has reduced from high to low f - No increase in the loss of in-stream habitat through sedimentation g - Riparian vegetation longitudinal continuity has improved from moderate to good h - Riparian vegetation width has been maintained in moderate condition i - The increase in low flow magnitude threat score has reduced from moderate to low		
Values linked to regional goals	Rural Water Sources for Prod (4) Native Fish (4) Significant Fish Non Migratory (4)	**Threats addressed by work program**	Bank Instability (4) Deg Rip Veg - Large Trees (5) Invasive Flora (Riparian) - Tree Layer (3) Livestock Access (3) Loss of Ins Hab (Large Wood) (4) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (3)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Investigate instream habitat (large wood) density	35 ha	**CCMA**/ ARI	Loss of Ins Hab (Large Wood) (4)	e
Establish woody weed control - willows, blackberry, gorse	20 ha	**CCMA**/ UBLN, LH	Invasive Flora (Riparian) - Tree Layer (3)	c
Establish native indigenous vegetation - 18ha of reach frontage. 40ha of Matthews, Birregurra, Boundary and Yan Yan Gurt Creek frontages. Other revegetation (for sed control) refer to 33-23, 24, 25, 26, 27 and 33.	58 ha	**CCMA**/ UBLN, LH	Bank Instability (4), Deg Rip Veg - Large Trees (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, b, g, h
Install riparian fence - 9km (25%) of reach length - 18km frontage. 40km of Matthews, Birregurra, Boundary and Yan Yan Gurt Creek frontages. Other fencing (for sed control) refer to 33-23, 24, 25, 26, 27 and 33.	58 km	**CCMA**/ UBLN, LH	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, d, f, g, h,
Establish stewardship/management agreement	58 ha	**Land Manager /** CCMA	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, d, f, g, h,
Implement Central Region Sustainable Waterway Strategy action for Upper Barwon environmental entitlement – Not costed.	N/A	**CCMA**/ VEWH, DEPI, BW, SRW	Inc in Low Flow Magnitude (3)	i

Estimated cost of activities	**$ 2,808,500**

Barwon River West Branch

Waterway	Barwon River West Branch	Landscape Zone	Upper Barwon
Identification No.	33-06, 33-07	**Basin**	Otway Coast



Links to Regional Goals

Due to its values, Barwon River West Branch (33-06) is a priority under the following regional goals	
Goal ENV3	Manage water for the environment to improve waterway condition

Due to its values, Barwon River West Branch (33-07) is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Important Bird Habitats	Birds Australia consider as Important Bird Area
	Significant EVCs	Streamside Zone Sub-Index Score of 8 with known endangered EVC present: Cool Temperate Rainforest
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity 10,000-50,000ML)

Threats

Threat	Details
Loss of Instream Habitat (Large Wood)	Very Poor Habitat. Typical features: No instream wood visible. (3ISC Large Wood Value Score: <0.5)
Barriers to Fish Migration	Artificial barrier exists in the floodplain reach (3ISC location of barriers)
Invasive Fauna Aquatic	Invasive aquatic species directly prey on native species and/or damage native species habitat
Invasive Fauna Terrestrial	Invasive terrestrial species directly prey on native species and/or damage native species habitat
Red in High Flow Magnitude	A high flow index score of 6
Inc in Low Flow Magnitude	Low flow index score of 7

Work Program for Barwon River West Branch 33-06

Waterway	Barwon River West Branch	Identification No.	33-06

Long-term Resource Condition Targets	12 - Environmental Water entitlements for priority waterways are managed to maximise environmental outcomes.		
Management Outcome Targets (MOTs)	a - The increase in low flow magnitude threat score has reduced from moderate to low b - The reduction in high flow magnitude threat has been maintained at moderate threat level		
Values linked to regional goals	Environmental Water Entitlement	**Threats addressed by Work Program**	Red in High Flow Magnitude (3) Inc in Low Flow Magnitude (2)

Management Activity/Output	Quantity	Lead and (Partners)	Threats addressed by activity	MOT link
Implement Central Region Sustainable Waterway Strategy action for Upper Barwon environmental entitlement – Not costed.	-	**CCMA**/VEWH, DEPI, BW, SRW	Red in High Flow Magnitude (3) Inc in Low Flow Magnitude (2)	a, b

Estimated cost of activities	$ -

Work Program for Barwon River West Branch 33-07

Waterway	Barwon River West Branch	Identification No.	33-07

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Water Storages (4)	**Threats addressed by Work Program**	-

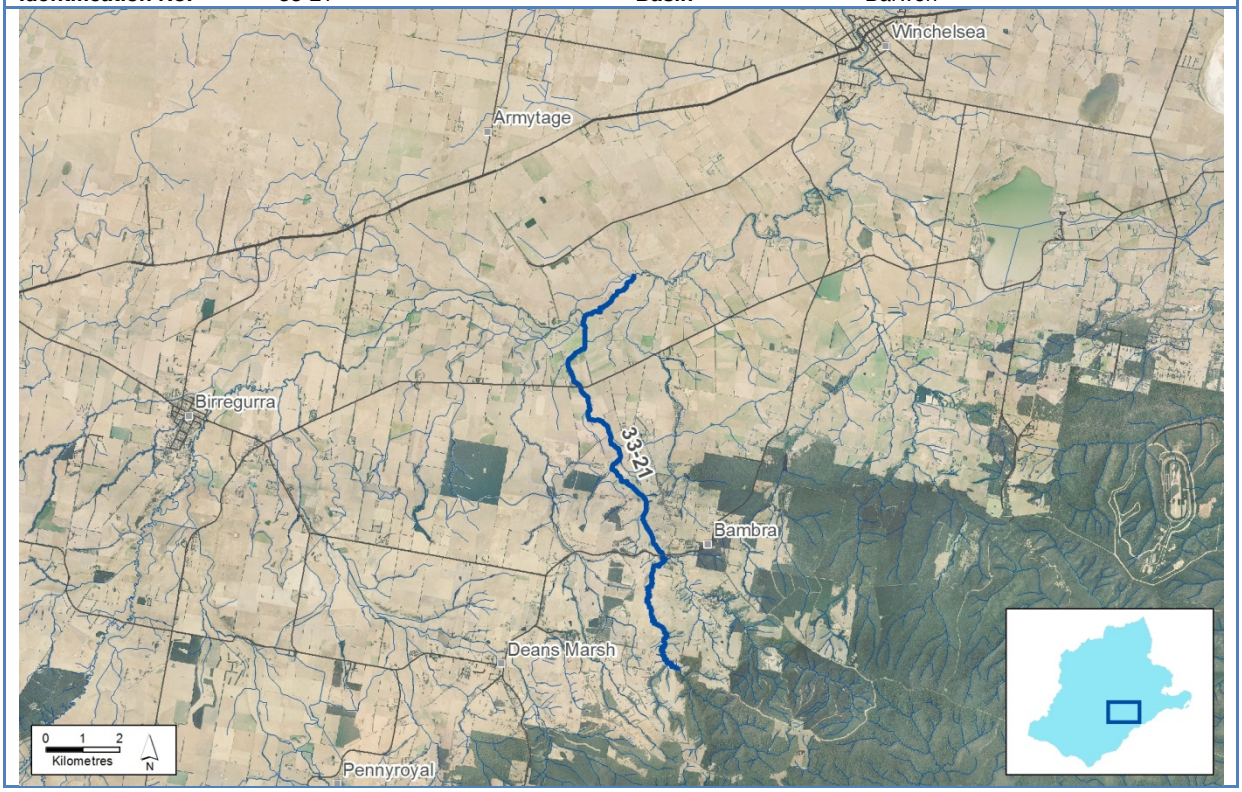
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition. Not costed.	N/A	**CCMA**/ BW	N/A*	a

Estimated cost of activities	$ -

*The threats are insignificant and do not require intervention. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Retreat Creek

Waterway	Retreat Creek	Landscape Zone	Upper Barwon
Identification No.	33-21	**Basin**	Barwon



Links to Regional Goals

Due to its values, Retreat Creek meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Drought Refuge	Is a modelled drought refuge for significant fish
	Significant EVCs	Floodplain Riparian Woodland - Endangered Sedgy Riparian Woodland - Endangered
	Aquatic Invertebrate Community Condition	Meets all biological objectives for rivers and streams
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Bank Instability	50 – 90% of the reach is eroding
Degraded Riparian Vegetation – Large Trees and Vegetation Width	Large trees are largely absent from the riparian zone and the riparian corridor is narrow for the size of the stream
Livestock Access	25-75% of the reach is affected by livestock access
Loss of Instream Habitat Sedimentation	Deposition of sediments above natural levels mainly at bends and-or instream obstructions

Work Program Retreat Creek

Waterway	Retreat Creek	Identification No.	33-21

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from poor to moderate b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - Livestock have been excluded from over 50% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation e - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Bank Instability (4) Deg Rip Veg - Large Trees (5) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 7ha of reach frontage	7 ha	**CCMA**/ UBLN, LH	Bank Instability (4), Deg Rip Veg - Large Trees (5), Loss of Ins Hab (Sed) (3)	a, b, d
Install riparian fence - 3.5km (20%) of reach length - 7km frontage	7 km	**CCMA**/ UBLN, LH	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	a, c, d, e
Establish stewardship/management agreement	7 ha	**Land Manager /** CCMA	Bank Instability (4), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	a, c, d, e
Install chute structure - stabilisation works downstream of Cape Otway Rd	1 no.	**CCMA**/ UBLN, LH	Bank Instability (4)	a

Estimated cost of activities	**$274,000**

Penny Royal Creek

Waterway	Pennyroyal Creek	Landscape Zone	Upper Barwon
Identification No.	33-23, 33-24	**Basin**	Barwon

Links to Regional Goals

Due to its values, Pennyroyal Creek (33-23) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Pennyroyal Creek (33-24) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List) (33-23)
	Drought Refuges	Is a modelled drought refuge for significant fish
	Significant EVCs	Floodplain Riparian Woodland - Endangered Sedgy Riparian Woodland - Depleted Wet Forest – Least Concern
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures (33-23)
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment

Threats

Threat	Details
Degraded Riparian Vegetation - Large Trees, Connectivity and Width	Large trees are largely absent from the riparian zone. The riparian zone is patchy along the reach and is narrow for the size of the stream.
Degraded water quality	Fails to meet SIGNAL objective in SEPP (WoV)
Invasive Flora (Riparian) – Tree Layer	Willows are present

Invasive Flora (Riparian) – Ground Layer	Gorse and blacberry are present
Livestock Access	Livestock access 25-75% of the waterway frontage
Loss of instream Habitat (Sediment)	Deposition of sediments above natural levels mainly at bends and-or instream obstructions

Work Program for Pennyroyal Creek (33-23)

Waterway	Pennyroyal Creek	Identification No.	33-23

Long-term Resource Condition Targets	02 - Waterways within Special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive riparian flora (tree layer) has reduced to a low threat level d - Livestock have been excluded from over 50% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation f - Riparian vegetation longitudinal continuity has improved from moderate to good g - Riparian vegetation width has improved from poor to moderate condition h - Investigation completed and opportunities (where required) are identified I - Invasive riparian flora (ground layer) has reduced to a low threat level		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4) Significant Fish Non Migratory (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Flora (Riparian) - Tree Layer (3) Invasive Flora (Riparian) - Ground Layer (3) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish woody weed control - willow, gorse, blackberry	9 ha	**CCMA**/ UBLN, LH	Invasive Flora (Riparian) - Tree Layer (3) Invasive Flora (Riparian) - Ground Layer (3)	c
Establish native indigenous vegetation - 4ha of reach frontage. 5ha Deans Marsh Creek	9 ha	**CCMA**/ UBLN, LH	Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Vegetation Width (4)	a, b, g
Install riparian fence - 2km (10%) of reach length - 4km frontage. 2.5 km of Deans Marsh Creek frontage	9 km	**CCMA**/ UBLN, LH	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (3)	b, d, e, f
Establish stewardship/management agreement	9 ha	**Land Manager /** CCMA	Degraded Water Quality (5), Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (3)	b, d, e, f
Investigate impacts to environmental flows throughout the broader Barwon catchment to secure and better manage environmental water where required – Not costed – refer to Environmental management program (CWS Section 5.1.3)	N/A	**CCMA**/DEPI, SRW	Red in High Flow Magnitude (3)	h

Estimated cost of activities	**$751,500**

Work Program for Pennyroyal Creek (33-24)

Waterway	Pennyroyal Creek	Identification No.	33-24

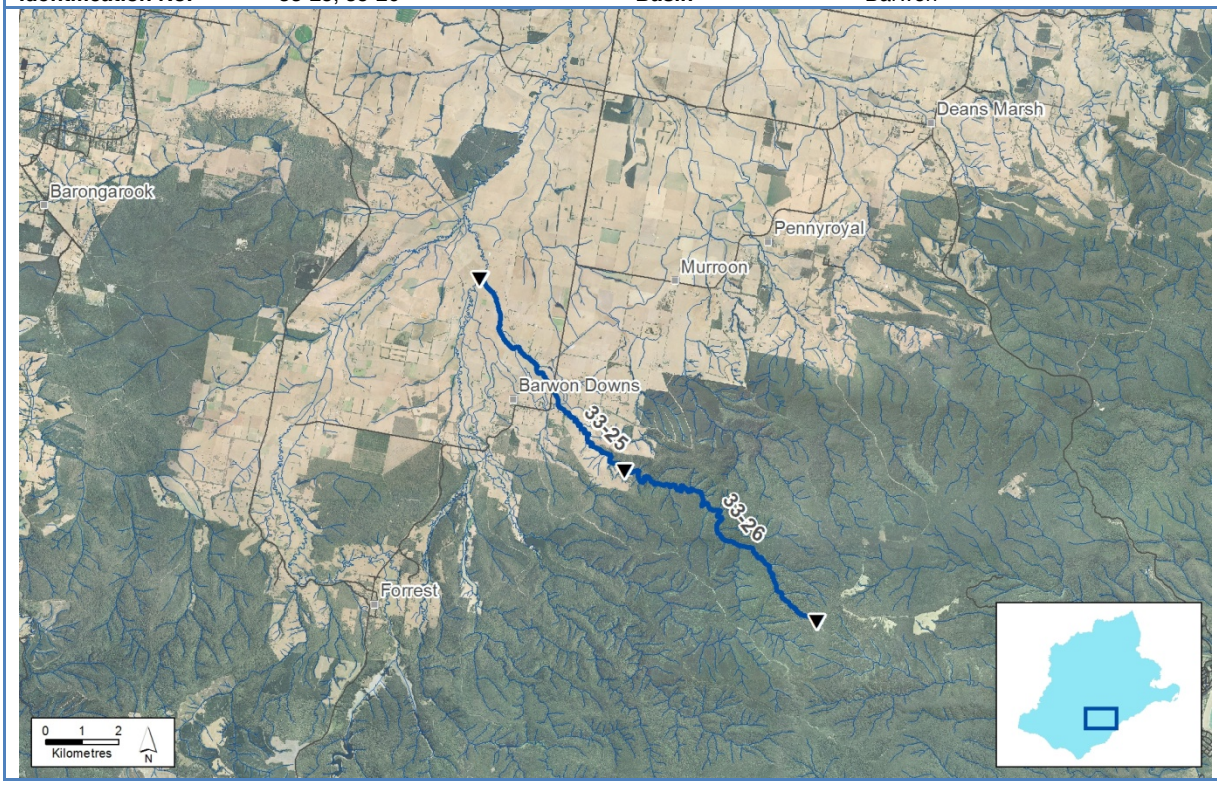
Long-term Resource Condition Targets	02 - Waterways within Special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period c - Invasive riparian flora (shrub layer) threat has been maintained at very low d - Invasive riparian flora (tree layer) has been maintained at a low threat level e - Livestock have been excluded from over 75% of the waterway frontage f - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (4) Degraded Water Quality (5) Invasive Flora (Riparian) - Shrub Layer (1) Invasive Flora (Riparian) - Tree Layer (2) Livestock Access (1) Inc in Low Flow Magnitude (4)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish native indigenous vegetation - 5ha of reach frontage	5 ha	**CCMA**/ UBLN, LH	Deg Rip Veg - Large Trees (4), Degraded Water Quality (5)	a, b
Establish woody weed control - willow, blackberry	5 ha	**CCMA**/ UBLN, LH	Invasive Flora (Riparian) - Shrub Layer (1), Invasive Flora (Riparian) - Tree Layer (2)	c, d
Install riparian fence - 2.5km (25%) of reach length - 5km frontage	5 km	**CCMA**/ UBLN, LH	Degraded Water Quality (5), Livestock Access (1)	b, e
Establish stewardship/management agreement	5 ha	**Land Manager /** CCMA	Degraded Water Quality (5), Livestock Access (1)	b, e
Investigate impacts to environmental flows throughout the broader Barwon catchment to secure and better manage environmental water where required – Not costed – refer to Environmental management program (CWS Section 5.1.3)	N/A	**CCMA**/DEPI, SRW	Inc in Low Flow Magnitude (4)	f

Estimated cost of activities	**$282,500**

Dewing Creek

Waterway	Dewing Creek	Landscape Zone	Upper Barwon
Identification No.	33-25, 35-26	**Basin**	Barwon



Links to Regional Goals

Due to its values, Dewing Creek (33-25) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Due to its values, Dewing Creek (33-26) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Drought Refuge	Is a modelled drought refuge for fish
	Significant EVCs	Riparian Forest - Least Concern Floodplain Riparian Woodland – Endangered (33-25) Swampy Riparian Woodland - Endangered (33-25) Cool Temperate Rainforest – Endangered (33-26)
	Riparian Vegetation Condition	Streamside Zone Sub-Index Score of 10
Economic	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment supplying Geelong and district.

