CORANGAMITE REGIONAL CATCHMENT STRATEGY 2021 - 2027

Date printed: 29 July 2024

CORANGAMITE CMA

Contents

Bellarine and Surf Coast

Geelong City

Ballarat City

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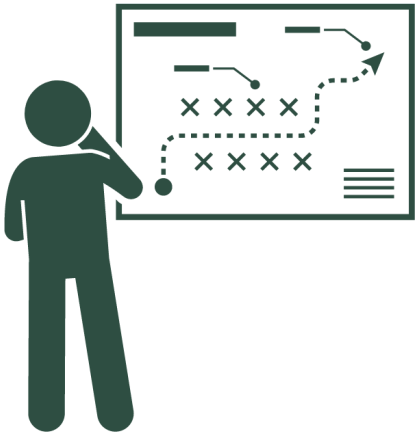
VICTORIA State Government

Home

Welcome to the Corangamite Regional Catchment Strategy

What is the Regional Catchment Strategy?
The Corangamite Regional Catchment Strategy (RCS) is a high level blueprint for catchment health. It provides a strategic, integrated framework for natural resource management in the Corangamite Catchment Management Authority's region of Victoria.



The Strategy identifies:

The nature, causes, extent and severity of land and water degradation of catchments

The region's land, water and biodiversity resources and how they are utilised

A long-term vision for the region

Regionally significant land, water and biodiversity assets and landscapes

Catchment condition objectives, and

A program of management measures for the life of the strategy delivered through Landscape System based actions.

Why is it important for our Region?

The RCS identifies desired regional outcomes and priorities, as well as describing an approach for further inclusion of local priorities. It is an overarching strategic framework for action.

The RCS is a high-level strategy supported by implementation plans and will be supported by a relevant integrated sub-strategies. It is a whole of region strategy that reflects what the catchment partners as a collective are striving to achieved for Natural Resources Management within the region.

It provides the principles for appropriate, integrated land and water management within the region by identifying roles and responsibilities of those involved in the management of such land and water-based assets and promotes stewardship by the community. It identifies the various systems that drive land and water management within the regional context and provides the basis of integrated place-based action within local areas.

We acknowledge landholders, Landcare, farming bodies, volunteers, community groups and members of the Corangamite region for their significant contribution and investment in the development of this strategy

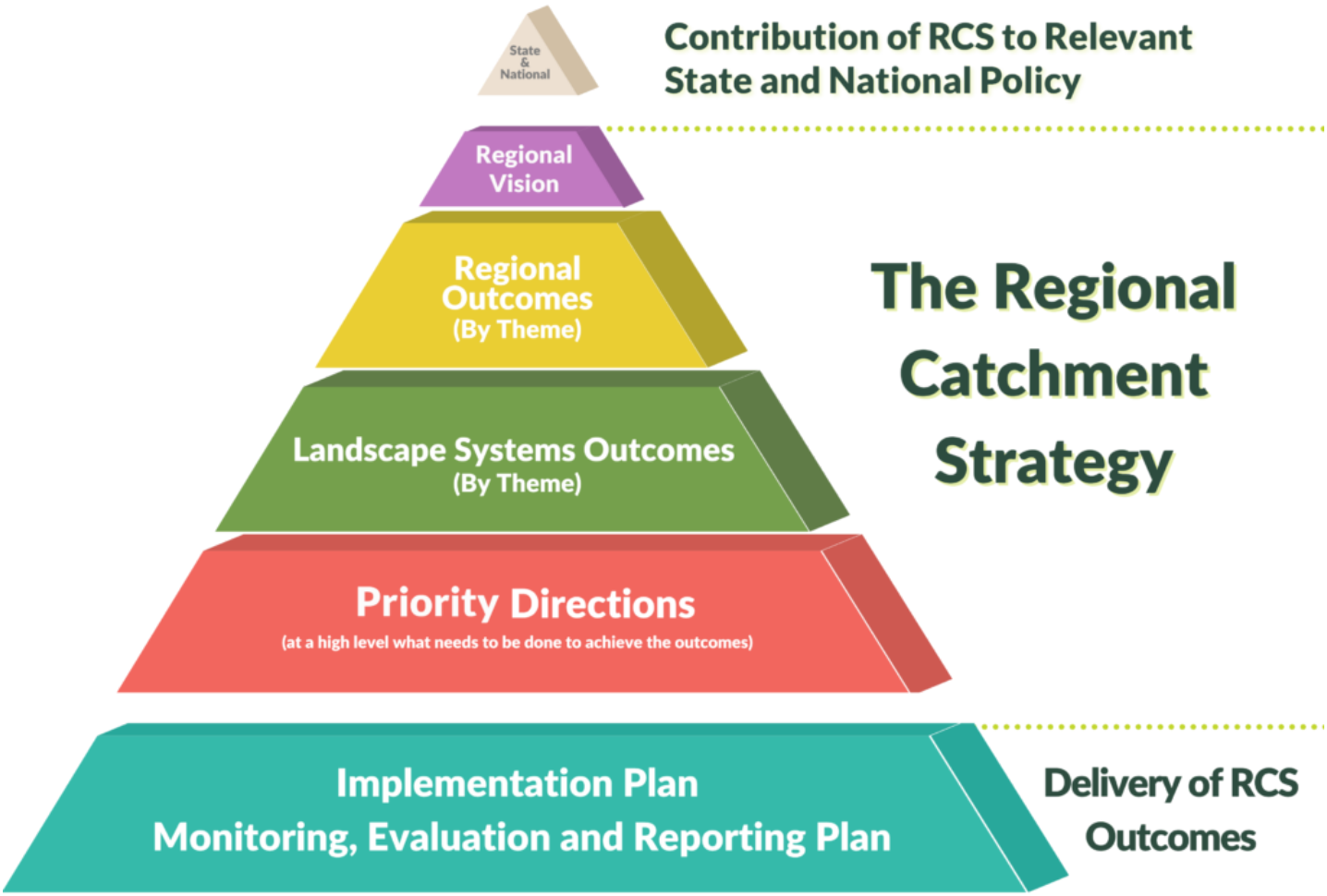
Vision for the Corangamite Region

Healthy and productive lands and waters cared for and enjoyed by thriving communities

The vision for the Regional Catchment Strategy sets the long-term aspirations for the condition of the region at 2050. It provides the basis for delivery of long, medium and and short term outcomes at both a regional and landscape system level that will contribute to the delivery of this vision. The regional outcomes align with statewide policies and outcomes, thereby improving the way the RCS reinforces, promotes and supports Government policy and objectives.

The Strategic Directions identified within the strategy provide the basis for action at both a regional and landscape system level that supports the delivery of the outcomes through Landscape System based actions.

How the Regional Catchment Strategy fits in a broader framework?



State & National – Contribution of RCS to relevant state and national policy.

Regional Vision – RCS

Regional Outcomes by Themes – RCS

Landscape System Outcomes by Themes – RCS

Priority Directions within Landscape Systems – RCS

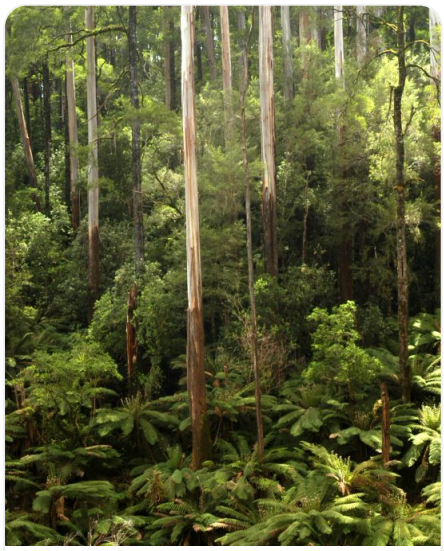
Implementation plan & Monitoring, evaluation and reporting plan – Delivery of RCS outcomes

The Regional Catchment Strategy is a high level strategy that focuses on the vision for the region and the desired outcomes; it is not an action plan and does not focus on outputs or activities. Implementation plans based on landscape systems are where the activities required to deliver the RCS will be developed, articulated, delivered, monitored, evaluated and reported against with further input from and collaboration with relevant communities, partners and stakeholders.

Themes

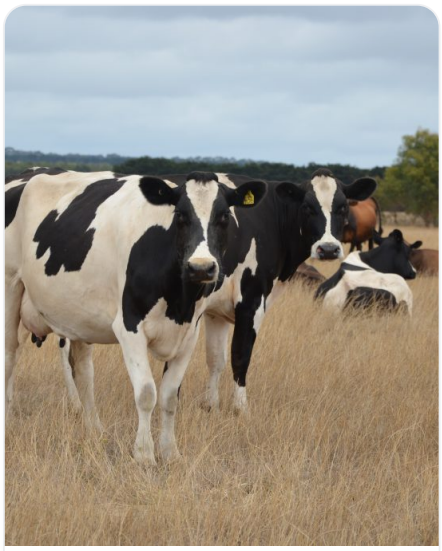
Water

Learn More



Biodiversity

Learn More



Land

Learn More

Coast & Marine

Learn More

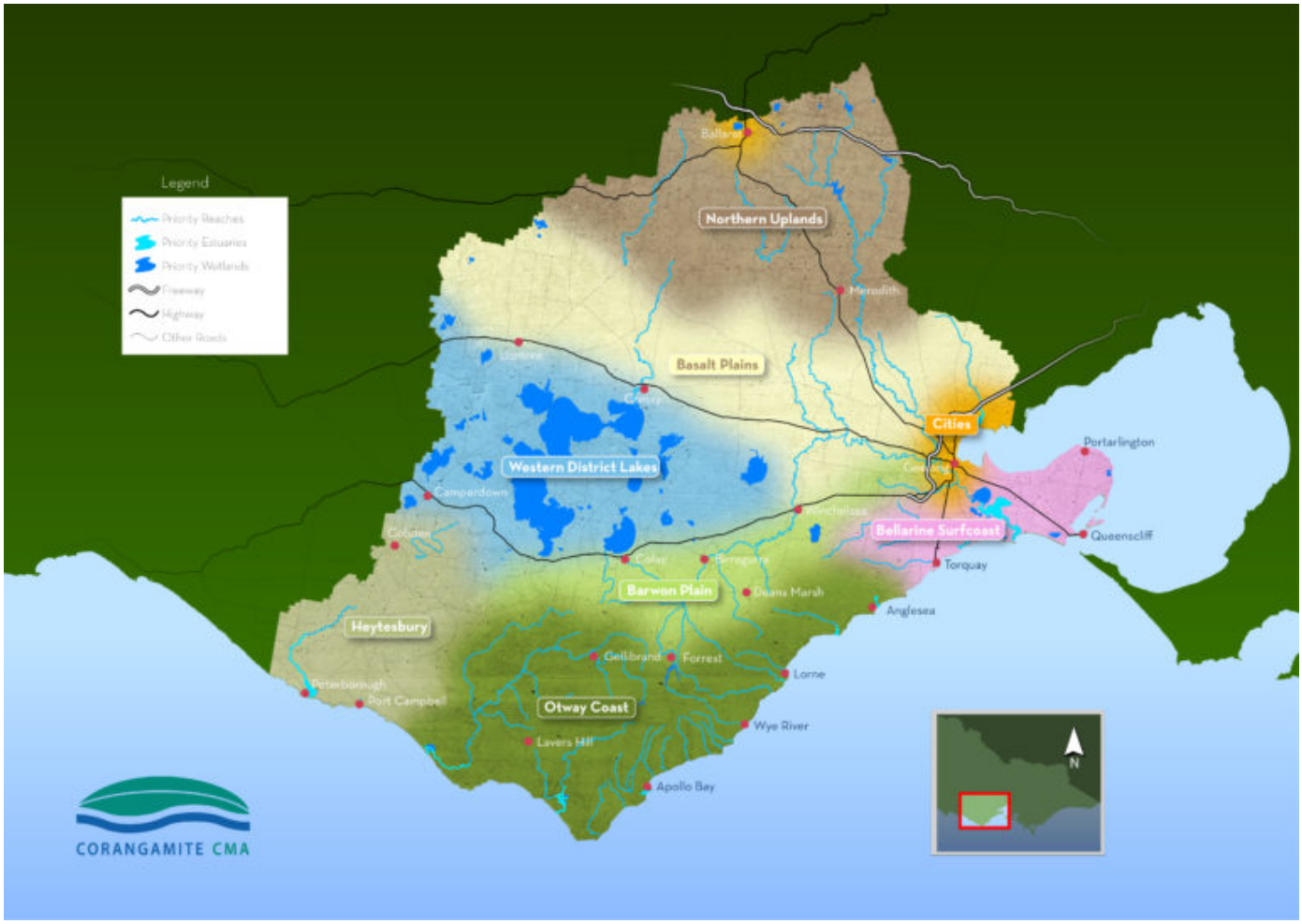
Communities

Learn More

The Corangamite RCS includes nine local areas called Landscape Systems that are based on current priority landscapes as shown in the map below. The landscape systems for the Corangamite region have been developed based on the principles of Landscape (the visible features of an area of land), Livelihood (how the land is used for productive purposes) and Lifestyle (the way that people live), with areas having common traits relating to these providing the basis for the local areas.

The landscape systems are the following:

Northern Uplands, Basalt Plains, Western District Lakes, Heytesbury, Otway Coast, Barwon Plains, Bellarine & Surf Coast, Geelong City, and Ballarat City



Landscape Systems of the Corangamite Region

The Regional Catchment Strategy provides the framework for integrated management of the region's natural resources. It is not an action plan, but provides the basis for the development of action plans that are guided by the Priority Directions for each landscape system (local area) as shown in the map above. Landscape system based programs that involve all relevant partners and stakeholders provide the basis for on-ground coordinated action to deliver the six year (life of strategy) outcomes and contribute to its longer term (20 year) aspirational outcomes and vision.

Landscape System Action Planning

Quick Links:

Regional Catchment Strategy Summary

Terminology

Eastern Maar Aboriginal Corporation

Wadawurrung Traditional Owner Aboriginal Corporation

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This Region

Located in the near south west of Victoria a short distance from Melbourne, the Corangamite region is bordered by the coast along its southern margins, includes a large portion of the Victorian Volcanic Plain through its centre and the Central Highlands to the north.

The region covers:
• 1.3 million ha of land, with 78% in private ownership
• 175 km of coast
• four catchment basins – Barwon, Lake Corangamite, Otway Coast and Moorabool.
It includes all or part of the cities of Ballarat and Greater Geelong, the Borough of Queenscliffe, and the Shires of Colac Otway, Corangamite, Golden Plains, Moorabool, Moyne, and Surf Coast.

The Corangamite region has rich and diverse landscapes reflecting its geological, climatic and human history. The natural resources of our region are critical to sustaining the lifestyle of its residents and visitors, as well as providing important habitat for flora and fauna. They support valuable industries such as agriculture and nature-based tourism, and underpin the region's urban water supply needs.

Traditional Owners Acknowledgement

Aboriginal peoples have lived in the area now known as the Corangamite region for thousands of generations. (click on link). We acknowledge their Ancestors and Elders, past and present.

Eastern Maar Welcome to Country

Wadawurrung Welcome to Country

Regional Overview

The Corangamite region is rich in environmental, social and economic values and has important cultural foundation (click on link to find out more)

Traditional Owner Acknowledgement

Aboriginal peoples have lived in the area now known as the Corangamite region for thousands of generations. The land, biodiversity and waterways of the region are living and integrated natural entities and the Traditional Owners are seen as the 'voice of these living entities'.

We acknowledge their Ancestors and Elders, past and present.

- We will integrate Aboriginal engagement and participation in the planning, governance, implementation and review of our programs and projects.
- Our people will be actively supported to engage Aboriginal communities and to build partnerships.
- Our Aboriginal engagement and participation approaches will be well planned, tailored, targeted and evaluated.
- We will provide respectful opportunities for Aboriginal people to contribute to strategies and initiatives.
- We will work transparently and respectfully with Aboriginal people, and establish clear roles and expectations.
- We will develop genuine and enduring partnerships.

The two Traditional Owners of the lands within the Corangamite Region are the Wadawurrung and Eastern Maar.

Eastern Maar Welcome to Country

Wadawurrung Welcome to Country

Map showing traditional owner land in the Corangamite region with Eastern Maar having claims to the southwest and Wadawurrung to the northeast

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Eastern Maar Welcome to Country

Maar language	English meaning
Ngatanwarr.	Together body and Country, we know long time.
Ngeerang meerreeng-an.	(We see all of you), greeting.
Peepay meerreeng-an.	Mother my Country.
Kakayee meerreeng-an.	Father my Country.
Wartee meerreeng-an.	Sister my Country.
Maara-wanoong, laka.	Brother my Country.
Wanga-kee-ngeeye.	We are the Maar speaking Peoples. Hear us.
Meereeng-ngeeye, pareeyt, nganpeeyan, weeyn, wooroot, poondeeya-teeyt.	Our Country is water, air, fire, trees, life.
Meerreeng-ngeeye, nhakateeyt, woorroong, leehnan, mooroop, keerray.	Our Country is thought, language, heart, soul, blood.
Meerreeng-ngeeye, thookay-ngeeye, pareeyt pareeyt ba waran waran-ngeeye, wangeeyarr ba wangeet – ngeeye, maar ba thanampool-ngeeye, Ngalam Meen-ngeeye, mooroop-ngeeye.	Our Country is our Children, our youth, our Elders, our men and women, our Ancestors, our spirit.
Meerreeng-ngeeye Maar, Maar meerreeng.	Our Country is Maar, Maar is Country.
Wamba-wanoong yaapteeyt-oo, leerpeeneeyt-ngeeye, kooweekoowee-ngeeye nhakapooreepooree-ngeeye, keeyan-ngeeye Wamba-wanoong nhoonpee yaapteeyt-oo, tyama-takoort meerreeng.	We bring to the light our songs, our stories, our vision, our love. We bring these things to the light so All can know Country.
Peetyawan weeyn Meerreeng, nhaka Meerreeng, keeyan Meerreeng, nganto-pay ngootyoonayt meerreeng.	To care for Country. To think about Country. To love Country. To protect Country.
Kooweeya-wanoong takoort meerreeng-ee ba watanoo Meerreng-ngeeye, yana-thalap-ee ba wanga-kee Meerreeng laka.	We invite all that choose to live on or visit our Country to slow down. To tread softly and listen to Country speak.
Ngeetoong keeyan-ngeen Meerreeng, Meerreeng keeyan ngooteen.	If you love Country, Country will love you.

Date printed: 29 July 2024

Wadawurrung Welcome to Country

KIM-BARNE WADAWURRUNG TABAYL

(Welcome to Wadawurrung Country)

We acknowledge our Ancestors and our Elders past and present.

We acknowledge that our Ancestors nurtured and cared for Wadawurrung Country for tens of thousands of years.

We acknowledge the hardships, the horror and the harm that they suffered following colonisation and the devastating impacts of that, which are still evident and felt today.

The fact that Wadawurrung People and Culture have managed to survive and thrive demonstrates enormous strength, resilience and adaptability.

Wadawurrung People are determined to see their unique cultural heritage protected and respected. Wadawurrung aims to restore Traditional knowledge and authority over the management of Wadawurrung Country for the betterment of those living on, prospering from and/or simply enjoying its land, waterways and coastal areas.

Wadawurrung people are the Traditional Owners of this land (see map below). Our family have looked after and cared for this country for over a thousand generations, and are still caring for it to this very day.

The Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) is the Registered Aboriginal Party (RAP) for Wadawurrung country. With the statutory authority for the management of Aboriginal heritage values and culture, under the Victorian Aboriginal Heritage Act, 2006.

In support of our above responsibilities, we provide a wide variety of services to organisations, assisting them in compliance with the aforementioned Act. We provide field representatives to assist with the discovery and repatriation of cultural heritage artefacts and ancestral remains. Our induction programs help to acquaint individuals and organisations with our heritage.

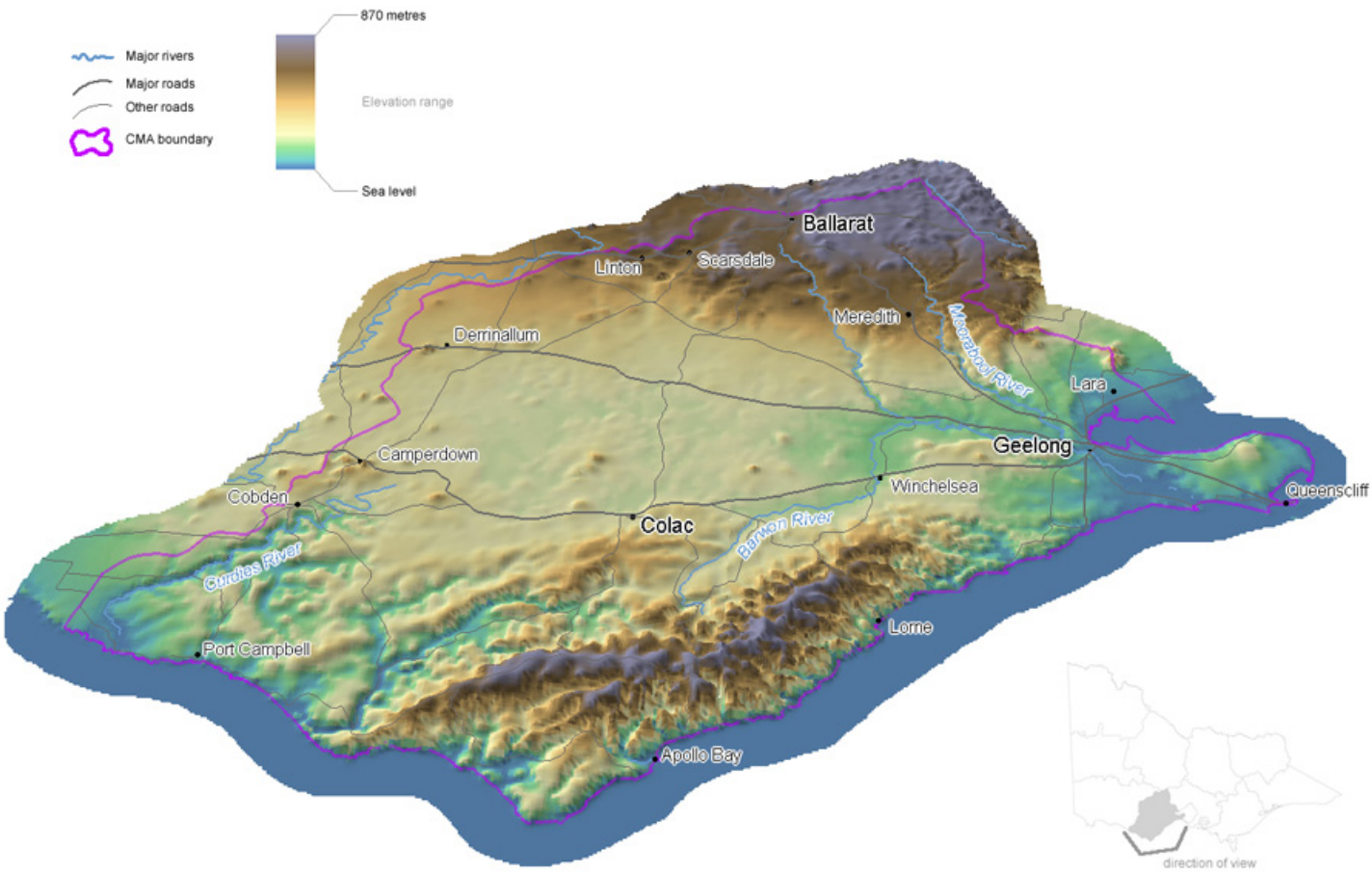
Regional Overview

One of ten Catchment Management Authorities in Victoria

The Corangamite Catchment Management Authority's region is one of ten regions in Victoria set up under the Catchment and Land Protection Act of 1998.

Victoria's Catchment Management Regions: Mallee, Wimmera, Glenelg Hopkins, North Central, Corangamite, Goulburn Broken, Port Phillip & Westernport, North East, West Gippsland, East Gippsland

Located in the south of Victoria, the region stretches from the Bellarine Peninsular to the east, south to Cape Otway and north to Ballarat and includes the Corangamite, Otway Coast, Barwon and Moorabool drainage basins.



Regional features and assets

The Corangamite region is rich in cultural, environmental, social and economic values. The region extends across:

- 1.3 million ha of land, with 78% in private ownership
- 175 km of coast
- four catchment basins – Barwon, Lake Corangamite, Otway Coast and Moorabool.

The Corangamite region has formed through landscape-building episodes over the past 600 million years, in a variety of environments ranging from deep sea sedimentation to explosive volcanoes. Landscapes continually evolve and processes such as earthquakes, landslides and even saline groundwater discharge, are manifestations of this evolutionary process.

The Corangamite region has rich and diverse landscapes, reflecting its geological, climatic and human history. The natural resources of our region are critical to sustaining the lifestyle of its residents and visitors, as well as providing important habitat for flora and fauna. They support valuable industries such as agriculture and nature-based tourism and underpin the region's urban water supply needs.

The region includes all or part of the cities of Ballarat and Greater Geelong, the Borough of Queenscliffe, and the Shires of Colac Otway, Corangamite, Golden Plains, Moorabool, Moyne, and Surf Coast.

Notable features of the region include Lake Corangamite, the largest permanent saline lake in Australia and the largest natural lake in Victoria, which is a Ramsar listed wetland and a haven for migratory and non-migratory birds. The Western District Lakes Ramsar site covers approximately 33,000 hectares and comprises nine separate lakes, which lie to the west, north and east of Colac.

The Corangamite region was one of the first regions of European settlement in Victoria. Settlers attracted to the open grassland plains moved rapidly inland from Geelong and Portland to establish grazing runs. The tall forests of the Otways attracted timber cutters in search of resources to establish the rapidly growing cities and towns of the colony. The gold rush of the mid-19th century promoted very rapid population growth around Ballarat. By the start of the 20th century, subdivision of the original grazing runs saw the establishment of more intensive agricultural industries such as dairying and cropping.

The range of coastal environments includes sandy beaches, rocky headlands, estuaries and bays, and the cliffs, caves and sea stacks of the Shipwreck Coast. The adjoining Otway Ranges are highly valued with their deeply incised rivers, gorges, rapids and waterfalls and extensive forests.

The region contains a variety of parks and reserves, including the Port Campbell and Great Otway National Parks, the Twelve Apostles and Point Addis Marine National Parks and part of the Brisbane Ranges National Park. The rivers and waterways of the region underpin water supplies to towns and cities.

The region's widespread, diverse and productive landscapes support forests, cropping, grazing, horticulture, viticulture and dairy enterprises. The economy of the region reflects its mix of agricultural and other primary industries, tourism, manufacturing and service industries. Agriculture, Forestry and Fishing is just outside the top 10 employers in the region at number 11 with 5,939 in 2016, or 3% of the total workforce. Healthcare (15%), retail trade (11%) and education and training (10%) made up the top three employers in 2016. Mixed farming and grazing is the predominant agricultural land use in the Corangamite region (66%), followed by dairy (14%), beef (7%) and sheep (5%) production.

Traditional Owners

Aboriginal peoples have lived in the area now known as the Corangamite region for thousands of generations. Wadawurrung Country stretches from the Great Dividing Range of Ballarat to the coast, from the Werribee River to along the Surf Coast, including Geelong, the Bellarine Peninsula. The Eastern Maar are Traditional Owners of south-western Victoria. Their land extends as far north as Ararat and encompasses the Warrnambool, Port Fairy and Great Ocean Road areas.

Regional communities

The presence of the cities of Geelong and Ballarat plays a large role in shaping population growth and distribution in the Corangamite region. As Victoria's second largest city, Geelong is an important service centre in south west Victoria. With its close proximity to Melbourne, Geelong is increasingly being seen as a major urban growth location within the broader Melbourne context. Ballarat, too, is experiencing strong population growth as its role as a regional service centre expands. The western area of Melbourne is experiencing rapid growth and this will have an impact on both Geelong and Ballarat in future. Future growth is also expected in the peri-urban municipalities of Surf Coast, Golden Plains and Moorabool.

The economy of the region reflects its mix of agricultural and other primary industries, tourism, manufacturing and service industries. Agriculture is the dominant land use of the region. The domestic and international tourism industry is a significant employer in the Corangamite region, especially in the Bellarine and Surfcoast, Otway Coast and Heytesbury landscape systems. Many of the smaller townships within the region rely on and support the agricultural and tourism industries.

A trend towards lifestyle change has seen larger properties previously used for agricultural production being divided up into smaller holdings. This has especially been the case in the peri-urban areas around Geelong and Ballarat and in the Bellarine and Surf Coast landscape systems.

Challenges and drivers of change

Climate change presents the greatest long-term challenge for the Corangamite region. The future climate of the region is expected to be hotter and drier than today with a higher frequency of extreme weather events such as bushfires and floods. Victorian Climate Projections covering the Corangamite region forecast that both maximum and minimum temperatures will continue to increase. Extreme rainfall events are predicted on average to increase in intensity but remain highly variable in space and time. The region's native vegetation, waterways, wetlands and soil are vulnerable to a hotter, drier climate. The region's estuaries and coastal wetlands are vulnerable to sea level rise.

In the short and mid term the increase in urbanisation, especially around major centers such as Geelong and Ballarat, has seen areas that were previously used for primary production being utilised for urban and peri-urban settlements. Demand for coastal real estate has also placed a heavy burden on our marine and coastal areas. The need for water has also increased as the population of the region continues to grow.

With regard to agriculture across the region, emerging trends include:

- fewer farmers
- enterprise changes
- smaller properties
- less income from agriculture
- older farmers.

More than 70% of land in the region is privately owned, presenting significant challenges in engaging with land owners and managers. There is concern about the viability of rural communities with socio-economic issues related to an ageing population, the loss of important services and reduced employment opportunities becoming more relevant.