Threats

Threat	Details
Degraded Water Quality	Fails to meet SIGNAL objective
Livestock Access	Livestock access 25-75% of the waterway frontage
Reduced Vegetation Width	Riparian vegetation is narrow for the size of the stream
Bank instability	10 – 20% of the reach is eroding
Barriers to Fish Migration	Artificial barrier exists in floodplain reach

Work Program for Dewing Creek (33-25)

Waterway	Dewing Creek	Identification No.	33-25

Long-term Resource Condition Targets	02 - Waterways within Special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - Bank instability has improved from moderate to good c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation width has been maintained in moderate condition e - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by work program**	Degraded Water Quality (5) Bank instability (3) Livestock Access (3) Red Veg Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Install riparian fence – upstream of Barwon Water offtake (50%) 2km of frontage.	2km	**CCMA**/UBLN, BW, LH	Bank instability (3) Livestock Access (3) Degraded Water Quality (5)	a,b,c
Establish stewardship/management agreement	2 ha	**Land Manager /** CCMA	Bank instability (3) Livestock Access (3) Degraded Water Quality (5)	a,b,c
Establish native vegetation – upstream of Barwon Water offtake.	4 ha	**CCMA**/UBLN, BW, LH	Red Vegetation Width (3) Bank instability (3) Degraded Water Quality (5)	a,b,d
Investigate impacts to environmental flows throughout the broader Barwon catchment to secure and better manage environmental water where required – Not costed – refer to Environmental management program (CWS Section 5.1.3)	N/A	**CCMA**/DEPI, VEWH, BW, SRW	Knowledge gap	e

Estimated cost of activities	**$ 86,200**

Work Program for Dewing Creek (33-26)

Waterway	Dewing Creek	Identification No.	33-26

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - Waterway remains in current condition		
Values linked to regional goals	Urban or Rural Township Water Sources (4)	**Threats addressed by Work Program**	-

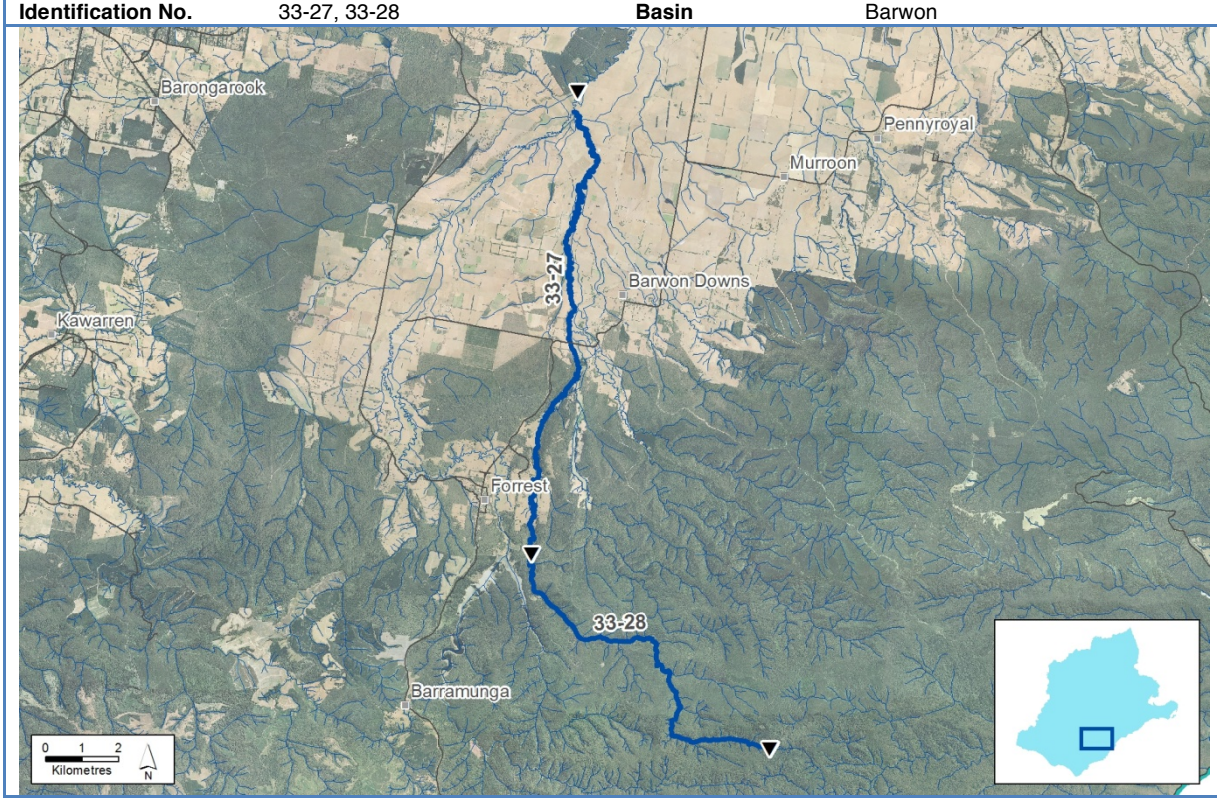
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Conduct monitoring and maintenance to ensure that waterway remains in current condition	N/A	**CCMA**/ BW	N/A*	a

Estimated cost of activities	**$ -**

*The threats are insignificant and do not require intervention. The condition of these waterways will continue to be monitored and intervention will occur if the condition of the waterway deteriorates below baseline conditions set by the Index of Stream Condition.

Barwon River East Branch

Waterway	Barwon River East Branch	Landscape Zone	Upper Barwon
Identification No.	33-27, 33-28	**Basin**	Barwon



Links to Regional Goals

Due to its values, Barwon River East Branch (Reach 33-27) meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Due to its values, Barwon River East Branch (33-28) meets the following regional goals	
Goal S1	Maintain or improve waterway condition where it supports high social values
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Important Bird Habitat	Site is of global importance for bird conservation - Otways
	Significant EVCs	Wet Forest - Least Concern Floodplain Riparian Woodland – Endangered (33-27) Swampy Riparian Woodland Endangered (33-27) Riparian Forest - Least Concern (33-28) Cool Temperate Rainforest – Endangered (33-28)
	Significant Fish Non Migratory	Dwarf Galaxias (*Galaxiella pusilla*) (High priority actions in high priority areas (ABC), Vulnerable (IUCN, EPBC, Adv List)
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures
	Urban or Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment supplying the Geelong water supply system, which covers the areas of greater Geelong, Bellarine, parts of the Surf Coast and Golden Plains.

Threats

Threat	Details
Degraded Water Quality	Fails to meet SIGNAL objective
Livestock Access	Livestock access 25-75% of the waterway frontage
Reduced Vegetation Width	Riparian vegetation is narrow for the size of the stream
Invasive Flora Riparian – Tree Layer	Willows are present in reach 33-28
Invasive Flora Aquatic	Reed Sweet Grass

Work Program for Barwon River East Branch (33-27)

Waterway	Barwon River East Branch	Identification No.	33-27

Long-term Resource Condition Targets	02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies. 03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 06 - The probability that important Dwarf Galaxias populations become self-sustaining is increased.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period b - The extent of the invasive aquatic flora is understood and management planning is underway c - Livestock have been excluded from over 50% of the waterway frontage d - Riparian vegetation width has been maintained in moderate condition e - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Rural Water Sources for Prod (4) Urban or Rural Township Water Sources (4) Significant Fish Non Migratory (5)	**Threats addressed by work program**	Degraded Water Quality (5) Invasive Flora (Aquatic) (-1) Livestock Access (3) Reduced Vegetation Width (3) Red in High Flow Magnitude (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish invasive species assessment and management - reed sweetgrass	5 ha	**CCMA**/ UBLN, BW	Invasive Flora (Aquatic) (-1)	b
Establish native indigenous vegetation - 4ha of reach frontage	4 ha	**CCMA**/ UBLN,LH	Degraded Water Quality (5), Reduced Vegetation Width (3)	a, d
Install riparian fence - 2km (10%) of reach length - 4km frontage (flood fencing)	4 km	**CCMA**/ UBLN, LH	Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, c, d
Establish stewardship/management agreement	4 ha	**Land Manager /** CCMA	Degraded Water Quality (5), Livestock Access (3), Reduced Vegetation Width (3)	a, c, d
Investigate impacts to environmental flows throughout the broader Barwon catchment to secure and better manage environmental water where required – Not costed – refer to Environmental management program (CWS Section 5.1.3)	N/A	**CCMA**/DEPI, VEWH, SRW, BW	Red in High Flow Magnitude (3)	e

Estimated cost of activities	**$165,000**

Work Program for Barwon River East Branch (33-28)

Waterway	Barwon River East Branch	Identification No.	33-28

Long-term Resource Condition Targets	01 - High value social attributes of waterways are maintained. 02 - Waterways within special water supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - Invasive riparian flora (tree layer) has been maintained at a very low threat level b - Investigation completed and opportunities (where required) are identified		
Values linked to regional goals	Urban or Rural Township Water Sources (4) Camping (5) Picnics and Barbecues (5) Sightseeing (5) Tracks (5)	**Threats addressed by work program**	Invasive Flora (Riparian) - Tree Layer (1)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Maintain woody weed control - willow follow-up	10 ha	**CCMA**/ UBLN, LH	Invasive Flora (Riparian) - Tree Layer (1)	a

Estimated cost of activities	**$50,000**

Boundary Creek

Boundary Creek is a tributary of the Barwon River. It is located south east of Colac and rises near Barongarook before joining the Barwon River at Yeodene.

Waterway	Boundary Creek	Landscape Zone	Upper Barwon
Identification No.	33-33	**Basin**	Barwon

Links to Regional Goals

Due to its values, Boundary Creek meets the following regional goals	
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Birds Riparian	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List)
	Significant Birds Waterway	Eastern Great Egret (*Ardea modesta*) - Status: Vulnerable (Adv List)
	Significant Invertebrates Aquatic	Otways Cray *(Geocharax gracilis)*- Status: Endangered (Adv List)
	Significant EVCs	Riparian Scrub/Swampy Riparian Woodland Complex - Depleted Floodplain Riparian Woodland - Endangered Swampy Riparian Woodland - Endangered Sedgy Riparian Woodland - Depleted

Threats

Threat	Details
Disturbance of Acid Sulfate Soils	Adjacent land contains acid sulfate soils
Invasive Flora (Riparian) Shrub Layer	Blackberries are present
Livestock access	Livestock access 25% of the waterway frontage

Work Program for Boundary Creek

Waterway	Boundary Creek	Identification No.	33-33

Long-term Resource Condition Targets	11 - All extant populations of Otways Cray are secured.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - No measurable outcome targets are able to be set for the disturbance of acid sulfate soil threat addressed over the eight-year implementation period c - Invasive riparian flora (shrub layer) threat has reduced from moderate to low d - Livestock have been excluded from over 50% of the waterway frontage		
Values linked to regional goals	Significant Birds Riparian (4) Significant Birds Waterway (4) Significant Invertebrates Aquatic (5)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (3) Disturbance of Acid Sulfate Soils (5) Invasive Flora (Riparian) - Shrub Layer (3) Livestock Access (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk – Not costed.	40 ha	**BW, DEPI, SRW**/, COS, CCMA	Disturbance of Acid Sulfate Soils (5)	b
Establish woody weed control - blackberry	5 ha	**CCMA**/ UBLN, LH	Invasive Flora (Riparian) - Shrub Layer (3)	c
Establish native indigenous vegetation - 5ha of reach frontage	5 ha	**CCMA**/ UBLN, LH	Deg Rip Veg - Large Trees (3)	a
Install riparian fence - 2.5km (10%) of reach length - 5km frontage	5 km	**CCMA**/ UBLN, LH	Livestock Access (3)	d
Establish stewardship/management agreement	5 ha	**Land Manager /** CCMA	Livestock Access (3)	d

Estimated cost of activities	**$262,500**

Lake Ayrey & Unnamed wetland

Lake Ayrey and Unnamed wetland are located east of Lake Colac, north of the Princes Highway.

Waterway	Lake Ayrey & Unnamed wetland	Landscape Zone	Upper Barwon
Identification No.	52365	**Basin**	Barwon

Links to Regional Goals

Due to their values, Lake Ayrey and wetland are a priority under the following regional goal	
Goal ENV5	Maintain the extent and condition of other significant wetlands (by type)

Key Values

Type	Attribute	Details
Environmental	Significant EVCs	Plains Grassy Wetland - Endangered
	Significant Birds	Brolga (*Grus rubicunda*) – Vulnerable (52365)
	Drought refuge	Modelled Drought Refuge

Threats

Threat	Details
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on Brolga (Grus rubicunda) and other bird species
Degraded Water Quality	The Index of Wetland Condition indicates that the wetland has very poor water quality, or very highly changed water properties
Invasive Flora (Wetland)	Phalaris is present and outcompeting indigenous wetland species

Work Program for Lake Ayrey

Waterway	Lake Ayrey	Identification No.	52365

Long-term Resource Condition Targets	16 -The condition of wetlands supporting Plains Grassland Wetland EVC is maintained or improved.		
Management Outcome Targets (MOTs)	a - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts)		
Values linked to regional goals	Significant EVCs (5)	**Threats addressed by work program**	Invasive Fauna (Terrestrial) (5)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	a

Estimated cost of activities	$-

Work Program for Unnamed wetland

Waterway	Unnamed wetland

Long-term Resource Condition Targets	16 - The condition of freshwater marshes and meadows supporting the seasonal herbaceous wetlands ecological community are maintained or improved.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved from very poor to moderate condition b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive wetland flora threat is maintained at a low threat level		
Values linked to regional goals	Wetland Vegetation Condition (4)	**Threats addressed by work program**	Degraded Buffer (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Wetland) (2)

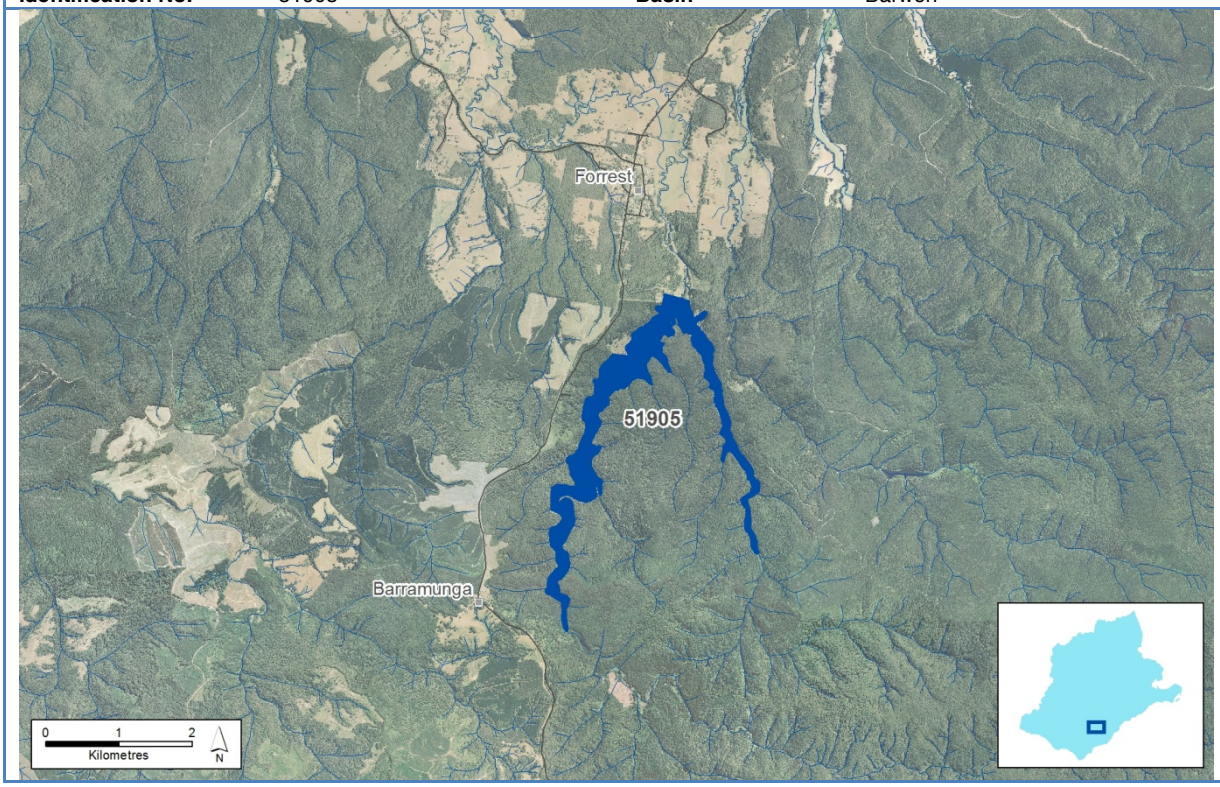
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish non-woody weed control - phalaris	8 ha	**CCMA**/ UBLN, LH	Degraded Buffer (5), Invasive Flora (Wetland) (2)	a, c
Establish stewardship/management agreement	4 ha	**Land Manager /** CCMA	Degraded Buffer (5), Invasive Flora (Wetland) (2)	a, c
Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program). Not costed	N/A	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b

Estimated cost of activities	$32,000

West Barwon Dam

West Barwon Reservoir is located near Forrest in the Otway Ranges National Park. It is the largest storage in the Geelong water supply system. The West Barwon Reservoir is supplied by the catchment of the West Barwon River.

Waterway	West Barwon Dam	Landscape Zone	Upper Barwon
Identification No.	51905	**Basin**	Barwon



Links to Regional Goals

Due to its values, West Barwon Reservoir is a priority under the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Social	Picnics and Barbeques	Designated picnic/barbecue areas present
	Recreational Fishing	Listed as a priority/key/popular fishery in a Regional Fishery Management Plan or rated as a 'best fishing water' in A Guide to the Inland Angling Waters of Victoria
Economic	Urban/Rural Township Water Sources	Waterway forms part of an open State Water Supply Catchment
	Water Storages	Waterway used to store water for rural and/or urban water supply (storage capacity 10,000-50,000ML)

Work Program for West Barwon Dam

Waterway	West Barwon Dam	Identification No.	51905

Long-term Resource Condition Targets	02 - Waterways within Special Water Supply catchments are managed to provide quality water for urban water supplies.		
Management Outcome Targets (MOTs)	a - No outcome target can be set that is measurable over the eight-year implementation period		
Values linked to regional goals	Water Storages (4) Urban/Rural Township Water Sources (4)	**Threats addressed by Work Program**	Threats to water quality within these systems are addressed through activities aimed at protecting river reaches within upstream water supply catchments.

Management Activity/Output	Quantity	Lead and (Partners)	Threats addressed by activity	MOT link
Continue to comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans. Not costed	N/A	**BW**	N/A	a

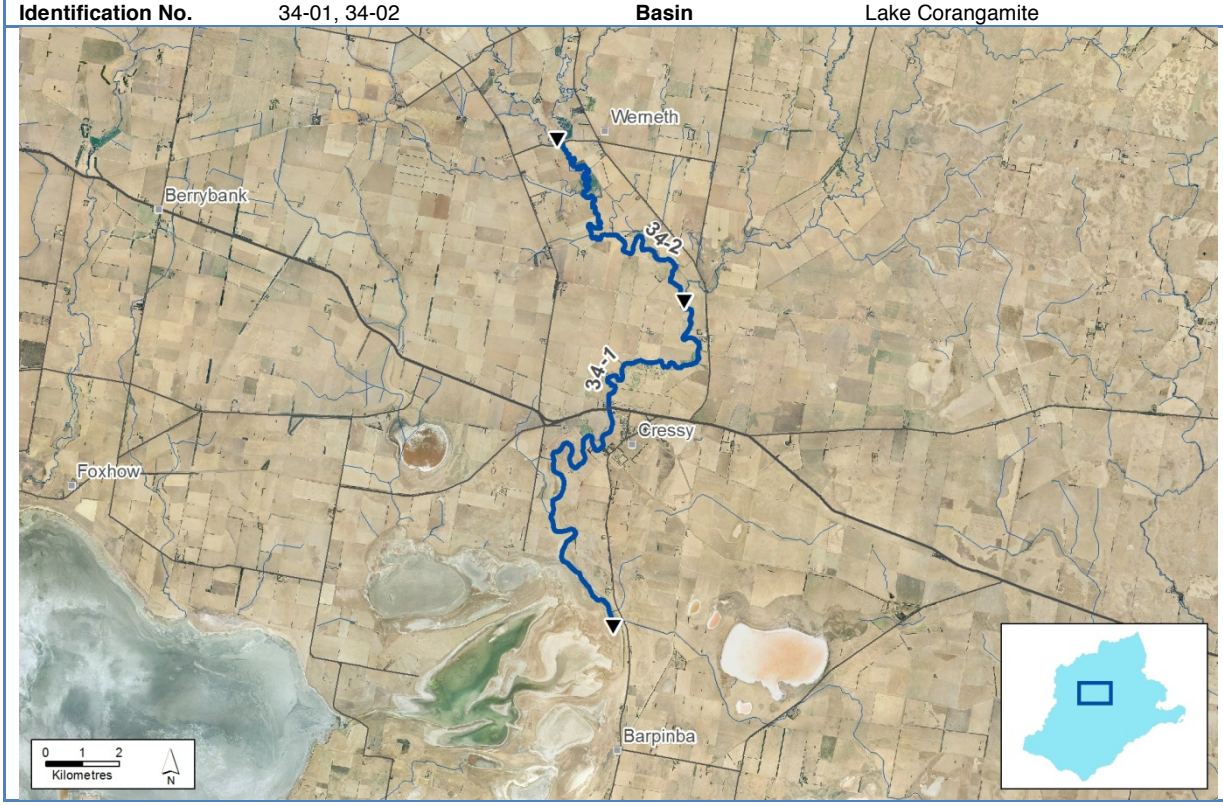
Estimated cost of activities	$ -

8.16 Woady Yaloak Landscape Zone

Woady Yaloak River

The Woady Yaloak River rises in the area north of Haddon (west of Ballarat) and flows generally southward through Smythesdale, Scarsdale and Cressy into Lake Martin and eventually to Lake Corangamite. It is approximately 105 km in length.

Waterway	Woady Yaloak River	Landscape Zone	Woady Yaloak
Identification No.	34-01, 34-02	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Woady Yaloak River meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Drought Refuge	Modelled drought refuge for significant species
	Significant Birds	Australasian Shoveler (*Anas rhynchotis*) – Vulnerable Eastern Great Egret (*Ardea modesta*) - Vulnerable
	Significant EVCs	Swamp Scrub – Endangered Floodplain Riparian Woodland - Endangered
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Degraded Riparian Vegetation – Large Trees, Riparian Connectivity	Large trees are largely absent from the riparian zone, the riparian zone is patchy and narrow for the stream width

and Vegetation Width	
Livestock Access	Livestock access over 75% of the waterway frontage
Loss of Instream Habitat (Sedimentation)	Deposition of sediments above natural levels mainly at bends and/ or instream obstructions
Degraded Water Quality	This is not currently recorded as a threat for this reach, however salinity may affect water quality and limit use for stock and agriculture. Further investigation is required

Work Program Woady Yaloak River (34-01)

Waterway	**Woady Yaloak River**	**Identification No.**	**34-01**

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource. 05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Livestock have been excluded from over 25% of the waterway frontage d - No increase in the loss of in-stream habitat through sedimentation e - Riparian vegetation longitudinal continuity has improved from poor to moderate f - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4) Significant Fish Non Migratory (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Invasive Fauna (Terrestrial) (5) Livestock Access (5) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (4) Reduced Vegetation Width (5)

Management Activity/Output	**Quantity**	**Lead/ Partners**	**Threats addressed by activity**	**MOT link**
Establish terrestrial pest animal control - rabbit control	49 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Establish native indigenous vegetation - 9ha of reach frontage. 40ha of frontage within Kurac A Ruc catchment. Other revegetation (for sediment control) refer to 34-2	49 ha	**CCMA**/ WYCG/LH	Deg Rip Veg - Large Trees (5), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (4), Reduced Vegetation Width (5)	a, d, e, f
Install riparian fence - 4.5km (25%) of reach length - 9km frontage. 40km of frontage within Kurac A Ruc catchment. Other fencing (for sediment control) refer to 34-2	49 km	**CCMA**/ WYCG/LH	Livestock Access (5), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (4)	c, d, e
Establish stewardship/management agreement	49 ha	**Land Manager /** CCMA	Livestock Access (5), Loss of Ins Hab (Sed) (3), Reduced Riparian Connectivity (4)	c, d, e

Estimated cost of activities	**$1,274,000**

Waterway	Woady Yaloak River	Landscape Zone	Woady Yaloak
Identification No.	34-02	**Basin**	Lake Corangamite

Links to Regional Goals

Due to its values, Woady Yaloak River meets the following regional goals	
Goal EC1	Secure and manage waterways that provide significant economic benefits to the region

Key Values

Type	Attribute	Details
Environmental	Drought Refuge	Modelled drought refuge for significant species
	Significant EVCs	Floodplain Riparian Woodland - Endangered
Economic	Rural Water Sources for Prod	Water source is used for irrigated modified pastures

Threats

Threat	Details
Degraded Riparian Vegetation – Large Trees, Riparian Connectivity and Vegetation Width	Large trees are largely absent from the riparian zone, the riparian zone is patchy and significantly narrow for the stream width
Livestock Access	Livestock access 25- 75% of the waterway frontage
Loss of Instream Habitat (Sedimentation)	Deposition of sediments above natural levels mainly at bends and/ or instream obstructions
Degraded Water Quality	Fails to meet SIGNAL objective in SEPP (WoV). Additionally salinity may affect water quality and limit use for stock and agriculture (further investigation is required).

Work Program for Woady Yaloak River (34-02)

Waterway	Woady Yaloak River	Identification No.	34-02

Long-term Resource Condition Targets	03 - Waterways that support licensed diversions for irrigated agriculture are managed to maintain or improve the quality and viability of the resource.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period c - No measurable outcome target is able to be set for the water quality threat over the eight-year implementation period d - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) e - Livestock have been excluded from over 50% of the waterway frontage f - Riparian vegetation longitudinal continuity has improved from moderate to good g - Riparian vegetation width has improved from poor to moderate condition		
Values linked to regional goals	Rural Water Sources for Prod (4)	**Threats addressed by work program**	Bank Instability (3) Deg Rip Veg - Large Trees (5) Degraded Water Quality (5) Invasive Fauna (Terrestrial) (5) Livestock Access (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (5)

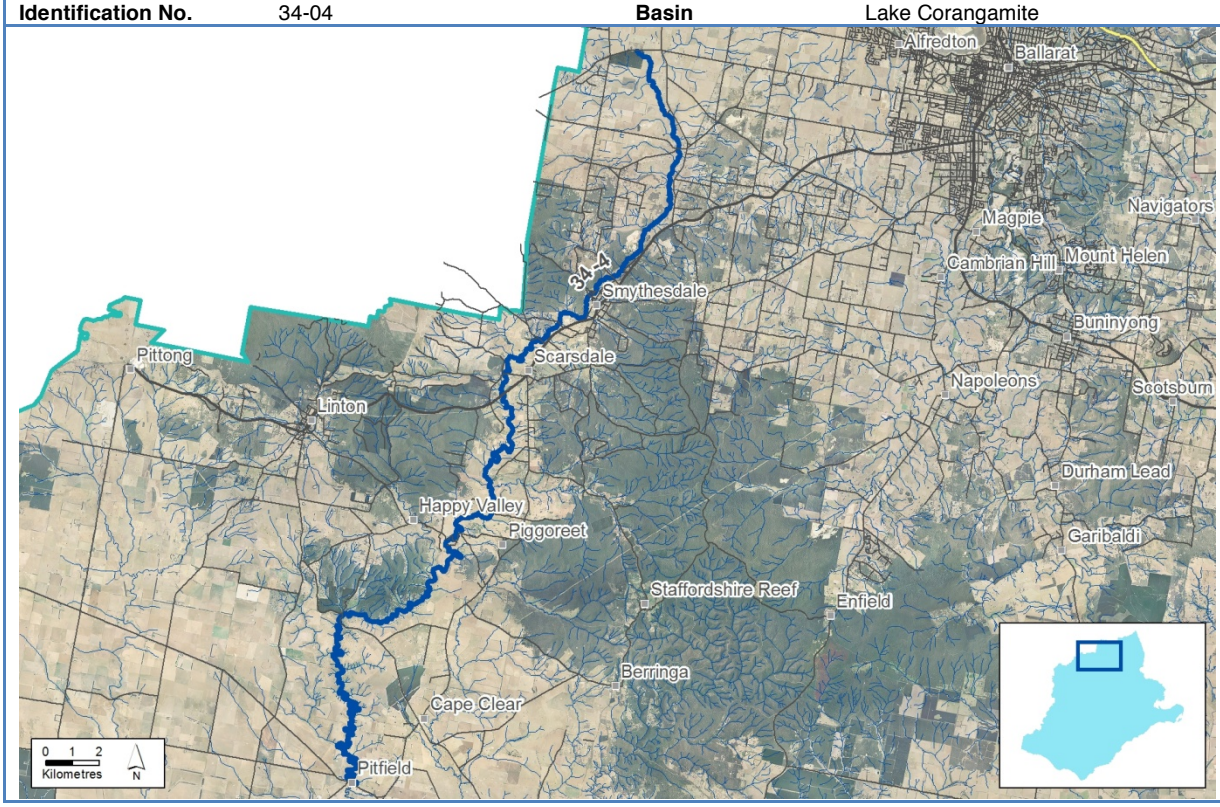
Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Implement best management practice on grazing properties - Not costed - refer to Ag BMP (CWS, Section 5.1.3)	N/A	**CCMA**/ WYCG, LH	Degraded Water Quality (5)	c
Establish terrestrial pest animal control - rabbit control	30 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	d
Establish native indigenous vegetation - 5ha of reach frontage. 20ha of frontage within Naringhil catchment. Other revegetation (for WQ) refer to 34-10	30 ha	**CCMA**/ WYCG, LH	Bank Instability (3), Deg Rip Veg - Large Trees (5), Degraded Water Quality (5), Reduced Riparian Connectivity (3), Reduced Vegetation Width (5)	a, b, c, f, g
Install riparian fence - 5km (50%) of reach length - 10km frontage. 20km of frontage within Naringhil	30 km	**CCMA**/ WYCG, LH	Bank Instability (3), Degraded Water Quality (5), Livestock Access (3)	a, c, e

catchment. Other fencing (for WQ) refer to 34-10				
Establish stewardship/management agreement	30 ha	**Land Manager /** CCMA	Bank Instability (3), Degraded Water Quality (5), Livestock Access (3)	a, c, e

Estimated cost of activities	**$1,005,000**

Woady Yaloak River

Waterway	Woady Yaloak River	Landscape Zone	Woady Yaloak
Identification No.	34-04	**Basin**	Lake Corangamite



Links to Regional Goals

Due to its values, Woady Yaloak River meets the following regional goals	
Goal ENV1	Maintain the viability of populations of threatened native fish species
Goal ENV2	Maintain or improve the resilience of other threatened waterway dependent species

Key Values

Type	Attribute	Details
Environmental	Significant Amphibians	Growling Grass Frog (*Litoria raniformis*) - Status: Endangered (IUCN, Adv List), Vulnerable (EPBC)
	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant EVCs	Creekline Herb-rich Woodland - Endangered Riparian Woodland - Endangered Stream Bank Shrubland - Endangered

Threats

Threat	Details
Degraded Riparian Vegetation – Large Trees and Vegetation Width	Large trees are largely absent from the riparian zone, the riparian zone is narrow for the stream width
Livestock Access	Livestock access 25- 75% of the waterway frontage
Loss of Instream Habitat (Sedimentation)	Deposition of sediments above natural levels mainly at bends and/ or instream obstructions
Invasive Fauna Terrestrial	Foxes are present and actively prey on wildlife
Invasive Flora (Riparian) Shrub Layer	Gorse is present

Work Program for Woady Yaloak River (34-04)

Waterway	Woady Yaloak River	Identification No.	34-04

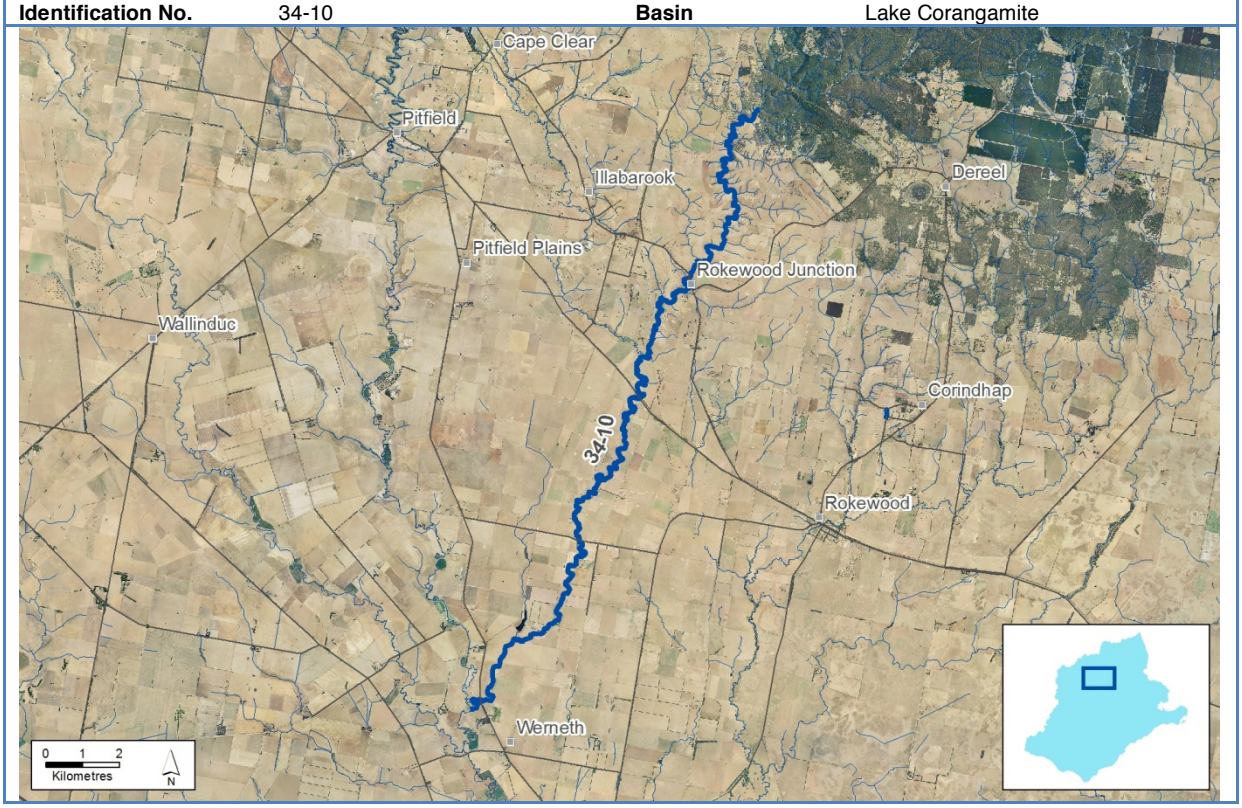
Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline. 10 - Populations of Growling Grass Frog are secured, particularly those occurring in known breeding habitats.		
Management Outcome Targets (MOTs)	a - No measurable outcome target is able to be set for the degraded riparian vegetation – large trees threat over the eight-year implementation period b - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) c - Invasive riparian flora (shrub layer) threat has reduced from moderate to low d - Livestock have been excluded from over 50% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation f - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Significant Amphibians (5) Significant Fish Non Migratory (4)	**Threats addressed by work program**	Deg Rip Veg - Large Trees (5) Invasive Fauna (Terrestrial) (5) Invasive Flora (Riparian) - Shrub Layer (3) Livestock Access (3) Loss of Ins Hab (Sed) (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Stabilise gully networks - u/s of Rokewood-Skipton Road	11 km	**CCMA**/ WYCG, LH, DEPI	Loss of Ins Hab (Sed) (3)	e
Establish terrestrial pest animal control - rabbit control	10 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	b
Establish woody weed control - gorse	5 ha	**CCMA**/ WYCG, LH	Invasive Flora (Riparian) - Shrub Layer (3)	c
Establish native indigenous vegetation - 10ha of reach frontage	10 ha	**CCMA**/ WYCG, LH	Deg Rip Veg - Large Trees (5)	a
Install riparian fence - 5km (10%) of reach length - 10km frontage	10 km	**CCMA**/ WYCG, LH	Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	d, e, f
Establish stewardship/management agreement	10 ha	**Land Manager /** CCMA	Livestock Access (3), Loss of Ins Hab (Sed) (3), Reduced Vegetation Width (3)	d, e, f