Landscape Systems

The region has been divided into nine sub regional landscape systems. These have been developed based on the principles of **Landscape** (the visible features of an area of land), **Livelihood** (how the land is used for productive purposes) and **Lifestyle** (the way that people live) with areas having common traits relating to these providing the basis for the local areas. These are Northern Uplands, Basalt Plains, Western District Lakes, Heytesbury, Otway Coast, Barwon Plains, Bellarine & Surf Coast, Geelong City and Ballarat City.

The process used in the development of these geographic areas can be refined further if required within each landscape system. It is important to enable people to relate spatially to an area and that recognised points of reference can be identified. This has meant that in some situations "best fit" principles have been used in defining these areas. Major roads have been used in some situations, while public land boundaries have also been used where suitable.

Further refinement of each landscape system for both engagement and delivery purposes can be based around communities. Depending on the landscape system, community networks such as landcare groups/networks, fire brigades, commodity groups, proximity to townships, municipalities etc could be used to further reflect local priorities.

Date printed: 29 July 2024

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This Strategy

Regional Catchment Strategies are a requirement under Part 4, Division 1 of the Catchment and Land Protection Act (1994). The Corangamite Regional Catchment Strategy has been renewed in line with approved Guidelines that were provided by the Victorian Catchment Management Council.

Chair's Foreword

Welcome and foreword from the Chairman on behalf of the Corangamite Catchment Management Authority's Board, Staff, Partners and the Community.

Policy Context

A key part of the renewal process is the need to align with a range of policies, strategies and legislations that are relevant to the management of land and water. Click on the link above to access information relating to this.

Partners

The Corangamite Regional Catchment Strategy has been developed and will be delivered in conjunction with a range of partners, click on the above link to access information regarding the various partners involved.

Monitoring, Reporting and Review

The delivery of the strategy will be monitored and reported against a state-wide outcomes framework that will ensure consistency and continuity of reporting across its life. Meaningful indicators will provide the basis of monitoring, evaluation and reporting against actions implemented in the strategy's delivery. The above link provides access to this.

Foundations of Change

The foundations of change recognise that the community is the single most important agent of change in natural resource management. This RCS has identified four key elements that will provide the foundations for developing and implementing the detailed actions needed to deliver the desired outcomes.

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Chair's Foreword

Welcome to the Corangamite Regional Catchment Strategy

Alice Knight

Welcome to the Corangamite Regional Catchment Strategy which provides a vision for the integrated management of natural resources in the Corangamite Region to 2027. It is a blueprint for catchment health into the future and builds from the achievements and lessons from the past. For the first time, it is an on-line document that provides linkages to a wide range of information and resources.

The role that the region's two recognised Traditional Owner groups, Wadawurrung and Eastern Maar, have played and continue to play in the nurturing of country is acknowledged. Their aspirations and knowledge being a key aspect of this Strategy's development and ultimately, implementation consistent with their Healthy Country Plans.

The Corangamite region is one of the most productive parts of the state, with more than two-thirds of the region land managed by rural landholders. The landscapes of the region are diverse with spectacular coast lines and waterway, vast volcanic plains and the soaring old growth forests of the Otways. The catchment is 13,340 square kilometres, stretching from Ballarat to Geelong and along the coast to Peterborough in the west. Its landscape supports strong agriculture and forestry sectors, tourism and the two fastest growing cities outside of Melbourne – Geelong and Ballarat. The region also faces a number of stressors due to its location and popularity as a place to visit and live. The population growth and impacts of climate change effects the land, waterway, biodiversity and coastal assets. Identifying these stressors and implementing appropriate actions to mitigate these in collaboration will enable us to realise the vision of this strategy of *healthy and productive lands and waters cared for and enjoyed by thriving communities.*

The recognition that our communities are diverse but the most important agents of change in the stewardship of our natural resources in the Corangamite region has led to the identification of nine distinctive, Landscape Systems as the basis of localised action.

The RCS has been developed through a process of extensive community engagement and recognises the need to encourage the communities across the region to invest and participate in the protection, restoration and enhancement of natural resources across.

We are inextricably linked to our landscapes and we have a shared responsibility to act to ensure that the environment is healthy and supports our lifestyle and livelihoods. Not only for current but also future generations. Together we can continue to make a difference.

Alice Knight, OAM

Chair

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Policy context

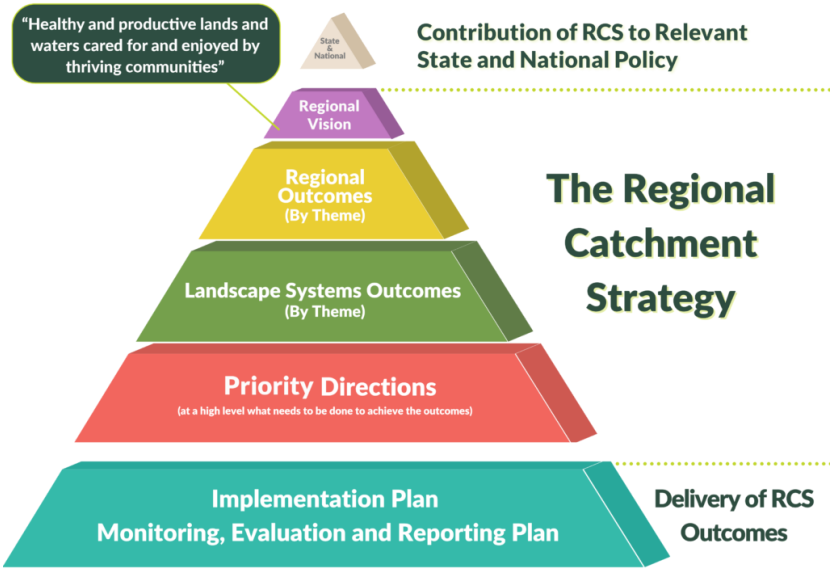
Key Legislative and Policy Frameworks

The Regional Catchment Strategy (RCS) has been prepared under the provisions of the Catchment and Land Protection Act, 1994 (CaLP Act), drawing on two key objectives of that Act:

- balancing land productivity and conservation outcomes
- encouraging and supporting community engagement in catchment management.

The RCS has also been developed in accordance with the requirements of national and state legislation and policies relating to biodiversity, land and water resources.

Implementation of this RCS will support regional delivery of national and state natural resource management legislation and policy.



State & National – Contribution of RCS to relevant state and national policy.

More Information

Regional Vision

Regional Outcomes by Themes
Landscape System Outcomes by Themes

Priority Directions within Landscape Systems

Implementation plan & Monitoring, evaluation and reporting plan – Delivery of RCS outcomes

This includes, but is not limited to the following:

Water for Victoria is a plan for a future with less water as Victoria responds to the impact of climate change and a growing population. The actions set out in the plan support a healthy environment, a prosperous economy with growing agricultural production, and thriving communities.

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

Our Catchments Our Communities commits to the continuation of the community's important role in land management and puts it at the centre of how integrated catchment management is planned and delivered in Victoria.

Protecting Victoria's Environment - Biodiversity 2037 is Victoria's plan to stop the decline of our native plants and animals and improve our natural environment.

Strong, Innovative, Sustainable: A new strategy for Agriculture in Victoria is a new ten year strategy that supports a stronger, more innovative and sustainable agriculture industry.

Victoria's Climate Change Strategy sets out the Government's plan for further reducing our emissions and building resilience to the impacts of climate change. In addition, a Natural Environment Adaptation Action Plan will be released in early 2022 and will iteratively guide adaptation efforts over the next five years and lay vital foundations in a systematic way to facilitate adaptation of the natural environment..

The State Environment Protection Policy (Waters) ensures Victoria has clear and relevant standards, legal rules, and statutory obligations to protect and improve the health of our water environments.

Victoria's Marine and Coastal Policy guides decision makers in the planning, management and sustainable use of our coastal and marine environment. It provides direction to decision makers including local councils and land managers on a range of issues such as dealing with the impacts of climate change, population growth and ageing coastal structures. The associated Marine and Coastal Strategy is a five-year action plan that implements the Marine and Coastal Policy.

Pupangarli Marnmarnepu 'Owning Our Future' Aboriginal Self-Determination Reform Strategy 2020-2025 is DELWP's roadmap to building a better future with Traditional Owners and Aboriginal Victorians, including ensuring that Traditional Owners' aspirations for land, water and culture are realised.

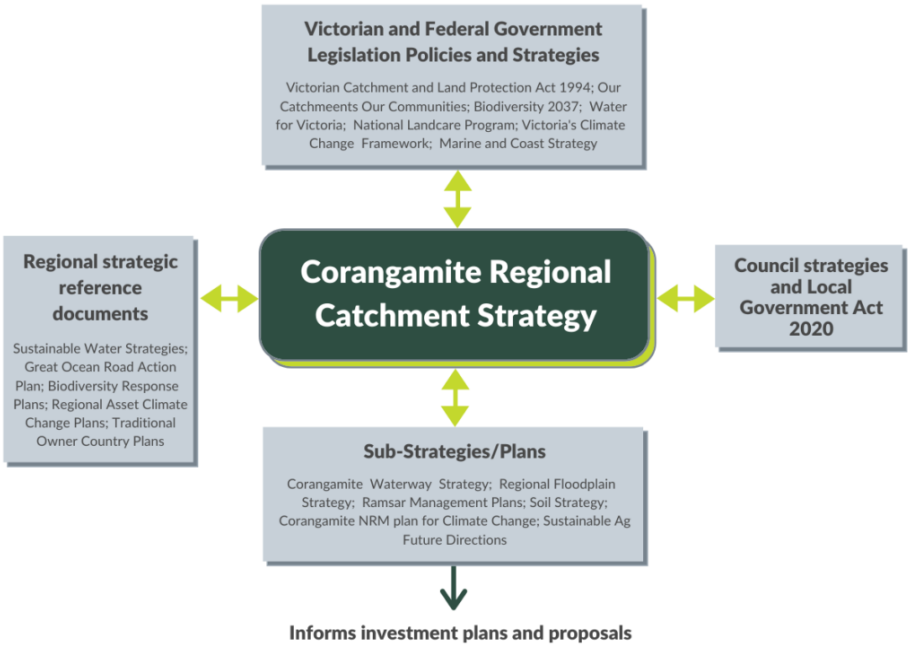
The Eastern Maar Country Plan (Meerreengeeye ngakeepoorryeeyt) defines Eastern Maar's vision for the future and identifies six goals that form the focus of effort. Each of the six goals has a number of objectives that are worked towards by Eastern Maar as individuals, as a nation and in partnership with others.

The Wadawurrung Healthy Country Plan (Paleert Tjaara Dja) articulates how Wadawurrung see Country being cared for and managed over the next 10 years. This includes walking together with government (federal, state, and local) and other key stakeholders to achieve self-determination, ensuring sustainable Wadawurrung managed investment in Country going forward.

Victorians Volunteering for Nature - Environmental Volunteering Plan

Victorian Planning Provisions

The Australian Government's National Landcare Program is a key part of the Australian Government's commitment to protect and conserve Australia's water, soil, plants, animals and ecosystems, as well as supporting the productive and sustainable use of these valuable resources.



Summary of Diagram (Vision Impaired)

- Regional strategic reference documents
  - Sustainable Water Strategies; Great Ocean Road Action Plan; Biodiversity Response Plans; Regional Asset Climate Change Plans; Traditional Owner Country Plans
- Victorian and Federal Government Legislation Policies and Strategies
  - Victorian Catchment and Land Protection Act 1994; Our Catchmeents Our Communities; Biodiversity 2037; Water for Victoria; National Landcare Program; Victoria's Climate Change Framework; Marine and Coast Strategy
- Council strategies and Local Government Act 2020
- Sub-Strategies/Plans
  - Corangamite Waterway Strategy; Regional Floodplain Strategy; Ramsar Management Plans; Soil Strategy; Corangamite NRM plan for Climate Change; Sustainable Ag Future Directions
    - Informs investment plans and proposals

The Regional Catchment Strategy also aligns with and contributes to the United Nations (UN) Sustainable Development Goals. This is especially the case for the five following goals:

GOAL	Outcome	RCS contribution
6 CLEAN WATER AND SANITATION	Ensure availability and sustainable management of water and sanitation for all.	Clean water is a key outcome of the RCS.

11 SUSTAINABLE CITIES AND COMMUNITIES	Make cities and human settlements inclusive, safe, resilient and sustainable.	With two major centres in the region this is addressed through the Themes and Priority Directions. The Communities theme has a focus on this aspect as well.
13 CLIMATE ACTION	Take urgent action to combat climate change and its impacts.	Adaptation and mitigation are embedded into RCS Themes and Priority Directions
14 LIFE BELOW WATER	Conserve and sustainably use the oceans, seas and marine resources for sustainable development.	Helping to maintain the quality of the world's oceans through appropriate catchment management
15 LIFE ON LAND	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Embedded in goals for each of the Themes and reflected in Priority Directions

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Strategy development

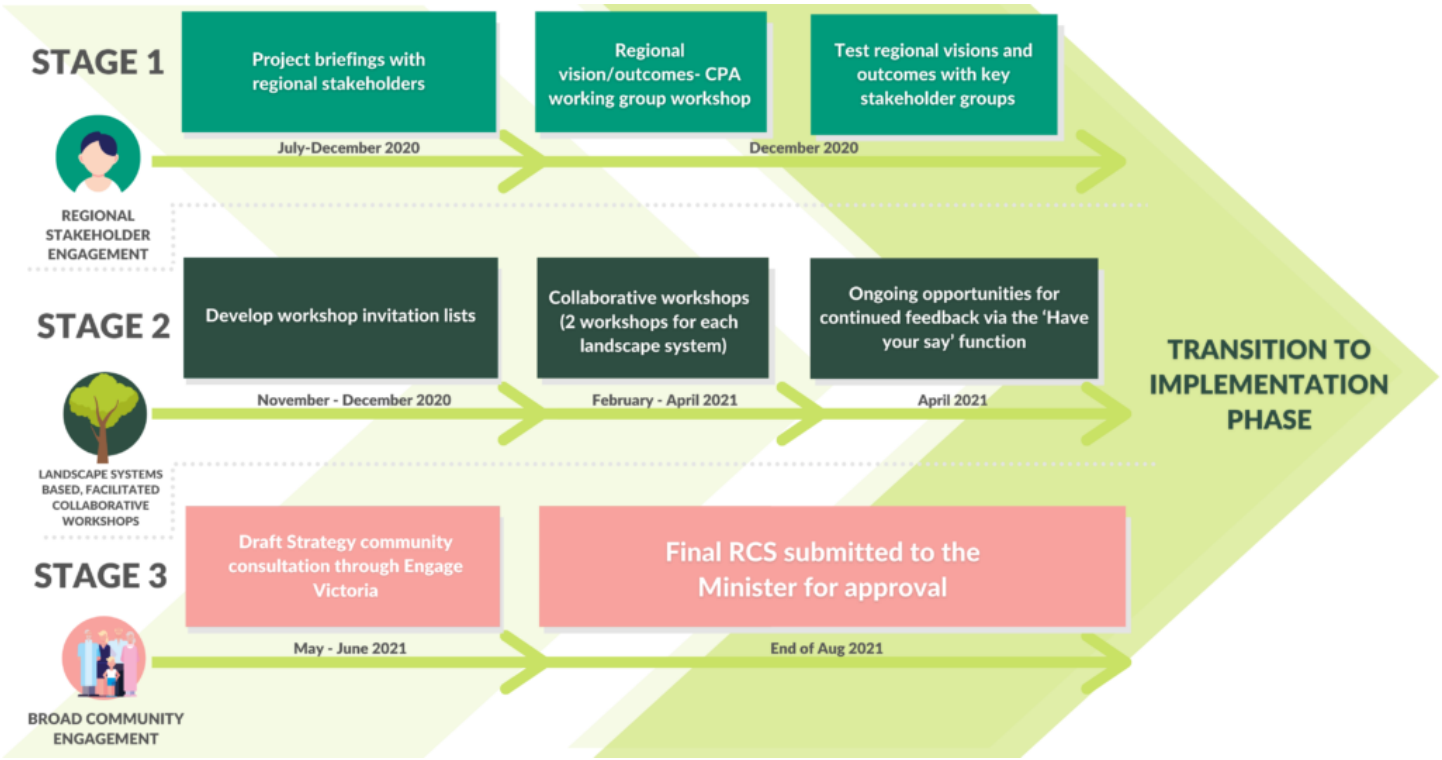
The development of the Corangamite Regional Catchment Strategy followed an extensive review of the previous strategy, initial engagement with a range of stakeholders and partners to ascertain their aspirations for this strategy and involvement in the development of a state-wide approach.

The Victorian Catchment Management Council (VCMC) developed the guidelines that ensured that Regional Catchment Strategies (RCS) complied with the requirements of the Catchment and Land Protection Act (1994) for their development. Key requirements under the VCMC Guidelines are that the Corangamite Regional Catchment Strategy contributes to consistent integrated catchment management outcomes across Victoria.

Key regional drivers for the development of this RCS were the need to better align local management areas to the landscapes of the region and how they function due to soil type, topography, climate, biodiversity and location. These have been identified within this strategy as landscape systems.

Key partners that were engaged with during the development of the Regional Catchment Strategy include traditional owners, all municipalities, all relevant agencies, industry groups, community groups such as Landcare and relevant community members. The Corangamite Catchment Partnership Agreement Forum played a key role in its development, as did the Corangamite Community Engagement Network.

The Communication and Engagement process for the development of this strategy occurred at three levels as outlined in the following diagram.



RCS Communication and engagement process

The Victorian Catchment Management Council Guidelines highlighted the need for greater regard for Aboriginal cultural values and traditional ecological knowledge. To this end, in the development of this strategy agreement was reached with both the Eastern Maar and Wadawurrung Traditional Owners to engage with them in a coordinated manner with other Catchment Management Authorities (CMAs). Corangamite, Glenelg-Hopkins and Wimmera CMAs have engaged with Eastern Maar as a collective. The same has occurred with Wadawurrung by Corangamite, Glenelg-Hopkins and Port Phillip-Westernport CMAs.

As part of Stage 2, collaborative on-line workshops were held across the region's Landscape Systems to ensure that local outcomes and priority directions were captured and included into the strategy. Two 2- hour workshops were held for each of the nine Landscape Systems through an on-line forum due to the issues presented by the COVID-19 pandemic. A report on this process can be accessed here. The findings from these workshops were synthesised and included in the draft RCS which was placed onto the Engage Victoria site from the 15th June until 16th July 2021 to capture wider community feedback.

Learnings from previous RCS and what is different now

A report commissioned by Corangamite Catchment Management Authority by Deakin University in 2019 (*Corangamite Catchment Management Authority: A report informing the 2020 Regional Catchment Strategy renewal process)* by Dr Tanya King and Shaya Kaartinen-Price posed the question "**What should consultation look like for the renewal of the RCS?"**

- Most people indicated a preference for workshops (18%), followed by community advisory group/steering committee (13%), technical reports/discussion papers (11%), online consultation (10%) and submissions (10%), then community information sessions (9%).
- It should be noted that the difference between 'online consultation' and 'submission' is not clear, nor the difference between 'community information sessions' and 'workshops', at least in terms of how they may incorporate respondent contributions to the new RCS. Seeking this kind of information is a worthwhile task, but the options provided to respondents need to be clear and actionable.
- Consultation tends to mean different things to different people. For some, it is being provided with information. For others, it is the opportunity to have direct and impactful input into a process. It is suggested that CCMA clarify the level of involvement that staff (in particular) may have in relation to the RCS renewal process, and how this may feed into the new RCS. (Deakin Uni analysis)
- When asked how they interact with the CCMA (multiple responses possible), 17% of responses (not respon*dents*, but distinct responses) referred to CCMA as a funding agency, 9% referred to providing information to the CCMA, while nearly 20% referred to a partnership arrangement with the CCMA. Half (50%) of the responses depicted the CCMA as an advisory or service provision agency. (Deakin Uni analysis)
- A question for CCMA in the future might be what level of understanding is necessary for different stakeholders to engage effectively, and how might that be communicated effectively?

As part of the process for renewal of the Corangamite Regional Catchment Strategy, a series of interviews was conducted with partners and stakeholders at a variety of levels to ascertain how the RCS has influenced the way they have managed the region's resources.

The process used was a face-to-face discussion which enabled the population of a template with relevant information. All participants had the information captured relayed back to them to check that the required information was captured. Interviewees were also given the opportunity to provide comment as they felt necessary.

Summary of findings

There is a wide variation of understanding of the purpose of the RCS with no respondent being able to clearly articulate its purpose to "provide a vision for the integrated management of natural resources in the Corangamite region. It is a blueprint for catchment health in the future and builds on the achievements and lessons from the past".

There was a large variation of experience with involvement in the RCS development process. One major theme was that involvement with RCS3 was less than the initial two RCSs.

There was very little use of the RCS by those interviewed. One recurring theme was that there was much greater use of sub-strategies (although many of these had not been renewed during the term of the current RCS). Key feedback from community groups was that they generally only used the RCS to access grants.

Conversely most of those interviewed believed it should have a high relevance to their work. There were a number of comments regarding the RCS' role in setting priorities and enabling collaboration.

Some of the key proposals to make the RCS more relevant were:

- Enable specification, prioritisation, collaboration and delivery.
- Have a role in informing statutory planning at a state-wide and municipal level.
- Needs to involve local government more
- Be a reference for useful information
- Needs to take into consideration other strategies and plans
- Provide funds

With regard to how engagement should occur for the next RCS there was an expectation that as stakeholders, a higher level of engagement than that for RCS 3 was wanted. Such engagement needs to be focused on relevant levels of organisations and the type of engagement needs to be suited to that level, with the ability to escalate if necessary. Some community-based organisations indicated that there may be a need to pay sitting fees to enable these organisations to have more meaningful input.

There was general consensus that organisations were willing to co-invest in projects. This co-investment could be in terms of funds, staff time and services. Such investment would need to meet the investors' outcomes, leverage other investment and be under some form of agreement.

The major themes that arose from final comments were:

- Needs to be fit for purpose and people have to want to use it
- Needs to be relevant to all agencies
- Should have a focus on developing partnerships similar to CPA.

The change to Landscape Systems from Landscape Zones (sub-catchments) provides a systematic approach to managing issues. Within Landscape Systems there is a greater degree of commonality and consistency in landscape features, land use for productivity and the lifestyle of those within those systems.

The desire for the strategy to "be a reference for useful information" is provided through its on-line format. This format provides the opportunity to enable links to relevant information being incorporated within its layout under various sections. The ability to link to the Natural Resource Management Portal and the CCMA Knowledge Base also provides users with a pathway to find information.

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Partners

The Corangamite Regional Catchment Strategy is produced by the Corangamite Catchment Management Authority on behalf of the entire Corangamite community. It sets out how the catchments in the region are to be managed by assessing the land and water resources in the region and how they are used.

The delivery of the Corangamite Regional Catchment Strategy will require all land managers within the region working in partnership to deliver an integrated approach to managing the land and water resources.

The following listing presents the range of partners who will work together to ensure the successful delivery of this strategy.

Catchment Partners

The Corangamite Catchment Partnership Agreement provides the basis for agencies to work cooperatively within the Corangamite Region to deliver Integrated Catchment Management outcomes. Signatories to the agreement are:

Department of Environment, Land, Water & Planning

State Government Victoria

Department of Environment, Land, Water and Planning is focused on creating a liveable, inclusive and sustainable Victoria with thriving natural environments – where the community is at the centre of everything they do. The Department also has oversight of various Committees of Management who manage Crown Land Reserves, these include Bellarine Bayside and Barwon Coast Committees of Management.

GREAT OCEAN ROAD
COAST & PARKS AUTHORITY

The Great Ocean Road Coast and Parks Authority was established on 1 December 2020. The Authority manages, protects, rehabilitates and fosters resilience of the natural, cultural and heritage values of coastal Crown land and marine waters along the Great Ocean Road.

Department of Jobs, Precincts and Regions – Agriculture Victoria has been created to give greater visibility to the agriculture activities of the department, giving a clear identity to agricultural services and initiatives within the department. Agriculture Victoria supports this agenda by delivering policy, research, development, extension, regulation and market access/facilitation services to long established and mature agricultural industries such as dairy, as well as new and emerging industries.

Department of Jobs, Precincts and Regions – Regional Development Victoria (RDV) is the Victorian Government's lead agency responsible for rural and regional economic development. RDV operates in partnership with regional businesses and communities, and all tiers of government to deliver the Government's regional development agenda and instigate positive change for regional and rural Victorians.

The state of the environment can affect human health. The Environment Protection Authority works to protect the environment and human health from pollution and waste.

Parks Victoria manages a diverse network of parks that are home to over 4,300 native plant species and 948 native animal species. These parks include some of Corangamite's largest and most undisturbed ecosystems – landscapes like the Otways, the Lake Connewarre complex and the Western District Lakes. It also covers the region's marine national parks and sanctuaries that protect a wide array of marine life.

Barwon Water's vision is for an economically, socially and environmentally prosperous region. Their mission is to strengthen the region's economy, liveability and sustainability through the delivery of high quality and affordable water and sewerage services.

Central Highlands Water

Central Highlands Water is a regional water corporation providing drinking water, sewerage, trade waste and recycled water services to customers throughout the Central Highlands region of Victoria.

Southern Rural Water

Southern Rural Water is responsible for managing irrigation districts, the regulation of surface water and groundwater licensing, and storage dams across the southern third of Victoria.

wannonWATER

Wannon Water's vital role is in delivering safe, secure and affordable water and sewerage services for their customers, but also recognise the importance of their place in south-west Victoria, and the need to lead by example.

CITY OF GREATER GEELONG

With a population of over 250,00 the City of Greater Geelong is Victoria's largest provincial city. It has some of the most breathtaking landscapes in Australia – from rugged untouched coastline on the Bellarine, to wildflower infused grassland on the volcanic plain, to majestic open forest in the Brisbane Ranges.

The Borough of Queenscliffe Council and community are very passionate about the unique coastal environment that surrounds us. Protecting and enhancing our environment is one of the key focus areas of Council. Residents, businesses and visitors are encouraged to support Council's efforts.

Our community members consistently show their desire to protect our natural world and a commitment to sustainable and environmentally friendly practices.

Colac Otway Shire is widely regarded as one of the most beautiful areas in Australia. It comprises of a wide variety of vegetation communities ranging from coastal scrub to rainforest and areas of native grasslands. It is important that with its expanding growth that it retains the natural values and landscape character of each area.

The Shire is approximately 4,600 square kilometres. It extends from the spectacular limestone cliffs at Port Campbell and Princetown to the historic town of Skipton, in the north, near Ballarat.

The rural areas of Ballarat are a natural resource. It is important that there is acknowledgement of environmental issues that can impact on the health of this resource and ability to farm and live in the rural areas.

Moorabool Shire is a fast growing semi-rural municipality nestled between Melbourne, Geelong and Ballarat. The Council through its actions, as well as working with other agencies and groups with an environmental stewardship role, focus to assist communities to live sustainably so that we leave a healthy and prosperous environment for the future generations.

Natural beauty is a huge feature in Golden Plains with the Brisbane Ranges National Park, Enfield State Forest and Moorabool River popular for their wildflower displays, koalas, scenic drives, walks, trails and picnic grounds, offering day-trippers an enjoyable tourism experience.

Trust for Nature partners with private landholders in Victoria to protect native plants and wildlife for future generations. Together with conservation covenants and reserves, we have protected more than 100,000 hectares across Victoria.

Wadawurrung Country stretches from the Great Dividing Range of Ballarat, to the coast from the Werribee River to Aireys Inlet, including Geelong, the Bellarine Peninsula and Surf Coast

The Eastern Maar are Traditional Owners in the south-west of Victoria. Their traditional land extends as far north as Ararat and encompasses the Warrnambool, Port Fairy and Great Ocean Road areas.

Industry stakeholders

Southern Farming Systems is a farm driven, non-profit organisation helping higher rainfall farmers with practical research and information that produces sustainable results.

WestVic Dairy is a Regional Development Program (RDP) set up by Dairy Australia in the 1990s. Dairy Australia invests across the dairy supply chain, identifying the best opportunities for collective action.

The Victorian Farmers Federation is an active, powerful lobby group dedicated to the interests of farmers and making a difference to communities.

Education and Research providers

Primary and secondary schools are a major source of education for the population, and reach or have reached most of the region's inhabitants. This process provides a major opportunity to educate current and future students, and through them their parents, about the importance of environmental issues and sustainable behaviour.

Tertiary education providers are also a major source of training and education of future generations of professionals who will have a key role in managing the catchment into the future. These institutions also play a key role in identifying and developing solutions to gaps in knowledge. The Corangamite community is fortunate to have key universities including Deakin and Federation Universities within the region.

The Corangamite CMA has also worked closely in partnership with the Centre for eResearch and Digital Innovation (CeRDI) at Federation University in the development of a range of portals and other information sharing platforms.

Community organisations

Many of our community organisations are involved in activities that seek to improve the environment in which they live. Their members work together as stewards and advocates for the environment and seek to improve its condition.

Within the Corangamite region there are a multitude of such organisations which have been highlighted within each of the Landscape Systems. Some of the key community based organisations within the region include the following:

Victorian Landcare Gateway

Landcare represents thousands of people across Victoria, working together to increase biodiversity and promote the sustainable management of land. The Corangamite Landcare Program has ten Landcare networks and locally-based Landcare Facilitators. There are more than 152 Landcare and community-based natural resource management groups with more than 4,200 volunteers developing innovative partnerships to achieve large-scale landscape projects.

WATERWATCH Victoria

Waterwatch Victoria is a successful community engagement program connecting local communities with river health and sustainable water issues and management since 1993.

EstuaryWatch

Waterwatch Victoria has a sister program called EstuaryWatch. EstuaryWatch is a successful citizen science program that supports community members to actively participate in the monitoring of estuary health.