Estimated cost of activities	**$915,500**

Little Woady Yaloak Creek

Waterway	Little Woady Yaloak Creek	Landscape Zone	Woady Yaloak
Identification No.	34-10	**Basin**	Lake Corangamite



Links to regional goals

Due to its values, Little Woady Yaloak Creek meets the following regional goals:	
Goal ENV1	Maintain the viability of populations of threatened native fish species

Key Values

Type	Attribute	Details
Environmental	Significant Fish Non Migratory	Yarra Pygmy Perch (*Nannoperca obscura*) - Status: Vulnerable (EPBC), Near Threatened (Adv List)
	Significant EVCs	Floodplain Riparian Woodland - Endangered Creekline Herb-rich Woodland - Vulnerable Riparian Woodland - Endangered

Threats

Threat	Details
Degraded Riparian Vegetation – Large Trees and Vegetation Width	Large trees are largely absent from the riparian zone, the riparian zone is patchy and narrow for the stream width
Livestock Access	Livestock access more than 75% of the waterway frontage
Loss of Instream Habitat (Sedimentation)	Deposition of sediments above natural levels mainly at bends and/ or instream obstructions
Invasive Fauna Terrestrial	Foxes are present and actively prey on wildlife

Work Program for Little Woady Yaloak Creek

Waterway	Little Woady Yaloak Creek	Identification No.	34-10

Long-term Resource Condition Targets	05 - The condition of sites where Yarra Pygmy Perch currently occur show no further decline.		
Management Outcome Targets (MOTs)	a - Bank instability has improved from moderate to good b - The data gap on riparian large trees in this reach has been investigated and managing planning is underway c - Invasive fauna species (terrestrial) are contained (they are present but have no significant impacts) d - Livestock have been excluded from over 25% of the waterway frontage e - No increase in the loss of in-stream habitat through sedimentation f - Riparian vegetation longitudinal continuity has improved from moderate to good g - Riparian vegetation width has been maintained in moderate condition		
Values linked to regional goals	Significant Fish Non Migratory (4)	**Threats addressed by work program**	Bank Instability (3) Deg Rip Veg - Large Trees (-1) Invasive Fauna (Terrestrial) (5) Livestock Access (5) Loss of Ins Hab (Sed) (3) Reduced Riparian Connectivity (3) Reduced Vegetation Width (3)

Management Activity/Output	Quantity	Lead/ Partners	Threats addressed by activity	MOT link
Establish terrestrial pest animal control - rabbit control	35 ha	**Land manager**/ CCMA, DEPI (Biosecurity), Landcare Network	Invasive Fauna (Terrestrial) (5)	c
Stabilise gully networks - within Mount Misery, Moonlight and Illabarook catchments	17 km	**CCMA**/ WYCG, LH, DEPI	Loss of Ins Hab (Sed) (3)	e
Establish native indigenous vegetation - 16ha of reach frontage. 9ha of frontage within Moonlight catchment. 10ha of frontage within Illabarook catchment	35 ha	**CCMA**/ WYCG, LH	Bank Instability (3), Deg Rip Veg - Large Trees (-1), Reduced Riparian Connectivity (3), Reduced Vegetation Width (3)	a, b, f, g
Install riparian fence - 8km (25%) of reach length - 16km frontage. 9km of frontage within Moonlight catchment. 10km of frontage within Illabarook catchment	35 km	**CCMA**/ WYCG, LH	Bank Instability (3), Livestock Access (5), Loss of Ins Hab (Sed) (3)	a, d, e
Establish stewardship/management agreement	35 ha	**Land Manager /** CCMA	Bank Instability (3), Livestock Access (5), Loss of Ins Hab (Sed) (3)	a, d, e

Estimated cost of activities	**$1,861,000**

8.17 Glenelg Hopkins CMA Region

Lake Bookar is included in the Corangamite Waterway Strategy as it forms part of the Western District Lakes Ramsar Site, for which the planning sits within the CWS.

Lake Bookar

Lake Bookar is located just over the western boundary of the Corangamite Region. Lake Bookar is one of nine lakes within the Western District Lakes Ramsar Site. It is approximately 500 ha in size.

Due to its values Lake Bookar meets the following Corangamite regional goals:	
Goal ENV4	Maintain or improve waterways with formally recognised significance

Values

Type	Attribute	Details
Formally Recognised Significance	Ramsar Site	Lake Bookar is one of nine wetlands that form the Western District Lakes Ramsar Site.
	Nationally Important Wetland	Lake Bookar was listed in the Directory of Important Wetlands in Australia for meeting the following criteria: 1. It is a good example of a wetland type occurring within a biogeographic region in Australia. 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail. 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
Environmental	Drought Refuge	As a permanent brackish-saline lake, Lake Bookar is considered to be a high value wetland for avifauna.
	Important Bird Habitat	38 Water bird species have been supported at Lake Bookar. Up to 6,597 Hoary-headed Grebe (*Poliocephalus poliocephalus)*, 400 Great Crested Grebes (*Podiceps cristatus)*, 328 Australian Pelicans (*Pelecanus conspicillatus)*, 450 Great Cormorants (*Phalacrocorax carbo)*, 800 Black Swans (*Cygnus atratus)*, 200 Freckled Duck, 1,526 Grey Teal (*Anas gibberifrons)*, 911 Australasian Shoveler (*A. rhynchotis)*, 3,456 Pink- eared Duck (*Malacorhynchus membranaceous*)and 10,900 Eurasian Coots (*Fulica atra)* have been observed on Lake Bookar.
	Significant Birds	Lake Bookar supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as endangered (EN) or vulnerable (VU): • Australasian Shoveler (*Anas rhynchotis*) (VU). Habitat[25]: all kinds of wetlands, preferring large undisturbed heavily vegetated freshwater swamps. It is also found on open waters and occasionally along the coast. • Eastern Great Egret (*Ardea modesta)* (VU). Habitat[26]: a wide range of wetland habitats (e.g. swamps and marshes; margins of rivers and lakes; damp or flooded grasslands). The species usually frequents shallow waters. • Freckled Duck (*Stictonetta naevosa)* (EN). Habitat[27]: prefers large, well-vegetated swamps, but moves to open water after breeding or in dry periods. • Hardhead (*Aythya australis)* (VU). Habitat[28]: freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding. • Musk Duck (*Biziura lobata)* (VU). Habitat: permanent swamps with dense vegetation. • Pied Cormorant *(Phalacrocorax varius)* – Near Threatened • Royal Spoonbill (*Platalea regia*)- Vulnerable • Whiskered Tern *(Chlidonias hybrida)* – Near Threatened • Wood Sandpiper (*Tringa glareola*) – Vulnerable • Blue-billed Duck *(Oxyura australis)*- Endangered • Brolga (*Grus rubicunda*) - Vulnerable
	Significant EVCs	Swamp Scrub - Endangered

[25] http://www.birdlife.org.au/bird-profile/australasian-shoveler
[26] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1004#habitat
[27] http://bird.net.au/bird/index.php?title=Freckled_Duck
[28] http://www.birdlife.org.au/bird-profile/hardhead

Threats

Threat	Details
Degraded Buffer	The Index of Wetland Condition indicates that the wetland buffer is in very poor condition
Invasive Fauna (Terrestrial)	Foxes are present and directly prey on bird species

Work program for Lake Bookar[29]

Basin:	Hopkins	Management Area:	Volcanic Plain
Waterway	**Lake Bookar**	**Identification No.**	**32240**

Long-term Resource Condition targets	21 - To ensure that identified drought refuges within the Glenelg Hopkins region continue to meet the listing criteria. 22 - To ensure that listed important bird habitats within the Glenelg Hopkins region continue to meet the listing criteria. 23 - To ensure that the blue-billed duck can survive, flourish and retain its potential for evolutionary development in the wild. 38 - To protect high value wetlands known to be utilised by freckled duck.		
Ramsar Limits of Acceptable Change	LAC1 – Hydrology - permanent wetlands not drying for more than two months in any five year period (not feasible to address through this work program). LAC2 – Salinity - saline (5 to 50 parts per thousand) (not feasible to address through this work program). LAC3 – Vegetation - Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar Site at least one year in any five year period. LAC4 – Waterbirds - Total waterbird numbers not less than 28,000 during summer. Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period. Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar Site at least once in every five year period.		
Management Outcome Targets (MOTs)	a - The wetland buffer vegetation has improved to good condition (also addresses LAC3, LAC4) b - Maintain the ecological character of the Ramsar Site (see LACs above)		
Values linked to regional goals	Important Bird Habitats (5) Drought Refuges (5) Significant Birds (5)	**Threats addressed by work program**	Degraded Buffer (5), Degraded Water Quality (3), Invasive Fauna (Terrestrial) (5)

GHCMA Activity ID	Management Activity/Output	Quantity	Lead/Partner	MOT Link
32240.1	**Implement best management practice on dairy farms**	150 ha	**DEPI** / dairy industry / landholders	n/a
32240.2	**Install riparian fence (on private land only)**	3.75 km	**Parks Victoria**	a, b
32240.3	**Grazing exclusion**	15 ha	**LH**/ CMA	a, b
32240.4	**Establish terrestrial pest animal control at waterway as part of a cooperative regional partnership program**	15 ha	**Land managers**	n/a
32240.5	**Maintain grass buffer strip**	15 ha	**LH**/CMA	a, b

[29] Extracted from Glenelg Hopkins Waterway Strategy 2014-2022, pp161

Glossary of terms and acronyms

Terms

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.

Aquifer
A discrete layer of fractured rock, gravel, sand, or limestone below the ground that is porous enough to hold and convey groundwater.

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.

Bank Erosion
Loss of soil from river or gully banks which may result from movement of water in the stream channel, livestock impacts and/or the loss of vegetation.

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.

Biodiversity
A word used to describe biological heterogeneity. It covers the number of species of plants and animals present, as well as how different they are from one another.

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.

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.

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.

Community values
The importance that regional communities place on a natural asset or asset theme.

Connectivity
Refers to the links between different habitats and species within a landscape

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.

Ecosystem services
The resources and processes that natural ecosystems supply. Ecosystem Services are often referred to in terms of Social, Environmental, or Economic values or services.

Environmental flow regime
The timing, frequency, duration and magnitude of flows for the environment.

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.

EstuaryWatch
A Victorian community based estuarine monitoring program that is managed by the Corangamite Catchment Management Authority.

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

Goal
A statement that describes a desired outcome of waterway management, on a regional scale, at the end of a 20-year period.

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.

Heritage River
A Heritage River in Victoria has: one or more values of national or international significance, where those values are strongly associated with a substantial section of the watercourse; or an aggregation of at least four values, generally of State or greater significance, which together create a corridor of Victorian heritage river status.

Hydrology
The science that considers the distribution of water over the land (as opposed to hydraulics that considers the physical effects of the water in its passage).

Instream
The component of a river within the river channel, including pools, riffles, woody debris, the river bank and benches.

Integrated catchment management
Integrated catchment management is the co-ordinated involvement of agencies, stakeholders and the general public in policy making, planning, and management to promote sustainable use of natural resources.

Landscape zones
Management zones within the region based on criteria such as waterway catchments, bioregions and existing remnant vegetation.

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 base flows that occur over the drier periods of the year that are sustained for some period (weeks to months), due to short bursts of rain.

Macroinvertebrates
An invertebrate (animal without a backbone) that is visible to the naked eye.

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.

pH
A measure of the concentration of the acidity or alkalinity of the water (hydrogen ions in water).

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.

Regulated flows/systems
Systems where the flow of the river is regulated through the operation of large dams or weirs.

Resilience
The ability of an ecosystem to return to its original state after being disturbed.

Riparian
Refers to land or vegetation that adjoins a river, creek, estuary, lake or wetland.

Rock Chute
Construction within the river channel which is made up of a layer of dense angular rock used to build a long sloping chute. Total fall usually limited to about 1m. The design incorporates an upstream crest, a chute section and an energy dissipating area. Used to control active bed erosion in gullies, streams and rivers.

Salinity
The concentration of dissolved salts in water, mainly chlorides, bicarbonates and sulphates of sodium, calcium, magnesium and potassium. Salinity is a natural feature of waterways and varies across the landscape. Increasing salinity from changed land and water issue is a serious issue for both aquatic and terrestrial ecosystems.

Sedimentation
The deposition and/or accumulation of small particles of soil, sand or clay which has dropped out of the water column. Can lead to in-stream habitat degradation and may be the result of up-stream erosion.

Strategic action
An action that needs to occur over the six-year life of the RCS if one or more of the objectives are to be achieved. Strategic actions are regionally focused, strategic, and not specific to any individual area or asset.

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.

Threat
An element that has potential to harm an asset, e.g. pest plants, pest animals, erosion.

Vision
A statement describing a future state that we aspire to achieve. Set with a 50-year horizon.

Waterwatch
Waterwatch is a community engagement program in Victoria that connects local communities with river health and sustainable water issues and management.

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.

Acronyms

Acronym	Full description
ABC database	Actions for Biodiversity Conservation
ANZECC guidelines	*Australian and New Zealand guidelines for fresh and marine water quality*
AROTS	Australian Rare or Threatened Species
ASS	Acid sulphate soils
AVIRA	Aquatic Value Identification and Risk Assessment
CaLP Act	*Catchment and Land Protection Act 1994*
CAP	Coastal Action Plans
CAMBA	Chinese Australia Migratory Birds Agreement
CMA	Catchment Management Authority
CRHS	*Corangamite River Health Strategy*
CWS	*Corangamite Waterway Strategy*
DIWA	Directory of Important Wetlands Australia
DEPI	Department of Environment and Primary Industries
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment
EEMSS	Estuary Entrance Management Support System
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
EWMP	Environmental Water Management Plans
EWR	Environmental Water Reserve
FFG Act	*Flora and Fauna Guarantee Act 1988*
GDE	Groundwater Dependent Ecosystem
IEC	Index of Estuary Condition
ISC	Index of Stream Condition
IWC	Index of Wetland Condition
IWCM	Integrated water cycle management
JAMBA	Japanese Australia Migratory Birds Agreement
MOT	Management outcome target
MOU	Memorandum of Understanding
NRM	Natural Resource Management
OAAV	Office of Aboriginal Affairs Victoria
RAP	Registered Aboriginal Party
RCS	*Regional Catchment Strategy*
RCT	Resource condition target
SWS	Sustainable Waterway Strategy
SEPP	*State Environment Protection Policies*
VCS	*Victorian Coastal Strategy*
VEFMAP	Victorian Environmental Flows Monitoring and Assessment Program
VEWH	Victorian Environmental Water Holder
VRHS	*Victorian River Health Strategy*
VROTS	Victorian Rare or Threatened Species
VVP	Victorian Volcanic Plains
VWMS	*Victorian Waterway Management Strategy*
WCB	Western Coastal Board

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APPENDIX A – Legislation, strategies and policies

International

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

The Convention on Wetlands of International Importance (the Ramsar Convention) provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. The Convention encourages member countries to nominate sites containing representative, rare or unique wetlands, or that are important for conserving biological diversity, to the List of Wetlands of International Importance (Ramsar sites). Ramsar sites are a matter of national environmental significance under the *Environment Protection and Biodiversity Act 1999* (Cth).

Over the last three decades, Australia has played an important role in international efforts to protect and conserve migratory birds of the East Asian - Australasian Flyway. This work began with bilateral migratory bird agreements, which provide a formal framework for cooperation between two countries on issues of mutual interest. The Australian Government has entered into three bilateral migratory bird agreements: Japan-Australia Migratory Bird Agreement (JAMBA); China-Australia Migratory Bird Agreement (CAMBA); and the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

National

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

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance.

The *Native Title Act 1993* (Cth) provides a framework for the protection and recognition of native title. The Native Title Act gives Indigenous Australians who hold native title rights and interests—or who have made a native title claim—the right to be consulted and, in some cases, to participate in decisions about activities proposed to be undertaken on the land.

State

The *Victorian Waterway Management Strategy* (VWMS) developed in 2013 provides the framework for government, in partnership with the community, to manage rivers, estuaries and wetlands so they can support environmental, social, cultural and economic values now and into the future. The VWMS updates the 2002 *Victorian River Health Strategy* (VRHS) which was a significant milestone for river management in Victoria. It outlined clear principles for making regional decisions on river protection and restoration, identifying regional priorities for management activities and state-wide direction on important management issues affecting river health.

Victoria's water allocation framework provides the basis for the management of Victoria's water resources. Under the *Water Act 1989*, the Victorian Government retains the overall right to the use, flow and control of all surface water and groundwater on behalf of all Victorians. All water taken for consumptive purposes is done so under entitlements set out in the Water Act. Victoria's water allocation framework takes a whole-of-system water management approach and considers all water resources (surface water and groundwater) for both consumptive and environmental purposes at all phases of the water cycle. Like surface water, groundwater is allocated for commercial and irrigation purposes under strict licensing arrangements under the Water Act.

The *Water Act 1989* also defines the Environmental Water Reserve (EWR) as the amount of water set aside to meet environmental needs. The Victorian Environmental Water Holder was established in 2011, under the Water Act, as an independent statutory body responsible for making decisions on the most efficient and effective use of Victoria's environmental entitlements.

The key state-wide policy framework for water quality protection in Victoria is the *State Environment Protection Policy (Waters of Victoria)*. It provides a statutory framework for State and local government agencies, businesses and communities to work together to protect and restore Victoria's surface water environments. The *State Environment Protection Policy (Waters of Victoria)* identifies beneficial uses of water and sets the environmental quality objectives and policy directions required to address higher risk impacts and activities.

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. The FFG Act lists threatened species and ecological communities; and threatening processes. The FFG Act provides for the preparation of a Flora and Fauna Guarantee Strategy, which was launched as *Victoria's Biodiversity Strategy* in 1997.

The *Coastal Management Act 1995* establishes a framework for co-ordinated strategic coastal planning in Victoria and provides for the use, development and protection of coastal Crown Land. The Coastal Management Act establishes the Victorian Coastal Council and the three coastal boards, Western, Central and Gippsland. The Coastal Management Act provides for the preparation of the *Victorian Coastal Strategy*, Coastal Action Plans and management plans. The Victorian Coastal council establishes the strategic framework for planning, and management of the Victorian coast sustainably into the future.

The *Wildlife Act 1975* provides for the protection and conservation of wildlife, including the sustainable use of and access to wildlife. It establishes State wildlife and nature reserves and provides for the issue of game licenses for the taking of particular species. It regulates the conduct of persons engaged in activities concerning or related to wildlife.

Regional

The *Catchment and Land Protection Act 1994* establishes Regional Catchment Strategies (RCSs) as the primary framework for integrated management of land, water and biodiversity in each of the ten catchment regions of Victoria. The Corangamite Catchment Management Authority is responsible for preparing the Corangamite RCS and co-ordinating and monitoring its implementation. The Corangamite RCS 2013-19 is the overarching strategy, under which are a range of sub-strategies and action plans for the Corangamite region, including the CWS. The long-term objectives and priorities for action in the Corangamite RCS that relate to waterways will be implemented through this CWS.

Regional planning processes for waterway management were established in 2002 under the VRHS and implemented in the Corangamite region through the *2006 Corangamite River Health Strategy* (CRHS) and 2010 Addendum. Community input and participation in this regional planning process was a critical element to ensure that regional planning reflected the community values of waterways in the Corangamite region. The CRHS identified high value rivers and priority management actions to be undertaken over a six-year period. The CRHS was the cornerstone of the regional planning framework for waterways, but has now passed its intended lifespan. The development of this CWS is a statutory requirement under the *Water Act 1989* and will replace (and build on) the CRHS.

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

APPENDIX B – Partners and their roles and responsibilities in waterway management

Agency or statutory body	Partners	Roles and responsibilities/links with waterways
State Government Agencies and statutory bodies	Department of Environment and Primary Industries	The Department of Environment and Primary Industries (DEPI) is the lead agency for waterway management. It is responsible for the development of waterway policy, co-ordination of regional delivery and prioritisation of Government investment in waterways. DEPI is also responsible for other aspects of natural resource management that are of relevance to waterways, including: • Sustainable management of Victoria's water resources. • Overseeing the catchment planning framework to promote integrated catchment management throughout Victoria. • Management of biodiversity. • Management of public land, including Crown frontages. It is responsible for their administration, including their licensing for riparian management and for grazing and ensuring compliance with licence conditions. It also has a direct on ground responsibility for unlicensed Crown frontages and is responsible for some aspects of waterways on public land. • Bushfire management on public land. • Delivery of sustainability and environment services at the regional level, including some services that relate to waterway management. • Manage fisheries and recreational fishing in waterways to optimise economic and social value while ensuring the sustainability of resources. • Invest in and delivers farming programs on private land where waterways occur. • Oversee the management of biosecurity, including aquatic invasive species.
	Environment Protection Authority Victoria	The EPA Victoria is an independent body responsible for the protection and improvement of Victoria's environment by establishing environmental standards, regulating and working with organisations to meet these standards. Their roles and responsibilities include: • Identifying 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). • Setting statutory standards for acceptable water quality and indicators of water quality. • Investigating water quality incidents classified as 'pollution'. • Using mandatory and regulatory mechanisms, such as licensing and other discretionary tools to assist in the achievement of water quality objectives. • Acting in partnership with DEPI and regional bodies to monitor water quality and waterway health, and enables problem solving approaches and independent audits of impacts on the environment and the protection of beneficial uses.
	Parks Victoria	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. They create, manage and maintain visitor sites and manage 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.
	Western and Central Coastal Boards	The Western and Central Coastal Boards are two of three regional coastal boards formed under the *Coastal Management Act 1995* reporting to the Minister for Environment and Climate Change. The Coastal Board's principal role is to implement the *Victorian Coastal Strategy*, provide advice

Agency or statutory body	Partners	Roles and responsibilities/links with waterways
		to the minister and the Victorian Coastal Council, and prepare and implement regional coastal plans. Another key activity is facilitating improved coastal management through liaison with industry, government and the community. The boundary between the two Coastal Boards is the entrance to Port Phillip Bay at Point Lonsdale.
	Coastal Committees of Managements	The Coastal Committees of Management are appointed by DEPI to manage coastal crown land areas under *Crown Land (Reserves) Act 1978*. These areas can also include the management of estuaries depending on the specific arrangements at each site. Within the Corangamite region there are 4 coastal committees of management: the Bellarine Bayside Committee of Management; Barwon Coast Committee of Management; the Great Ocean Road Committee of Management; and the Otway Coast Committee of Management.
	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, Commonwealth Environmental Water Holder, Murray–Darling Basin Authority, storage operators and land managers to ensure environmental water entitlements are used to achieve the best environmental outcomes.
Water Corporations	Southern Rural Water , Barwon Water, Central Highlands Water and Wannon Water	Water corporations in Victoria are established under the *Water Act 1989* and provide a range of water services to customers within their service areas. Southern Rural Water, Barwon Water, Central Highlands Water and Wannon Water provide a combination of irrigation services, domestic and stock services, bulk water supply services and urban water and wastewater services in the Corangamite region. Their link with the CWS includes: • Broader catchment health and improved water quality links to water supply. • Water reform, operational role in environmental water management.
Local Government	City of Ballarat, Colac-Otway Shire, Corangamite Shire, City of Greater Geelong, Golden Plains Shire, Surf Coast Shire, Moyne Shire and the Borough of Queenscliff	Councils are involved in the management of waterways in Victoria through their role as responsible planning authorities, managers of stormwater drainage and onsite domestic wastewater systems, users of integrated water systems, land managers, emergency management bodies, and supporters of community groups. Specifically with regard to waterways, local government have the following roles and responsibilities: • incorporate waterway and catchment management objectives, priorities and actions into strategic and statutory planning processes • undertake elements of floodplain management in accordance with the renewed *Victorian Floodplain Management Strategy* • develop and implement urban stormwater plans • manage on-site domestic wastewater systems • manage sections of waterways where formal agreements are in place • manage rural drainage where appropriate.
Traditional Owners	Traditional Owner Boards/Councils	Traditional Owners with recognised native title rights or formal agreements with the State are important in land and water management. Joint management co-operative management agreements can involve establishment of majority Traditional Owner boards or councils that prepare management plans and/or provide advice about the management of specific areas. At the time of preparation, there is currently one registered aboriginal party

Agency or statutory body	Partners	Roles and responsibilities/links with waterways
		(RAP) Wadawurrung and no recognised native title holders within the Corangamite region. It is however acknowledged that other RAP and Native Title applicants are currently being assessed.
Community	Landholders	Landholders are vital to successful implementation of this strategy, as most works are on privately owned land or affect areas that require private co-operation, and their land management practices have a vital role in catchment health. Under the *Catchment and Land Protection Act 1994* landholders are required to: • Protect water resources. • Avoid causing or contributing to land degradation which causes or may cause damage to land of another owner. • Conserve soil. • Eradicate regionally prohibited weeds and prevent the growth and spread of regionally controlled weeds. • Prevent the spread of, and as far as possible eradicate, established pest animals.
	Individuals	Community members have an important role in protecting waterway health by avoiding and reporting pollution, reducing resource consumption and contributing to environmental management processes.
	Community Groups	Community groups (such as Landcare, Waterwatch, Estuarywatch, 'Friends of' groups) participate in regional planning, priority setting and the implementation of regional works programs, participate in monitoring waterways condition and undertake projects in priority areas.
	Industry	Industry can assist in the protection and improvement of waterways by managing its activities in accordance with the principles of ecologically sustainable development and minimising impact on the environment by the implementation of best practices, in accordance with 'duty of care' responsibilities and good corporate citizenship.

APPENDIX C – Ramsar criteria met

Port Phillip Bay (Western Shoreline) and Bellarine Peninsula

Information taken from the draft Ecological Character Description for the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site (unpublished), herein referred to as PPB Ramsar site.

Criterion 1

A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region

The majority of the wetland types within the PPB Ramsar site cannot be considered unique within the bioregion, as there are many inland, marine and artificial wetlands across the bioregion and even in nearby environments. In addition, there are a number of other wetlands nearby that provide comparable values to parts of the PPB Ramsar site. For example the Eastern Treatment Plant, is an example of another high value artificial wetland in the bioregion; Western Port is an example of high conservation value coastal system and Corner Inlet and the Gippsland Lakes are high conservation value sites also located within the bioregion. As such it is difficult to make a case for the PPB Ramsar site meeting this criterion at this stage. However, in the absence of evidence to the contrary, it is considered the site continues to meet this criterion.

Criterion 2

A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

There are six threatened species supported by the wetlands within the PPB Ramsar site that contribute to the site meeting this criterion. This includes four birds, one fish and an amphibian:

- Australasian bittern (*Botaurus poiciloptilus*) listed as endangered under the IUCN Red List has been recorded on numerous occasions at Reedy Lake and The WTP (Birds Australia unpublished).
- Orange-bellied parrot (*Neophema chrysogaster*) listed as critically endangered under both the EPBC Act and the IUCN Red List is commonly recorded in all saltmarsh areas within the PPB Ramsar site (Birds Australia unpublished).
- Australian painted snipe (*Rostratula australis*) listed as vulnerable under the EPBC Act was recorded several times in the late 1970s and mid 1980s at Lake Connewarre and the WTP, including one breeding observation from the WTP (DSE unpublished).
- Fairy tern (*Sterna nereis*), listed as vulnerable under the IUCN Red List is commonly recorded at the WTP, Swan Bay and Mud Islands (Birds Australia unpublished).
- Australian grayling (*Prototroctes maraena*) listed as vulnerable under the EPBC Act and the IUCN Red List is recorded from the Barwon River and estuary (DPI 2008a; DCNR 1995).
- Growling grass frog (*Litoria raniformis*) listed as vulnerable under the EPBC Act and endangered under the IUCN Red List is commonly recorded from the WTP (DSE unpublished).

Criterion 3

A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

In the absence of any species unique to the PPB Ramsar site, or evidence that this site is substantially more species rich or diverse than other comparable areas, it is not possible to definitively state that this criterion is met. However, in the absence of evidence to the contrary, it is considered the site continues to meet this criterion.

Criterion 4

A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

The critical life stage of migration. All areas within the site support migratory shorebirds, with over 20,000 shorebirds recorded annually (AWSG 2008). This figure includes a large number of international migratory species, most of which utilise the site during the summer non-breeding months. However, a number of juvenile birds as well as the southern breeding double-banded plover utilise the site during winter. In addition, the

Barwon River Estuary provides a migratory corridor for a number of native diadromous fish species including the Australian grayling and the short-finned eel (*Anguilla australis*) (DCNR 1995; Billows and Gwyther 2007).

The critical life stage of drought refuge. The majority of inland, freshwater wetlands in southern Victoria are temporary systems, either filling annually during winter / spring or intermittently during years of above average rainfall. The permanent freshwaters of Reedy Lake and the WTP lagoons provide valuable habitat for waterfowl and other native species when these other wetlands are dry. This has been of particular importance in the prolonged drought experienced in south-eastern Australia over the last decade.

The critical life stage of breeding. The PPB Ramsar site supports breeding of at least 49 species of waterbird this includes large breeding colonies of several species on Mud Islands (Menkhorst 2010). The seagrass areas of Swan Bay are known to be important breeding and nursery areas for marine fish (Jenkins and McKinnon 2006). In addition, the WTP supports breeding of native frogs including the growling grass frog (DSE unpublished).

The critical life stage of moulting. The lagoons of the WTP annually support large numbers of waterfowl, most notably, Australian Shelduck. Over 30,000 birds have been recorded in primary moult at this site (Bob Swindley pers. com.).

Criterion 5

A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

The PPB Ramsar site is comprised of six separate areas and as such waterbird counts are most often reported for a portion of the PPB Ramsar site rather than the whole. Summer wader counts (AWSG unpublished) indicate that the site regularly supports > 20,000 shorebirds over summer (Table A1). This figure does not include other waterfowl and other non-wading species of waterbird. Lake Connewarre and Reedy Lake both support significant numbers of waterfowl during the summer months as does the WTP. Counts of total waterfowl for some areas within the PPB site were reported by the Royal Australasian Ornithologist Union (RAOU) from 1987 to 1992 (Table A2). This data does not include a number of locations within the PPB Ramsar site such as Mud Islands, Point Cooke and the Cheetham Wetlands and as such total counts could be expected to be higher. However, it is clear that there is sufficient evidence that the PPB Ramsar site meets this criterion.

Table C1 - Summer shorebird counts from sites within the PPB Ramsar site (compiled from data supplied by the AWSG 2008)

Year	Count	Year	Count	Year	Count
-	-	**1990**	15,564	**2000**	26,578
1981	21,969	**1991**	13,428	**2001**	21,405
1982	24,581	**1992**	22,881	**2002**	20,394
1983	35,262	**1993**	12,341	**2003**	33,006
1984	21,889	**1994**	32,735	**2004**	25,831
1985	27,699	**1995**	27,337	**2005**	16,566
1986	16,954	**1996**	18,349	**2006**	39,794
1987	17,108	**1997**	15,267	**2007**	28,416
1988	17,275	**1998**	28,370	**2008**	33,037
1989	33,930	**1999**	22,115	-	-

Table C2 – Summer total waterfowl counts from locations within the PPB Ramsar site (data from RAOU Reports)

Location	1987	1988	1989	1990	1991	1992
Lake Connewarre	870	924	6,115	4,427	5,900	6,524
Reedy Lake	2,662	3,992	2,916	4,371	4,986	2,942
WTP	37,552	59,463	38,904	50,137	68,869	68,637
Swan Bay		3,640	444	3,765	5,094	5,280
Total	**41,084**	**68,019**	**48,379**	**62,700**	**84,849**	**83,383**

Criterion 6

A wetland should be considered internationally important if it regularly supports one percent of the individuals in a population of one species or subspecies of waterbird.

Assessment of the PPB Ramsar site against this criterion has been made using the latest Waterbird Population Estimates (Wetlands International 2006) and by considering bird counts from within the boundary of the site only. Previous assessments against this criterion (at the time of nomination and/or 1999 RIS) were not limited to the boundary of the site, but included adjacent areas such as Swan Island and Laverton Saltworks (e.g. counts contained in Watkins 1993).

The PPB Ramsar site could be considered to regularly support > 1% of the relevant populations of 14 species of birds; four internationally migrant species, one tern, a gull and eight species of waterfowl (Table C3). In addition, at the time of listing, the site regularly supported greater than one third of the population of the orange-bellied parrot. However, as this species is technically not a waterbird, it cannot be said to contribute to the site meeting this criterion.

Table C3 - Waterbirds species for which the PPB site supports > 1% of the relevant population

Common name	Species name	Population (1%)	Maximum Count and other locations where 1% met
Curlew sandpiper	*Calidris ferruginea*	EAAF (1,800)	12,000 Feb 1983 at The Spit. Also Lake Connewarre, WTP and Pt. Cook.
Double-banded plover	*Charadrius bicinctus*	EAAF (500)	932 June 1988 at Pt. Wilson. Also The Spit and Pt. Cook.
Red-necked stint	*Calidris ruficollis*	EAAF (3,200)	10,204 Feb 2007 at the WTP. Also Lake Connewarre, The Spit and Pt. Cook.
Sharp-tailed sandpiper	*Calidris acuminata*	EAAF (1,600)	4,170 Feb 1985 at Reedy Lake. Also Lake Connewarre, WTP and The Spit.
Fairy tern	*Sterna nereis*	S. Aust (25)	110 in December 1990 near Bates Point in the Point Wilson / Limeburners Bay part of the PPB Ramsar site. Also Mud Islands, WTP, The Spit Swan Bay and Lake Connewarre.
Australasian shoveler	*Anas rhynchotis*	SE Aust. (1,000)	17,433 in 2001 at the WTP. Also Reedy Lake.
Australian shelduck	*Tadorna tadornoides*	Australia (10000)	20,997 In 2007/8 at WTP.
Blue-billed duck	*Oxyura australis*	Australia (1,000)	11,659 In 2002/3 at WTP.
Freckled duck	*Stictonetta naevosa*	Australia (250)	553 In 2003/4 at WTP.
Musk duck	*Biziura lobata*	Australia (250)	1,927 In 2007/8 at WTP.
Hoary-headed grebe	*Poliocephalus poliocephalus*	Australia (20,000)	24,881 In 2005/6 at WTP.
Pink-eared duck	*Malacorhynchus membranaceus*	Australia (20,000)	41,013 In 2006/7 at WTP.
Straw-necked Ibis	*Threskiornis spinicollis*	Australia (20,000)	57,000 breeding pairs at Mud Islands in 2009.
Silver gull	*Chroicocephalus novaehollandiae*	S Australia (20,000)	30,000 – 50,000 nests annually Mud Islands.