OTWAY AGROFORESTRY NETWORK

Otway Agroforestry Network (OAN) is a landcare group that encourages farmers to establish and manage trees for the reasons that matter to them. Landholders in our region want trees on their farms to shelter farm stock and crops; control soil erosion and dryland salinity; enhance their property values; and, if at all possible, generate alternative sources of income.

Geelong Environment Council Inc.

The Geelong Environment Council is a community group that was formed in 1972 to assist in the protection of the environment in and around Geelong.

Coastcare Victoria

Coastcare Victoria proudly supports hundreds of community volunteer groups working to protect and enhance Victoria's coastline.

Corangamite private land managers

The majority of the Corangamite catchment is in private ownership. Of the 1.3 million hectares of the catchment, 78% is privately owned. It is recognised that land owners invest much time and money into the management of their properties and how this contributes to catchment health. In all cases they are stewards of the land over which they have control. To ensure land is managed sustainably requires the implementation of integrated catchment management principles and application of best management practice involving a range of participants.

This strategy provides the overarching principles for the appropriate management of the catchment over its life. It identifies the drivers that are needed to ensure sustainable use of the region's natural resources. It is also important to ensure that individuals are supported in meeting their duty of care to the entire community.

Corangamite citizens

The citizens of this region, and visitors to it, undertake individual actions every day that collectively have a significant influence on the health and resilience of the environment.

Their contribution to environmental health begins at home and they are important partners in the efforts to achieve environmental targets by minimising waste, using environmentally-friendly products, increasing recycling, helping put an end to littering, and becoming active in local efforts to enhance native flora and fauna.

This strategy includes opportunities for citizens to be active monitors of environmental condition and collectors of data. It is envisaged that this strategy will evolve and enable citizens to contribute current information and data. For example: native vegetation extent and quality; native animal sightings; and water quality in waterways, wetlands and marine environments.

A key aim of the Strategy is to promote a stewardship ethic with all of the Corangamite community and visitors to the region to ensure that the environment is a consideration in their day to day activities.

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Monitoring, Evaluation and Reporting

Outcome Monitoring

The *Catchment and Land Protection Act 1994* requires CMAs to identify procedures for monitoring the implementation of their Regional Catchment Strategy (RCS). An Outcomes Framework has been developed, providing a consistent approach to monitoring and reporting on the implementation of RCSs across Victoria's 10 catchment management regions.

The framework identifies a set of standard indicators that align with Victorian Government and Australian Government policies, thereby improving the way RCSs reinforce, promote and support government policy and objectives. While the Outcomes Framework primarily applies to the regional outcomes in the RCS to enable a more consistent approach to monitoring and reporting, they may also apply to relevant outcomes at the landscape system scale. Additional outcome indicators specific to the remaining landscape system outcomes will also be included in the Monitoring, Evaluation and Reporting Plan for this RCS.

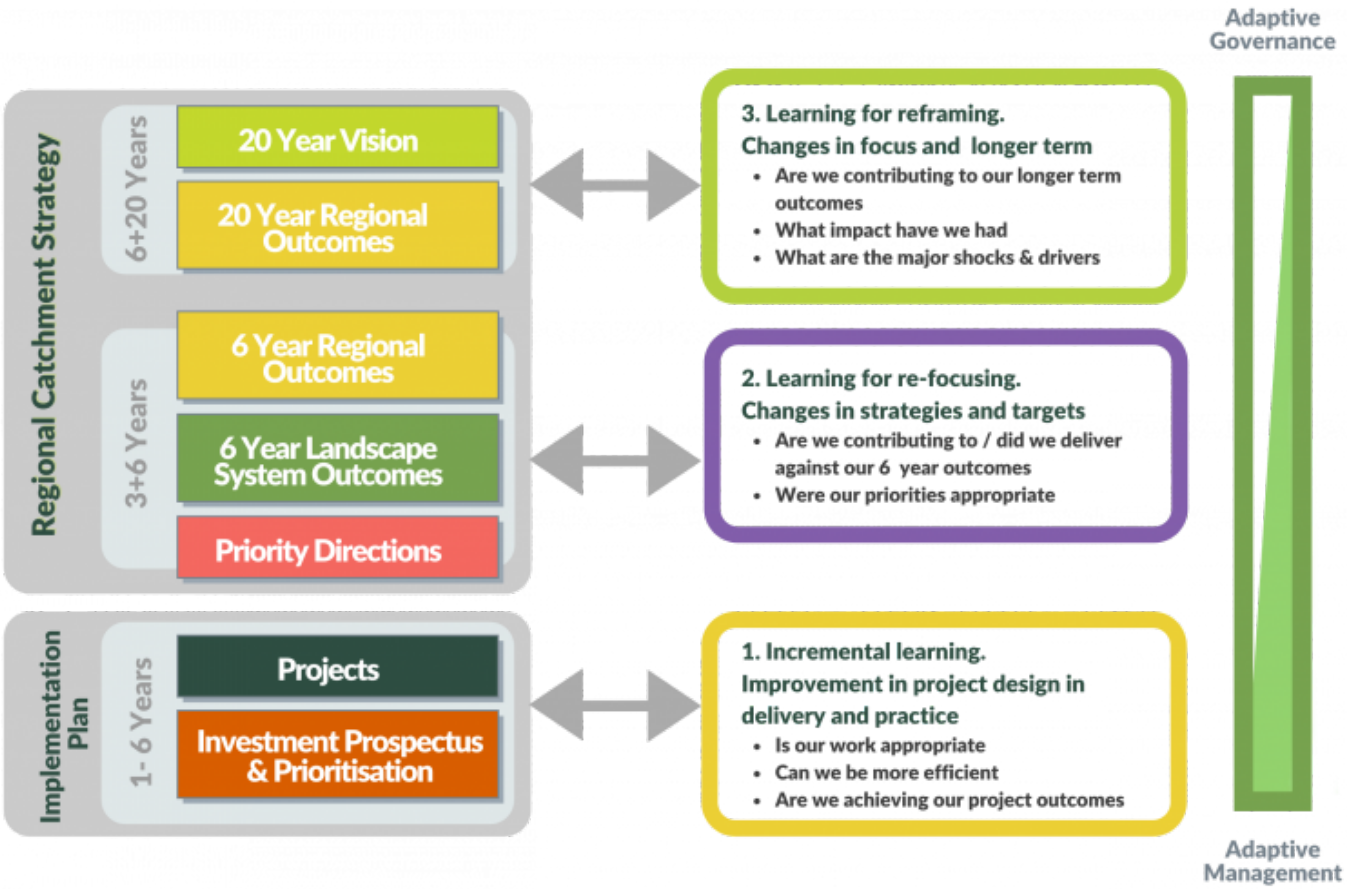
The outcome monitoring is supported by other qualitative and quantitative evidence to inform the various stages of review.

Evaluation and reporting

Progress against RCS implementation will be monitored with implementation partners annually and reported to community and stakeholders in accordance with the Monitoring, Evaluation and Reporting Plan. The annual review process will provide incremental learning and enable collaborative decisions on project design, delivery and practice.

A mid-term and final review of the RCS will also provide robust processes to measure progress towards the RCS outcomes. These review processes will focus on changes that maybe required in strategies to address the outcomes.

The diagram below reflects the different review stages and their focus over the life of the RCS.



Summary of Diagram (Vision Impaired)

The implementation plan for the regional catchment strategy will be reviewed annually to check on progress implementation will then be adapted accordingly.

A more detailed evaluation that considers outcomes within the evaluation will occur at the mid-term (3 year) and then final stage (6 year) of the RCS. The 3 and 6 year evaluations will also be informed by how well the implementation has performed.

The 6 year evaluation will inform the renewal of the next Regional Catchment Strategy and the contribution to the 20 year outcomes.

Monitoring, Evaluation, Reporting and Learning Plan

The Catchment Condition report section of the 2022 – 23 Annual Report can be found here.

Outcomes Monitoring Framework

Date printed: 29 July 2024

Foundations of change

A region-wide approach to improving natural resource management is needed to achieve the goal of the RCS. The approach in this RCS recognises that the community is the single most important agent of change in natural resource management. Even though funds are essential for achieving this change, it will not occur unless the community is motivated and engaged. Taking this into account, this RCS has identified four key elements that will provide the foundations for developing and implementing the detailed action plans required to achieve the natural resource management objectives identified in this strategy.

Increased breadth and depth of participation

Participation in the protection, enhancement and restoration of natural resources by landholders, community, industry and agencies has increased.

Natural resource management partnerships have grown and existing partnerships are adequately supported.

Increased investment and development of joint priorities

The aggregate investment to protect, enhance and restore the region's natural resources has increased.

Joint priorities for investment in the protection of natural resources are identified and pursued.

Working in partnership with Traditional Owner groups on natural resource management projects that are a priority to their Country Plans.

Improved integration and coordination

Natural resource management partnerships have matured and the region's partners are working collaboratively to achieve effective integrated catchment management.

Investment is targeted to the protection of high value natural resources with feasible and cost effective solutions.

Increased and widely shared knowledge.

Knowledge of the region's natural resources and how to protect, restore and enhance them has increased, resulting in improved practices.

The connection of Traditional Owners to land is respected and planning and activities are informed by their skills and knowledge.

Improved knowledge of the impacts of climate change is used to review the objectives and actions to protect natural resources

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Themes

The Corangamite Regional Catchment Strategy covers the following themes which are the building blocks of healthy and resilient environments and the focus of integrated natural resource management. Under each of these themes are sub-themes that focus on the various values that these themes provide.

Water

Water Outcomes and Priority Directions

Click on the above link to access

In the words of the Wadawurrung people:

"All our waters are living sources from Bundjil – the Karringalabul Murrup , the Creator spirit. He created all you see. Our waters were made for our survival, the survival of all things living"

 Melinda Kennedy, Wadawurrung Traditional Owner (from The Wadawurrung Healthy Country Plan)

"Our main river systems are the Barwon/Moorabool, Yarrawee and Leigh rivers or Barre Warre Yulluk-Yulluk (great river) that runs from barre the (mountains) to the warre (ocean), and our stories tell of these connections. The name Barwon is derived from parwan meaning 'magpie' or 'great wide'.

Fyansford is a significant cultural place where the Barwon and Moorabool meet.

The chain of ponds from the Barwon River to Reedy Lake, Hospital Lake, Lake Connewarre and Estuary Bay is connected through water and our Connewarre (Black Swan) Dreaming. The Connewarre Wetland Complex is internationally significant for wader and shoreline birds and forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site.

Our waterways were like our highways, they were how Wadawurrung people moved around Country. Our people used canoes or in calmer waters, Murriyans bark floats, or punts pushed by long poles to gather the abundance of food. On the natural rises along the waterways our people camped and caught eels, other fish and waterbirds to eat. Important decisions were made on the banks of these waterways by our Ancestors. They were important living and meeting places. Just as they are today."

 Waddawurrung Healthy Country Plan

In the words of the Eastern Maar People:

"We care about the management of water on our Country. It is not just something to buy and sell, or pollute in the process of extracting minerals, oil or gas. It nourishes our Country – the plants and animals, the cultural landscapes and the people. Water should not just be allocated to whoever can pay the most, it should be used in a responsible way, go to where it is most needed and where it will sustain the system.

We need to have a say on decision-making processes that determine where government resources for land management are directed, and we need to make sure that agencies are working with us to manage the land and waters to a standard that we have determined."

 Eastern Maar Country Plan

Waterways

The waterways (rivers and streams) 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 strategic plan that guides the management of the waterways of the Corangamite region is the Corangamite Waterway Strategy.

The Corangamite region consists of four drainage basins that reflect the geology and landscape evolution of the region. These basins are:

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 as 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.

Wetlands

The wetlands of the Corangamite region both permanent and ephemeral are diverse and complex ecosystems that have unique environmental values, providing habitat for native fish, invertebrates and water birds, while supporting extensive vegetation communities.

The strategic plan that guides the management of the waterways of the Corangamite region is the Corangamite Waterway Strategy.

Estuaries

Estuaries are the places where rivers and the sea meet. They are typically semi-enclosed coastal bodies of water with a connection with the open sea and within which sea water is measurably diluted with fresh water from land drainage. There are 40 estuaries within the Corangamite region, of all shapes and sizes.

Groundwater

An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt). There are two general types of aquifers: confined and unconfined. Confined aquifers have a layer of lower permeability rock or clay above them, while unconfined aquifers lie below a permeable layer of soil. The rate at which groundwater moves through an aquifer varies depending on the rock's permeability.

The Corangamite region contains significant unconfined and confined aquifers used for a variety of stock, domestic, industrial, irrigation and urban water supply. For instance, groundwater in the region supplements drinking water for many towns in the region including Ballarat, Anglesea, Aireys Inlet, Torquay, the Bellarine Peninsula, and Geelong. Aquifers can discharge to the surface and are often important components of river flow and water for wetlands and native vegetation.

More information on the occurrence, management and significance of groundwater in the region can be found here.

Biodiversity

Biodiversity Outcomes and Priority Directions

Click on the above link to access

The biodiversity of the region faces challenges associated with addressing and reversing continued land clearing, changing land use and climate change stresses.

The Corangamite region is home to flora and fauna species unique to the area, many of which are dependent on the region's natural assets. Since European settlement, the region has lost nearly 75 percent of its original vegetation cover. Unfortunately, the region has over 300 species that are classified as threatened in Victoria, with 53 threatened on a national level.

Native vegetation and Habitats

Native vegetation in Corangamite's fragmented landscape supports the majority of the region's biodiversity. Around 40 percent of Victoria's native land vertebrate species (mammals, bird, amphibians, reptiles and fish not confined to marine or coastal habitats) are virtually restricted to fragmented landscapes. The region's largely intact landscapes are generally confined to the Otway Ranges in the south of the region and other areas of public land and national parks scattered across the remainder of the region.

Most of the current losses of native vegetation in the region may be attributed to loss in condition (80 percent) with 20 percent being removed through clearing (VEAC, 2011). The survival of threatened flora and fauna and ecological communities depends a great deal on the health of native vegetation, and the continuation of other important habitats that are threatened by human activities and vulnerable to climate change stress.

Native Fauna

The native fauna of the Corangamite region is reliant on the habitat provided by native vegetation communities which have become more and more fragmented over time. There are a number of threatened fauna species in the Corangamite region which have generally been related to the loss of habitat clearing and fragmentation along with the impact of introduced pest species such as foxes.

Land

Land Outcomes and Priority Directions

Click on the above to access the link

Land use changes

Soil health

Sustainable agriculture

Communities

Communities Outcomes and Priority Directions

Click on the above to access the link

Communities in ICM

Traditional Owners and Aboriginal Victorians in ICM

Eastern Maar

Wadawurrung

Coast and Marine

Coast and Marine Outcomes and Priority Directions

Click on the above to access the link

The marine and coastal environments within the Corangamite region are highly diverse. Marine habitats include intertidal rocky reefs, shallow rocky reefs, deep rocky reefs, pelagic waters, sand beaches, subtidal sandy and muddy seabeds, and intertidal mudflats (Parks Victoria, 2003). Coastal habitats are dominated by a variety of vegetation classes, including Coastal Dune Scrub, Coastal Headland Scrub, Coastal Tussock Grassland, and Coastal Saltmarsh Ecological Vegetation Classes.

The condition of Corangamite's coastal waters is generally good, with low levels of nutrients, turbidity and bio-contaminants, and generally good light penetration, due to reasonably low turbidity. Biological habitats include kelp forests on shallow rocky reefs, sponge and coral gardens and deep rocky reefs, seagrass on sandy seabeds, and mangrove and saltmarsh on sheltered intertidal sediments.

In the words of the Wadawurrung people:

"Our coastal country stretches from the Werribee River, it takes in the Avalon Coastal reserve, *Jilang* (Geelong) – stingaree bayside, the *Bellawiyn* (Bellarine) Peninsula and down along the Barwon, Torquay and Airey's Inlet coastline.

Our sandy beaches, rock pools, rocky platforms and reefs were and continue to be places of abundance for harvesting food and resources like crustaceans, shellfish and kelp.

The coastal woodlands and Anglesea heathlands hold stories that teach us of cultural practices like the *moonah* woodlands which are disappearing putting our marriage stories at risk. Our *Wiyn* (grass trees) which we use for fire and spears are badly affected by disease.

The coast holds cultural significance for Wadawurrung People today. With the number of people who call our coast home and come to visit increasing, there is more pressure on the coastal plants, animals and sites."

 Wadawurrung Healthy Country Plan

Coastal environment

Marine environment

Date printed: 29 July 2024

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CORANGAMITE CMA

VICTORIA State Government

Water

Water is central to every community, powering our industries and economy, improving our quality of life and nurturing our natural environment. The health of our catchments are fundamental to providing water for domestic, agricultural, industrial, recreational and environmental purposes. Corangamite's Traditional Owners have cultural, spiritual, and economic connections to water through their associations and relationship with Country. Traditional Owners have managed land and water sustainably over thousands of generations. Waterways within the Corangamite region are living and integrated natural entities and the Traditional Owners, both Wadawurrung and Eastern Maar are the voice of these living entities.

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 (Corangamite Waterway Strategy, 2014 – 2022). Groundwater is an important resource shared by many users, sustaining key components of the region's environment and services. Groundwater is not a limitless resource and needs to be managed to ensure its use is sustainable.

Integrated Catchment Management is a holistic way of managing land, water and biodiversity and recognises the intrinsic linkages between land-use and subsequent impacts on land, water and biodiversity. Integrated Catchment Management co-ordinates actions that deliver shared benefits and reduces unintended consequences for communities, the environment and regional economies. Although much progress has been made in recent years to implement Integrated Catchment Management, there is still a significant journey ahead. Much can be learned from the Wadawurrung and Eastern Maar People on how they view land, water and biodiversity assets as a single and inter-connected entity of 'Country' . Although this RCS separates discussion around these different asset classes, there is an intrinsic thread of integrated catchment management throughout with strong acknowledgement of the need to manage the system or catchment as a whole including incorporating the experience and wisdom of the Wadawurrung and Eastern Maar People.

The Corangamite Waterway Strategy defines waterways as:

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

Under the Water Theme in the Corangamite Regional Catchment Strategy are four Sub-themes:

Regional Outcomes

20 Year Outcome

By 2042, regional waterways (rivers, wetlands, lakes, estuaries and groundwater) are more resilient to the impacts of climate and land use change.

6 Year Outcomes

By 2027 there is an improvement in riparian extent and condition, hydrological regime and water quality compared to 2022 baselines in priority waterways defined in the Corangamite Waterway Strategy. **WO1**

By 2027, the efficiency of consumptive water use from our priority waterways will be improved though use of cost effective alternative water sources and demand management strategies. **WO2**

By 2027, waterway amenity will be improved for high priority urbanised waterways to enhance the user experience and connection to the natural landscape, compared to 2021 baseline. **WO3**

By 2027, the condition of Ramsar listed wetlands and other priority wetlands identified in the Corangamite Waterway Strategy will be maintained and improved compared to 2021 baseline. **WO4**

By 2027, the water quality of priority estuaries are maintained or improved, compared to index of estuary condition 2019 baseline. **WO5**

By 2027, Wadawurrung and Eastern Maar Traditional Owner rights to access and manage water will be acknowledged and respected including a strong Traditional Owner voice on:

- all water planning activities which have the potential to provide water for Traditional Owner cultural or economic purposes;
- the timing and quantum of all environmental water releases;
- minimum environmental flows required for a healthy river;
- land management activities contributing to a healthy river system;
- knowledge and education on Traditional Owner values of water and connection to Country; and,
- development activities which may impact culturally significant water and riparian assets **WO6**

By 2027, there is an increased understanding of floodplain management in relation to ecological and cultural values and mechanisms to mitigate the risk of flooding. **WO7**

By 2027, the community's understanding and awareness of the environmental, social and economic values of water will be increased compared to 2022 baseline. **WO8**

By 2027 there will have been an increase in the extent of in-stream habitat compared to 2021 baseline in priority waterways for resilience of threatened native fish and waterway dependent species. **WO9**

Regional Priority Directions

The following priority directions have been developed to deliver the 6 year outcomes identified for the Water Theme. They were developed through community consultation across the the nine Landscape Systems and will provide the basis for localised action. Landscape specific priority directions can be found here.

Code	Priority Direction	Lead	Collaborators
W1	Develop and implement a monitoring and evaluation framework that enables timely adaptive management and decision making. The framework will allow for: 1) accessible monitoring frameworks and repository of the region's NRM resource data 2) develop measures and assessments to determine the community's awareness of the natural values, their connection to these and their willingness to protect, enhance, and restore these 3) reporting to the community on implementation progress.	CCMA	CPA Partners
W2	Catchment partners and the community collaborate to deliver a coordinated approach to water management with clear roles and responsibilities communicated	CCMA	Water Authorities, Local Govt, DELWP, Southern Rural Water

W3	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Urban Water Strategies for town water supply systems operated by Barwon Water, Central Highlands Water and Wannon Water; 2) priority projects identified by the Barwon, Central Highlands and Great South Coast Integrated Water Management Forums; and, 3) relevant actions from the 2022 Central and Gippsland Sustainable Water Strategy	Water Authorities	CCMA, Local Govt, DELWP, Southern Rural Water
W4	Develop enduring partnerships with WTOAC and EMAC to enable joint decisions on: 1) all seasonal watering proposals related to current environmental water entitlements 2) environmental flow recommendations 3) priority areas for riparian vegetation protection and enhancement 4) enhancement of waterway amenity 5) waterway cultural education and tourism opportunities 6) other water related business opportunities for Traditional Owners 7) water planning 8) changes to water allocations	CCMA: 1) to 7) DELWP: 8)	DELWP, WTOAC, EMAC, Water Authorities, Local Govt.
W5	Deliver waterway health programs identified in the Corangamite Waterway Strategy using an integrated catchment management approach	CCMA	DELWP, CPA Partners
W6	Landuse planning, decisions to take into account the potential impact of proposals on the natural function of floodplains, waterways and the riparian zone.	Local Govt	CCMA
W7	Works on waterways, floodplain management and water management decisions to take into account the potential impact of proposals on the natural function of floodplains, waterways and the riparian zone.	CCMA	Local Govt
W8	Protect and enhance areas of riparian vegetation along priority waterways as defined in the Corangamite Waterway Strategy including fencing to reduce the impact of livestock.	CCMA	Local Govt, Landcare
W9	By end of 2024, renew the Corangamite Waterway Strategy	CCMA	CPA Partners
W10	Encourage developers to implement water sensitive urban design and integrated water management principles and require developers to protect native vegetation, cultural heritage and floodplain function.	Local Govt	CCMA, DELWP
W11	Ensure the impact of groundwater extraction on Groundwater Dependent Ecosystems (GDEs) is monitored, assessed and taken into account in decisions on applications for new or transfers of groundwater entitlements.	SRW	CCMA, DELWP
W12	Implement the Corangamite Regional Floodplain Management Strategy with specific focus on: 1) reducing existing flood risks, avoiding future flood risks and managing residual flood risks; 2) influencing strategic planning processes and outcomes during the early phase of state and regionally significant developments; and, 3) retaining the ecological function of riverine and estuarine floodplains	CCMA	Local Govt, PV, DELWP, SES

Relevant Water Information Sources

The following documents have been referred to in developing the Water theme:

Our Living Rivers of the Barwon, A Discussion Paper for the Future

Corangamite Natural Resource Plan for Climate Change

Corangamite Regional Floodplain Management Strategy, 2018-2028

Corangamite Waterway Strategy, 2014- 2022

Guidelines for assessing the impact of climate change on water availability in Victoria – 2020

Long Term Water Resource Assessment

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

Victorian Index of Stream Condition 2010

Western District Lakes Interim Ramsar Site Management Plan

Date printed: 29 July 2024

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CORANGAMITE CMA

VICTORIA State Government

Waterways

Overview

The waterways 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.

There are approximately 19,600 km of waterways in the Corangamite Region. The Otway National Park contains some of the most naturally intact waterways in Australia, featuring good water quality. In contrast, other waterways (such as the Moorabool and Woady Yaloak rivers) have experienced significant degradation and now exhibit poor water quality.

Waterways act as connections between catchments, aquifers, riparian zones (streamside environments), estuaries, and the marine environment, and their health and functioning can substantially impact upon these dependent ecosystems. Since European settlement, human interactions with waterways, through changes in and intensification of land use, as well as modification of the natural environment, have led to altered water flows and a decline in waterway health.

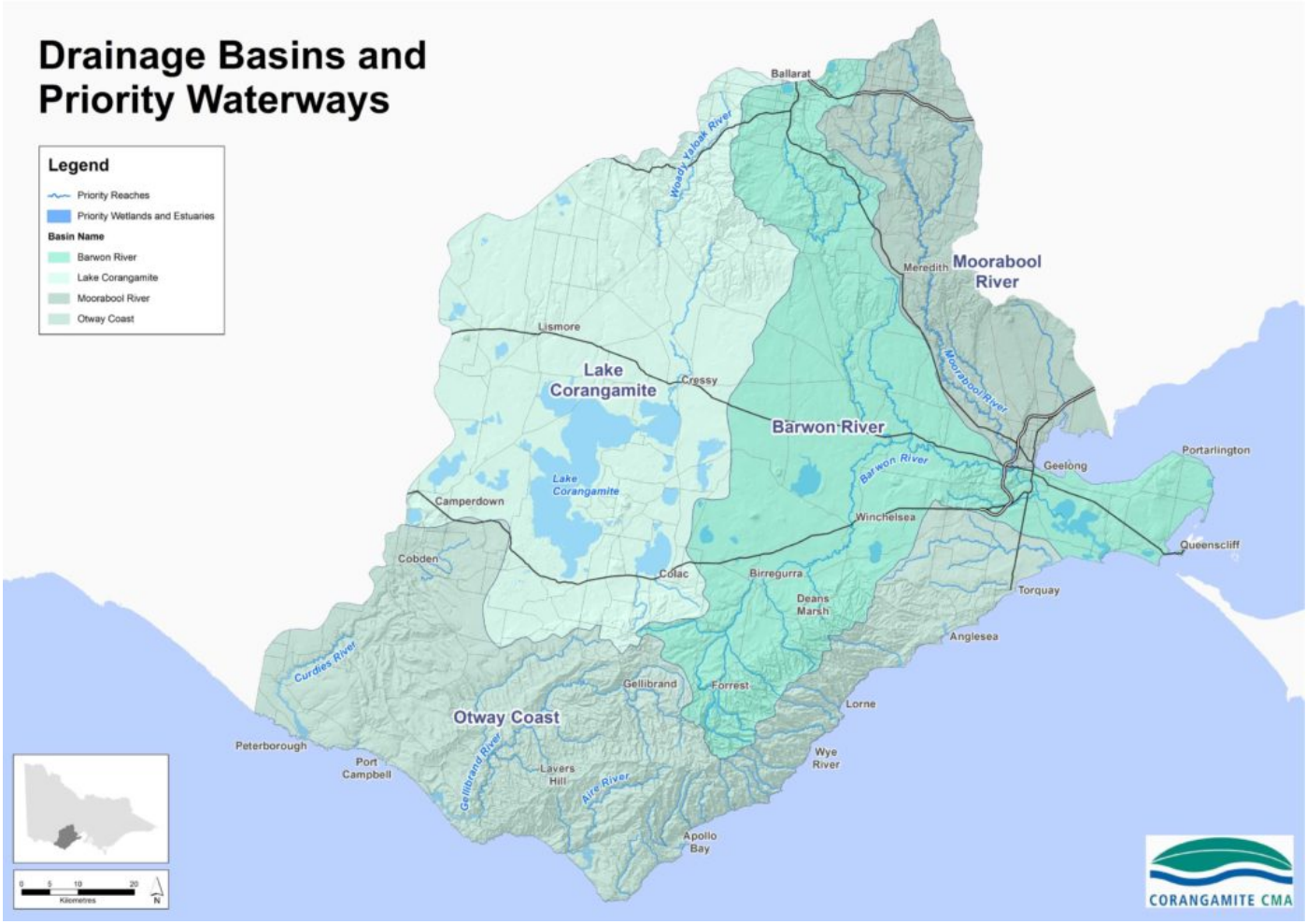
The Corangamite region consists of four drainage basins that reflect the geology and landscape evolution of the region. These basins are:

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 as 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.



Management of the region's waterways is guided by the Corangamite Waterway Strategy 2014-2022 which sets out a plan for the conservation and restoration of all water bodies in the region (including wetlands and estuaries). Waterway management in Corangamite has a strong community-based program history, through Landcare, WaterWatch and EstuaryWatch initiatives. These volunteer initiatives are especially important, given that 78% of the region is under private ownership.

The Corangamite Waterway Strategy focuses on the management, maintenance and improvement of all waterways within the region, 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 themes.

The Corangamite Regional Floodplain Management Strategy outlines how the ecological and cultural values of the natural floodplains can be protected while also managing the risks to life, property and assets associated with flooding. Corangamite flood mapping can be accessed on, Digital Twin Victoria the authoritative and comprehensive digital model of our state.

Given the importance of waterways to the Wadawurrung and Eastern Maar Traditional Owners, it is important that they have a strong voice in how they are managed. Opportunities for management and use of water by Wadawurrung and Eastern Maar people for cultural, economic, tourism and business opportunities need to be explored and implemented. Developing enduring partnerships with the Wadawurrung and Eastern Maar people will help to ensure their voice is not only heard but used to develop and implement jointly agreed goals for priority waterways in the region.