Criterion 8

There are a number of locations within the PPB Ramsar site that are important sources of food, nursery and migration paths for fish. The seagrass beds in Swan Bay in particular are known to be important feeding and nursery areas for a number of fish species, including the commercially important King George whiting (*Sillaginodes punctata*) (Jenkins and McKinnon 2006). Over 50 species have been recorded in Swan Bay, including estuarine and marine species.

Reedy Lake, Lake Connewarre and the Barwon River Estuary are also important areas for native fish and over twenty species have been recorded in these areas (DCNR 1995). In addition, the Barwon River Estuary is an important migratory route for native fish that travel between fresh and marine waters to spawn. These include short-finned eels, common galaxias, broad-finned galaxias, Australian grayling and lamprey (DCNR 1995). Although this criterion was not introduced until 1996, it would have been met at the time of listing and continues to be met.

Western District Lakes Ramsar site

The Western District Lakes Ramsar site is herein referred to as WDL Ramsar site. Information taken from the WDL Ramsar site Ecological Character Description (Hale and Butcher, 2011).

Criterion 1

A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region

Lake Corangamite is the largest inland permanent saline lake in Australia (Timms 2004) and therefore within the bioregion. In addition, at the time of listing it was considered to be a good representative example (arguably the best) of a permanent saline lake within the bioregion (based on the combined knowledge of the steering committee for this project). The bioregion for the aquatic ecosystems is the South East Coast Drainage Division.

Criterion 2

A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

There are two nationally threatened species supported by the wetlands within the WDL Ramsar site:

- Salt Lake Tussock-grass (*Poa sallacustris*) listed as vulnerable under the EPBC Act 1999 occurs at Lake Corangamite and Lake Terangpom (Carter and Walsh 2006).
- Spiny Peppercress (*Lepidium aschersonii*) listed as vulnerable under the *EPBC Act 1999* occurs at Lake Corangamite and Lake Beeac within the WDL Ramsar site (DSE unpublished).

Criterion 4

A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

The critical life stage of migration. Lakes within the WDL Ramsar site (most notably Lake Murdeduke and Corangamite) support large numbers of migratory shorebirds (GFNC 1993 – 2008; Birds Australia unpublished). This includes 20 species listed under international migratory bird agreements (Bonn, CAMB, JAMBA, ROKAMBA).

The critical life stage of breeding. The WDL Ramsar site supports breeding of at least 11 species of waterbird.

The critical life stage of moulting. There is evidence that waterfowl such as hardheads and Australian shelduck, use the large expanses of open water at Lakes Corangamite and Murdeduke during times of moult (GFNC 1993 – 2008).

Criterion 5

A wetland should be considered internationally important if it regularly supports 20 000 or more waterbirds.

Counts of total waterfowl for some areas within the WDL Ramsar site were reported by the Royal Australasian Ornithologist Union (RAOU) from 1987 to 1992 (refer to Table A4). This data does not consistently cover all

wetlands in the WDL Ramsar site and does not include other waterbirds such as herons and ibis and shorebirds, as such total counts are likely to be higher. However, it is clear that there is sufficient evidence to state that the WDL Ramsar site meets this criterion, with consistent numbers over six years greater than 20,000.

Table C4: Summer total waterfowl counts from locations within the WDL Ramsar site (data from RAOU Reports). Blank cells indicate no count reported.

Location	1987[1]	1988[2]	1989[3]	1990[4]	1991[5]	1992[6]
Beeac	619					
Bookar	1,488	2,488	150		604	807
Colongulac		15,706	9,777	6,303	12,652	6,253
Corangamite	17,810	29,654	21,865	5,320	6,738	8,066
Gnarpurt	1,042	902				
Milangil	954	6,004	4,911	5,213	13,731	12,196
Murdeduke	14,451	9,328	4,886	12,667	8,295	4,840
Terangpom	909	16,650	6,906	2,281	5,352	3,208
Total	37,233	80,732	48,495	31,784	47,372	35,370

Criterion 6

A wetland should be considered internationally important if it regularly supports one percent of the individuals in a population of one species or subspecies of waterbird.

Assessment of the WDL Ramsar site against this criterion has been made using the latest Waterbird Population Estimates (Wetlands International 2006) and by considering bird counts from within the site boundary only. Large numbers of birds have been regularly recorded from Lake Martin / Cundare Pool, which is adjacent to the north east corner of Lake Corangamite. However, this wetland is not within the boundary of the WDL Ramsar site and birds observed in this wetland have been excluded from the analysis. Species for which maximum counts have exceeded the relevant one percent population thresholds are provided in Table C5). Given the lack of consistent count data, an application of the principle “regularly supports” is difficult. While there is insufficient evidence for the majority of the species in Table C5, there is strong evidence for a number of waterfowl species including Australian shelduck, Australasian shoveler and chestnut teal, for which one percent population thresholds were exceeded in at least two thirds of seasons in which data is available (1987 to 1992).

[1] Martindale 1988
[2] Hewish 1988
[3] Peter 1989
[4] Peter 1990
[5] Peter 1991
[6] Peter 1992

Table C5: Waterbirds species for which maximum counts in the WDL Ramsar site exceed one percent of the relevant population (those with sufficient evidence to meet the provision of "regularly supports" are highlighted)

Common name	Species name	Population (one percent)	Maximum count	Years with counts above threshold
Australasian shoveler	*Anas rhynchotis*	Australian (1,000)	3,552 February 1991 combined count[5]	1988, 1989, 1990, 1991, 1992, 1999, 2003, 2004
Australian shelduck	*Tadorna tadornoides*	Australian (10,000)	22,950 February 1988 at Lake Corangamite[2]	1983. 1987, 1988, 1989, 1999, 2002, 2004, 2006
Banded stilt	*Cladorhynchus leucocephalus*	Australian (2,100)	112,000 August 2006 at Lake Corangamite[7]	1983, 1984, 1987, 1996, 2000, 2002, 2003, 2006, 2007
Black swan	*Cygnus atratus*	Australian (10,000)	10,000 February 2001 at Lake Murdeduke[7]	1983, 1987, 1989, 2001
Blue-billed duck	*Oxyura australis*	Australian (100)	1,560 February 1999 at Lake Milangil[8]	1991, 1992, 1999, 2003
Chestnut teal	*Anas castanea*	Australian (1,000)	4,558 March 1999 at Lake Corangamite[9]	1989, 1990, 1991, 1992, 1999, 2002
Eurasian coot	*Fulica atra*	Australian (10,000)	20,000 March1996 at Lake Milangil[9]	1981, 1987, 1988, 1991, 1992, 1997, 1998, 2000, 2002
Freckled duck	*Stictonetta naevosa*	Australian (250)	730 January 1983 at Lake Murdeduke[9]	1981, 1983, 2002
Glossy ibis	*Threskiornis spinicollis*	Australian (10,000)	90,000 Jan 1974 at Lake Corangamite[9]	1974
Great crested grebe	*Podiceps cristatus*	Australian (250)	2,000 July 1980 at Lake Colongulac[9]	1979, 1980
Hoary-headed grebe	*Poliocephalus poliocephalus*	Australian (3,000)	4,000 Feb 1998 at Lake Corangamite[9]	1998
Musk duck	*Biziura lobata*	Australian (250)	1,000 Jan 1983 at Lake Corangamite[9]	1983

[7] GFNC 1993 - 2008
[8] Birds Australia unpublished
[9] DSE unpublished

APPENDIX D – Ramsar ecological character and Limits of Acceptable Change

This information has been taken from the Ecological Character Description for the Western District Lakes Ramsar Site (Hale and Butcher 2011). This is the most recent information available on the current status against the LACs.

Ecological character is the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time. A change in ecological character is the human induced adverse alteration of any ecosystem component, process and or ecosystem benefit/service.

Limits of Acceptable Change (LACs) are defined as the variation that is considered acceptable in a particular component or process of the ecological character of the wetland, without indicating change in ecological character that may lead to a reduction or loss of the criteria for which the site was Ramsar listed (DSEWPAC 2012). They are developed as a tool to understand and describe the ecological character of Ramsar wetlands. The current status is outlined in Table D1 below.

Table D1 – Ecosystem Services and Benefits, Components and Processes which are critical to the Ecological Character of the Western District Lakes Ramsar site

	Description	Limit of Acceptable Change (LAC)	Current Status		
			Does not exceed LAC	Exceeds LAC	No Data/No LAC set
Ecosystem service/benefit					
Diversity of wetland types	The site contains a diversity of wetland types (contributing to criterion one).	See LACs for hydrology and salinity.			X
Physical habitat	The lakes provide habitat for feeding, breeding and moulting of waterbirds.	See LACs for hydrology, salinity and waterbirds.			X
Priority wetland species	The site supports 20 species of shorebird listed under international migratory bird treaties.	See LAC for waterbirds.			X
Threatened species	The site supports two species of plant listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): Salt-lake Tussock-grass (*Poa sallacustris*) and Spiny Peppercress (*Lepidium aschersonii*).	See LAC for threatened flora.			X
Components and processes					
Hydrology	At the time of listing six of the lakes were considered permanent (not drying in the past 100 years), Lake Colongulac was near permanent drying on occasion in the last 100 years and Lakes Beeac and Cundare were seasonal or intermittent. All lakes are connected to saline, surficial groundwater. The major water source, however, is direct rainfall and most water is lost via evaporation. All except Beeac and Cundare are groundwater flow-through lakes, discharging to groundwater down gradient. Lakes vary in water level on seasonal cycles.	No change in wetland hydrological type for any given wetland. That is the following hydrological regimes maintained: • Lakes Beeac and Cundare – intermittent wetlands drying seasonally but having water for at least a few months of each year; • Lake Colongulac – near permanent wetland drying for no more than twelve months in any five year period; • Lakes Bookar, Corangamite, Gnarpurt, Milangil, Murdeduke and Lake Terangpom – permanent wetlands not drying for more than two months in any five year period.		X[1]	

	Description	Limit of Acceptable Change (LAC)	Current Status		
			Does not exceed LAC	Exceeds LAC	No Data/No LAC set
Salinity	Salinity of the lakes is variable seasonally and with longer term climate patterns. Lakes Bookar, Colongulac, Gnarpurt, Milangil and Murdeduke are considered mesosaline. Lake Corangamite is saline. Lakes Beeac and Cundare are hypersaline. Lake Terangpom is freshwater / brackish.	No change in salinity category for any given wetland. That is the following salinity regimes maintained: • Lakes Beeac and Cundare – hypersaline (greater than 50 parts per thousand); • Lakes Bookar, Colongulac, Corangamite, Gnarpurt, Milangil and Murdeduke – saline (5 to 50 parts per thousand); • Lake Terangpom –fresh / brackish (less than three parts per thousand)		X[2]	
Vegetation	Spiny peppercress – nine populations, total of 0.6 hectares (Carter and Walsh 2006); and Salt-lake tussock-grass - 97 plants were recorded along the eastern lunette of Lake Beeac and 107 plants at Lake Corangamite (DSE 2009).	Presence of spiny peppercress and salt-lake tussock-grass within the Ramsar site at least one year in any five year period.	X[3]		
Waterbirds	Seventy species of waterbird including 20 international migratory species have been recorded in the site. At the time of listing, waterbird abundances were high, with greater than 20 000 waterbirds recorded annually. The site supported greater than one percent of the population of 11 species of waterbird. Breeding has been recorded for 11 species.	Total waterbird numbers not less than 28,000 during summer.		X[4]	
		Australian shelduck, Australasian shoveler, chestnut teal and Eurasian coot - greater than one per cent of population (from latest Wetlands International population estimates) recorded at least once in every five year period.		X[5]	
		Presence of curlew sandpiper, red-necked stint and sharp-tailed sandpiper within the Ramsar site at least once in every five year period.			X

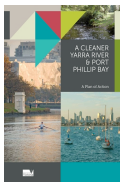
[1] Lakes Bookar, Gnarpurt, Milangil and Terangpom have all dried completely on a number of occasions in the past decade for extended periods of time.
[2] Salinity has increased to greater than 50 parts per thousand at Lakes Bookar, Colongulac, Corangamite, Gnarpurt, Milangil and Murdeduke; and greater than three parts per thousand at Terangpom.
[3] Spiny Peppercress and Salt-lake Tussock-grass remain within the Ramsar site.
[4] Total summer waterbird numbers were less than 28 000 from 2005 to 2010 inclusive.
[5] The one percent population thresholds for two of three species (*Australian shelduck, Australasian shoveler and chestnut teal*) have not been exceeded in the five consecutive years (2007 to 2011) and the threshold for Australian shelduck was exceeded on only one occasion in this time, in 2011.

APPENDIX E – Recommended monitoring needs for the Western District Lakes Ramsar site

These monitoring needs have been identified in the Ecological Character Description for the Western District Lakes Ramsar Site (Hale and Butcher 2011). They are the recommended monitoring to meet the obligations under the Ramsar Convention and the EPBC Act.

Parameter	Purpose	Indicator	Locations	Frequency	Priority
Hydrology	Assessment against LAC	Water level	Each wetland	Monthly	Moderate
Water quality	Assessment against LAC and threat indicator	Salinity Nutrients	Each wetland	Monthly	Moderate
Threatened plant species	Assessment against LAC	Location, abundance	Lakes Beeac, Corangamite and Terangpom	Annual	High
Aquatic Invertebrates	Knowledge gap	Community composition, abundance	Entire Ramsar site	Once in five years during spring	Moderate
Waterbirds	Assessment against LAC	Abundance and species identifications, breeding observations	Entire Ramsar site	Biannual	High
Vegetation (weeds)	Threat indicator	Location, extent	Lakes Beeac, Corangamite and Terangpom	Annual	High
Pest animals (foxes, rabbits)	Threat indicator	Abundance	Entire Ramsar site	Annual	Moderate

APPENDIX F - A Cleaner Yarra River and Port Phillip Bay - Action Plan



A Cleaner Yarra River and Port Phillip Bay - Action Plan

GEELONG & BELLARINE STAKEHOLDER WORKSHOP REPORT

Prepared by: *Tony Overman, Strategy & Sustainability Coordinator, Barwon Water*

Introduction

In March 2012 the Minister for Environment and Climate Change set up a government task force to develop and action plan to improve the health of the Yarra River and Port Phillip Bay. The task force developed the *Cleaner Yarra River and Port Phillip Bay Action Plan.*

An action identified at the most recent taskforce meeting in June 2013 identified the need to better explore opportunities to deliver on the Action Plan within the Corio Bellarine basin. The Department of Primary Industries and Environment and Corangamite Catchment Management Authority convened a workshop on 3 September 2013 with local stakeholders including City of Greater Geelong, Parks Victoria, Environment Protection Authority, Barwon Waste Management Group and Bayside and Bellarine Committee of Management. This report summarises the findings of this workshop.

Potential opportunities

The workshop discussed each of the actions in the plan (Attachment 1). For each of these actions, the group discussed the following:

- Review the action and identify if the problem it addresses is directly relevant to Geelong and the Bellarine
- For relevant actions, identify the root causes of the problem in the local context
- Clarify what is already being done to address these cause, by whom and the degree of success achieved to date
- Identify any gaps or barriers to addressing the problem
- Identify potential solutions to overcome these.

Potential solutions

The workshop then worked through the potential solutions. The group discussed the following:

- clarify the solution being proposed
- check it is within the region's stakeholders control to action
- Rate the priority of each in terms of
    - Ease of implementation (high/medium/low) and
    - Desirability (high/medium/low)

The notes from this session are summarised in Attachment 2

PRIORITY ACTIONS

Based on the discussions held in the solutions session at the workshop, seven priority actions have been proposed for consideration by participants. These have been identified in Attachment 3.

Attachment 1 – Cleaner Yarra River and Port Phillip Bay Actions

Objective	*Actions*
CLEARER, MORE RESPONSIVE MANAGEMENT	1 Identify the lead agencies for managing water quality in the Yarra River and Port Phillip Bay
	2 Develop a new Environment Management Plan for Port Phillip Bay to help address key risks to bay health including marine pests and nutrient loads
	3 Put in place a Response Plan for water quality events in Port Phillip Bay such as algal blooms
	4 Extend the role of the Yarra River and Port Phillip Bay government taskforce to oversee and coordinate implementation of the plan
	5 Update best practice environmental guidelines for dredging
PREVENTING POLLUTION & REDUCING LITTER	6 Work with catchment managers to improve water quality at beaches in Port Phillip Bay
	7 Revise the guidelines for urban stormwater management for new urban development, to facilitate and support best practice
	8 Identify litter hotspots and develop local partnerships with community, businesses and local government to cut litter in these areas
	9 Target pollution hotspots to improve compliance by industry, land developers and others sources of pollution in waterways
	10 Investigate and trial improved early warning and community information programs for sewage spills and leaks affecting waterways
	11 Develop innovative approaches to reduce wastewater impacts on waterways, including accelerating the sewering of unsewered areas
	12 Update guidance and requirements for on-site wastewater management
PROVIDING ACCESSIBLE INFORMATION	13 Provide water quality information and advice through a 'one stop shop' so Victorians can quickly and easily access up-to-date information including beach closures and algal blooms
	14 Prepare a report card that summarises the Yarra and bay's water quality and health
	15 Improve key water quality monitoring programs, including the Port Phillip Bay Beach Report
SUPPORT FOR COMMUNITY ACTION	16 Support Victorians to take action and protect water quality and reduce litter. This includes working with communities to assist them identify and apply for funding from programs such as the Victorian Government's $20 million Communities for Nature program, Landcare and Coastcare
	17 Encourage environmental citizenship including reporting of litter and pollution, learning more about water quality, and joining community groups to take action to protect the Yarra River and Port Phillip Bay

Attachment 2 – solutions

Action	Solutions	Control/influence/Concern	Ease of Implementation	Importance /Desirability
1	Map local entities and improve local engagement	Control	H	H
2	Identify Corio Bellarine as a basin; identify impact of stormwater on the marine environment	Control; Influence	H; H	H; H
3	Test response plans locally and identify gaps	Control	H	H
4	Set up a Sub group for the local areas	Control	M	H
5	Involve local stakeholders in review of guidelines	Control	H	M
6	Promote EPA's Beach Report to inform community of impacts to water quality at local beaches	Control	H	H
7	EPA to lead implementation	Influence	H	H
8	Develop a regional litter strategy informed by the state strategy.	Control	M	M
9	Conduct local industrial waste risk assessment	Control	H	M
10	Use protocols developed in Melbourne to inform local procedures	Control	L	H
11	Scope business case	Control	M	H
12	COGG to check if relevant staff are aware of new guidelines, Update waste water management plans	Control; Control	H; L	H; M
13	One stop shop	Concern*	-	-
14	Report Card	Concern*	-	-
15	Review of programs including implementing LSV information project across bay	Concern*	-	-
16	Support local groups to be aware of grants programs; confirm which groups are eligible to apply for funding	Control	H	H
17	Creative engagement empowerment	Influence	L	M

Attachment 3 – Proposed priority local actions

Action	Local Actions	Who	When	Comment
1	Map local entities and improve local engagement	IWCM network	TBD	To support this process DEPI will provide a copy of the report on review of response protocols across PPB
2	Identify Corio Bellarine as a basin	All	From Now	-
3	Test response plans locally and identify gaps	IWCM network	From Now	To support this process DEPI will provide a copy of Port Phillip Bay Marine Algal Bloom Response Protocol: and a copy of the report on review of response protocols across PPB
4	Set up a Sub group for the local area	IWCM network		Rather than set up a new group it was recommended we use the existing IWCM network and ensure YBAP is a standing item on agenda. YBAP team in Melbourne are available to attend meetings on an as needs basis
6	Promote EPA's Beach Report to inform community of impacts to water quality at local beaches	All	From Dec 2013	-
12	COGG to check if relevant staff are aware of new onsite wastewater guidelines,	COGG	From now	-
16	Support local groups to be aware of grants programs; confirm which groups are eligible to apply for funding	All	From now	Could this be linked to the Future Proofing Geelong Working Group?

APPENDIX G – List of AVIRA values and threats

Table G1 – Values

Value	Category	Sub-category
Environmental values	Formally Recognised Significance	International Significance: • Ramsar Sites • East Asian-Australasian Flyway Sites
		National Significance: • Nationally Important Wetlands • Living Murray Icon Sites • High Ecological Value Aquatic Ecosystems • National Heritage Sites
		State Significance: • Heritage Rivers • Icon Rivers • Essentially Natural Catchments • Victorian Parks and Reserves • Victorian Heritage Sites
	Representativeness	Representative Rivers. Representative Wetlands.* Representative Estuaries.*
	Rare or threatened species/communities	Significant Fauna (Invertebrates). Significant Fauna (Vertebrates). Significant Flora. Significant Riparian EVCs. Significant Wetland EVCs. Significant Estuarine EVCs.*
	Naturalness	Aquatic Invertebrate Community Condition: • River Reaches • Wetlands* Native Fish.* Riparian Vegetation Condition. Wetland Vegetation Condition. Estuary Vegetation Condition.*
	Landscape features	Drought Refuges. Important Bird Habitats. Biosphere Reserves.
Social	Activity	Recreational Fishing. Non-Motor Boating. Motor Boating. Camping. Swimming. Beside Water Activities: • Walking, Hiking, Cycling • Sightseeing • Picnics/Barbecues Game Hunting.
	Place	Heritage: • Pre-European (Indigenous) Heritage • Post-European Heritage Landscape.
	People	Community groups. Use of flagship species.

Value	Category	Sub-category
Economic	Water	Urban/Rural Township Water Sources. Rural Water Sources for Production. Water Storages. Water Carriers. Wastewater Discharges.
	Power generation	Hydro-electricity.
	Other resources	Commercial fishing. Extractive industries. Timber harvesting and firewood collection.

*To be developed

Table G2 – Threats

Threat	River reaches	Wetlands	Estuaries
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	Changed Water Regime	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 Marine Exchange: • Intermittently Open Estuaries • Permanently Open Estuaries
Altered physical form	Bank Instability. Bed Instability (Degradation).	Reduced Wetland Area. Altered Wetland Form.	Bank Instability. Reduced Estuary Extent.
Poor water quality	Degraded Water Quality. Thermal Water Pollution. Disturbance of Acid Sulfate Soils.	Changed Water Properties. Disturbance of Acid Sulfate Soils.	Changed Water Properties. Disturbance of Acid Sulfate Soils.
Degraded habitats	Degraded Riparian Vegetation: • Large Trees Loss of Instream Habitat: • Large Wood • Sedimentation Livestock Access.	Soil Disturbance.	Degraded Riparian Vegetation.* Livestock Access. Altered Extent of Aquatic Macrophytes. Sedimentation: • Decreased Particle Size • Increased Sediment Respiration Rate
Invasive flora and fauna	Invasive Flora (Riparian): • Trees • Shrub Layer • Ground Layer Invasive Flora (Aquatic). Invasive Fauna (Terrestrial). Invasive Fauna (Aquatic).	Invasive Flora (Wetland). Invasive Fauna (Terrestrial). Invasive Fauna (Aquatic).	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 Wetland Connectivity.*	Barriers to Estuarine Biota. Reduced Floodplain and Wetland Connectivity.

**To be developed*

APPENDIX H – AVIRA metrics/categories used to identify high value waterways

Value type	High value category	AVIRA scoring rule
Environmental values		
Formally recognised – international significance	Ramsar Sites (wetlands only)	Yes
	East Asian-Australasian Flyway sites (wetlands and estuaries only)	Yes
Formally recognised – national or state significance	Nationally Important Wetlands	Yes
	Living Murray Icon Sites	Yes
	National Heritage Sites	Yes
	Heritage Rivers	Yes
	Icon Rivers	Yes
	Essentially Natural Catchments	Yes
	Victorian Parks and Reserves	Yes
	Victorian Heritage Sites	Yes
Representativeness	Representative Rivers	Yes
Rare or threatened species/communities	Significant fish	4-5
	Significant birds	4-5
	Significant amphibians (rivers and wetlands only)	4-5
	Significant invertebrates (rivers and wetlands only)	4-5
	Significant reptiles	4-5
	Significant mammals (rivers and wetlands only)	4-5
	Significant flora	4-5
	Significant riparian EVCs (rivers only)	5
	Significant wetland EVCs (wetlands only)	4-5
	Significant estuarine EVCs (estuaries only)	4-5
Naturalness	Aquatic invertebrate community condition (rivers and wetlands only)	4-5
	Native fish communities (rivers only)	4-5
	Riparian vegetation condition (rivers only)	4-5
	Wetland vegetation condition (wetlands only)	4-5
	Drought refuges	3,5
	Important bird habitat	5
	Biosphere Reserves	Yes
Social values		
Activity	Recreational fishing	5
	Non-motor boating	4-5
	Motor boating	4-5
	Camping	4-5
	Swimming	5
	Beside Water Activities : - walking, hiking, cycling - sightseeing - picnics/barbecues	5 5 5
	Game hunting	5
Place	Heritage: - Aboriginal cultural heritage - post-European heritage	Known Known
	Landscape	3-5
People	Community groups	5
	Use of Flagship species	5
Economic values		

Value type	High value category	AVIRA scoring rule
Water	Urban/rural township water sources	3-5
	Rural water sources for production	3-5
	Water carriers (rivers and wetlands only)	5
	Waste water discharges	5
	Water storages (rivers and wetlands only)	3-5
Power generation	Hydro-electricity (rivers and wetlands only)	3-5
Other resources	Commercial fishing	5
	Extractive industries	5
	Timber harvesting and firewood collection	3,5

APPENDIX I – High value waterways

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
RIVER REACHES												
32~1	Moorabool River	x		x		x	x	x		x		x
32~2	Moorabool River					x	x		x	x		
32~3	Moorabool River					x	x	x	x	x		x
32~4	Moorabool River				x	x	x		x	x		
32~5	Moorabool River West Branch					x		x	x	x		x
32~6	Moorabool River West Branch	x		x		x				x		x
32~7	Sutherland Creek West Branch	x		x		x				x		
32~8	Sutherland Creek West Branch					x	x					
32~9	Sutherland Creek East Branch					x		x				
32~10	Moorabool River East Branch				x		x			x		x
32~11	Moorabool River East Branch				x	x		x	x	x		x
32~12	Moorabool River East Branch					x	x			x		
32~13	Spring Creek									x		
32~14	Lal Lal Creek			x			x			x		x
32~15	Hovells Creek	x		x		x	x					x
32~16	Hovells Creek			x		x		x	x			x
33~2	Barwon River	x		x	x	x	x	x		x		x
33~3	Barwon River			x	x	x	x	x	x	x		x
33~4	Barwon River	x		x	x	x	x	x	x	x		x
33~5	Barwon River			x	x	x	x	x	x	x		x
33~6	Barwon River West Branch				x	x		x				x
33~7	Barwon River West Branch	x			x	x				x		x
33~8	Waurn Ponds Creek	x		x	x	x	x	x				x
33~9	Bruce Creek	x		x	x	x						x
33~10	Native Hut Creek					x	x		x	x		
33~11	Leigh River	x		x	x		x		x	x		x
33~12	Leigh River					x						
33~13	Woodbourne Creek					x	x					
33~14	Yarrowee River					x			x	x		x
33~15	Yarrowee River						x					x
33~16	Williamson Creek				x					x		x
33~17	Winter Creek*											
33~18	Warrambine Creek				x	x	x					
33~19	Warrambine Creek			x		x						x
33~20	Scrubby Creek				x	x						x
33~21	Retreat Creek				x	x				x		

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
33~22	Retreat Creek											x
33~23	Penny Royal Creek			x	x	x				x		
33~24	Penny Royal Creek	x				x				x		x
33~25	Dewing Creek				x	x				x		x
33~26	Dewing Creek					x				x		x
33~27	Barwon River East Branch	x		x	x	x		x		x		x
33~28	Barwon River East Branch	x			x	x	x		x	x		x
33~29	Mia Mia Creek				x	x						
33~30	Mia Mia Creek			x	x		x		x			x
33~33	Boundary Creek			x		x		x				x
34~1	Woady Yaloak River			x		x			x	x		x
34~2	Woady Yaloak River					x				x		x
34~3	Woady Yaloak River					x						
34~4	Woady Yaloak River			x	x	x	x	x	x			x
34~5	Kuruc-A-Ruc Creek			x								
34~6	Kuruc-A-Ruc Creek											x
34~7	Kuruc-A-Ruc Creek					x						
34~8	Ferrers Creek	x										x
34~9	Naringhil Creek					x						
34~10	Little Woady Yaloak Creek	x		x			x					x
34~11	Little Woady Yaloak Creek						x					
34~12	Unnamed Waterway			x			x	x				x
34~13	Mundy Gully					x						
34~14	Mundy Gully*											
34~15	Salt Creek					x						
34~16	Gnarkeet Chain of Ponds					x	x					x
34~17	Pirron Yalock Creek			x		x						
34~18	Spring Gully Creek							x	x			
34~19	Dean Creek			x	x			x	x			
34~20	Barongarook Creek			x		x	x	x				
35~2	Curdies River	x		x	x	x	x			x		
35~3	Curdies River				x	x	x					x
35~4	Curdies River				x	x	x	x		x		x
35~5	Cooriemungle Creek				x	x	x		x			
35~6	Scotts Creek				x	x						
35~7	Cooriemungle Creek			x	x	x						
35~8	Black Glen Creek				x							
35~11	Port Campbell Creek				x	x						
35~13	Gellibrand River	x		x	x	x	x	x		x		x
35~14	Gellibrand River	x		x	x	x	x			x		x

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
35~15	Gellibrand River				x	x	x			x		x
35~16	Gellibrand River				x	x	x			x		x
35~17	Kennedys Creek			x	x	x				x		
35~18	Kennedys Creek			x	x	x		x				x
35~19	Chapple Creek				x	x				x		x
35~20	Sandy Creek				x	x			x	x		x
35~21	Carlisle River				x	x	x			x		x
35~22	Gum Gully Creek				x					x		
35~23	Lardner Creek				x	x				x		x
35~24	Love Creek			x	x	x	x	x		x		x
35~25	Love Creek			x		x		x		x		x
35~26	Ford River			x	x	x	x	x				x
35~27	Aire River	x	x	x	x	x	x					x
35~28	Aire River	x	x	x	x	x	x	x				x
35~29	Little Aire River	x		x	x	x	x					
35~30	Barham River				x	x	x		x			
35~31	Barham River East Branch	x		x	x	x	x	x		x		
35~32	Cumberland River	x		x	x	x	x	x				
35~33	Erskine River	x		x	x	x	x	x				x
35~34	Anglesea River			x	x	x	x					x
35~35	Spring Creek			x	x	x	x					x
35~36	Thompson Creek			x	x	x	x					
35~37	Thompson Creek				x	x	x					x
35~38	Duneed Creek				x		x					
35~39	Merrijig Creek				x							
35~40	Salt Creek				x	x						x
35~41	Distillery Creek			x	x	x	x					
35~42	Painkalac Creek					x	x			x		
35~43	Moggs Creek			x			x					x
35~44	St George River	x		x	x	x	x	x	x			x
35~45	St George River	x				x			x	x		
35~46	Wye River	x		x	x	x	x					
35~47	Kennett River	x				x	x	x				
35~48	Grey River	x		x		x	x					
35~49	Carisbrook Creek	x		x		x	x					
35~50	Smythes Creek	x		x	x	x		x				
35~51	Skenes Creek			x		x	x	x				
35~52	Wild Dog Creek			x	x	x	x	x				
35~53	Barham River East Branch					x	x	x		x		
35~54	Elliott River	x		x	x	x	x	x				

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
35-55	Parker River	x		x		x	x	x				
35-56	Aire River	x			x	x	x					x
ESTUARY REACHES												
32~215	Limeburners Lagoon	x		x		x	x					
33~201	Barwon River	x		x		x	x					x
35~201	Curdies Inlet	x		x		x	x	x				x
35~202	Sherbrook River	x		x								
35~203	Johanna River	x		x								
35~211	Port Campbell Creek	x		x		x	x		x			x
35~212	Gellibrand River	x		x		x	x	x				x
35~227	Aire River	x		x		x	x	x	x			x
35~230	Barham River	x		x		x	x	x	x			
35~233	Erskine River	x		x		x	x	x				
35~234	Anglesea River	x		x		x	x					x
35~235	Spring Creek	x		x		x	x					
35~236	Thompson Creek			x		x	x					
35~242	Painkalac Creek	x		x		x	x					
35~244	St George River	x				x	x					x
35~246	Wye River	x		x		x	x					
35~247	Kennett River	x		x		x	x					
WETLANDS AND LAKES												
50201	Lake Horden	x		x		x						
50203	Lake Craven	x		x		x						
50205	Lake Costin	x				x						
50211	Unnamed wetland	x		x		x	x					
50212	Unnamed wetland	x		x		x	x					
50406	Lake Corangamite	x		x		x						x
50407	Lake Struan			x		x	x					
50435	The Basins	x		x								
50505	Red Rock Lakes	x		x								
50509	Red Rock Lakes	x		x								
50522	Lake Werowrap	x										
50527	Stonyford-Bungador Wetlands	x				x	x					
50529	Stonyford-Bungador Wetlands						x					
50536	Stonyford-Bungador Wetlands	x		x		x	x					
50547	Stonyford-Bungador Wetlands	x				x	x					
50555	Stonyford-Bungador Wetlands	x				x	x					
50561	Lake Terangpom	x		x		x						
50563	Stoneyford-Bungador Wetlands	x				x	x					
50566	Stoneyford-Bungador Wetlands	x				x	x					

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
50585	Lake Coradgill			x		x	x					
50597	Lake Bullen Merri	x		x		x	x					
50614	Lake Colongulac	x		x		x	x					
50652	Lake Kariah			x			x					
50663	Lake Milangil	x		x		x						
50671	Lake Purrumbete			x		x	x			x		x
50680	Lake Koreetnung			x		x	x					
50700	Kooraweera Lakes	x		x		x						
50718	Lake Gnarpurt	x		x		x	x					
50722	Unnamed wetland	x		x		x						
50725	Lake Weeranganuk			x		x	x					
51400	Lake Widderin/Widderin Swamps	x		x		x	x					
51487	Widderin Swamps	x				x						
51432	Deep Lake			x			x					x
51439	Lake Logan			x			x					
51463	Banongill Network	x		x			x					
51465	Banongill Network	x					x					
51469	Banongill Network	x					x					
51491	Lake Tooliorook			x		x	x					x
51903	West Gellibrand Dam									x		x
51905	West Barwon Dam						x			x		x
52028	Lake Coragulac			x			x					
52143	Lake Rosine			x		x						
52178	Lake Colac			x			x					x
52181	Lake Ondit			x			x					
52208	Cundare Pool/Lake Martin	x		x		x	x					
52222	Horseshoe Lake	x		x		x						
52225	Lake Beeac	x		x		x	x					
52297	Lough Calverts	x				x						
52302	Lake Weering			x		x	x					
52305	Lake Thurrumbong	x		x		x	x					
52308	Eurack Swamp	x		x		x						
52333	Lake Burn			x			x					
52361	Unnamed wetland					x	x					
52365	Lake Ayrey			x								
52422	Lake Murdeduke	x		x		x	x					
52629	Lough Calverts	x				x						
52632	Lough Calverts	x				x						
52634	Lough Calverts	x		x		x						
54029	Dereel Swamp			x								