Waterways also support a range of human "amenity" values related to the quality of the sensory visitor experience. The amenity values of waterways are defined by the experience of naturalness, escape and safety and the built infrastructure designed to enhance these experiences. For instance waterways support many recreational activities such as walking, cycling, boating and cultural heritage education. Visitors to waterways have different expectations on the types of recreational activities catered for, the feeling of naturalness that they would like to see and the absence or presence of facilities, signage and access to various river lengths. Therefore, planning waterway amenity should be driven by community expectations, the existing natural features of each waterway and the current infrastructure and recreational activities catered for. Careful planning is required to ensure that along any one waterway, there are a variety of amenity values catering for different user experiences.

Assessment of current condition and trends

Waterways support 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.

Waterways act as connections between catchments, aquifers, riparian zones (streamside environments) estuaries and the marine environment and their health and functioning can substantially impact upon these dependent ecosystems.

The 2010 Index of Stream Condition report for the Corangamite region shows stream condition varies. The majority of stream length in good and excellent condition was clustered in the heavily forested Otway Coast Basin (44% of stream length). Only 11% of the Corangamite region's waterway length was found to be in excellent condition, and a further 7% in good condition. 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. All streams within or adjacent to major urban centres (Geelong and Ballarat) were assessed as being in very poor condition.

In December 2020 the Long Term Water Resource Assessment for southern Victoria was released by the State Government. One of the main objectives of this work was to determine if long-term water availability had declined and if there were changes in how water was shared between the environment and consumptive uses. The study estimated the following reductions in water availability since the previous Sustainable Water Strategies (2011 for the Western Sustainable Water Strategy that included the Gellibrand, and 2006 for the Central Sustainable Water Strategy that includes the Barwon Moorabool and Leigh):
1) Barwon Basin: Current: 232.5 GL/yr; Historical: 262.1 GL/year (11% reduction)
2) Moorabool Basin: Current 92.2 GL/yr; Historical: 114.7 GL/year (20% reduction)
3) Lake Corangamite Basin: Current: 54.7 GL/year; Historical: 69.4 GL/year (21% reduction)
4) Otway Coast Basin: Current: 563.8 GL/year; Historical: 589.6 GL/yr (4% reduction)
The Long Term Water Resource Assessment also showed that for the Moorabool and Barwon Basins, the reduction in water availability has fallen disproportionally on the environment relative to consumptive use. The Central and Gippsland Sustainable Water Strategy currently in development will set out the Victorian Government's plan for a climate resilient future – a future where we have the water we need for our economic, environmental, social and cultural purposes.

Victoria's water resources are managed under a water entitlement framework which balances demands for water for both consumptive and environmental purposes. Different entitlements are necessary depending on where and how water is taken, and what it is then used for. Many of the region's major waterways are used to extract water for a variety of uses under water entitlements of various forms.

Bulk entitlements and environmental entitlements are legal rights to water granted by the Minister for Water under the *Water Act 1989*. They provide the right to take or store a volume of water, subject to a range of conditions. Bulk entitlements are held by specified authorities, such as water corporations, while environmental entitlements are held by the Victorian Environmental Water Holder. The Corangamite CMA currently manages three formal environmental entitlements in the Moorabool River, Lower Barwon Wetlands, and the Upper Barwon River on behalf of the Victorian Environmental Water Holder (VEWH). This involves development of 'seasonal water proposals' outlining the recommended timing and magnitude of allocated environmental water flows for maximum environmental and social benefit. The seasonal water proposals are then used by VEWH to inform an annual and statewide 'seasonal watering plan' which is then implemented by the various water storage managers.

Water quality in the catchment is monitored by dedicated volunteers through the Corangamite Waterwatch Program, which has been running since 1995. Since then, numerous citizen scientists have been actively involved in local waterway monitoring and onground activities. Data collected from waterways is, in many instances, the only data collected at these particular sites. There are currently 62 active volunteers monitoring 125 active sites in the Corangamite region. In addition, schools have been engaged with the freshwater education program River Detectives. The Corangamite Waterwatch Program monitors the following water quality parameters:

- Electrical Conductivity
- pH
- Temperature
- Turbidity
- Reactive Phosphorus
- Dissolved Oxygen

Habitat surveys and aquatic macroinvertebrate (water bug) surveys are also performed at many Waterwatch sites. Assessment of macroinvertebrate communities enables an ecological assessment of the waterway health.

Although the physical health of a waterway can be defined by various measurable parameters described above, the sensory visitor experience or 'amenity' is more subjective. For this strategy, case studies of the Barwon River through Geelong to the estuary at Barwon Heads, the Moorabool River downstream of Meredith and the Yarrowee River through Ballarat were chosen to map current amenity based on the 'naturalness' and supporting infrastructure (see Regional maps). In addition, desired amenity was also mapped for the Yarrowee River through Ballarat based on the City of Ballarat's Yarrowee River Masterplan (see Regional maps). Comparisons between actual and desirable amenity provides opportunity to develop actions to address the difference via projects and plans such as the Barwon River Parklands Project and the Yarrowee River Corridor Masterplan. The case study reaches were chosen because they traverse a variety of urban and rural settings. In time, the method used in the case study areas will be applied to other main waterways in the region.

Major threats and drivers of change

Waterways are a focal point for many cities and towns in the Corangamite region, often providing important community benefits, and contributing to the identity of a place. Waterways near urban areas are often highly modified, which can impact significantly on their health. They are subject to increasing pressure from urban development, which leads to a greater proportion of impervious surfaces that increase runoff of stormwater, changing the intensity and frequency of flows that would otherwise be gradually released through soil and vegetation.

As the population of the Corangamite region is one of the fastest growing areas in Victoria, this is expected to further increase pressures, given increasing associated demand for water supply, as well as impacts from further urban development. With population growth and increased urbanisation comes a greater demand for sensory escape to the natural world with a heightened need to conserve and build on the natural features of waterways and develop infrastructure to enhance the visitor experience.

Climate change presents a major threat to the waterways of the region. 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. It will also have a major impact on river flows in both extent and timing. Recent estimates of the likely percentage reduction in average flows over the next 50 years are provided in the climate change page of this strategy (source: DELWP water availability climate change guidelines). The most vulnerable waterways in the region are those in the Otway Ranges, especially those flowing southwards into the Southern Ocean. These waterways have small, confined catchments, are unregulated, rely on high levels of rainfall and are relatively short in length. Reduced runoff into these rivers and streams will have a detrimental impact on these systems.

Extreme events such as fires and floods also present a major threat to the region's waterways. The adverse effects of floods and bushfire on waterways are primarily related to erosion and mobilisation of sediment, damage to native riparian vegetation and acceleration of the spread of invasive 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 as well as phalaris and tall wheat grass 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.

Activities on the land upstream, surrounding or adjacent to waterways (e.g. land clearing, cropping, 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. Water harvested for stock and domestic use from farm dams, waterways and groundwater bores outside of the allocation and licensing framework can also have a significant impact on flows into waterways and wetlands.

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.

Date printed: 29 July 2024

CORANGAMITE CMA

VICTORIA State Government

Wetlands

Overview

Corangamite has more than 1500 wetlands covering 63,000 ha (5% of the region). These wetlands range from large open-water saline lakes to shallow, ephemeral, freshwater meadows – many of which are rich in native flora. While 75% of the total wetland area is on public land, a large number of small wetlands are found on private land. Lake Corangamite is the largest permanent saline lake in Australia, with a surface area of 234km^2 and hypersaline water – saltier than seawater.

Two wetland areas within the region, Port Phillip Bay – Western Shoreline and Bellarine Peninsula, and the Western District Lakes are recognised as Wetlands of International Importance under the Ramsar Convention. The Ramsar Convention recognises internationally significant wetlands that contain substantial biodiversity and other environmental values (including importance to waterbirds), with an agreement for their conservation. 24 wetlands in the region have been classified as Wetlands of National Importance under the Directory of Important Wetlands in Australia (DIWA). Wetlands and lakes of the Victorian Volcanic Plains were formed through volcanic craters and lava flows impacting the landscape. The diversity of the landscape and geomorphology in the area has also resulted in wide variations in salinity in the wetlands.

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.

Assessment of current condition and trends

Wetlands are among the most threatened habitats globally. While significant wetlands, from internationally-significant Ramsar sites and nationally listed Directory of Important Wetlands in Australian (DIWA) have been assessed to determine their condition, many wetlands in the region have not undergone official assessment, leading to considerable knowledge gaps in understanding the overall condition of Corangamite's wetlands.

The condition of a wetland affects its ability to provide environmental functions and values. From the sample of wetlands tested through the state-developed first Index of Wetland Condition (IWC) assessment between 2009- 2010 (just the ones considered 'important'), 15% were rated as excellent, 47% as good, 33% were moderate, and 5% were in poor condition (with none rated as very poor).

As pointed out in the previous Regional Catchment Strategy, there are still significant gaps in knowledge of the condition of wetlands in the Corangamite region. Research continues to close these gaps, however, and will continue to be required to help direct investments for improved wetland management.

Major threats and drivers of change

Factors that have contributed to a decline in the health and condition of wetlands and have the potential to threaten their future values include:

- accelerated erosive processes
- run-off and point-source discharge (affecting water quality)
- pest plants and animals
- uncontrolled stock access
- degraded vegetation
- climate change

- physical change (e.g. drainage, change in salinity)
- land use change (e.g. drainage of wetlands for cropping or grazing)
- water storage, diversion and extraction
- inappropriate use (e.g. inappropriate grazing regimes and cropping)
- poor waste management
- urban development and inappropriate recreational activities.

Factors threatening wetlands have been shown to be up to ten times more prevalent on wetlands on private land, than on public land. This means that while a smaller portion of the region's (larger) wetlands are on private land, most of them are facing increased threats.

Date printed: 29 July 2024

CORANGAMITE CMA

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Estuaries

Overview

Estuaries are the places where rivers and the sea meet. They are typically semi-enclosed coastal bodies of water with a connection with the open sea and within which seawater is measurably diluted with fresh water from land drainage. There are 40 estuaries within the Corangamite region, of all shapes and sizes. Estuaries of the Corangamite region are highly valued for recreational use, particularly the Barwon River estuary and the numerous estuaries along the 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, provide significant breeding and feeding areas for birds, and 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.

The Barwon River estuary is the only estuary in the region that is permanently open. All the rest are classed as "intermittently open/closed estuaries", which means they sometimes close to the ocean. Corangamite CMA regulates artificial openings of estuaries throughout the region. An artificial opening most commonly occurs when the estuary mouth is closed off from the ocean due to a berm (a sandbar) that has naturally built up, meaning the river water cannot empty into the ocean. The region's estuaries are normally quite resilient to coastal processes such as tidal exchanges, shoreline recession and natural estuary openings.

Habitats in estuaries include shallow wetlands, saltmarshes, mangroves, seagrass beds, sandy and muddy sediments as well as the water column itself. These habitats support a range of waterbirds, fish and invertebrates. The survival, health and distribution of these plants and animals are dependent on various physical and chemical processes operating in each estuary.

Assessment of current condition and trends

The condition of estuaries within the Corangamite region was assessed as part of the 2010 Index of Stream Condition, with 18 estuaries included in the assessment (two in the Barwon Basin and sixteen in the Otway Coast Basin). From this assessment, 61% of estuaries were classified as being in moderate to excellent condition.

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. Artificial estuary openings are typically undertaken to protect human assets and infrastructure. Artificial estuary openings are not undertaken for environmental reasons.

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 environmental impacts associated with this intervention. 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.

EstuaryWatch is a successful citizen science program that supports community members to actively participate in the monitoring of estuary health. EstuaryWatch volunteers are passionate about their local environment and meet once a month to collect valuable data on the condition of their local estuary. The Corangamite EstuaryWatch program was established in 2006 in response to a groundswell of community interest, and a lack of long term data on the condition of Victoria's estuaries. There are currently 61 active EstuaryWatch volunteers monitoring 11 Estuaries in the Corangamite region. EstuaryWatch data has been used to educate and inform better estuary management. Water quality data, estuary observations and photos collected by EstuaryWatch have been referred to as part of algal bloom, fish death and storm surge response and has been incorporated into estuary management plans, research projects and the decision support tool for artificial estuary openings in Victoria, the Estuary Entrance Management Support System (EEMSS). The monitoring undertaken by the EstuaryWatch program follows standardised methodologies set in Standard Operating Procedure manuals to ensure EstuaryWatch produces credible data. The data is stored on the State-wide EstuaryWatch Database.

The Corangamite EstuaryWatch Program monitors the following water quality parameters:
• electrical Conductivity
• salinity
• pH
• temperature
• turbidity
• dissolved Oxygen.

Estuary mouth condition monitoring, and photo-point surveys are regularly conducted. Estuary mouth condition monitoring takes place where the river meets the sea. Each month, EstuaryWatch begins with estuary mouth condition monitoring. Volunteers take a series of photos of the estuary mouth. These photos are taken from the same location each month so that the condition of the estuary mouth can be compared over time. One month the estuary might be closed to the sea, the next month it might be open to the sea.

Major threats and drivers of change

With sea levels projected to rise on average by 0.8-1.1 metres by 2100, combined with an increase in storm surge events and reduced inflows, climate change is expected to greatly impact all estuaries in the region. Climate change impact is expected to be higher in the estuaries of the Curdies, Gellibrand, Aire and Anglesea rivers. It is also expected to have a major impact on the Barwon River estuary, especially in the upper reaches of the estuary into Lake Connewarre.

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. The establishment of townships within close proximity to many of the region's estuaries places pressure on how these function. There is a high level of expectation that estuaries will be opened when there is a threat of flooding to private property and infrastructure. The effect of run-off and pollution from these settlements can also have an impact on estuary health.

Other threats to the condition of estuaries include:

- unauthorised 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)
- invasion by weeds or pest animals
- salinisation, acidification and acid sulfate soils.

Date printed: 29 July 2024

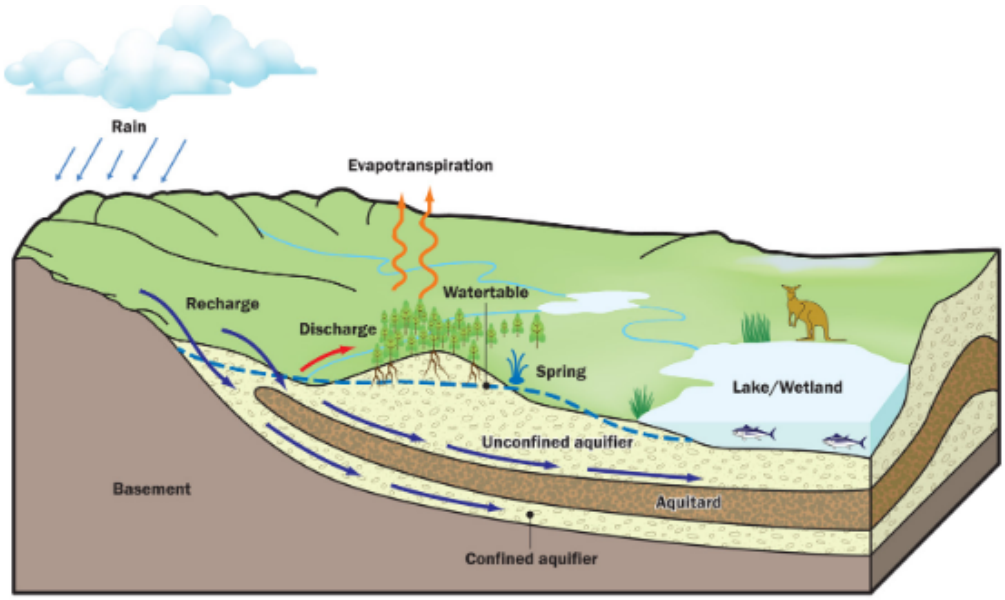
CORANGAMITE CMA

VICTORIA State Government

Groundwater

Overview

Groundwater is sub-surface water contained in the pores, cracks and fractures within the sediments and rocks. Surface water from rainfall or other water bodies percolates through the ground to the water table (recharge) where it is stored in aquifers (a layer of fractured rock, gravel, sand or limestone below the ground that is porous enough to hold groundwater, and allow it to flow). Groundwater moves laterally within and between aquifers with intervening aquitards retarding or restricting flow. Aquifers can discharge to the surface and are often important components of river flow and water for wetlands and native vegetation.



Groundwater processes (from Southern Rural Water 2011, *South-West Victoria Groundwater Atlas*)

The Corangamite region contains a variety of deep and shallow groundwater aquifers of varying water quality and yield. Most of the Corangamite region is covered by the deep Otway sedimentary basin containing up to 700 metres thickness of sand and gravel aquifers interlayered by clay dominated aquitards overlying a deep bedrock. The basin is flanked to the south by the Otway Ranges covering Anglesea, Lorne, Forrest and Apollo Bay regions and to the north by the Great Dividing Range in the Ballarat, Meredith and Bunniyong regions. Both of these flanking areas contain shallow bedrock aquifers. More information on groundwater resources in the area can be found at:

- Visualising Victoria's Groundwater data base provides information from groundwater bores across the state.
- Southern Rural Water's (SRW) 2011 South West Victorian Groundwater Atlas provides a comprehensive overview of the location and depth of aquifers, groundwater management, limitations, and use in the Corangamite region.

In the Corangamite region, groundwater is valued by the community and shared by many users. The Corangamite CMA region's low stream flows and lack of topography suitable for dams has led to a high reliance on groundwater. Groundwater provides drinking water for many towns in the region (including Geelong, Ballarat, Bellarine Peninsula and Surf Coast). It is also drawn on for the supply of stock and domestic purposes, especially during low rainfall or drought periods. Therefore, the quality of this water is important for many rural asset managers across the Region.

The Corangamite region has many groundwater dependent ecosystems (GDEs), with groundwater playing an important role in the health of most wetlands and rivers. Groundwater discharge plays a key role in sustaining terrestrial vegetation communities, cave ecosystems and both terrestrial and aquatic fauna. There are two main types of groundwater dependent ecosystems in the region: 1) aquatic GDEs that rely on direct groundwater discharge such as wetlands, rivers and springs and 2) terrestrial GDEs that rely on vegetation drawing water from the watertable.

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. State policy and guidance on groundwater planning and licensing matters is provided by DELWP.

For major aquifers of the region, Groundwater Management Units are designated under the Water Act to ensure groundwater extraction remains sustainable. Each Groundwater Management Unit has a designated Permissible Consumptive Volume (PCV) which caps the volume of groundwater licence entitlement for uses such as irrigation and town water supply. The volume used for stock and domestic use is not counted as part of the PCV. In the Corangamite region, there are nine Groundwater Management Units covering the following aquifers:

- Cardigan and Bungaree GMUs – covering the shallow basalt aquifers in the Ballarat region
- Colongulac and Warrion GMUs – covering shallow basalt aquifers in the Colac and Camperdown regions
- Paaratte, Newlingrook, Gellibrand, Gerangamete and Jan Juc GMUs – covering the deep Dilwyn Formation and Eastern View Formation aquifers overlying bedrock in the Otway Basin stretching from Port Campbell in the west to Torquay in the east.

Assessment of current condition and trends

Groundwater is a finite resource and needs to be managed to ensure sustainable use. Data on groundwater levels show that after a period of decline, aquifers in Groundwater Management Areas in the Corangamite region recovered in the mid 2000s and are now stable. Exceptions to this generality due to groundwater pumping influences include:

- Cardigan GMU: during the millennium drought groundwater levels declined due to pumping by Central Highlands Water for Ballarat's urban supply, however they have since recovered.
- Gerangamete GMU: groundwater levels are gradually recovering from three pumping cycles in the late 1980s, late 1990s and from 2006 to 2010 and 2016 when the Barwon Downs borefield was used as supply for Geelong.
- Gellibrand GMU: groundwater levels are mainly influenced by pumping by Wannon Water for supply to Warrnambool and other towns in the region.
- Jan Juc GMU: Groundwater levels were fairly stable before the 2000s, however there has been some decline since then due to increased reliance on this water for urban supply.

More information on groundwater level trends in the region can be found at Southern Rural Water's Groundwater Hub. The Visualising Victoria's Groundwater data base provides information from groundwater bores across the state. Southern Rural Water's (SRW) 2011 South West Victorian Groundwater Atlas provides a comprehensive overview of the location and depth of aquifers, groundwater management, limitations, and use in the Corangamite region.

Major threats and drivers of change

Unsustainable groundwater extraction causing groundwater levels to fall has the potential to impact neighbouring users and groundwater dependent eco-systems such as river, wetlands and native vegetation. In an ever increasingly water-constrained environment, actual groundwater use is likely to increase as more of the currently unused portion of licences are used or traded. Combined with reduced recharge from climate change, such increased groundwater pumping is a potential risk to the health of groundwater dependent ecosystems such as rivers and wetlands.

Of particular interest in the Corangamite region is the demonstrated hydraulic connection between the deep aquifer tapped in the Barwon Water's Barwon Downs borefield and flow in the Boundary Creek where the aquifer outcrops further south. The borefield was historically used to supplement Geelong's water supply and was last used for a brief time in January 2016. Work commissioned by Barwon Water in 2017 confirmed that intermittent use of the Barwon Downs Borefield over the past 30 years – combined with the effects of a dry climate – led to a reduction in flows to Boundary Creek and the subsequent activation of acid sulfate soils in Big Swamp (the Yeodene peat swamp). Since major pumping ceased from the borefield, groundwater levels are recovering along with the impacts on connected groundwater dependent ecosystems. In March 2019 Barwon Water formally withdrew their application to renew the licence for Barwon Downs borefield to focus wholly on remediation of the environmental impacts of past groundwater pumping.

Other threats to groundwater resources and connected systems include:

- reduced groundwater recharge from urban development and large-scale revegetation or plantation establishment
- the potential for Acid Sulphate Soils to develop due to falling groundwater levels along lakes and the coast
- groundwater contamination from industry including landfills and inappropriate chemical use
- inappropriate fertiliser practices (wrong rate, timing or type) contributing to increased nutrients in groundwater
- climate change reducing groundwater recharge from rainfall
- replacement of native vegetation with crops and pastures (with or without irrigation) causing higher watertable levels resulting in land and water salinisation.

Date printed: 29 July 2024

Biodiversity

The biodiversity of the region faces challenges associated with addressing and reversing continued land clearing, changing land use and climate change stresses. Aboriginal people have a deep connection with the land or Country, which is central to their spiritual identity. This connection remains despite the many Aboriginal people who no longer live on their land. Aboriginal people describe the land as sustaining and comforting, fundamental to their health, their relationships and their culture and identity. This connection is inclusive of plants and fauna.

Biodiversity is a compound word derived from the term "biological diversity". It refers to all the variety of life that can be found on Earth (plants, animals, fungi and micro-organisms) as well as to the communities that they form and the habitats in which they live across our land, rivers, coast and ocean. It includes the diversity of their genetic information, the habitats and ecosystems within which they live, and their connections with other life forms and the natural world.

Protecting Victoria's Environment – Biodiversity 2037 is Victoria's 20-year plan for the future of Victoria's biodiversity. The Biodiversity 2037 Implementation Cycle reflects the key implementation stages within and across this 20-year timeframe. These are:

- The strategy itself (Biodiversity 2037) and its review after 20 years.
- The enabling environment and planning process, including work that the Department of Environment, Land, Water and Planning does to provide tools and systems, regulations and standards; access to land; collaborative planning and so on.
- Everyone undertaking actions that contribute to the targets of Biodiversity 2037 – this includes all the contributions of individuals, community groups, Traditional Owners, non-government organisations and government agencies.
- Monitoring, evaluating, reporting and improving how we do things. This embeds continuous improvement into planning and action.

DELWP's Biodiversity Response Planning describes the collective cross-tenure biodiversity vision for an area of land or waters, and the five-yearly pledges (i.e. contributors' statements of intent) towards the statewide targets.

DELWP's BRP Fact Sheets provide information for many (but not all) landscapes across Victoria, containing general information on the key values and threats in each area. The fact sheets also include Strategic Management Prospects (SMP) which models biodiversity values such as species habitat distribution, landscape-scale threats and highlights the most cost-effectiveness action for specific locations.

For more information on threatened ecological communities and threatened species under the EPBC Act, see Relevant Biodiversity Documents below.

Under the Biodiversity Theme in the Corangamite Regional Catchment Strategy are two Sub-themes:

A healthy natural environment provides vital life-sustaining services for humans, and underpins many of the productive activities that generate value for the Corangamite community. The region's diverse and unique mix of plants, animals, soils, seas and waterways function together as ecosystems, which in turn meet some of humans' most basic needs – provisions such as clean air and water, productive soils, natural pest control, pollination, flood mitigation and carbon sequestration. Ecosystems also provide us with food, raw materials for production (such as timber, pastures and fertilisers), genetic resources and pharmaceuticals, while contributing to waste decomposition and detoxification. The term 'natural capital' is often used to describe the resources provided by nature – minerals, soil, water, ecosystem services, and all living things from which we derive material or financial value. Biodiverse ecosystems are the core component of natural capital.

Regional Outcomes

20 Year Outcomes

By 2042, 90% of the region's ecosystems are biodiverse and resilient to the challenges of climate and land use change.

By 2042, a regional net improvement across all native species – with a priority on threatened species and ecological communities – is achieved (as measured by Change in Suitable Habitat).

By 2042, a regional net gain of the overall extent and condition of habitats across terrestrial, waterway and marine environments is achieved.

6 Year Outcomes

By 2027, there is a 10% increase in the regional community valuing biodiverse landscapes, planning for climate change adaptation and actively contributing to their protection, enhancement, and restoration. BO1

By 2027, 90% of biodiversity planning, decision making, monitoring and data access is based on state-wide biodiversity decision tools and complemented by local specific information. **BO2**

By 2027, there is an overall net gain of habitat for all flora and fauna species within the region. **BO3**

By 2027, threats to biodiversity from pest species are recognised and appropriately controlled in priority locations across all land tenures. **BO4**

By 2027 120,000 hectares in priority locations are under sustained herbivore control. **BO5**

By 2027 20,000 hectares in priority locations are under sustained predator control **BO6**

By 2027 20,000 hectares in priority locations are under sustained weed control **BO7**

By 2027 4,500 hectares of revegetation in priority locations for habitat connectivity is established **BO8**

By 2027, 4,500 hectares of new permanently protected area on private land is established **BO9**

Regional Priority Directions

The following priority directions have been developed to deliver the 6 year outcomes identified for the Biodiversity Theme. They were developed through community consultation across the the nine Landscape Systems and will provide the basis for localised action. Landscape specific priority directions can be found here.

Code	Priority Direction	Lead	Collaborators
B1	Develop and implement a monitoring and evaluation framework that enables timely adaptive management and decision making. The framework will allow for: 1) accessible monitoring frameworks and repository of the region's NRM resource data 2) develop measures and assessments to determine the community's awareness of the natural values, their connection to these and their willingness to protect, enhance, and restore these 3) reporting to the community on implementation progress.	CCMA	CPA Partners
B2	Develop regional baselines and indicators to allow for the effective measurement of the community's awareness of the value of biodiverse landscapes, their connection to these landscapes and their willingness to protect, enhance and restore them in the context of adaptation to climate change.	CCMA	DELWP
B3	Use the Landscape System-based Implementation Planning process to identify high priority actions for each area.	CCMA	DELWP
B4	Use the Landscape System-based Implementation Planning process to outline the contribution to the targets set out in Biodiversity 2037.	CCMA	DELWP
B5	Target an increase of 25% in non-government investment into Biodiversity	CCMA	CPA Partners
B6	Adopt and as needed develop regionally accredited decision-making and support tools for biodiversity planning and management for use by all agencies.	CCMA	DELWP
B7	Develop a regional biodiversity monitoring framework to enable understanding of condition and trends.	CCMA	DELWP
B8	Develop a repository of the region's biodiversity data that is accessible for evidence-based decision making.	CCMA	DELWP, Local Govt, PV
B9	Adopt an accredited natural capital based decision-making process for the region's government organisations and public land managers.	CCMA	DELWP
B10	Develop partnership agreements that enable best management practices and standards for managing the region's natural habitats and the flora and fauna that they support.	CCMA	DELWP, Local Govt

B11	Develop baseline indicators for focal species that enable the effective measurement of overall net gain of habitat extent, connectivity and quality by 2027.	CCMA	DELWP
B12	Within the region, develop actions to deliver an overall net gain of 'Suitable Habitat' for focal species by 2027.	CCMA	DELWP
B13	Develop baseline data for indicator species that enable the effective measurement of overall net gain of habitat extent, connectivity and quality by 2027	CCMA	DELWP
B14	Within the region, develop actions to deliver an overall net gain of 'Suitable Habitat' for indicator species by 2027	CCMA	DELWP
B15	Develop an incentives toolkit for landholders that enables an additional 4,500 hectares of high priority EVCs within the region to be within a Comprehensive Adequate and Representative (CAR) system.	CCMA	TfN, DELWP
B16	Introduce collaborative biodiversity planning for landholders that enables an additional 4,500 hectares of biodiverse revegetation in priority locations within the region for habitat connectivity.	DELWP	CCMA
B17	Collaborate with Traditional Owners to develop methods based on traditional knowledge that enable improved and sustained management of problem herbivores in priority locations.	CCMA	DELWP, EMAC, WTOAC
B18	Implement an additional 20,000 hectares of sustained predator control (not year by year cumulative total) in priority locations as defined by Biodiversity Response Plans and other regional plans.	DELWP	CCMA, PV
B19	Implement an additional 20,000 hectares of sustained weed control (not year by year cumulative total) in priority locations within the region as defined by Biodiversity Response Plans and other regional plans.	DELWP	CCMA, PV
B20	Implement an additional 120,000 hectares of sustained herbivore control (not year by year cumulative) in priority locations within the region as defined by Biodiversity Response Plans and other regional plans.	DELWP	CCMA , PV

Relevant Biodiversity Information Sources

The following documents have been referred to in developing the Biodiversity theme:

Protecting Victoria's Environment – Biodiversity 2037

EPBC Act 1999

Department of Agriculture, Water and the Environment. Threatened Species Under the EPBC Act

Department of Agriculture, Water and the Environment, Threatened Ecological Communities

Department of Agriculture, Water and the Environment, Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland & Grassy Eucalypt Woodland

National Recovery Plan for the Orange-Bellied Parrot, Neophema Chrysogaster

Victorian Government, Department of Environment, Land, Water and Planning, Biodiversity Response Planning – Working together for biodiversity, 2021

Date printed: 29 July 2024

This information was correct at the time of printing. The Corangamite Catchment Management Authority takes no responsibility for information that is inaccurate or out of date. To view the current Corangamite Regional Catchment Strategy go to https://corangamite.rcs.vic.gov.au/.