Waterway		Environmental Values					Social Values			Economic Values		
ID No.	Name	Formally Recognised Significance	Representativeness	Rare or Threatened Species / Communities	Naturalness	Landscape Features	Activity	Place	People	Water	Power Generation	Other Resources
54038	Lake Wendouree	x		x		x	x					
54043	Bingley Swamp			x			x					
54116	White Swan Reservoir			x			x			x		x
54124	Gong Gong Reservoir			x			x			x		
54518	Lake Gherang			x								
54534	Lake Modewarre			x			x					
54535	Brown Swamp			x								
54548	Gheringhap Swamp			x			x					
54573	Hospital Swamp	x		x		x	x					x
54577	Reedy Lake	x		x		x	x					x
54584	Lake Connewarre	x		x		x	x					x
54595	Lake Murtnaghurt	x		x		x	x					
54643	Wurdiboluc Reservoir			x			x			x		
55526	Wilson Reservoir			x						x		
55553	Lal Lal Reservoir			x						x		x
55560	Moorabool Reservoir			x			x			x		x
55588	Bostock Reservoir						x			x		
55660	Unnamed wetland**											
56000	Korweinguboora Reservoir									x		x
56117	Lake Victoria			x		x						
56131	Salt Lagoon			x		x						

*Not identified as high value (did not meet required criteria in Appendix I)
**Not identified as high value (invalid/insufficient data)

APPENDIX J – AVIRA rules for goals

Regional Goal	Approach	AVIRA Rule
AVIRA rules for the social goal		
Maintain or improve waterway condition where it supports high social and community values.	Maintain or improve waterway reaches with multiple social benefits, indicative of use by a broad cross section of the community (e.g. Barwon through Geelong) or of regional significance (e.g. recreational fishing at Lake Bullen Merri).	Rank waterways based on the number of social values met under the category: activity. A waterway will be considered to have met the goal if: • it has 4 or more high value social attributes under the category: activity[10]
AVIRA rules for the economic goal		
Secure and manage waterways that provide significant economic benefits to the region.	Securing Special Water Supply catchments to maintain water quality for urban water supply.	Include waterways within Declared Water Supply Catchments, under the Catchment and Land Protection Act 1994. AVIRA identifies waterways within Special Water Supply Catchments with a score of 4 (open SWSC) or 5 (closed SWSC) for the 'urban/rural township water sources' value
	Maintaining waterway reaches that support licensed diversions for irrigated agriculture to protect the quality and viability of the resource.	Include waterways with a score of: • 5 (water source is used for horticulture (e.g. cut flowers, vegetables, fruit, grapes, tree nuts); or • 4 (Water source is used for irrigated modified pastures; or • 3 (Water source is used for irrigated cropping, legumes, oilseeds etc.)
AVIRA rules for environmental goals		
Maintain the viability of populations of threatened native fish species.	Maintaining or improving the resilience of known populations of Australian Grayling, Yarra Pygmy Perch, Australian Mudfish and Dwarf Galaxias.	AVIRA scores of 4 or 5 for significant fish
Maintain or improve the resilience of other threatened waterway dependent species	Proposed approach - Maintaining or improving the resilience of known populations of other significant waterway dependent species.	Include waterways with: • One or more critically endangered or endangered species present • OR • Three or more threatened species present (vulnerable or greater)

Secure and manage water for the environment to improve waterway condition.	Managing existing environmental water entitlements to maximise environmental outcomes in priority reaches.	All existing formal entitlements. The following AVIRA rules apply to the Moorabool River downstream of Lal Lal Reservoir.
		For reaches 32-1 and 32-2 (Reach 4 - Moorabool River below Sharp Road, She Oaks to the confluence with the Barwon River), the goal is met if:
		• any of the following fish species are present (Australian Grayling, Short-finned Eel, Common Galaxias, Spotted Galaxias, Short-headed Lamprey, Tupong, River Blackfish, Southern Pygmy Perch)
		• diverse macroinvertebrate community with a score of 4 or 5 for naturalness
		• EVCs are present with a score of 5
		• For reaches 32-3, 32-4 and 32-5 (Reach 3 - West Moorabool River below Lal Lal Reservoir to Sharp Road, She Oaks), the goal is met if:
		  ○ any of the following fish species are present (Short-finned Eel, River Blackfish, Southern Pygmy Perch, Australian Smelt)
		  ○ diverse macroinvertebrate community with a score of 4 or 5 for naturalness
		  ○ EVCs are present with a score of 5.

AVIRA rules for environmental goals cont'd		
Maintain or improve waterways with formally recognised significance.	Maintaining or improving the ecological character of Ramsar wetlands.	Listed as a key feature of a Ramsar site
	Maintaining or improving the condition of values of formally recognised wetlands and wetland types/communities (including estuaries) listed under mechanisms such as the EPBC act	Listed as a key feature of a Nationally Important Wetland
	Managing heritage listed rivers to maintain their listed values.	Forms part of a Heritage River
Maintain the extent and condition of other significant wetlands (by type).	Maintaining or improving the condition of wetlands supporting Plains Grassland Wetland EVC.	Include waterways with Plains Grassy Wetland EVC
Protect waterways in near natural condition.	Protect all environmental values of near natural waterways.	Near natural river reaches: • 3ISC Environmental Condition - Excellent AND • meeting 3ISC sub-index thresholds of: - Physical Form 10 - Vegetation 9-10 - Hydrology 8-10 - Bugs 8-10 AND • no motor boating, wastewater discharge, water carrier, extractive industries or timber harvesting

APPENDIX K – Ranking priority waterways – risks assessment and feasibilities example

50663 Lake Milangil | **Priority Waterway Score** | **11.2**

High Value Waterway Status

Type	Category	Status
Environmental	Formally Recognised Significance	x
	Representativeness	
	Rare or Threatened Species/Communities	x
	Naturalness	
	Landscape Features	x
Social	Activity	
	Place	
	People	
Economic	Water	
	Power Generation	
	Other Resources	

Links to Regional Goals

Goal	Link
Maintain or improve waterway condition where it supports high social and community values	
Secure and manage waterways that provide significant economic benefits to the region	
Maintain or improve the resilience of known populations of Australian Grayling, YPP, Australian Mudfish and Dwarf Galaxids	
Maintaining or improving the resilience of known populations of other significant waterway dependent species	x
Manage and identify water for the environment to improve waterway condition	
Maintaining or improving the ecological character of Ramsar wetlands	x
Maintaining or improving the condition of values of formally recognised wetlands (nationally important wetlands)	x
Maintaining or improving the condition of values of significant wetland types/communities (Plains Grassy Wetland EVC)	

Risk Assessment

Type	Value Name	Value Score	Goal Link	Threat Name	Threat Score	Association	Confidence	Risk Level	Treatment	Feasibility		
										High	Moderate	Low
Environmental	Wetland Vegetation Condition	5	x	Disturbance of Acid Sulfate Soils	-1	High	High	Very High	Fill Data Gap			
Environmental	Significant Birds	5	x	Invasive Fauna (Terrestrial)	5	High	Medium	Very High	Reduce Threat Level	x		
Environmental	Significant Birds	5	x	Degraded Buffer	5	High	Medium	Very High	Reduce Threat Level	x		
Environmental	Drought Refuges	5	x	Disturbance of Acid Sulfate Soils	-1	High	Low	Very High	Fill Data Gap			
Environmental	Important Bird Habitats	5	x	Disturbance of Acid Sulfate Soils	-1	High	Low	Very High	Fill Data Gap			
Environmental	Important Bird Habitats	5	x	Degraded Buffer	5	High	Low	Very High	Reduce Threat Level	x		
Environmental	Significant Birds	5	x	Disturbance of Acid Sulfate Soils	-1	High	Low	Very High	Fill Data Gap			
Environmental	Wetland Vegetation Condition	5	x	Invasive Fauna (Terrestrial)	5	High	Low	Very High	Reduce Threat Level	x		
Environmental	Drought Refuges	5	x	Invasive Fauna (Terrestrial)	5	Medium	Low	High	Reduce Threat Level	x		
Environmental	Important Bird Habitats	5	x	Invasive Fauna (Terrestrial)	5	Medium	Low	High	Reduce Threat Level	x		
Environmental	Significant Birds	5	x	Livestock Access to Buffer	3	High	Medium	Moderate	Reduce Threat Level	x		
Environmental	Important Bird Habitats	5	x	Livestock Access to Buffer	3	High	Low	Moderate	Reduce Threat Level	x		
Environmental	Wetland Vegetation Condition	5	x	Invasive Flora (Wetland)	3	High	Low	Moderate	Reduce Threat Level		x	
Environmental	Wetland Vegetation Condition	5	x	Degraded Buffer	5	Low	Medium	Moderate	Reduce Threat Level			
Environmental	Drought Refuges	5	x	Degraded Buffer	5	Low	Low	Moderate	Reduce Threat Level			
Environmental	Wetland Vegetation Condition	5	x	Soil Disturbance	2	High	Low	Low	Protect			
Environmental	Drought Refuges	5	x	Invasive Flora (Wetland)	3	Medium	Low	Low	Reduce Threat Level		x	
Environmental	Important Bird Habitats	5	x	Changed Water Regime	1	High	High	Very Low	Protect			
Environmental	Important Bird Habitats	5	x	Reduced Wetland Area	1	High	High	Very Low	Protect			
Environmental	Significant Birds	5	x	Changed Water Regime	1	High	High	Very Low	Protect			
Environmental	Significant Birds	5	x	Reduced Wetland Area	1	High	High	Very Low	Protect			
Environmental	Wetland Vegetation Condition	5	x	Changed Water Regime	1	High	High	Very Low	Protect			

Feasibilities explanation

Feasibility is completed only for values that are relevant to regional goals, and, where there is a need to 'reduce threat level' (see 'treatment' column, above).

Lake Milangil is a priority waterway within the Corangamite region. It is linked to two regional goals:

- maintaining or improving the resilience of known populations of other significant waterway dependent species (Lake Milangil has several significant bird species); and
- maintaining or improving the condition of values of formally recognised wetlands (Lake Milangil forms part of the Western District lakes Ramsar site and is also listed as a nationally important wetland).

This prioritisation example for Lake Milangil, highlights the risks to the values of the lake relevant to the CWS goals, i.e.:

- Significant Birds. Three species of migratory shorebirds listed under international agreements have been recorded within Lake Milangil: Double-banded Plover (*Charadrius bicinctus*), Curlew sandpiper (*Calidris ferruginea*), Red-necked Stint (*Calidris ruficollis*). Lake Milangil also supports the following bird species listed under the Advisory List of Threatened Vertebrate Fauna in Victoria as Endangered or Vulnerable: Australasian Shoveler (*Anas rhynchotis*), Blue-billed Duck (*Oxyura australis*), Freckled Duck (*Stictonetta naevosa*), Hardhead (*Aythya australis*), Musk Duck (*Biziura lobata*).
- Drought Refuges. Lake Milangil is rarely dry, acting as a drought refuge that can support a high diversity of waterbirds.
- Important Bird Habitats. Thirty-three waterbird species have been recorded at this wetland. The waterway is known to occasionally support large numbers of waterbirds with more than 10,000 birds recorded on occasion. Internationally significant numbers (> 1% of the relevant population have been recorded for the following species (maximum count provided):
    - Australasian Shoveler (*Anas rhynchotis*) – 2057
    - Blue-billed Duck (*Oxyura australis*) – 1560
    - Chestnut Teal (*Anas castanea*) – 1256
    - Eurasian Coot (*Fulica atra*) – 15 509
- Wetland Vegetation Condition. The Index of Wetland Condition Biota Sub-index score for Lake Milangil was rated as excellent condition.

It is these values that will be the focus for protection through the CWS works program (i.e. addressing the threats to these values).

APPENDIX L – Priority waterways and priority waterway scores

Table L1 – River reaches

No	Name	Priority Waterway Score
35-24	Love Creek	12.5
32-15	Hovells Creek	12.2
35-18	Kennedys Creek	12.0
35-47	Kennett River	11.5
35-48	Grey River	11.5
35-26	Ford River	11.3
32-03	Moorabool River	10.7
35-55	Parker River	10.5
32-01	Moorabool River	10.5
35-25	Love Creek	10.2
32-02	Moorabool River	9.8
35-54	Elliot River	9.7
35-22	Gum Gully Creek	9.5
35-36	Thompson Creek	9.4
35-31	Barham River East Branch	9.2
35-32	Cumberland River	9.2
35-52	Wild Dog Creek	8.5
33-02	Barwon River	8.4
32-16	Hovell Creek	8.3
33-10	Native Hut Creek	8.3
35-39	Merrijig Creek	8.2
33-24	Penny Royal Creek	8.0
35-42	Painkalac Creek	8.0
35-46	Wye River	8.0
35-35	Spring Creek	7.9
33-04	Barwon River	7.9
32-04	Moorabool River	7.8
35-49	Carisbrook Creek	7.8
32-05	Moorabool River West Branch	7.4
34-20	Barongarook Creek	7.3
35-17	Kennedys Creek	7.3
35-56	Aire River	7.1
33-03	Barwon River	7.0
33-14	Yarrowee River	7.0
35-50	Smythes Creek	7.0
35-02	Curdies River	6.9
35-27	Aire River	6.9
35-38	Duneed Creek	6.7
33-11	Leigh River	6.7
35-28	Aire River	6.6

Table L1 – River reaches cont'd

No	Name	Priority Waterway Score
32-13	Spring Creek	6.4
33-08	Waurn Ponds Creek	6.4
32-10	Moorabool River East Branch	6.3
34-01	Woady Yaloak River	6.3
33-27	Barwon River East Branch	6.2
33-23	Penny Royal Creek	6.0
34-19	Dean Creek	6.0
35-13	Gellibrand River	6.0
33-33	Boundary Creek	5.9
34-02	Woady Yaloak River	5.6
35-04	Curdies River	5.6
32-06	Moorabool River West Branch	5.3
34-04	Woady Yaloak River	5.2
33-25	Dewing Creek	5.2
35-37	Thompson Creek	5.1
32-07	Sutherland Creek West Branch	5.0
33-16	Williamson Creek	5.0
33-21	Retreat Creek	5.0
34-10	Little Woady Yaloak Creek	5.0
32-11	Moorabool River East Branch	4.8
33-28	Barwon River East Branch	4.8
35-14	Gellibrand River	4.7
35-44	St George River	4.7
35-51	Skenes Creek	4.7
35-15	Gellibrand River	4.6
33-05	Barwon River	4.5
32-14	Lal Lal Creek	4.4
35-33	Erskine River	4.0
35-53	Barham River West Branch	4.0
35-16	Gellibrand River	3.1
32-12	Moorabool River East Branch	3.0
35-45	St George River	3.0
35-19	Chapple Creek	2.0
35-21	Carlisle River	2.0
33-06	Barwon River West Branch	0.0
33-07	Barwon River West Branch	0.0
33-26	Dewing Creek	0.0
35-20	Sandy Creek	0.0
35-23	Lardner Creek	0.0

Table L2 – Wetlands

No	Name	Priority Waterway Score
50722	unnamed wetland	13.50
51400	Lake Widderin	12.75
54595	Lake Murtnagurt	12.50
52634	Lough Calverts	12.43
52222	Horseshoe Lake	12.33
50527	Stonyford-Bungador wetland	12.00
50536	Stonyford-Bungador wetland	12.00
50547	Stonyford-Bungador wetland	12.00
51463	Banongill network	12.00
51469	Banongill network	12.00
51487	Widderin Swamps	12.00
50700	Kooraweera Lakes	11.70
50614	Lake Colongulac	11.69
52225	Lake Beeac	11.31
52308	Eurack Swamp	11.25
50555	Stonyford-Bungador wetland	11.23
50563	Stonyford-Bungador wetland	11.23
50663	Lake Milangil	11.20
51465	Banongill network	11.00
50561	Lake Terangpom	10.93
52305	Lake Forest	10.88
52629	Lough Calverts	10.80
51439	Lake Logan	10.67
52028	Lake Coragulac	10.67
54573	Hospital Swamp	10.64
52632	Lough Calverts	10.57
52365	Lake Ayrey	10.50
50205	Lake Costin	10.47
50505	Red Rock Lakes	10.40
50509	Red Rock Lakes	10.40
50566	Stonyford-Bungador wetland	10.31
50718	Lake Gnarpurt	10.23
50522	Lake Werowrap	10.00
54584	Lake Connewarre	9.64
50212	Princetown wetlands	9.56
52422	Lake Murdeduke	9.44
52208	Cundare Pool/Lake Martin	9.35
50725	Lake Weeranganuk	9.33
52181	Lake Ondit	9.33
50211	Princetown wetlands	9.00
56131	Salt Lagoon	9.00
50201	Lake Horden	8.92

Table L2 – Wetlands Cont'd

No	Name	Priority Waterway Score
54577	Reedy Lake	8.78
50203	Lake Craven	8.67
52297	Lough Calverts	8.60
50597	Lake Bullen Merri	8.43
56117	Lake Victoria	8.33
50406	Lake Corangamite	8.05
50435	The Basins	8.00
52361	unnamed wetland	8.00
54038	Lake Wendouree	6.52
52178	Lake Colac	4.00
55526	Wilson Reservoir	4.00
54643	Wurdiboluc Reservoir	3.00
50680	Lake Koreetnung	0.00
51432	Deep Lake	0.00
51491	Lake Tooliorook	0.00
51903	West Gellibrand Dam	0.00
51905	West Barwon Dam	0.00
54116	White Swan Reservoir	0.00
54124	Gong Gong Reservoir	0.00
55553	Lal Lal Reservoir	0.00
55560	Moorabool Reservoir	0.00
55588	Bostock Reservoir	0.00
56000	Korweinguboora Reservoir	0.00

Table L3 - Estuaries

No	Name	Priority Waterway Score
35~234	Anglesea River	9.2
35~242	Painkalac Creek	9.1
35~230	Barham River	7.7
35~227	Aire River	7.7
33~201	Barwon River	7.6
35~246	Wye River	7.6
35~201	Curdies Inlet	7.6
35~233	Erskine River	7.3
35~212	Gellibrand River	7.1
35~244	St George River	7.0
35~211	Port Campbell Creek	7.0
35~236	Thompsons Creek	6.6
32~215	Limeburners Lagoon	6.4
35~247	Kennett River	5.5

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