CORANGAMITE CMA

VICTORIA State Government

Native Vegetation and Habitats

Overview

The Corangamite Region is covered by five ecological zones (bioregions), these are the Victorian Volcanic Plain, the Otway Plain, the Otway Ranges, the Warrnambool Plain and the Central Victorian Uplands. Each of these zones has vegetation communities that reflect the conditions within these zones.

Native vegetation is a fundamental part of the landscape. It is an important element in all ecological processes and it plays a major part in our everyday lives. The region's native vegetation requires proper management, at both a regional, local and site-specific scale to ensure its survival.

Native vegetation in the Corangamite region has undergone a major change since European settlement, with less than 25% of the region's original vegetation remaining. Native grasslands and grassy woodlands have been reduced to an estimated 1% of their former extent. The region has significant areas of remnant vegetation in protected reserves such as National Parks but most of the estimated 66,000 hectares of remnants on private land are under some form of pressure. These changes are most evident in areas that have been cleared for agriculture.

The loss of native vegetation has contributed to the main natural resource management problems in the region. Loss of biodiversity, salinity, soil erosion, poor water quality and the spread of exotic species are just some of the problems that have emerged. As well as aesthetic and landscape significance, native vegetation is a vital component in the sustainability of our landscapes and a key factor in the functioning of natural ecosystems.

The Wadawurrung Healthy Country Plan says "Our inland country includes western volcanic plains and grasslands, with their temperate grasslands and grassy eucalypt woodlands once had enough food and resources for us to live here permanently all year in our stone huts as a community in family groups. The grasslands were full of food grasses, and our women harvested roots and tubers, like *Murnong* and bulbine lily with their digging sticks. Our Country is home to many different types of snakes, lizards, frogs, moths, birds and mammals. *Kwenda* (Bandicoot) or *Yoorn* (spotted tail quoll) was once here as was the eastern barred bandicoot who helped our women in digging and tilling the soil to increase the growth of *Murnong*, helping our women to till the soil but now are extinct or rarely seen in this landscape."

Assessment of current condition and trends

The quality and extent of native vegetation affects its ability to carry out important environmental functions and provide other values such as nature-based tourism. Of the five bioregions within the Corangamite region, the Victorian Volcanic Plain, Warrnambool Plain and Otway Plain bioregions are amongst the most cleared in the State. The Central Victorian Uplands bioregion is moderately cleared, and the Otway Ranges bioregion is amongst the least cleared in Victoria.

In 5.92% of the entire Corangamite region, the Ecological Vegetation Classes (EVC's) that exist are classified as endangered. A further 4.24% of the Corangamite region is classified as vulnerable. A number of Ecological Vegetation Classes within the region are now presumed to be extinct, these include Coast Gully Thicket, Plains Grassy Wetland and Scoria Cone Woodland. There are a number that are currently endangered, including:

- Plains Sedgy Wetland (EVC 647)
- Aquatic Herbland (EVC 653)/Plains Sedgy Wetland (EVC 647) Mosaic
- Grassy Woodland (EVC 175)
- Lignum Swamp (EVC 104)

- Plains Grassland (EVC 132)
- Floodplain Riparian Woodland (EVC 56)
- Grassy Forest (EVC 128)
- Damp Heath Scrub (EVC 165)
- Swampy Riparian Woodland (EVC 83)
- Coastal Alkaline Scrub/Calcarenite Dune Woodland (EVC 858)
- Stream-bank Shrubland (EVC 851)
- Swamp Scrub, (EVC 53) and
- Damp Sands Herb-rich Woodland (EVC 3)

Of all the landscape systems, the Bellarine-Surf Coast has the largest relative percentage of land where the Ecological Vegetation Classes are classified as endangered (13.23%), followed by Geelong City landscape system (11%). The landscape system with the lowest percentage of EVCs classified as endangered is Heytesbury (1.88%). Conversely, of all the landscape systems, the Heytesbury region has the greatest percentage of land where the EVCs are classified as vulnerable (14.71%). This is followed by the Otway Coast, with 6.01% of the landscape area falling into vulnerable Ecological Vegetation Classes.

Most of the current losses of native vegetation in the region may be attributed to loss in condition (80%) with 20% being removed through clearing (VEAC, 2011). The survival of threatened flora and fauna and ecological communities depends a great deal on the health of native vegetation, and the continuation of other important habitats that are threatened by human activities and vulnerable to climate change stress.

For more information on threatened ecological communities and threatened species under the EPBC Act, see Relevant Biodiversity Documents under the Biodiversity tab.

Major threats and drivers of change

The consequences of removing native vegetation have been well documented. These include the loss of biodiversity, increased salinity, soil erosion, deteriorating water quality in our rivers, creeks and wetlands, and the consequent losses in farm productivity. Mismanagement of native vegetation, such as the introduction of environmental weeds, has also led to examples of detrimental impacts.

Land clearing is one of many factors contributing to the loss, fragmentation and degradation of native vegetation in the Corangamite region. Other factors threatening native vegetation include:

- pest plants and animals
- diseases
- disturbance such as fire or floods
- inappropriate land use and/or land management practices
- climate change.

It is expected that climate change will impact the region's native vegetation through modifications to vegetation communities, such as loss of particular plant species and changes to community structure, as a result of higher temperature and lower rainfall, changes to natural fire and flooding regimes and climatic conditions favouring new and established weed species.

DELWP's Biodiversity Response Planning (BRP) is a new state-wide, area-based approach to biodiversity conservation. It has been designed to strengthen alignment, collaboration and participation between government agencies, Traditional Owners, non-government agencies (NGOs) and the community. Response planning in each area shares the same key elements:

- situation analysis (looking at what the current state of biodiversity and its threats are in each region)
- cataloguing what actions are currently taking place (a list of who's doing what work where)
- gap analysis (looking for what's missing and what else needs to be done)
- discussing options (everyone in the network will talk about possible actions to take), and
- determining priorities (what's the most urgent thing to address).

The BRP maps will guide where biodiversity actions should occur, whether this is through voluntary efforts or as a result of future investment by the Government or other sources. The maps of agreed priorities and other outputs of these collaborative processes will be publicly available and regularly updated. The aim of BRP is to get the best possible outcome for biodiversity overall. Biodiversity Response Planning is how DELWP is implementing Victoria's plan for Biodiversity, Protecting Victoria's Environment – Biodiversity 2037, in different places.

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CORANGAMITE CMA

VICTORIA State Government

Native fauna

Overview

The Corangamite region is home to fauna species that are unique to the area, many of which are dependent on the natural assets such as native vegetation, waterways and wetlands. Unfortunately, the region has more than 300 species classified as 'threatened' in Victoria.

Many species have evolved over thousands of years and will not have the ability to adapt to a climate that is changing in a relatively short timeframe and as a result, changes to the distribution of species is expected to occur. A climate that is hotter and drier will lead to other indirect impacts, such as changes to natural fire and flooding regimes. An increase in these events may have direct impacts on already small, localised populations.

The survival of threatened flora and fauna and ecological communities depends a great deal on the health of native vegetation and the continuing existence of other important habitats.

The Wadawurrung Healthy Country Plan says "Native animals are all the animals that are indigenous and belong to Wadawurrung Country. It includes mammals like echidna and spotted-tailed quoll, birds like *Porronggitj* (brolga), emu, amphibians like frogs, reptiles like snakes, fish and eels. It also includes insects like butterflies, ants and spiders.

There are many animals that used to be found on Wadawurrung Country but aren't any more like dingoes and bilbies. All these animals are important because together with the plants and people they make Country healthy."

Assessment of current condition and trends

Native fauna is highly reliant on the habitat provided by native vegetation with its area and quality often being a determinant of what species will occur there. It is fair to say that the trend for native fauna has generally been on a downward trajectory since large scale land clearing with the majority of our native fauna occurring in protected areas or in locations that are not readily accessed by competition or predators. Within National Parks and reserves, sustainable populations of native fauna have generally been maintained.

DELWP's Biodiversity Response Planning (BRP) is a new state-wide, area-based approach to biodiversity conservation. It has been designed to strengthen alignment, collaboration and participation between government agencies, Traditional Owners, non-government agencies (NGOs) and the community. Response planning in each area shares the same key elements:

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For more information on threatened ecological communities and threatened species under the EPBC Act, see Relevant Biodiversity Documents under the Biodiversity tab.

Major threats and drivers of change

The major threats and drivers of change for the region's native fauna is the loss and deterioration of habitat. Urban encroachment has also had a major impact with some urban animal populations becoming problematic because of their impacts on amenity or their role as vectors of disease. Urban growth has been shown to cause overall reductions in the distributions of birds. Another result of urbanisation is that animals are increasingly exposed to urban boundaries with different edge contrasts.

Introduced animals have also had a major impact by either preying on native fauna or competing with it for food and habitat. Predation by foxes is a major threat to fauna and many wetland bird species, particularly ground-nesting birds.

Date printed: 29 July 2024

Land

The landscapes of the region face challenges associated with the many competing needs for land. Aboriginal people have a deep connection with the land or Country, which is central to their spiritual identity. This connection remains despite the many Aboriginal people who no longer live on their land. Aboriginal people describe the land as sustaining and comforting, fundamental to their health, their relationships and their culture and identity.

The Corangamite region has formed through landscape-building episodes over the past 600 million years, in a variety of environments ranging from deep sea sedimentation to explosive volcanoes. Landscapes continually evolve and processes such as earthquakes, landslides and even saline groundwater discharge are manifestations of this evolutionary process.

The Corangamite region has rich and diverse landscapes, reflecting its geological, climatic and human history. The natural resources of our region are critical to sustaining the lifestyle of its residents and visitors, as well as providing important habitat for flora and fauna. They support valuable industries such as agriculture and nature-based tourism and underpin the region's urban water supply needs.

The landscape systems of the region are outlined in the local areas section of this strategy.

Under the Land Theme in the Corangamite Regional Catchment Strategy are three Sub-themes:

Land use | Soil health | Sustainable agriculture

Regional Outcomes

20 Year Outcome

By 2042, the region's land is managed within its capacity as climate change impacts increase.

6 Year Outcomes

By 2027, land manager capacity in effective management practices is increased to address the range of threats and market changes. LO1

By 2027 there is a 20% increase (compared to 2022 levels) in private agricultural landholders engaging in sustainable land management practices. LO2

Regional Priority Directions

The following priority directions have been developed to deliver the 6 year outcomes identified for the Land Theme. They were developed through community consultation across the the nine Landscape Systems and will provide the basis for localised action. Landscape specific priority directions can be found here.

Code	Priority Direction	Lead	Collaborators
L1	Develop and implement a monitoring and evaluation framework that enables timely adaptive management and decision making. The framework will allow for: 1) accessible monitoring frameworks and repository of the region's NRM resource data 2) develop measures and assessments to determine the community's awareness of the natural values, their connection to these and their willingness to protect, enhance, and restore these 3) reporting to the community on implementation progress.	CCMA	CPA Partners
L2	Best land management practice approaches are implemented across farmers, agencies, developers, and the catchment community	CCMA	AgVic, Landcare
L3	Collaboration and effective relationships ensure agencies, the farming industry and other stakeholders successfully respond to changing circumstances.	CCMA	AgVic, SFS, WVD, Landcare
L4	Ensure engagement and information meets the demographics and needs of Corangamite Communities.	Landcare	CCMA, AgVic, Local Govt
L5	Develop targets to enable a baseline that enables net gain to be measured.	CCMA	AgVic, CeRDI
L6	Land use change including urban expansion does not occur to the detriment of biodiversity and other natural assets.	Local Govt	CCMA, DELWP

L7	Apply the CCMA's Irrigation Development Guidelines to ensure new irrigation developments do not have adverse off-site impacts such as waterlogging, salinity and nutrient discharge	CCMA	SRW
L8	Support farmers with information and tools to build resilience	AgVic	SFS, WVD, CCMA
L9	Support agriculture to manage climate risk	AgVic	SFS, WVD, CCMA

Relevant Land Information Sources

The following documents have been referred to in developing the Land theme:

Catchment and Land Protection Act 1994

Corangamite Natural Resource Plan for Climate Change

Corangamite Soil Health Strategy 2006 – 2012

Social Benchmarking for Natural Resource Management: 2019 Corangamite Region

Date printed: 29 July 2024

CORANGAMITE CMA

VICTORIA State Government

Land use

Overview

Agriculture is the dominant land use within the Corangamite region, with approximately 3,450 agricultural businesses operating across 772,436 hectares. Farming enterprises include sheep and cattle grazing, dairying, cropping, forestry and viticulture.

Just over 75% of private land used for food and fibre production is used for livestock grazing and 20% is used for crop production, including timber. In addition, the region has smaller areas dedicated to the poultry and pig industries. Livestock numbers in 2005-2006 were approximately 271,000 dairy cattle, 209,000 beef cattle and 1.7 million sheep and lambs. In 2005-2006, the Corangamite region produced approximately 10% of the gross value of agricultural commodities produced in Victoria.

- Agriculture is a reasonably high employer and key economic driver in the Corangamite region, with an annual value of almost $1.5 billion.
- Mixed farming and grazing is the predominant agricultural land use in the Corangamite region (66%), followed by dairy (14%), beef (7%) and sheep (5%) production.
- Meat ($660 million) and dairy products ($546 million) are the most valuable commodities in the region, contributing to 14% and 15% of Victoria's total value respectively.
- The region produces 16% of Victoria's hay and silage (tonnes) and 19% of its eggs (dozens).
- Slight contraction in grazing commodities over time may be driven by diversification and prevailing dry conditions.
- There has been a marked decline in broadacre cropping in recent years, however this is offset by increases in hay due to changes in seasonal conditions and grain quality.

Assessment of current condition and trends

A summary of the agriculture and land use profile in the region includes:

- The top three areas as a percentage of people employed in agriculture within the region are Corangamite-South (38%), Corangamite-North (32%) and Colac Region (29%).
- The average age of farmers continues to increase in line with other parts of Victoria (49 years old), however it is lower in some sectors such as intensive horticulture and poultry, and in more commercial enterprises (e.g. >$400K turnover per year).
- Mixed farming and grazing is the predominant agricultural land use in the Corangamite region (66%), followed by dairy (14%), beef (7%) and sheep (5%) production.
- Meat ($660 million) and dairy products ($546 million) are the most valuable commodities in the region, contributing to 14% and 15% of Victoria's total value respectively.
- The region produces 16% of Victoria's hay and silage (tonnes) and 19% of its eggs (dozens).
- Slight contraction in grazing commodities over time may be driven by diversification and prevailing dry conditions.
- There has been a marked decline in broadacre cropping in recent years, however this is offset by increases in hay due to changes in seasonal conditions and grain quality.
- The barriers to natural resource management (NRM) practice change are largely consistent with other regions and findings of previous studies. Cost (39%), the view that 'I have done everything I can do' (34%), lack of time (20%) and 'I am getting too old/planning to retire' (16%) will continue to be important barriers to address in the Corangamite region.
- There is an opportunity to build on the current sustainable agricultural practices in the region, including pasture management, cultivation, crop stubble and/or trash management, soil enhancer use and fertiliser use.

DELWP's Victorian Land Cover Time Series provides a snapshot of changes in land cover types between 1985 and the present. Between 1985-1990, Corangamite's top three land cover classes were non-native pasture (occupying over 51% of the region), native trees (19% of the region) and native grass herb (4% of the region). In the most recent 5 year epoch, 2015-2019, non-native pastures have decreased significantly to just under 43% of total coverage, native trees have slightly increased to just under 20% of the region, and dryland cropping now occupies the third most prevalent land cover, occupying over 10% of the Corangamite region (from a previous 2.9%). This represents an increase in dryland cropping of over 100,000 ha.

Over the 30-year period, native vegetation cover classes generally reduced, as did wetlands (perennial and seasonal), while mangroves and saltmarsh stayed fairly constant (although both land cover classes are the least represented). Wetlands showed a significant relative decrease, with perennial wetlands decreasing by 23%, and seasonal wetlands decreasing by 15%. Dryland cropping, exotic woody vegetation and both hardwood and pine plantation coverages increased. Urban and built up areas, whilst a small proportion of the region, increased over this period.

Major threats and drivers of change

Most major threats are natural processes (albeit some are the consequences of land clearing, agricultural, forestry and urban development and on-going activity). The consequences of these threats impacting on land and agriculture have also become greater. For instance, built infrastructure has spread across wider areas with a larger proportion of the population served by various utilities, roads etc. A growing and expanding human population requires larger volumes of water. High value biodiversity, wetlands and cultural heritage sites are considered more significant and valuable as their number has declined.

With regard to soils there are twelve key threats: landslides; water erosion (sheet/rill and gully/tunnel erosion); acid sulfate soils; secondary salinity; waterlogging; soil structure decline; wind erosion; soil nutrient decline; soil acidification; soil contamination; soil organic carbon decline; and soil biota decline.

Major drivers with regard to how land is used have been identified through the Corangamite 2019 Social Benchmarking Survey conducted by Professor Allan Curtis. In this report some of the key changes within the region since the last survey in 2006 are:

- fewer farmers
- enterprise changes
- smaller properties
- less income from agriculture

- older farmers.

Properties closer to major centres such as Geelong and Ballarat are generally smaller, reflecting the demand for lifestyle size properties which have led to more subdivision of farming properties in these areas. Property sizes are generally larger the further west you move across the region.

Date printed: 29 July 2024

CORANGAMITE CMA

VICTORIA State Government

Sustainable agriculture

Overview

The definition of sustainable agriculture in the context of the Corangamite CMA region is 'achieving productive agricultural land use and businesses, while protecting the natural resource base from threats related to agricultural land management practices'. This aims to ensure that both public (e.g. improved waterway quality) and private benefits (e.g. improved stock health and fertility) are delivered in line with the statutory obligations under the *Catchment and Land Protection Act 1994*.

Agriculture is a reasonably high employer and key economic driver in the Corangamite region, with an annual value of almost $1.5 billion. Mixed farming and grazing is the predominant agricultural land use in the Corangamite region (66%), followed by dairy (14%), beef (7%) and sheep (5%) production.

Meat ($660 million) and dairy products ($546 million) are the most valuable commodities in the region, contributing to 14% and 15% of Victoria's total value respectively. The region produces 16% of Victoria's hay and silage (tonnes) and 19% of its eggs (dozens). The slight contraction in grazing commodities over time may be driven by diversification and prevailing dry conditions. There has been a marked decline in broad acre cropping in recent years, however this is offset by increases in hay due to changes in seasonal conditions and grain quality.

The barriers to NRM practice change are largely consistent with other regions and findings of previous studies. Cost (39%), the view that 'I have done everything I can do' (34%), lack of time (20%) and 'I am getting too old/planning to retire' (16%) will continue to be important barriers to address in the Corangamite region.

There is an opportunity to build on the current sustainable agricultural practices in the region, including pasture management, cultivation, crop stubble and/or trash management, soil enhancer use and fertiliser use. Although irrigation is only a minor landuse in the region, there is also an opportunity to ensure current and new irrigation developments use sustainable irrigation practices to reduce the off-site impacts of irrigation including waterlogging, salinity and nutrient discharge.

Assessment of current condition and trends

There are a range of sustainable agricultural practices implemented by farmers in the Corangamite region that can be measured from the ABS Agricultural Census. This includes pasture management, cultivation, crop stubble and/or trash management, soil enhancer use and fertiliser use.

The majority of pasture in the region tends to be a mix of annual and perennial (124,215 ha, 10% of Victoria's total), rather than solely perennial (90,485 ha) or annual (26,471 ha). Land not cultivated (apart from sowing and planting) makes up 109,974 ha of the 705,488 ha (15%) used for agricultural production or cultivated only once (3%). Stubble retention to maintain ground cover is also practiced widely with 18,564 ha retained on ground and 18,339 ha standing (5% of agricultural land combined). Inter-row sowing and other inter-cropping practices are implemented across 5,617 ha.

Soil enhancers, such as compost and other organic amendments, are applied to approximately 11% of agricultural land (78,771 ha) across the region at a slightly higher application rate than the Victorian average (1.88 t/ha). Approximately 50% of pastures are improved with nitrogen-based fertilisers at slightly lower rates than the state average (0.14 t/ha), which are applied to a further 36% of other agricultural land (251,592 ha) at slightly higher than average rates (0.16 t/ha). Phosphorus-based fertilisers are applied to 44% of agricultural land (308,812 ha) at slightly higher than average rates (0.13 t/ha), although these still represent relatively low input extensive production systems.

Major threats and drivers of change

Climate change is a significant challenge facing Corangamite's agriculture sector. Average temperatures and the frequency of extremely hot days are increasing, while rainfall is decreasing and changing the pattern of how and when it falls. The sector needs support to prepare for changing conditions while reducing its own environmental footprint.

Potential threats to agricultural land and its productivity include:

- threats to soil health
- pest plants and animals
- soil-borne diseases
- population growth and urban development
- climate change (although this could also have positive impacts)
- unsustainable resource utilisation
- inadequate or poor management
- uncontrolled stock access to remnant vegetation or waterways.

There are also some practices that are not best practice still being implemented to manage crop stubble or trash, such as burning off. This includes 43,374 ha via cool moderate burn and 35,095 ha using a hot burn. Further, 10,394 ha of stubble is wind-rowed and removed meaning ground may be left bare fallow and at risk of erosion through wind and water.

Date printed: 29 July 2024

Soil health

Overview

Healthy soils support their natural local ecosystems. Disturbance disrupts these systems. In many cases, disruption leads to unintended consequences for other natural assets – such as waterways, biodiversity, vegetation – or leads to impacts on built assets such as human habitation, roads, pipelines and other structures. The region is subject to a variety of geohazards, among which landslides and erosion have the most significant impact. Over the past fifty years, landslides have resulted in loss of life and many millions of dollars damage to municipal infrastructure and development. Soil erosion by water and wind has also impacted on the region's waterways and environment, threatening a diverse range of assets from urban water quality to Ramsar-listed wetlands. More assets are placed at risk each year, as the increasing regional population results in an acceleration of anthropogenic modifications to landscapes.

Assessment of current condition and trends

High production soils in the south-west of the region are generally in fair to good condition. However, high fertility, high rainfall, topography and land-use in these localities make these soils prone to landslides, waterlogging and soil structure decline. These soils are also prone to acidification. These soils occur predominantly in the Heytesbury and Otway Coast Landscape Systems. Highly productive red volcanic soils of the north-east of the region are naturally fertile, but prone to acidification.

Medium production value soils, mostly found in the Victorian Volcanic Plains, are the most widespread soil type in the region. They are generally in average condition. Various inputs, like inorganic fertilisers and agricultural lime, are used to manage acidity and maintain, or improve, fertility. These soils are prone to waterlogging and can erode if groundcover is lost or the land is used beyond its capability. Secondary salinity may also affect land and soils for food and fibre, especially on the plains, reducing productivity and potentially impacting other catchment resources. These soils occur predominantly in the Northern Uplands, Basalt Plains and Western District Lakes Landscape Systems.

Lower production value sedimentary soils are generally of lower fertility and in average condition. These soils are geologically older and more fragile; they are poorly structured and more dispersive. They may be more subject to water erosion when exposed through the removal of groundcover or over-cultivation. These soils tend to acidify rapidly when disturbed from their natural state and used for agriculture.

Major threats and drivers of change

Potential threats and/or threatening processes to the health of the region's soils include:

- climate change
- over application of agricultural fertiliser
- nutrient decline
- acidification
- structure decline
- waterlogging
- soil organic carbon decline
- soil biota decline
- secondary salinity
- landslides
- water erosion
- wind erosion
- soil compaction
- decline in soil microbiology
- disturbance of potential acid sulfate soils
- contamination.

Soils naturally acidify, erode and slip. Natural salinity existed before European settlement and farm development. However, some agricultural practices aggravate these threats. Topography and climatic conditions also influence these threats to soil health.

Across the Corangamite region, potential acid sulfate soils (yet to be disturbed) have been mapped by CSIRO based on probability of occurrence. Overall, the Corangamite region has 0.03% of its total area with high probability (>70%), and 0.02% with low level of probability (5-70%) of acid sulfate soils occurrence. All landscape systems with coastline areas, particularly around estuarine zones, contain areas of high probability of acid sulfate soil occurrence (>70%), as well as upstream of the Barwon River near Geelong. Additionally, the Lake Connewarre Complex wetlands in the Bellarine & Surf Coast landscape system, and the Western District Lakes contain many areas with high probability of acid sulfate soils around the lakes. All other areas of the Corangamite region have extremely low probability of occurrence (<5%), and small distributions.

Landslide susceptibility represents a significant threat to the southern and south-western parts of the Corangamite region. The Otway Coast and Heytesbury landscape systems are the most vulnerable to landslide occurrences, ranging from moderate to very high susceptibility. The adjacent southern boundary of the Barwon Plain Landscape System also faces some moderate susceptibility to landslides, while the rest of the Corangamite region has generally very low susceptibility – particularly along the flat Victorian Volcanic Plains.

Sheet and rill erosions susceptibility across the Corangamite region is highly variable and distributed. The least susceptible land is located in the south-west around Heytesbury, Otway Coast and Barwon Plain Landscape Systems. The land at highest risk of sheet and rill erosion is located in the Northern Uplands, followed by the Basalt Plains. The remainder of the region is generally between moderate to moderate-high sheet and rill erosion susceptibility.

While there is some moderate susceptibility to gully erosion along the waterways of the Otway Coast and Heytesbury areas, these landscape systems generally exhibit the lowest risk. The Northern Uplands and Ballarat City Landscape Systems have a high proportion of land with moderately high risk of gully erosion. The Otway Coast's low susceptibility to gully erosion could be attributed to its vegetation cover and protection as a public national park, increasing soil health and stability.

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CORANGAMITE CMA

VICTORIA State Government

Coast and Marine

The Corangamite coastal environment is naturally dynamic and is constantly changing and evolving. It changes through the influence of wind, tides, waves and weather systems. Within reason, we must plan for and adapt to natural changes. This diversity and change reflect the dynamic, complex and interconnected nature of coastal and marine habitats.

The coastal and marine areas of the region are part of Traditional Owners' Country. Aboriginal people have a deep connection with Country, which is central to their spiritual identity. This connection remains despite the many Aboriginal people who no longer live on their Country. Aboriginal people describe Country as sustaining and comforting, fundamental to their health, their relationships and their culture and identity.

The marine and coastal environments within the Corangamite region are highly diverse. Marine habitats include intertidal rocky reefs, shallow rocky reefs, deep rocky reefs, pelagic waters, sand beaches, subtidal sandy and muddy seabeds, and intertidal mudflats (Parks Victoria, 2003). Coastal habitats are dominated by a variety of vegetation classes, including Coastal Dune Scrub, Coastal Headland Scrub, Coastal Tussock Grassland, and Coastal Saltmarsh Ecological Vegetation Classes.

Under the Coast and Marine Theme in the Corangamite Regional Catchment Strategy are two Sub-themes:

Coastal environments | Marine environment

Regional Outcomes

20 Year Outcome

By 2042, an increase in the extent and condition of coastal habitats, together with improved water quality flowing into the marine environment, contributes to building a healthy, dynamic and biodiverse marine and coastal environment.

6 Year Outcome

By 2027, proactive management of coastal ecosystems by land managers and the community results in a net gain in the health and resilience of the region's highly valued marine and coastal environment. MO1

Regional Priority Directions

The following priority directions have been developed to deliver the 6 year outcomes identified for the Coast and Marine Theme. They were developed through community consultation across the the nine Landscape Systems and will provide the basis for localised action. Landscape specific priority directions can be found here.

Code	Priority Direction	Lead	Collaborators
M1	Develop and implement a monitoring and evaluation framework that enables timely adaptive management and decision making. The framework will allow for: 1) accessible monitoring frameworks and repository of the region's NRM resource data 2) develop measures and assessments to determine the community's awareness of the natural values, their connection to these and their willingness to protect, enhance, and restore these 3) reporting to the community on implementation progress.	CCMA	CPA Partners
M2	Build research and knowledge, including Traditional Owner knowledge of coastal / marine systems and threatening processes to inform adaptive management and mitigation.	CCMA	EMAC, WTOAC, DELWP
M3	Manage upstream impacts to mitigate impacts on the coastal and marine environments.	CCMA	AgVic, DELWP, Local Govt, Landcare
M4	Regularly monitor the quality of the coastal environment to establish a baseline, identify change, and actively manage issues as they arise.	DELWP	CCMA, GORA, Local Govt, EPA, Landcare/Community Groups
M5	Explore carbon sequestration opportunities to deliver both climate and catchment/biodiversity benefits.	CCMA	Universities, DELWP
M6	Review relevant strategies and action plans to identify and reduce stressors on coastal and marine environments.	DELWP	CCMA, GORA, BB, BC, Local Govt
M7	Support Original Custodians (Traditional Owners) to manage the marine and coastal environment and to share cultural knowledge.	CCMA	DELWP, EMAC, WTOAC, GORA

M8	Participate in the development and implementation of a process for the provision of coastal erosion advice for long term planning, management and adaptation.	DELWP	CCMA, GORA, BB, BC, Local Govt
M9	Ensure planning for development considers, minimises and where possible avoids adversely impacting waterways, salt marsh vegetation, coastal sand dunes and beaches.	Local Govt	CCMA, DELWP, GORA

Relevant Coast and Information Sources

The following documents have been referred to in developing the Coast and Marine theme:

Corangamite Natural Resource Plan for Climate Change

Marine and Coastal Policy

Marine and Coastal Act 2018

Port Phillip (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan

VEAC Coastal Reserves Assessment

VEAC Assessment of Victoria's Marine Environment

Date printed: 29 July 2024

CORANGAMITE CMA

VICTORIA State Government

Coastal environments

Overview

Most Victorians have visited the coast in the past year. Walking/hiking remains the most common activity on the coast. Interactions with the coast are overwhelmingly positive – a coast or marine environment free of rubbish is the main contributor to Victorians' enjoyment of these environments. Victorians place a high value on local coast and marine environments and natural features are the most highly valued aspects of the Victorian coast.

Victoria's marine and coastal environments (which include our coastline, bays, and coastal lakes) are home to more than 12,000 plant and animal species, many not found anywhere else in the world. But these environments are facing many threats, including population growth and urbanisation, commercial and recreational fishing, invasive species and droughts and floods.

The Corangamite coastal environment is naturally dynamic and is constantly changing and evolving. It changes through the influence of wind, tides, waves and weather systems. Within reason, we must plan for and adapt to natural changes. This diversity and change reflect the dynamic, complex and interconnected nature of coastal and marine habitats.

While there are management practices in place, the coasts and estuaries of the region face significant challenges associated with the threats posed by climate change as well as population, land use and developmental pressures on the natural values of these assets.

The Marine and Coastal Act 2018 along with the Marine and Coastal Policy provide the overarching statutory and policy frameworks for the management of the region's marine and coastal environments. The Marine and Coastal Strategy currently being developed will identify key actions and responsibilities for the delivery of the Marine and Coastal Policy.

Assessment of current condition and trends

Coastal habitats are dominated by a variety of vegetation classes, including Coastal Dune Scrub, Coastal Headland Scrub, Coastal Tussock Grassland, and Coastal Saltmarsh Ecological Vegetation Classes.

The health and function of coastal ecosystems and associated habitats are being threatened by human uses and developments across the Corangamite region. Population growth and urbanisation are reducing and fragmenting surviving habitats, especially around larger centres such as Geelong and along the Bellarine and Surf Coast. While impacts on waterways and soils are disrupting ecosystem processes, invasive species and increasing extraction of natural resources are changing ecosystem species composition. Population growth in coastal areas is variable across the region with the major impacts of population growth and use being to the east of Cape Otway. The Coastal Demographics in Victoria report provides a state-wide overview of this issue.

The diversity of natural values of the regional coastal area is high. Both terrestrial and marine environments encompass a variety of interacting plants and animals that constitute and drive the natural ecosystems. A diversity of vegetation types, including forest, woodland, heathland and coastal dune communities are all found on the regional coastline, with corresponding high habitat diversity.

The Corangamite coastline constitutes four bioregions, dominated mainly by Otway Plain and Otway Range; with the latter maintaining a majority of its original vegetation cover (81.6%). Within the Corangamite region, the Otway Range and Otway Plain bioregions have the highest percentages of remnant vegetation within public land (79.1% and 61.9% respectively). Most of the remnant Corangamite Coastal Biodiversity in the region is reserved in national, state and other parks, state forests, and other public land reserves, including the Great Otway National Park and the Angahook-Lorne State Park.

Many species and ecosystems have evolved and adapted to specific fire regimes and rely on fire to regenerate and maintain health. Fire is continuously resetting and regenerating the mix of species and habitat structures, contributing to habitat diversity across the coastal landscape.

Priority Ecological Vegetation Classes (EVCs) include Coastal Dune Scrub/Coastal Dune Grassland Mosaic, Coastal Saltmarsh, Coastal Dune Scrub, Coastal Headland Scrub, Coastal Headland Scrub/Coastal Tussock Grassland Mosaic, Coastal Tussock Grassland and Coastal Alkaline Scrub.

Major threats and drivers of change

A 2012 poll for the Victorian Coastal Council showed that the top four marine and coastal issues for Victorians were overfishing/illegal fishing, pollution, development and storm water pollution. Compared to earlier polls, fewer respondents believed the coast was well-managed and two thirds felt that the sea level was rising due to climate change, causing erosion and flooding. How Victorians perceive the coast has been further assessed in Wave 5 Community Attitudes and Behaviour Report.

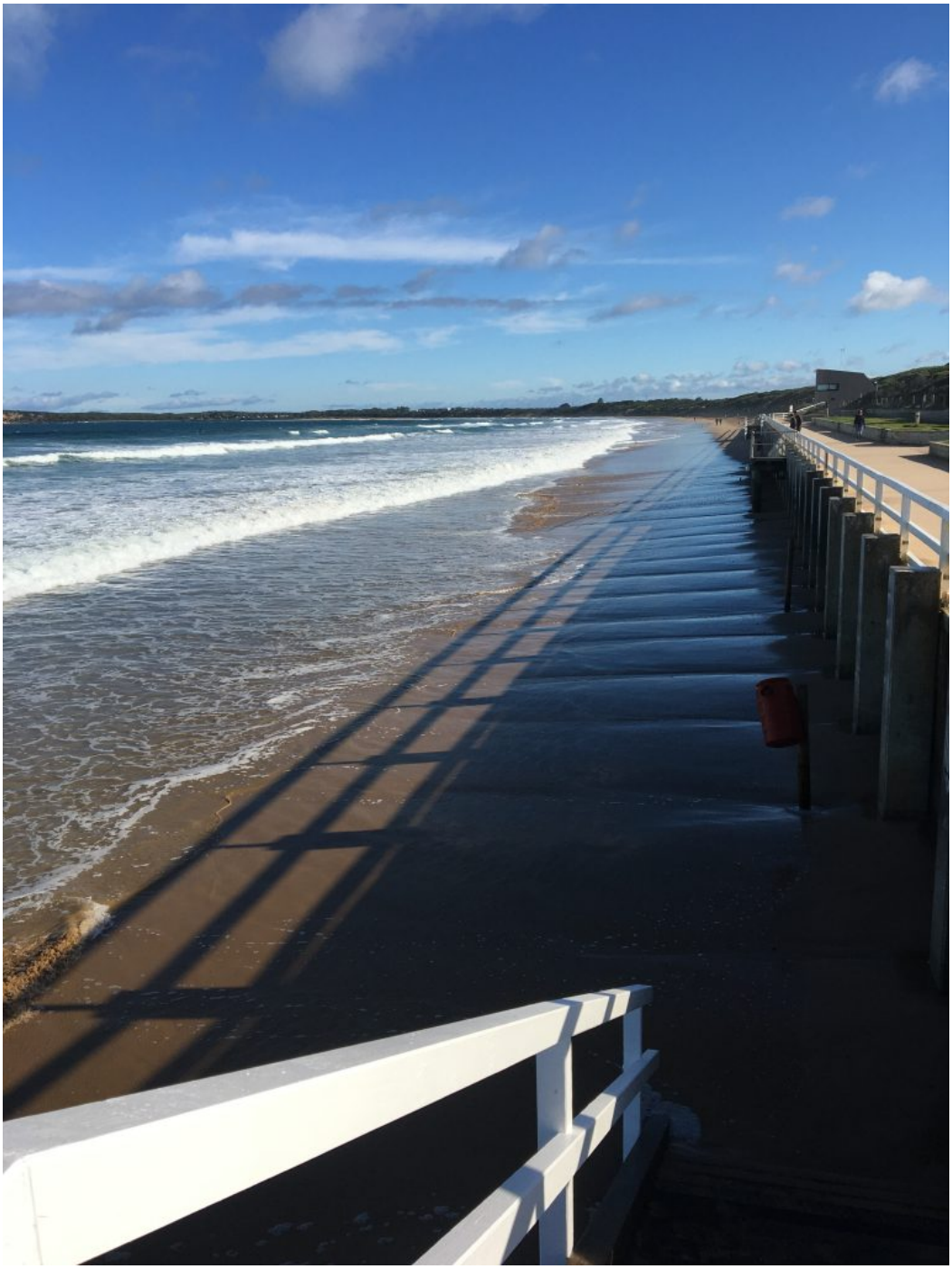
Coastal and catchment development over the past two centuries has led to significant losses of coastal ecological vegetation classes (EVCs), with some now endangered, vulnerable or depleted. Coastal Alkaline Scrub has been reduced to 22% of its original cover on the Victorian Volcanic Plain and 31% on the Otway Plain bioregions. The Otway Plain has just 26% of its pre-1750s cover of coastal saltmarsh.

Coastal environments are highly valued by the community in terms of the biological diversity they contain and/or support. A large proportion of the coastal environment within the Corangamite region is held in public ownership, but under varied management arrangements. The health of coastal biodiversity is subjected to a range of threatening processes.

Managing and protecting Corangamite's coastal environments in the best natural state has challenges, including:

- Hazards and risks associated with a changing climate and sea level rise

- Potential ecosystem changes from increased ocean temperatures, changes to ocean chemistry, and ocean acidification
- Vegetation clearing
- Soil erosion, landslides
- Acid sulfate soils
- Pest plants and animals
- Increasing population pressures and use
- Litter
- Damage from pets and livestock
- Growing cost of providing and maintaining coastal infrastructure
- Wastes and pollutants.



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CORANGAMITE CMA

VICTORIA State Government

Marine environment

Overview

Corangamite's coastal waters stretch from west of Peterborough, around Cape Otway, along the Surf Coast, through Port Phillip Heads and around Corio Bay nearly to Point Wilson in the east. There are three Marine National Parks in the region: Port Phillip Heads, Point Addis and Twelve Apostles Marine National Parks. There are also a number of Marine Sanctuaries within the region including The Arches, Marengo Reefs, Eagle Rock, Point Danger and Barwon Bluff. Parts of the Corangamite marine environment are also classified as Ramsar wetlands as part of the Port Phillip Bay (Western Shoreline) and Bellarine site which includes Point Lilias, Limeburners Bay, Swan Bay and Mud Islands.

A healthy marine and coastal environment is biodiverse and dynamic. It contains functioning biological, physical and chemical interactions that support the local environment's many and varied plants and animals. It is able to operate as a dynamic, constantly changing system.

Ecosystems are in a constant state of flux in response to processes like changing sea and air temperature, nutrient flows and ocean currents. A healthy marine and coastal environment can also be defined by its ability to sustain both its intrinsic value (the value it has in itself regardless of its value to humans) as well as the full range of environmental, social, cultural and economic values that benefit the Corangamite community.

The Marine and Coastal Act 2018 along with the Marine and Coastal Policy provide the overarching statutory and policy frameworks for the management of the region's marine and coastal environments. The Marine and Coastal Strategy currently being developed will identify key actions and responsibilities for the delivery of the Marine and Coastal Policy.

Wadawurrung Healthy Country Plan says "We see our *Dja* land and *Warre* sea Country as all one but we have highlighted it here as it needs some real help. For us it is full of resources, favourite foods and living places along our coast that show how the seas provide so plentifully for generations of Wadawurrung. Fishing, diving, harvesting from the rocky and intertidal reefs".

Assessment of current condition and trends

The condition of Corangamite's marine waters is generally good, with low levels of nutrients, turbidity and bio-contaminants, and generally good light conditions. Attention of nutrient and sediment fluxes in the catchments, and appropriate management of stormwater and wastewater in coastal towns is essential to preserve this good condition.

Corangamite's inshore marine areas are well known and loved by millions of Victorians and visitors, with many different and diverse environments. Both inshore and offshore marine areas also host the activities of several important sectors such as fisheries, ports and shipping.

Within the Corangamite region there are a number of marine sanctuaries and national parks. These include the The Arches, Marengo Reefs, Eagle Rock, Point Danger and Barwon Bluff Marine Sanctuaries. The region also includes the Twelve Apostles, Point Addis and Port Phillip Heads Marine National Parks. South of Cape Otway is the Apollo Commonwealth Marine Park.

Land use within the catchment influences water quality by causing nutrient and sediment pollution that threatens marine ecosystems. High levels of urbanisation such as that within the Geelong City and Bellarine & Surf Coast Landscape systems present issues with discharges from a variety of sources leading to detrimental impacts on the marine environments adjacent to these locations.

The condition of the marine environment is dependent on the land use in the hinterland that adjoins that environment, the impact of extractive uses and industries within that environment and the impacts of of broader issues such as invasive species, climate and pollution. The key role of this strategy is to ensure that terrestrial land and water use impacts on marine systems are minimised.

Major threats and drivers of change

The health of the Corangamite marine environment is under threat from multiple sources, including climate change and growth in towns, cities and industries that interact with their local marine ecosystems. These threats can lead to negative impacts on water quality, pollution and debris, invasive species, marine pests and diseases. Stormwater can contain hydrocarbons, pesticides, detergents, leaves, garden clippings, animal faeces and plastics, along with sewage from leaking, broken or overflowing sewers.

Seagrass beds, estuarine mudflats and mangroves are amongst the most vulnerable habitat types as they require sheltered environments that are at increased risk from nutrients and contaminants transported by storm water. These specialised habitats are critical for all or some life cycle stages of many marine species.

Growth in resident populations and visitor numbers puts pressure on the health of the marine and coastal environment, with direct impacts including:
• habitat loss and degradation
• increased introduction of invasive and pest species
• increased pollution from sources including litter, stormwater runoff and wastewater discharges
• erosion of dunes
• loss of character of coastal towns.

Climate change is increasing the pressure on Corangamite's marine environment by exacerbating existing threats and introducing new ones, such as:
• rising sea levels, leading to more inundation and erosion
• increased frequency and severity of storms and other extreme weather events
• changes in ocean temperatures, currents and acidification
• changes to waterway flows, levels and regimes
• changes in the range, distribution and abundance of both introduced and native plants and animals, taking advantage of a changed climate
• coastal squeeze, which occurs when coastal ecosystems forced inland by rising sea levels run into human-made barriers such as roads and housing.

More than 160 introduced marine species are now resident in Port Phillip Bay. Those of greatest concern are the northern Pacific seastar (Asterias amurensis), the European fan worm (Sabella spallanzanii), the European green shore crab (Carcinus maenas), Japanese kelp (Undaria pinnatifida), the New Zealand screw shell (Maoricolpus roseus) and the Pacific oyster (Crassostrea gigas). The Asian date mussel (Musculista senhousia), cordgrass (Spartina anglica and Spartina x townsendii sp.), dead man's finger (Codium fragile ssp.) and red algae (Grateloupia turuturu) are also of concern. Invasive marine species prey on – or outcompete – native species for space, food and light.

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CORANGAMITE CMA

VICTORIA State Government

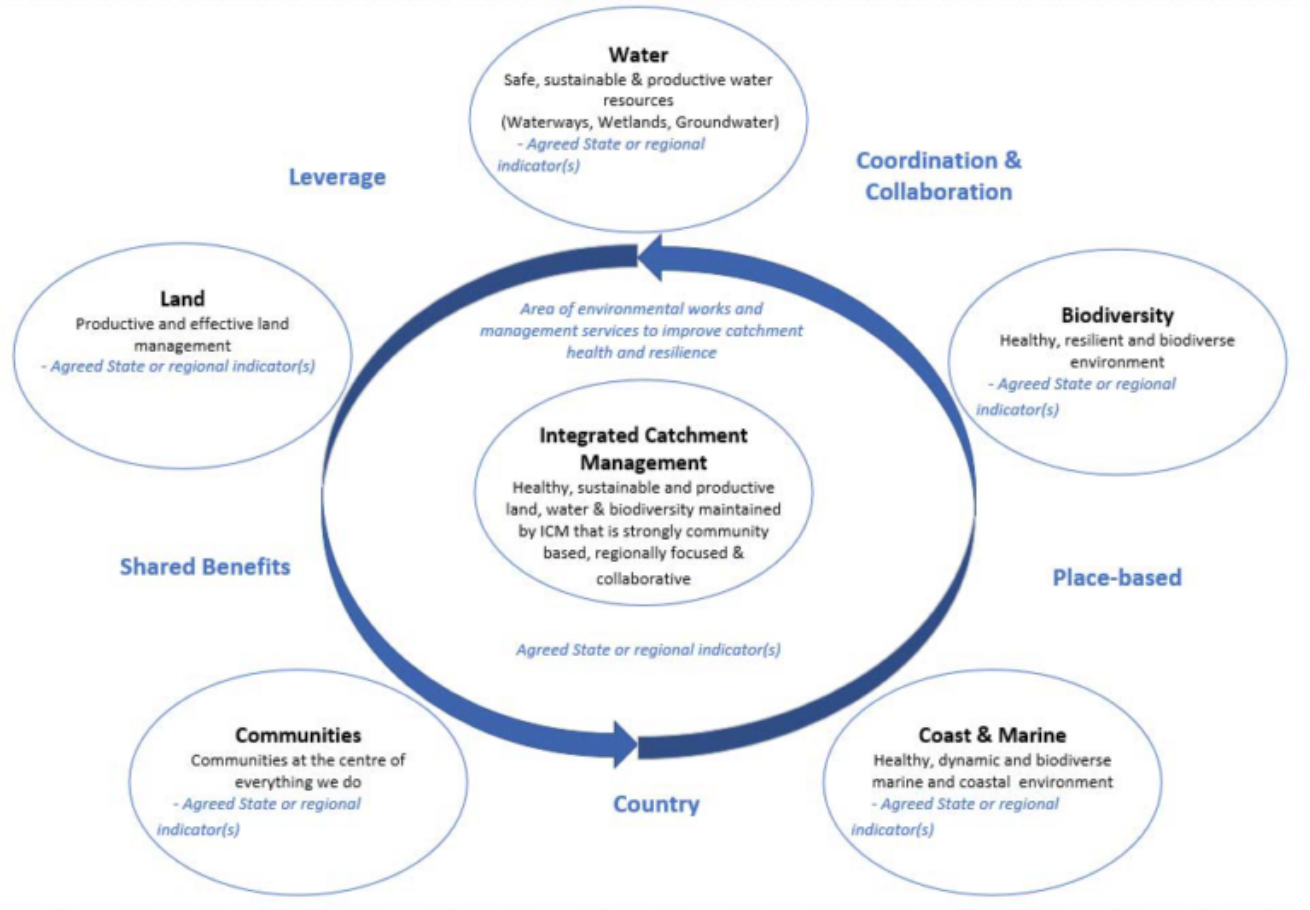
Communities

This RCS recognises the strong connection between the health of the catchment and the wellbeing of the community. It encourages greater participation and investment in the protection, enhancement and restoration of land, water and biodiversity resources in the Corangamite region. 'Community' refers to all those with an interest or potential interest in the environment who live or work in, or visit, the Corangamite region. Community includes individual landowners, community members and groups, government agencies, industry bodies, authorities and investors.

Under the Communities Theme in the Corangamite Regional Catchment Strategy are two Sub-themes:

Traditional owners | Regional communities

Integrated catchment management (ICM) adopts a whole-of-system approach to land, water and biodiversity planning and delivery for multiple outcomes within and across natural ecosystems. It captures the values and priorities of regional communities and brings together partners from across the catchment region to identify and respond to challenges that cannot be solved by one organisation or stakeholder alone.



Aboriginal peoples have lived in the area now known as the Corangamite region for thousands of generations. The natural environment of the region is in reality a cultural landscape. that has been lived in, used, managed and ultimately shaped by Aboriginal peoples over tens of thousands of years. Today's landscape has been heavily shaped by the actions of those who have lived here.

The Corangamite Catchment Management Authority acknowledges and respects Traditional Owners and Aboriginal communities and organisations, especially the Wadawurrung and Eastern Maar Traditional Owners. The diversity of their cultures and the deep connections they have with Corangamite's lands and waters are acknowledged. Partnerships with them for the health of people and country are also valued. Respect to their Elders past and present are acknowledged and the primacy of Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands and waters are recognised.

This will be achieved by:

- aligning and including the outcomes of Traditional Owner Healthy Country Plans to the delivery of the Regional Catchment Strategy
- integrating Aboriginal engagement and participation in the planning, governance, implementation and review of programs and projects
- actively engaging Aboriginal communities and building partnerships
- ensuring engagement and participation approaches are well planned, tailored, targeted and evaluated
- providing meaningful opportunities for Aboriginal people to contribute to strategies and initiatives
- establishing clear roles and expectations.

The commitment to recognising Traditional Owners is also represented by the inclusion in this Regional Catchment Strategy of individual pages dedicated to the Eastern Maar and Wadawurrung Traditional Owners as the two Registered Aboriginal Parties for the Corangamite region.

Regional Outcomes

20 Year Outcome

By 2042, communities are empowered to collaborate, connect and protect the region's natural assets.

6 Year Outcomes

By 2027, communities have the knowledge, skills and capacity to actively participate in and contribute to management of the region in a range of ways. **CO1**

By 2027, communities (local, new and visitor) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **CO2**

By 2027, communities (local, new and visitor) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **CO3**

By 2027, the increased capacity of Traditional Owner Groups enables their increased involvement in decision making that affects their Country. **CO4**

Regional Priority Directions

The following priority directions have been developed to deliver the 6 year outcomes identified for the Regional Communities sub-theme. They were developed through community consultation across the the nine Landscape Systems and will provide the basis for localised action. Priorities for Traditional Owners have been developed in conjunction with, and parallel to, this to enable the Wadawurrung and Eastern Maar to specifically identify their aspirations on their own dedicated pages. Landscape specific priority directions can be found here.

Code	Priority Direction	Lead	Collaborators

C1	Develop and implement a monitoring and evaluation framework that enables timely adaptive management and decision making. The framework will allow for: 1) accessible monitoring frameworks and repository of the region's NRM resource data 2) develop measures and assessments to determine the community's awareness of the natural values, their connection to these and their willingness to protect, enhance, and restore these 3) reporting to the community on implementation progress.	CCMA	CPA Partners, Landcare
C2	Ensure community education and engagement activities are grounded in the most recent and relevant social research available, and targeted to the specific local geographic area.	CCMA	Landcare
C3	Promote a culture of exchange that enables the sharing of resources, experiences and knowledge.	Landcare	CCMA, AgVic, SFS, WVD, Local Govt, EMAC, WTOAC
C4	Design and deliver a comprehensive education program to connect communities (local, new and visitor) to their local landscape and the enviromental services it provides and empower them to take action.	CCMA	Landcare
C5	Encourage and enable community participation (volunteering) in on-ground environmental works to restore and protect environmental assets.	Landcare	Local Govt, CCMA
C6	Actively celebrate and share the stories of success and impact of communities improving their local environment.	Landcare	CCMA
C7	Catchment partners work together to deliver a coordinated approach to supporting communities to participate in environmental programs.	CCMA	Landcare
C8	Support Traditional Owner groups so that we can maintain enduring and genuine partnerships.	CCMA	EMAC, WTOAC
C9	Engage with the community on the need to mitigate and adapt to climate change and its impacts.	CCMA	Landcare, DELWP, AgVic
C10	Promote and actively encourage the use of citizen science information by agencies, researchers and other members of the community.	CCMA	DELWP
C11	Encourage and support citizen scientists to continue to regularly monitor the quality of natural environments to provide long-term data sets and actively manage issues as they arise.	CCMA	Local Govt, Landcare

Relevant Community Information Sources

The following documents have been referred to in developing the Community theme:

Eastern Maar Country Plan (Meerreengeeye ngakeepoorryeeyt)

Social Benchmarking for Natural Resource Management: 2019 Corangamite Region

Wadawurrung Healthy Country Plan (Paleert Tjaara Dja)

Date printed: 29 July 2024

This information was correct at the time of printing. The Corangamite Catchment Management Authority takes no responsibility for information that is inaccurate or out of date. To view the current Corangamite Regional Catchment Strategy go to https://corangamite.rcs.vic.gov.au/.

CORANGAMITE CMA

VICTORIA State Government

Eastern Maar Aboriginal Corporation

Welcome to Country

The following statement (in Maar language and in English) is from the Eastern Maar— 'watnanda koong meerreeng, tyama-ngan malayeetoo'

Ngatanwarr

Ngeerang meerreeng-an

Peepay meerreeng-an

Kakayee meerreeng-an

Wartee meerreeng-an

Maara-wanoong, laka. Wanga-kee-ngeeye

Meereeng-ngeeye, pareeyt, nganpeeyan, weeyn, wooroot, poondeeya-teeyt

Meerreeng-ngeeye, nhakateeyt, woorroong, leehnan, mooroop, keerray

Meerreeng-ngeeye, thookay-ngeeye, pareeyt pareeyt ba waran waran-ngeeye, wangeeyarr ba wangeet – ngeeye, maar ba thanampool-ngeeye, Ngalam Meen-ngeeye, mooroop-ngeeye

Meerreeng-ngeeye Maar, Maar meerreeng

Wamba-wanoong yaapteeyt-oo, leerpeeneeyt-ngeeye, kooweekoowee-ngeeye nhakapooreepooree-ngeeye, keeyan-ngeeye Wamba-wanoong nhoonpee yaapteeyt-oo, tyama-takoort meerreeng

Peetyawan weeyn Meerreeng, nhaka Meerreeng, keeyan Meerreeng, nganto-pay ngootyoonayt meerreeng

Kooweeya-wanoong takoort meerreeng-ee ba watanoo Meerreng-ngeeye, yana-thalap-ee ba wanga-kee Meerreeng laka

Ngeetoong keeyan-ngeen Meerreeng, Meerreeng keeyan ngooteen

Together body and Country, we know long time.

(We see all of you), greeting.

Mother my Country.

Father my Country.

Sister my Country.

Brother my Country.

We are the Maar speaking Peoples. Hear us.

Our Country is water, air, fire, trees, life.

Our Country is thought, language, heart, soul, blood.

Our Country is our Children, our youth, our Elders, our men and women, our Ancestors, our spirit.

Our Country is Maar, Maar is Country.

We bring to the light our songs, our stories, our vision, our love.

We bring these things to the light so All can know Country.

To care for Country. To think about Country. To love Country. To protect Country.

We invite all that choose to live on or visit our Country to slow down. To tread softly and listen to Country speak.

If you love Country, Country will love you.

Photo courtesy of Eastern Maar

The **Eastern Maar** are Traditional Owners in south-western Victoria. Our land extends as far north as Ararat and encompasses the Warrnambool, Port Fairy and Great Ocean Road areas. It also stretches 100m out to sea from low tide (see map 1 below).

Eastern Maar is a name adopted by the people who identify as Maar, Eastern Gunditjmara, Tjap Wurrung, Peek Whurrong, Kirrae Whurrung, Kuurn Kopan Noot and/or Yarro waetch (Tooram Tribe) amongst others, who are Aboriginal people and who are:

- descendants, including by adoption, of the identified ancestors

- who are members of families who have an association with the former Framlingham Aboriginal Mission Station
- who are recognised by other members of the Eastern Maar People as members of the group.

Eastern Maar Aboriginal Corporation (EMAC) is the professional organisation that represents the Eastern Maar People of South West Victoria and manages their Native Title rights and interests. EMAC has a board of directors of Traditional Owners and is a registered organisation under the Corporations (Aboriginal and Torres Strait Islander) Act 2006. (EMAC Website)

EMAC is governed by a 12 member Board – each member represents a defined family grouping which is linked to a referenced ancestor who occupied territory at the time of European settlement. Up to 60% of its 12-member board is represented by proud Eastern Maar women, some of whom are senior Elders and applicants to EMAC's Native Title claim. EMAC operates as a society that has a unique decision-making structure – one which is committed to collectivism and inclusion, and which values common goals over individual pursuits.

The contemporary Eastern Maar nation traces an unbroken line of descent back to our ancestors over many thousands of years. We have survived as our Country's First People and, despite the well documented colonial history, continue to maintain economic, traditional, cultural, familial and spiritual ties to our homeland. Through the leadership and authority of our Elders, we are practising our laws and customs, strengthening our system of governance and nurturing our connection to Country.

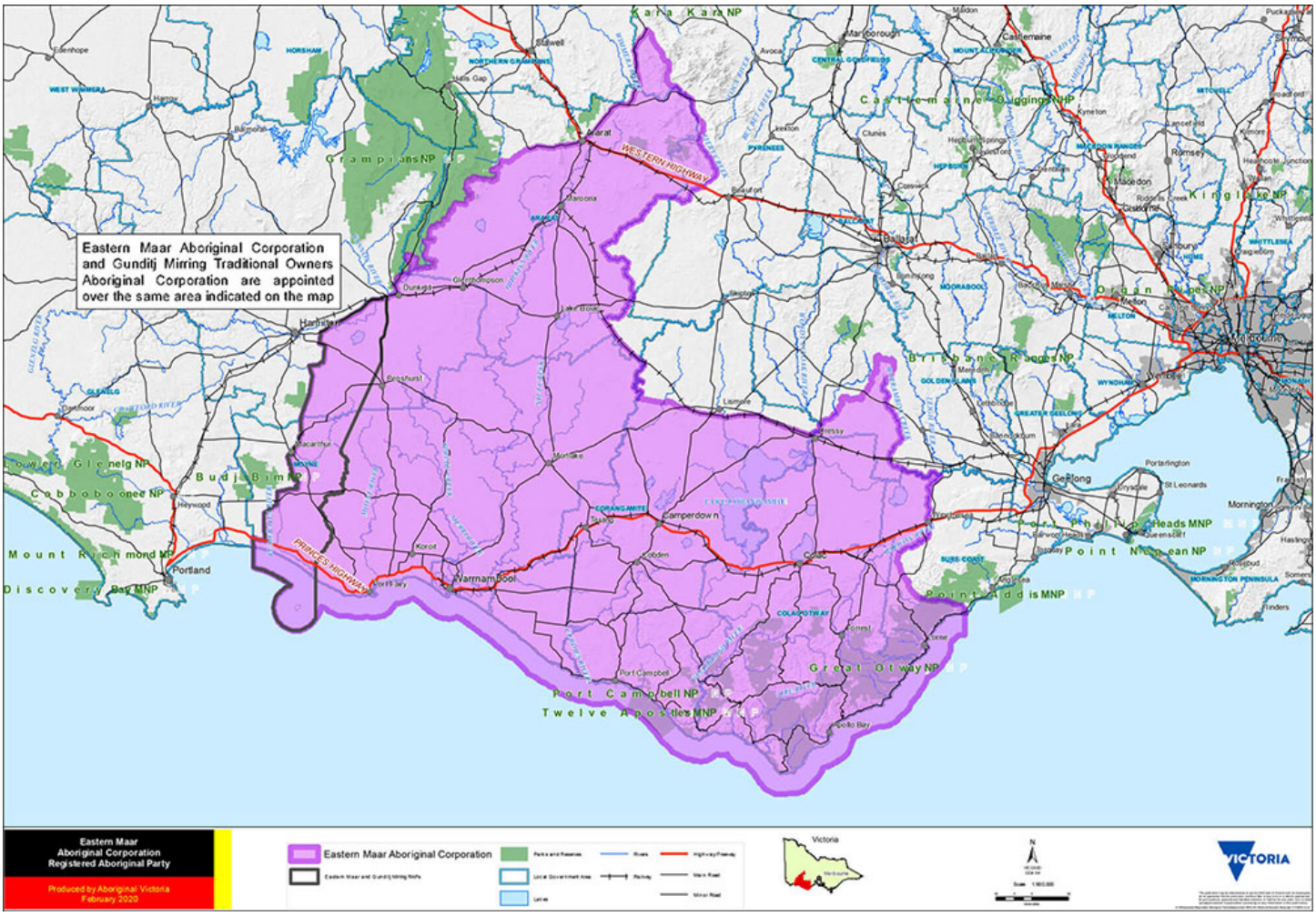
We continue to pass on our traditional knowledge from generation to generation, inducting our young people into Maar society as a cultural practice initiated by our Ancestors. It is a process that keeps customs and stories alive and ensures we are able to maintain Maar culture, language and society. Drawing strength from our identity and past, we are able to live our culture as a set of attitudes, customs, and beliefs; helping us to be resilient and adaptable in changing circumstances.

We are the eastern landholding group of a larger Aboriginal nation – the Maar Nation. The western landholding group of this Maar nation are the Gunditjmara, with whom we share the lands and waters between the Eumeralla and Shaw Rivers. The Country to the east of the Shaw River to the Leigh and the Barwon catchment basins, and the area from the sea in the south to the Great Dividing Range in the north belongs to Eastern Maar.

Before the arrival of Europeans, with their diseases and ambition to take over our Country, there were over 200 clan groups belonging to the Maar nation. This number diminished quickly to just a fraction of the original population, with small groups coalescing into larger ones, and yet larger ones still until there were only two Maar landholding groups left, each covering a large area of land and water.

In accordance with our law and custom, clans that became incapacitated were superseded by others who remained strong, handing on their sanctioned place in the landscape and responsibilities for looking after the clan estate. This process ensured that the cultural values and practices of Maar citizens remained intact.

Today some of our citizens continue to identify with the respective Maar clan groups of their ancestors, including Peek Whurrong, Chap Whurrong (Tjap Wurrung or Djab Wurrung), Kirrae Whurrong, Kuurn Kopan Noot and Yarro Waetch (Tooram Tribe). Other citizens comfortably identify as part of the broader Eastern Maar group without identifying with a particular clan. (From *Eastern Maar Country Plan: Meerreengeeye ngakeepoorryeey,* p6.*)*



Eastern Maar Country

The Creation story of Warrion, the bandicoot, is centered around Mount Warrion and its lava flow. The story tells of how Warrion's ancestor, a megafauna predecessor of the modern-day bandicoot, created the many small water holes East and South of Warrion hill by using his tail as a club. Warrion did this in order to change the direction of water flow away from Koorrang Koorrang, a saline lake to the west of Mount Warrion, toward Lake Colac. Koorrang Koorrang (Lake Corangamite), is Koorrang Meerreeng (Snake Country), and if too much water flows into the lake the sleeping woman will wake, flooding all the surrounding lands with her tears.

The story above is an example of a rich Maar cultural mosaic landscape that is now part of south west Victoria. *Pang-ngooteekeeya weeng malangeepa ngeeye* is a project that will examine and reintroduce the cultural land and water management practices of the Maar nation. It will use the creation stories such as the one above to inform EMAC of the management objectives of each Country and how to implement them. ("*Pang-ngooteekeeya weeng malangeepa ngeeye,* Remembering our Future – Bringing old ideas to the new" project plan; 2020)

Meerreengeyye ngakeepoorryeeyt (Country Plan)

For Aboriginal people, Country is more than the land, water and air, the plants and animals. It's more than just what we can see – it's our spirituality, our Ancestors and our connection. It is the way we feel, the way we live and the connection that holds and defines us. When the health of our Country declines, so does the health of our citizens – we are all inextricably linked.

We have had responsibility for caring for our Country for thousands of years. We have never simply taken from our Country without understanding the natural systems and managing them so that they stay healthy and keep providing for us. But that responsibility has been taken away. Much of our land is now farmland that we are not allowed to access, and the natural resources have been degraded. Rivers have been diverted creating saline lakes that no longer support the wildlife that was once there. The extensive land clearing has removed habitat for many of the animals that we relied on. Even sites with international obligations are not being managed properly and we are worried that our Country cannot take much more.

Through Meerreengeyye ngakeepoorryeeyt – our Country Plan – we have defined our vision for the future. To help us on the path to achieving our vision, we have identified six goals that will form the focus of our efforts. For each of our goals, we have a number of objectives that we will work towards – as individuals, as a nation and in partnership with others. These goals are underpinned by the law of the land, our oral authority that dictates how we live and behave, who we interact with and how we will always care for our Country.

Major threats and drivers of change

Climate Change, rising sea levels, coastal erosion, dune erosion.

Threats to Cultural Heritage. Strategically select sites to protect. EMAC conduct their own excavations and research at sites at risk. Direct learning opportunity – history plus techniques.

“Biggest threat to our Country is whitefellas. Not the people but the culture.”

Lack of capacity is EMAC’s biggest current challenge.

Desired outcomes for the future

One of the biggest challenges to collaborative land management is the way different parts of society define conservation. We see ourselves as part of the landscape and our philosophy is based fundamentally on sustainable use, which can include resource extraction and utilisation under the right circumstances. We need others to understand and respect this if we are to work together to ensure Country becomes healthy and productive into the future.

The RCS should lay the ground for change, plant the seed for changes that are coming. Articulate that change through the whole document, not just one part.

Community

20 year desired outcome:

By 2042, Integrated catchment management supports Traditional Owner self-determination

6 year outcomes:

EMAC1 By 2027, Traditional Owners rights, interests, obligations and access to Country and water, including cultural flows, are acknowledged and protected.

EMAC2 By 2027, Traditional Owner groups are decision makers and provide strategic leadership in Integrated Catchment Management.

EMAC3 By 2027, the social wellbeing of Traditional Owner communities increases as a result of involvement in Integrated Catchment Management.

EMAC4 By 2027, the economic benefit for Traditional Owner communities increases as a result of involvement in Integrated Catchment Management.

EMAC5 By 2027, there is an increased connection between agencies, authorities and community groups and Traditional Owner communities to raise awareness and understanding of cultural landscapes management.

Water

20 year desired outcome:

Rivers:

By 2042, Traditional Owner communities are decision makers and provide strategic leadership for river Country.

Wetlands:

By 2042, the function and resilience of wetlands is maintained or improved.

6 year outcomes:

Rivers:

EMAC6 By 2027, Traditional Owners rights, interests, obligations and access to water, including cultural flows, are acknowledged and protected.

EMAC7 By 2027, Traditional Owner communities have the capacity, knowledge and authority to look after river Country including cultural flows.

Wetlands:

EMAC8 By 2027, Traditional Owner communities have the capacity, knowledge and authority to look after wetlands and their restoration including cultural flows.

Coast and Marine

20 year desired outcome:

Traditional Owner communities are decision makers and provide strategic leadership for sea Country.

6 year outcomes:

EMAC9 By 2027, Traditional Owners rights, interests, obligations and access to the marine and coast environment, including water and cultural flows, are acknowledged and protected.

EMAC10 By 2027, Traditional Owner communities have the capacity, knowledge and authority to look after sea Country.

EMAC11 By 2027, there is increased understanding and protection of at risk Aboriginal cultural values and heritage sites along the coastline.

Biodiversity

20 year desired outcomes:

Native Vegetation:

By 2042, the condition, function and resilience of native ecosystems will be maintained or improved.

Threatened Species:

By 2042, the health of key populations of threatened species and communities is maintained or improved.

6 year outcomes

Native Vegetation:

EMAC12 By 2027, Traditional Owner communities have the capacity, knowledge and authority to look after their understanding of native habitats, including culturally significant species, and groundwater dependent systems.

Threatened Species:

EMAC13 By 2027, Traditional Owner communities have the capacity, knowledge and authority to look after their understanding of threatened native species, including culturally significant species, and groundwater dependent species and communities.

Land

Land Use

20 year desired outcome:

By 2042, land managers are supported to manage land and water within its capability

6 year outcome:

EMAC14 By 2027, there is increased understanding and protection of Aboriginal cultural values and heritage across the landscape and throughout the communities.

Sustainable Primary Production

20 year desired outcome:

By 2042, there is an increase in the capacity of land managers and agriculture systems to adapt to significant changes in climate and market demands.

6 year outcome

EMAC15 By 2027, Traditional Owners lead the regional development of the native food and botanical industry.

Date printed: 29 July 2024
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CORANGAMITE CMA

VICTORIA State Government

Wadawurrung

KIM-BARNE WADAWURRUNG TABAYL

(Welcome to Wadawurrung Country)

We acknowledge our Ancestors and our Elders past and present.

We acknowledge that our Ancestors nurtured and cared for Wadawurrung Country for tens of thousands of years.

We acknowledge the hardships, the horror and the harm that they suffered following colonisation and the devastating impacts of that, which are still evident and felt today.

The fact that Wadawurrung People and Culture have managed to survive and thrive demonstrates enormous strength, resilience and adaptability.

Wadawurrung People are determined to see their unique cultural heritage protected and respected. Wadawurrung aims to restore Traditional knowledge and authority over the management of Wadawurrung Country for the betterment of those living on, prospering from and/or simply enjoying its land, waterways and coastal areas.

Wadawurrung people are the Traditional Owners of this land (see map below). Our family have looked after and cared for this country for over a thousand generations, and are still caring for it to this very day.

The Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) is the Registered Aboriginal Party (RAP) for Wadawurrung country, with statutory authority for the management of Aboriginal heritage values and culture, under the Victorian Aboriginal Heritage Act, 2006.

In support of our above responsibilities, we provide a wide variety of services to organisations, assisting them in compliance with the aforementioned Act. We provide field representatives to assist with the discovery and repatriation of cultural heritage artefacts and ancestral remains. Our induction programs help to acquaint individuals and organisations with our heritage.

The Wadawurrung people

Wadawurrung Country stretches from the Great Dividing Range of Ballarat, to the coast from the Werribee River to Aireys Inlet, including Geelong, the Bellarine Peninsula and Surf Coast

We acknowledge that our ancestors nurtured and cared for Wadawurrung Country for tens of thousands of years. Wadawurrung People are determined to see their unique cultural heritage protected and respected.

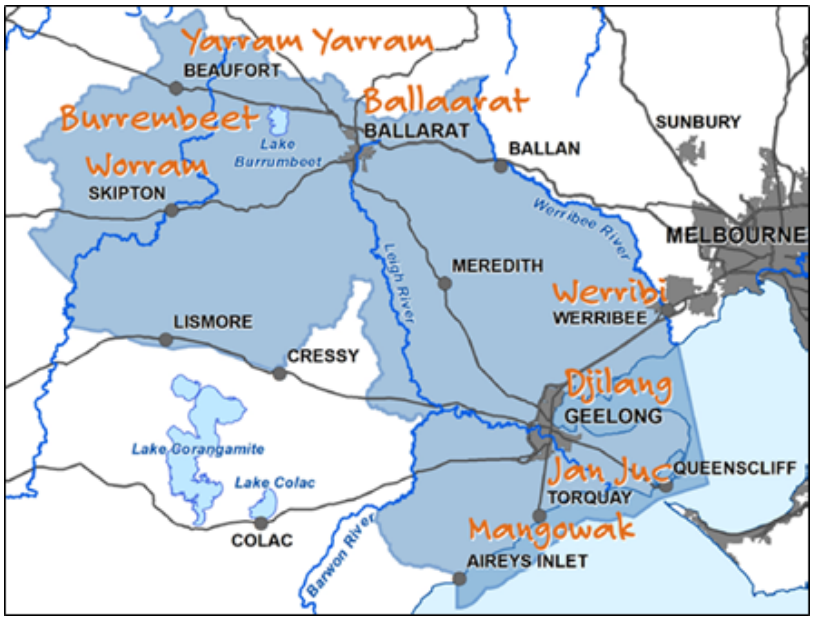
The Wadawurrung vision **is Wunggurrwil gupma bengadak Wadawurrung wurring-wurring baap dja** (All people working together to make Wadawurrung Country and Culture strong.)

Wadawurrung aims to restore Traditional knowledge and authority over the management of Wadawurrung Country for the betterment of those living on, prospering from and/or simply enjoying its land, waterways and coastal areas.

Wadawurrung Traditional Owners Aboriginal Corporation is the representative body for Wadawurrung Traditional Owners. The Corporation works to support their aspirations and protect Aboriginal Cultural Heritage in accordance with the Victorian Aboriginal Heritage Act 2006.

Wadawurrung Traditional Owners Aboriginal Corporation was appointed in May 2009 as a Registered Aboriginal Party under the Victorian Aboriginal Heritage Act 2006.

Wadawurrung's RAP area covers over 10,000 square kilometres on the western side Melbourne and including the major regional cities of Geelong and Ballarat. This area incorporates the activities of 11 separate local councils – including many that are experiencing very high rates of growth in terms of population, infrastructure, commercial and residential development. Wadawurrung Country also incorporates the start of the Great Ocean Road, one of Australia's most iconic and popular tourist destinations.



Paleert Tjaara Dja (Healthy Country Plan)

The Wadawurrung Healthy Country Plan has the vision of *All people working together to make Wadawurrung Country and Culture strong.*

Principles

Wadawurrung are a proud first nations people committed to working with our members, neighbours, government agencies, land and water managers and the broader community as we protect and heal Country together for all people.
Paleert Tjaara Dja – Let's make Country good together 2020-2030 – Wadawurrung Country Plan invites a respectful working, learning and committed sharing together approach based on cultural knowledge and practices.
The principles that guide our partnerships in Caring for Country are:

1. Respect and Acknowledgement for Wadawurrung Traditional Owners and our cultural, ancestral, spiritual and historical connections to Country.
2. Wadawurrung people's right to access and care for Country as an expression of our cultural obligation, responsibilities, connectedness, our well-being and as our economic basis.
3. Country is interconnected, alive with dreaming and creation stories, imprinted with our cultural values and social history – there is no separation between cultural and natural resources and people.
4. Free, prior and informed consent requires genuine engagement from the beginning of decision-making or project planning in a way that is relevant to us, providing timely information and processes that support cultural governance.

5. We seek partnerships that are genuine, are of benefit to Wadawurrung people, are in the spirit of reconciliation, that address past negative impacts and enable self-determination and real outcomes.
6. Providing appropriate and equitable resourcing for Wadawurrung people to participate in their obligation of care and management of Country.
7. Open and honest relationships that sustain effective working partnerships.
8. Wadawurrung Traditional Owners are the holders of cultural knowledge.
9. Respect for and appropriate protection of our intellectual and cultural property rights in sharing information.

The Healthy Country Plan can be viewed in its entirety by clicking here

A summary version is also available

There is also Healthy Country Plan video

Major threats and drivers of change

Water

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The upper Barwon/Moorabool, Yarowee and Leigh rivers or Barre Warre Yulluk catchment (including 94 tributaries) covers 5,380 km^2. These rivers provide the majority of the drinking water for Geelong and Ballarat. Water is extracted from rivers and underground aquifers to supply town water, farming and industry. To hold water in sections for use there are many weirs and barriers placed into our waterways.

This results in less water going into our rivers, wetlands and estuaries, affecting the water flows and availability. This harms our plants, animals, their homes, the nurseries for species such as wetland birds, fish and shellfish. This also affects their ability to feed, breed and impacts our cultural values and stories.

Biodiversity

Many types of plants found on Country are non-indigenous species that have come from other places. Some do very well and become weeds spreading rapidly, causing harm and stopping our native plants from thriving.

This can also include the many plantations like pine plantations in our inland country. Once these weeds start to grow, they can be spread by wind, water, by attachment to animals, humans and machinery, inclusion in mud, soil, fodder and mulch, ingestion as a food source or intentionally by humans.

When we take fire out of the landscape over time, we see thicker forested areas and dry sclerophyll matter build up over time. This creates higher intensity bushfires and very little stands a chance to survive. Wadawurrung want to reduce that risk, keep our people safe and eliminate the damage to culturally significant places, native plants and animals.

Rabbits establish warrens where suitable soil conditions allow and quickly establish breeding populations. They cause loss of plant cover and soil erosion through eating native plants and digging burrows. They can stop native plants from growing back after a fire because they eat all the seedlings.

Foxes and cats are pest predators that kill our native mammals like boo (bandicoot), spotted-tailed yoorn (quoll), birds like orange-bellied parrot and reptiles. Foxes and cats have contributed to some native species becoming extinct on Wadawurrung Country.

Land

Much of our Country has been substantially modified by urban development, particularly in those areas centred on Geelong and Ballarat. Our country is experiencing the largest urban growth corridor in Victoria.

The G21 Regional Growth Plan predicts that the population of this region will increase from its current 294,000 people to 433,000 by 2041.

The Central Highlands Regional Growth Plan predicts that the population of the Central Highlands region will increase from its current 169,300 people to 247,500 by 2041.

As the population grows there will be greater pressure to develop more land for housing, commercial and industrial purposes

Coast and Marine

Sea surface temperature is projected to increase in the range of 1.6 to 3.4 °C by 2090 under high carbon emissions. This poses a significant threat to the marine environment through biological changes in marine species, including local abundance, community structure and enhanced coral bleaching risk. The sea will also become more acidic proportional to emissions growth.

Sea level rises due to climate change will lead to inundation of coastal areas and loss of cultural sites. By 2030 the projected range of sea-level rise for the region's coastline is 0.08 to 0.18 m above the 1986 – 2005 level, with only minor differences between emission scenarios. Under certain circumstances, sea level rises higher than these may occur.

Community

The Wadawurrung today are the seven family groups, the descendants of John Robinson our apical ancestor, numbering approximately 600 people. John was the son of Wadawurrung Elder, Canobeen – Queen Mary of Ballarat (or Borriyallock) and John spent much of his time in the 1800s on the Terrinallum, Booriyallock, Mt. Emu and stations near Skipton in the north-west of Wadawurrung Country with his parents and people.

A key driver for the Wadawurrung community is the – Let's make country good together 2020-2030 – Paleert Tjaara Dja – Wadawurrung Country Plan. It is our collective dream and direction for the future of our people and Country. It tells the story of what is important to us, and what we need to do about it. It will be a guide for building upon our cultural heritage management work and progressing our broader Caring for Country aspirations.

Many land managers do not recognise Wadawurrung people as the Traditional Owners and custodians of Wadawurrung Country. We are often excluded from decisions making processes regarding what happens on Country. There is lack of education around the Aboriginal Cultural Heritage Act and our role as the legally recognised corporation to work with in protecting cultural heritage.

This is disempowering and not best for Country. By recognising us as the traditional owners and working with us to take care of Country we will all benefit. We will continue to seek formal recognition through all means available.

It is our cultural obligation to look after Wadawurrung Dja but there are only a few people who have jobs taking care of Country. To be able to work with the many land managers on Wadawurrung Country we need support for more Wadawurrung people to build the wide range of skills needed to be able to combine both current natural resource management techniques with traditional knowledge and practices.

Desired outcomes for the future

Water

Taken from Healthy Country Plan

WTOAC1: By 2030, there is enough water in the waterways of our main river systems Barwon/Moorabool, and Leigh rivers that flows through the system, without barriers and is clean enough to drink.

Biodiversity

Taken from Healthy Country Plan

WTOAC2: By 2030, the current extent of volcanic grass lands and woodlands is increased by 5%.

WTOAC3: By 2030, no more of our native animals have become threatened.

WTOAC4: By 2035, at least one threatened species is no longer threatened.

Land

WTOAC5: By 2030, 60% of Wadawurrung people who want to work on Country have jobs or businesses.

Coast and Marine

Taken from Healthy Country Plan

WTOAC6: By 2029, native vegetation extent remains or increases and cultural places are protected.

WTOAC7: By 2030, the sea life in species, the seaweed and water quality remains at 2020 numbers and levels.

Community

Wurrgurrwilwa gupma bengadak Wadawurrung wurring-wurring baap dja – All people working together to make Wadawurrung Country and Culture strong is the shared Vision of the Wadawurrung people.

A key driver for the Wadawurrung community is the – Let's make country good together 2020-2030 – Paleert Tjaara Dja – Wadawurrung Country Plan. It is our collective dream and direction for the future of our people and Country.

The plan will also help us strengthen our people's cultural knowledge and education to be able to develop our land and sea management program, pursuing purchases, access and co-management arrangements for Country. This can provide our people and future generations a foundation for protecting our culture and Country and have culturally appropriate social, cultural and economic development opportunities.

We are already providing some opportunities for Wadawurrung families to learn language and culture. We will provide dedicated ongoing opportunities year-round so that all Wadawurrung People can be on Country to share and learn and strengthen our cultural identity and family connections. Healing and building our Wadawurrung nation so we can continue to care for Country and share our rich culture with the broader public.

To provide connection to cultural knowledge and better understanding of Country in residents, visitors and lands managers. We will provide a safe place for our young people to learn and practice culture, so they can stand strong, proud and lead with this cultural knowledge.

WTOAC8: By 2025 70% of Wadawurrung Traditional Owners have strong cultural connection and knowledge, we are practicing culture and speaking language.

WTOAC9: By 2029 Wadawurrung people are involved in the management of all known cultural sites and places.

WTOAC10: By 2030, 60% of Wadawurrung people who want to work on Country have jobs or businesses.

WTOAC11: By 2030, there is enough of Wadawurrung People's favourite bush tucker.

WTOAC12: By 2021 we have established an ongoing cultural strengthening program for Wadawurrung people.

WTOAC13: By 2030 our younger generations are leading cultural practices.

Priority directions

9 areas

1. Respect and Acknowledgement for Wadawurrung Traditional Owners and our cultural, ancestral, spiritual and historical connections to Country.
2. Wadawurrung people's right to access and care for Country as an expression of our cultural obligation, responsibilities, connectedness, our well-being and as our economic basis.
3. Country is interconnected, alive with dreaming and creation stories, imprinted with our cultural values and social history – there is no separation between cultural and natural resources and people.
4. Free, prior and informed consent requires genuine engagement from the beginning of decision-making or project planning in a way that is relevant to us, providing timely information and processes that support cultural governance.
5. We seek partnerships that are genuine, are of benefit to Wadawurrung people, are in the spirit of reconciliation, that address past negative impacts and enable self-determination and real outcomes.
6. Providing appropriate and equitable resourcing for Wadawurrung people to participate in their obligation of care and management of Country.
7. Open and honest relationships that sustain effective working partnerships.
8. Wadawurrung Traditional Owners are the holders of cultural knowledge.
9. Respect for and appropriate protection of our intellectual and cultural property rights in sharing information.

Date printed: 29 July 2024
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Traditional Owners

Traditional Owner Partnerships

The Corangamite Catchment Management Authority is committed to building and strengthening our partnership with Traditional Owners. We are committed to engaging and working with Traditional Owners to manage and improve the health of lands and waters and to embrace cultural ways of Caring for Country and working together to support increased participation and engagement in Natural Resource Management. Waterways within the Corangamite region are living and integrated natural entities and the Traditional Owners, both Wadawurrung and Eastern Maar are the voice of these living entities.

The Corangamite CMA has worked with the Traditional Owner Groups to align the outcomes and priority directions in this Regional Catchment Strategy with the aspirations and priorities identified in their respective Country Plans. The outcomes below have been developed in partnership with the Traditional Owner group, and the content on their specific pages has been drafted by the individual Traditional Owner groups.

Eastern Maar Aboriginal Corporation

Eastern Maar
Aboriginal Corporation

Click on this link to access the Eastern Maar page

The following goals have been been developed as part of the engagement process with Eastern Maar and are not specifically captured in their current Country Plan. All parties involved in the implementation of the Corangamite Regional Catchment Strategy will work with traditional owners and strive to contribute to achieving these goals. When the Eastern Maar Country Plan is renewed these will need to be re-visited.

20 year desired outcome:

By 2042, integrated catchment management supports Traditional Owner self-determination.

6 year outcomes:

The social wellbeing of Traditional Owner communities increases as a result of involvement in Integrated Catchment Management.

The economic benefit for Traditional Owner communities increases as a result of involvement in Integrated Catchment Management.

Traditional Owner groups are decision makers and provide strategic leadership.

There is an increased connection of agencies, authorities and community groups with Traditional Owner Groups to build awareness and understanding of cultural landscape management.

Click on this link to access the Wadawurrung page

The following goals have been taken from the Wadawurrung Healthy Country Plan and align to the timelines of that plan. All parties involved in the implementation of the Corangamite Regional Catchment Strategy will work with Traditional Owners and strive to contribute to them achieving these goals.

By 2025 70% of Wadawurrung Traditional Owners have strong cultural connection and knowledge, we are practising culture and speaking language.

By 2029 Wadawurrung people are involved in the management of all known cultural sites and places.

By 2030, 60% of Wadawurrung people who want to work on Country have jobs or businesses.

By 2030, there is enough of Wadawurrung People's favourite bush tucker.

By 2021 we have established an ongoing cultural strengthening program for Wadawurrung people.

By 2030 our younger generations are leading cultural practices.

Date printed: 29 July 2024

Regional Communities

Overview

Community participation in the management of the Corangamite region is long-standing and substantial and constitutes a major investment in the conservation of our natural resources. Those involved with managing the land and water resources of the region play a key role in maintaining the natural resources that occur here. Private land managers invest a lot of money and resources into the land they manage and play a key role in the delivery of the integrated catchment management outcomes that are identified in this document. They are the stewards of the landscape.

Many private landholders have made, and will continue to make, substantial investments in natural resource management on their land. Without this private investment – sometimes supported by government, corporate or philanthropic sector investment – very little would have been achieved, and little will be achieved in the future without this.

The protection or restoration of natural resources on private land often requires individual landholders to voluntarily provide cash or in-kind resources, and to set aside land or water from their agricultural business to create an environmental benefit for the region, the state, and in some cases, the nation. Although protection of natural resources on private land is sometimes supported by government incentives, the full cost of such stewardship is often borne by the private landholder; even when government incentives or support is applied, the private landholder contribution often far exceeds government assistance.

Volunteers also give up their time and provide resources into ensuring the health of the catchment. Community groups and their volunteers are often the link between natural resource management on private and public land. Many groups are very active and make a significant contribution to the protection of natural resources on public and private land and should continue to be encouraged and supported.

Those directly responsible for the management of land and water can be influenced by and partner with a range of other stakeholders in the delivery of on-ground outcomes.

There are many reasons why the Corangamite Catchment Management Authority and other agencies engage with the community in natural resource management (NRM). These objectives extend beyond implementation of best-practice NRM and include: gathering local knowledge to inform priority setting and program implementation; building the capacity of the community to respond to future threats to environmental assets; establishing a constituency to support investment in NRM; and establishing relationships that demonstrate trustworthiness and build trust in the organization.

Assessment of current condition and trends

There are 152 natural resource management groups across the region with a voluntary membership of over 4,000 people. These groups are mature, with strong community ownership and a demonstrated capacity to initiate, plan, resource and carry out on-ground works in natural resource management at a considerable scale. Surveys indicate that landholders who participate and become involved in groups – such as Landcare or environmental groups – have greater knowledge of natural resource management and this leads to improved land and water management activities.

Community groups and their volunteers are often the link between natural resource management on private and public land. The Corangamite region has one of the best ‘care’ networks in Victoria. Many groups are very active and make a significant contribution to the protection of natural resources on public and private land and should continue to be encouraged and supported. Just as Landcare primarily invests in conservation outcomes on private property, environment groups, ‘friends’ groups, and some Landcare groups also invest in conservation outcomes on public land.

Major threats and drivers of change

Changing land use can have a major impact on rural communities, this is especially the case where properties are purchased by absentee owners, large corporations or are absorbed into adjoining holdings. Such changes have an impact on local populations and subsequently the community. The fabric of the local community being fractured in such ways can have an impact on organisations such as Landcare and environmental groups and their capability, capacity and functionality.

Changing demographics within communities can also have a major impact with populations moving for "tree change" reasons or as mentioned above the purchasing of properties by absentees. In the rural landscape, the age of most full-time farmers is gradually getting older. A reluctance by younger people to inherit or take over the operation often leads to the property being sold upon retirement and in many cases being absorbed into adjoining holdings. An ageing demographic can also impact on the landholder's ability to manage the land in a sustainable manner or implement the management decisions needed.

Increases in the extent of peri-urban areas (from agricultural land to rural living and new community members), especially within the proximity of major centres such as Geelong and Ballarat, sees many of the issues described above occurring. Larger properties that were previously managed by full-time farmers are split up into smaller holding owned by "hobby farmers" or absentees. This leads to more intensive use of the land which can have adverse effects both on and off site. It also changes the nature of the community and how it functions.

Within the region there are varying levels of community awareness, attitudes to, and knowledge of natural resource management, including climate change. This can be reflected by the demographics of the area, profitability of enterprises and a change in the provision of free services from agencies including the Corangamite CMA. Such lack of knowledge can impact on not only the natural resources of an area, but also the community fabric.

Land prices have also been a major driver of change especially in those areas to the east of the region and in proximity to the coast. The cost of purchasing properties within these areas often makes it prohibitive to continue as agricultural enterprises, leading to the breaking up of these properties into smaller units. This is one of the principal reasons for the Victorian Government to initiate programs around Distinctive Areas and Landscapes (DALs) and Strategic Agricultural Land programs.

Date printed: 29 July 2024

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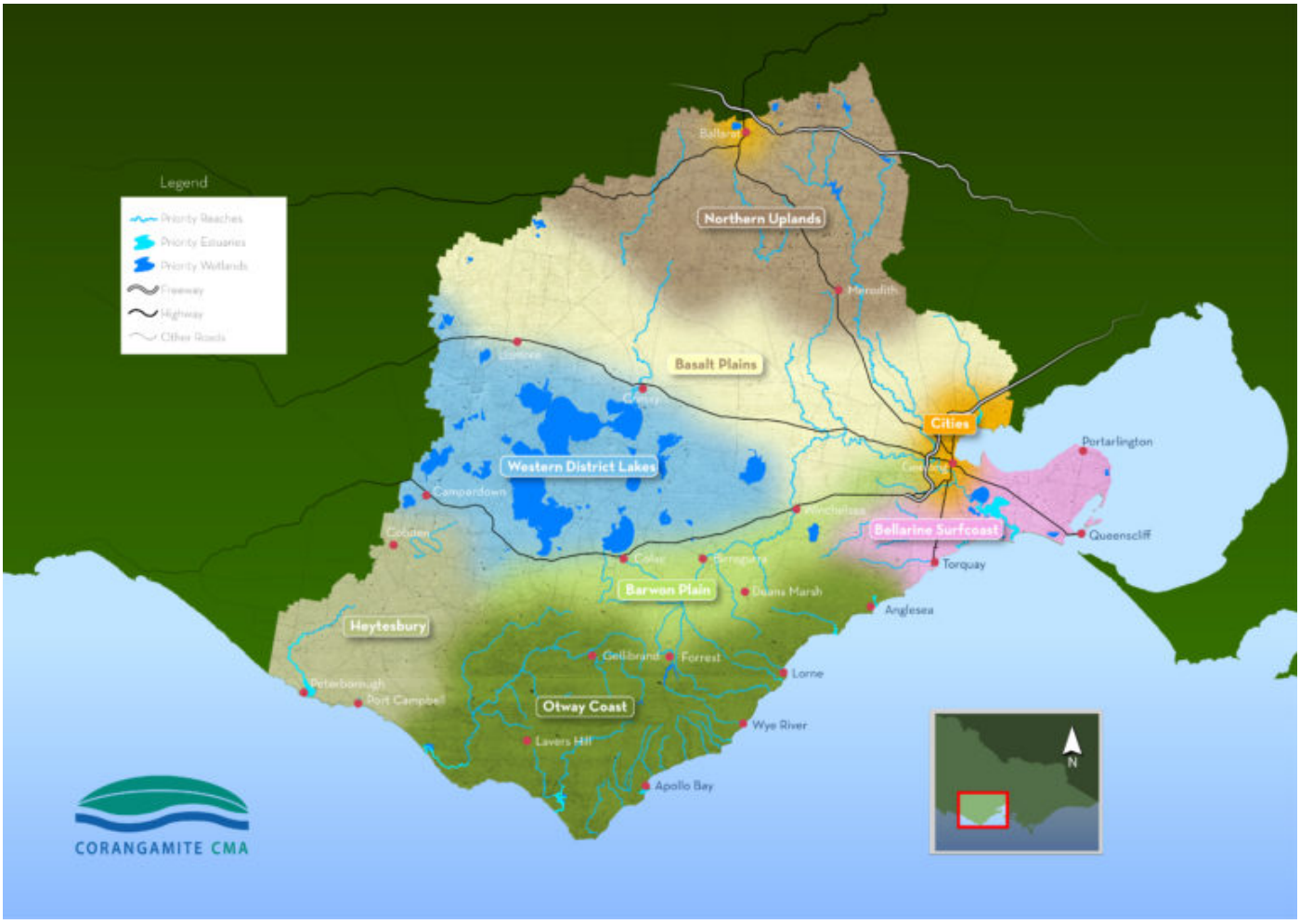
Local Areas

Landscape Systems

The Corangamite region is a large and diverse area ranging from Ballarat in the north to Geelong in the east to Camperdown in the west. The diversity of the landscapes, land use, climate and people across this area requires different management approaches to cope with this diversity.

Within these local areas consideration of important matters such as planning; land use change; landscape values; climate change; sustainable agriculture; water and land use planning; resilient and livable cities and towns; recreational use; demographic changes and so on need to be considered and where necessary, addressed.

To meet the needs of this diversity, nine sub-regional areas (landscape systems) have been identified and will provide the basis of localised, integrated action. A map of the Corangamite region's Landscape Systems and links to all nine systems are provided below.



Corangamite Landscape Systems

Corangamite Landscape Systems

Ballarat City

Barwon Plain

Basalt Plains

Bellarine and Surf Coast

Geelong City

Heytesbury

Northern Uplands

Otway Coast

Western District Lakes

An overview of the the various Landscape Systems and how they have been developed can be viewed by clicking here.

As outlined on the Home page, the Regional Catchment Strategy provides the framework for integrated management of the region's natural resources. The Strategy itself does not include specific actions, but provides the basis for the development of on-ground actions that are guided by the Priority Directions for each landscape system. Landscape system based programs that involve all relevant partners and stakeholders provide the basis for on-ground coordinated projects that deliver the six year (life of strategy) outcomes and contribute to its longer term (20 year) aspirational outcomes. The process for implementing these is provided below.

Landscape System Implementation Planning

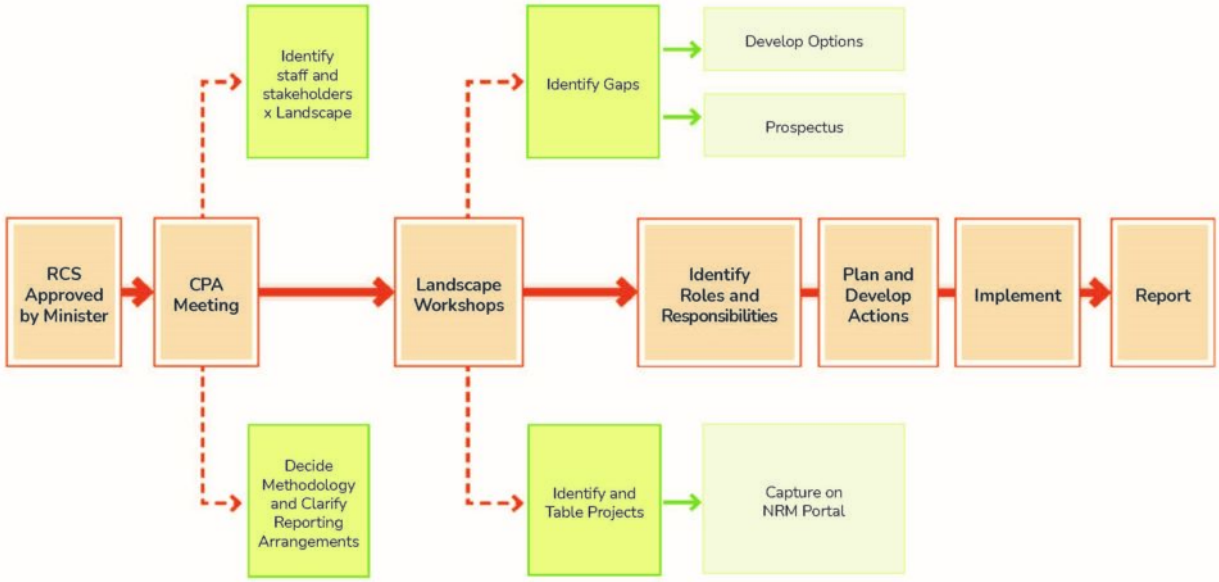
Landscape System based implementation plans will provide the basis of implementing the RCS up until the end of 2027. These plans will identify the actions that will deliver Regional Priority Directions that contribute to the delivery of the six year Outcomes for each theme. The priority directions for each landscape system have been developed through the following process:

- State-wide policy outcomes under the themes of Water, Biodiversity, Land, Coast & Marine and Communities provide the basis for Regional Outcomes.
- Regional Outcomes are both aspirational (20 year) and shorter term (6 year) with the six year outcomes contributing to the delivery of the 20 year outcomes. The six year outcomes are those that should be achieved across the life of this strategy.

- The six year outcomes for each of the five themes provide the basis for six year outcomes for each of the landscape systems. These provide the basis for the development of regional theme-based Priority Directions.
- Additional six year outcomes for each theme within each landscape system have been identified through community engagement.
- Priority Directions for landscape systems have been created by identifying all the relevant theme-based priority directions relevant to that landscape system and then consolidating them into a list of overall priority directions for that area.

Each of the priority directions has an identified lead and key collaborators who will contribute to the delivery of that particular priority direction through either direct action or by in-kind support. Other stakeholders will also contribute but will be captured under the relevant collaborator.

The process for implementation is outlined in the following diagram:



Delivery of on-ground actions will be reliant on appropriate resourcing; a key component of this process will be to identify available resources and any gaps. For this process to work, existing resourcing will need to be identified and captured spatially, with the preferred location for this being the NRM Portal. The NRM Portal provides details of past projects that have been delivered and can also be used to capture existing projects and project proposals.

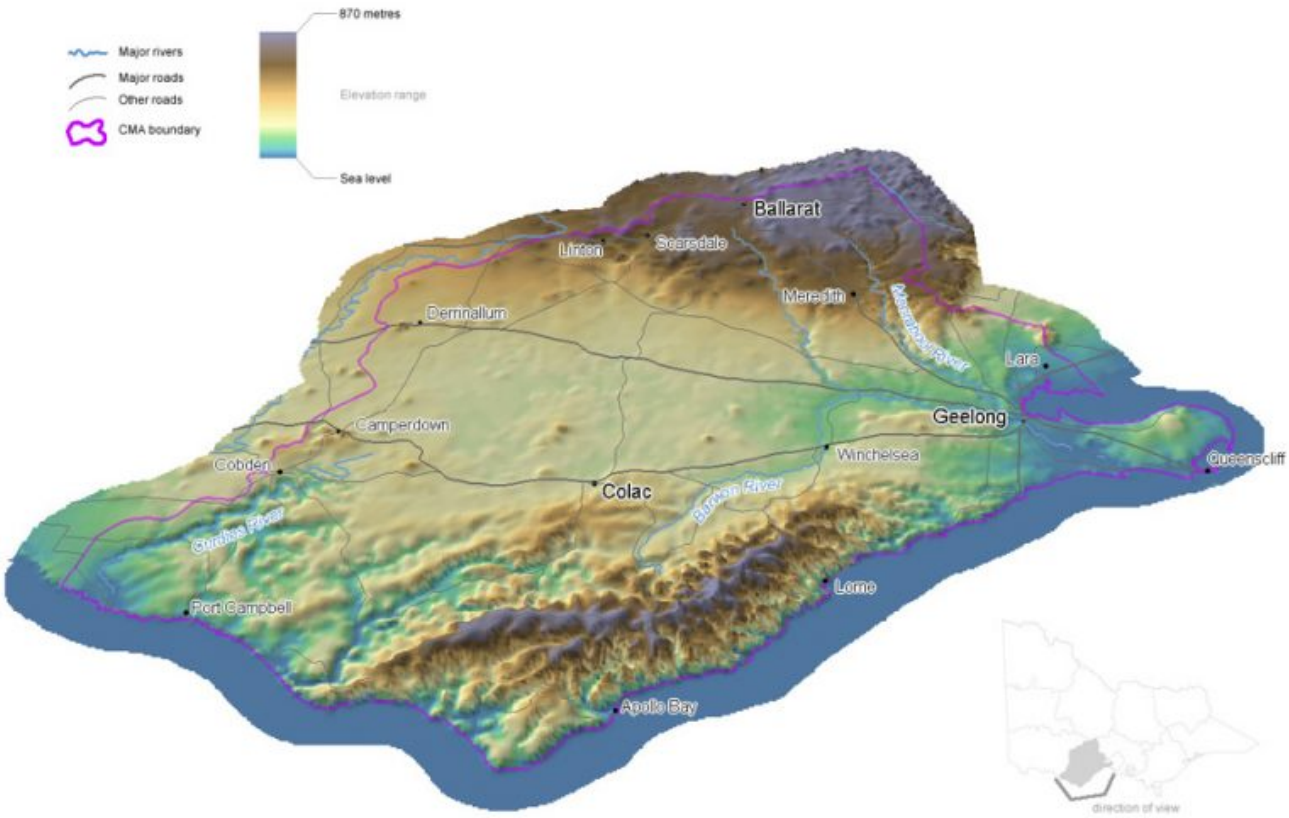
The capture of current projects on the NRM Portal will allow project delivery as well as appropriate monitoring, evaluation and reporting of projects. The ability to capture project proposals also enables the linking of these to the RCS Prospectus section for prospective investors to view.

Summary of local areas

The Regional Catchment Strategy Guidelines produced by the Victorian Catchment Management Council require that "each RCS will define a set of landscape priority areas that cover the whole region". Three to 10 areas were discussed as an appropriate range and would reflect integration and partnerships, cutting across the many themes (land, water, biodiversity, community and coast and marine) involved in integrated catchment management. The landscape priority areas will be described by each CMA to reflect their local communities' priorities and partnerships.

The Corangamite region has some distinctive features that include parts of the central highlands to the north of the region, the Victorian Volcanic Plain runs through the centre of the region, the Otway Ranges to the south of the region and the Bellarine Peninsula to the east.

The development of local areas is systems based approach to identify appropriate management units within the landscape. A review of relevant spatial data identified areas with common features based on demographics, land use, vegetation, geology, geomorphology, soil, topography, hydrology, climate, bioregions and connectivity.



Corangamite Region Landforms

A ***system*** is defined as a group of interacting or interrelated entities that form a unified whole. A system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning. It is reasonable to expect that the delivery of management actions will be simpler under this process as there will be more consistency in dealing with enterprise types, land types, climate and communities.

The previous Regional Catchment Strategy used sub-regional areas based on the region's four drainage basins, resulting in 15 sub-catchments or landscape zones. These did not necessarily reflect the way that land is managed or how community relate to where they live. The two major cities within the region were previously included within landscape zones Geelong (Bellarine) and Ballarat (Leigh). As these areas require management that is completely different to the surrounding rural areas it is logical that these are separated out. Three components that underpin the concept of socio-ecological systems are:

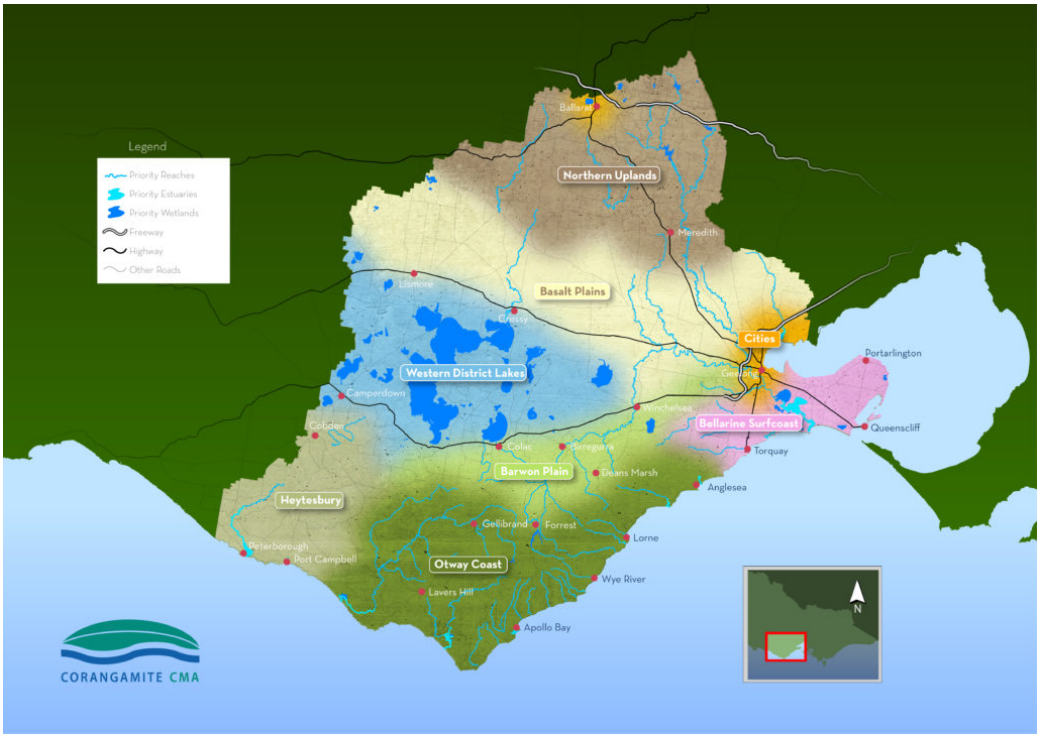
Landscape – the visible features of the land

Livelihood – a means of securing the necessities of life

Lifestyle – the way in which a person lives.

These can be readily applied to the nine landscape systems that have been developed for the Corangamite region and are reflected across these.

Corangamite Landscape Systems
Ballarat City
Barwon Plain
Basalt Plains
Bellarine & Surf Coast
Geelong City
Heytesbury
Northern Uplands
Otway Coast
Western District Lakes



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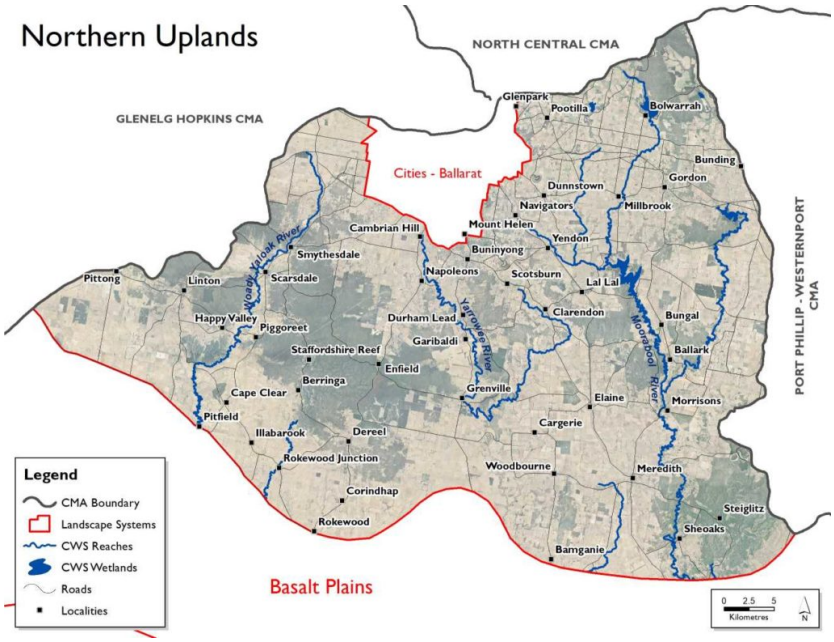
CORANGAMITE CMA

VICTORIA State Government

Northern Uplands

Overview

Overall area	233,373 hectares
Population	20,946
Climate	502 mm per annum at Lal Lal
Main towns	Bunninyong Meredith Smythesdale Linton Gordon Dunnstown
Land use	Broadacre grazing Cropping Horticulture Viticulture Poultry Plantation forestry
Main Industries	Agriculture Nature based-tourism Urban water supply Forestry
Main Natural Features	Moorabool River Leigh River Yarrowee River Leigh River Gorge Mount Buninyong Mount Mercer Mount Warrenheip Enfield State Park Steiglitz Historical Park Lal Lal Falls



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

This area spans the northern part of the region and extends from Ballarat in the north, is bounded in the south by the Basalt Plain and includes the townships of Meredith, Rokewood and Skipton, but does not include the urban area of Ballarat City which forms its own landscape system. Undulating hills and broad valleys characterise the landscapes formed on folded sedimentary rocks and granite plutons formed around 450 to 350 million years ago. Remnants of an ancient plain, formed about 40 to 30 million years ago, occur as caps of gravels sporadically distributed at various elevations. The majority of this landscape system is within the Central Victorian Uplands Bioregion.

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.

The Northern Uplands is split vertically across three catchment basins – Lake Corangamite, Barwon River and Moorabool River Basins. Three river systems drain the Northern Uplands of the Corangamite Region – the Moorabool River (east), Leigh River (central) and Woady Yaloak River (west). The Northern Uplands system is also the home to a number of other priority waterways including Lal Lal Creek, Spring Creek, Yarrowee River, Williams Creek and Little Woady Yallock Creek (upper).

Other environmental values identified include:

- known rare and threatened species
- significant Ecological Vegetation Classes
- rural water source
- aquatic invertebrate communities.

Livelihood

Most of the land in this landscape system is privately owned (approximately 80%).

The area contains highly productive agricultural and horticultural areas used for broadacre grazing and cropping, with some areas of intensive agriculture, including horticulture, viticulture and poultry. There are also large areas of pine plantations.

Lifestyle

The Northern Uplands supports a population of over 27,500 – around 6.7% of the Corangamite region. The most densely populated areas of the Northern Uplands are around the townships of Gordon, Mount Helen and Buninyong. The municipalities of the Ballarat, Golden Plains and Moorabool are partly covered in the system. The Traditional Owners are the Wadawurrung.

This landscape system has a rich gold mining history. The gold rush period of the mid to late 1800s, while notable in the colonial history of Victoria, also had a major impact on the health of the Yarrowee, Leigh and Moorabool rivers. 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.

The area's goldmining and cultural heritage and diverse landscapes attract many visitors and residents. The natural resources in the area support industries such as agriculture and nature based-tourism, supply urban water needs and provide important habitat for flora and fauna. Major features include Mount Buninyong, Mount Mercer and Mount Warrenheip along with the Enfield State Park and Steiglitz Historical Park.

The natural resource community of the Northern Uplands Landscape System is very robust with a good coverage through groups. Many of these groups come under the umbrellas of the Leigh Catchment Group and Moorabool Landcare Network. The Bunanyung Landscape Alliance is an alliance of community members, Landcare and Friends groups, networks and associations involved in promoting the health of biodiversity for the urban and rural catchments of the Moorabool, Leigh and Woady Yaloak waterways.

There is a diverse array of community groups engaged in natural resource management or environmental volunteer or lobbying activities. Community based groups in this area include the Ross Creek Landcare Group, NapoleonsEnfield Landcare Group, Garibaldi Landcare Group, Meredith Bamganie Landcare Group, Upper Williamson's Creek Landcare Group, Moorabool Catchment Landcare Group, East Moorabool Landcare Group, Lal Lal Catchment Landcare Group and Wattle Flat/Pootilla Landcare Group. Many of these groups come under the umbrellas of the Leigh Catchment Group and Moorabool Landcare Network.

Assessment of current condition and trends

Water

Major waterways of the Northern Uplands include the Woady Yaloak River, Little Woady Yallock Creek, Yarrowee River, Moorabool River and its tributaries.

The Northern Uplands is split vertically across three catchment basins – Lake Corangamite, Barwon River and Moorabool River Basins. Assessed through the Victorian Index of Stream Condition (ISC) in 2010, the overall condition of the Northern Uplands waterways was mixed, ranging from very poor to moderate, with over half found in moderate condition. One exception was the reach of the Little Woady Yallock Creek, which is rated excellent – the only site outside the Otway Basin in the entire Corangamite region. The four waterway reaches closest to the Ballarat urban area all rated very poorly.

The Moorabool River is considered one of the most flow-stressed rivers in the state. This system is the home of the region's first flagship waterway 'The Living Moorabool' *(Program site – downstream of Lal Lal Reservoir to the confluence of the Barwon River, including Sutherlands Creek)*. The Moorabool River has an Environmental Water Entitlement that is held in Lal Lal Reservoir; however this entitlement is not enough to sustain the natural assets of the river. The increase of farm dams within the system is one of the causes of decreased volumes of water entering the priority waterways.

The gorges and steep escarpments of the Moorabool and Leigh Rivers remain largely non-arable, protecting bands of remnant vegetation and providing important corridors of habitat for wildlife. However, many reaches within this system still require riparian fencing, establishment of native indigenous vegetation and woody weed control (willows, gorse, blackberry) as well as terrestrial pest animal control.

Weirs and bridges placed in the Moorabool and Leigh rivers to support agriculture activities over the last century have created fish barriers within the rivers which cause issues for fish migration, and even fish deaths, when the rivers cease to flow.

Of waterways tested from the Lake Corangamite Basin, the Little Woady Yallock Creek notably displayed near natural condition regarding hydrology.

For the Barwon River Basin waterways of the Northern Uplands, flow regimes varied. One reach of the Yarrowee River near Ballarat was among the poorest scoring in the basin. Most of the reaches from the Barwon River Basin (all tributaries of the Leigh River) exhibited extended periods of both low and zero flow in summer. Two of these reaches, one from the Yarrrowee River and the other from Winter Creek, also displayed low flows during winter, attributed to diversions, rainfall patterns and catchment modifications.

Of waterway reaches tested from the Moorabool River Basin, flow regimes were among the most highly modified of the entire Corangamite region. The two waterway reaches tested closest to the Ballarat urban area, Spring Creek and Lal Lal Creek, notably had extremely modified flow regimes, with periods of zero flow in summer, and extended periods of low flow in both summer and winter.

Corangamite Waterwatch, a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment; however, Waterwatch data for the Yarrowee-Leigh River is limited. Both monitoring sites are in the upper catchment, one upstream and one downstream of Ballarat. The water quality at the upstream site was mostly healthy, though at times displayed low dissolved oxygen and high turbidity. The site lacks native riparian vegetation and instream cover for aquatic organisms. The macroinvertebrate community indicate the site to be mildly to heavily impacted. The water quality of the downstream site was mostly healthy however phosphorus levels were high. High levels can stimulate excessive aquatic plant and algal growth which may impact on the beneficial uses. The riparian vegetation and aquatic habitat are degraded at this site and the macroinvertebrate community suggest the site is mildly impacted.

Williamsons Creek, a tributary of the Yarrowee-Leigh River, displayed relatively poor water quality. This intermittent stream exceeded most of the SEPP (Waters) water quality objectives. High electrical conductivity levels at times indicate the ingression of saline groundwater at times of low or no flow. The macroinvertebrate community indicate the site to be mildly to heavily impacted; in times of increased river flow (low electrical conductivity) more sensitive macroinvertebrate communities are present.

The water quality in the Moorabool River has changed over time. Before 2011, high salinity was common, due to water extraction and reduced flows associated with the Millennium drought. Post 2011, the introduction of environmental flows, particularly over summer to autumn, helped lower salinity and improve dissolved oxygen levels. Salinity levels were high in the East Branch in comparison to the West Branch, whilst reactive phosphate levels were higher in the West Branch. At the confluence of the East and West Branch the water quality is maintained at relatively healthy levels. Increases in salinity occur downstream, likely influenced by seasonal flow from the tributaries such as Teatree and Sutherland Creeks. There is evidence that during low flow, saline groundwater enters these streams. Whilst the sites on these waterways have good riparian vegetation and aquatic habitat, the macroinvertebrate community structure indicates the water quality to be degraded.

Throughout the Moorabool catchment the habitat quality is degraded. A lack of riparian vegetation, unrestricted stock access and poor aquatic habitat are evident. The implementation of environmental flows has improved the overall water quality in the Moorabool River, particularly the East Branch, whilst over time it appears dissolved oxygen levels have marginally declined .

Biodiversity

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 Weir 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 Moorabool River reach between Lal Lal Reservoir and She Oaks contains some of the most valuable in-stream and riparian habitats in the catchment, with remnant populations of threatened Ecological Vegetation Communities (EVCs) such as Stream Bank Shrub land and Riparian Woodland. Diverse macroinvertebrate communities and several non-migratory native fish species were recorded, in addition to migratory *Buniya* (Short-finned eels). The river reach from the Moorabool River East Branch (near Morrisons) to She Oaks Weir passes through extensive tracts of remnant native vegetation, including State and National Park between Morrisons and Meredith. Native fish recorded include non-migratory species such as River blackfish, Australian smelt and Flat-headed gudgeon (Tunbridge, 1988). Other ecological values in the reach include a diverse population of macroinvertebrates, platypus and rakali (Williams & Serena, 2006).

For the Barwon River Basin waterways of the Northern Uplands, most sites have vegetation in poor or moderate condition. For waterway reaches of the Moorabool River Basin, streamside vegetation quality varies, with most reaches being bereft of large trees. Sutherland Creek West Branch has vegetation in near-reference condition, the best of the catchment basin. Spring Creek's reach, near Ballarat, is among the poorest quality for the basin regarding vegetation, with low levels of diversity, vegetation width and continuity. For waterways from the Lake Corangamite Basin, streamside vegetation quality is generally poor. Kuruc-a-ruc Creek and Little Woady Yallock Creek represent the Lake Corangamite Basin's only excellent streamside vegetation, with near-reference condition.

DELWP's Habitat Distribution Models identify species with more than 5% of their Victorian range in this area, include notable plant species such as Golden Bushpea (rare, 56%), Brisbane Ranges Grevillea (rare, 47%), Gum-barked Bundy (vulnerable, 39%), Brittle Greenhood (endangered, 29%), Enfield Grevillea (vulnerable, 82%), Wombat Bush-pea (rare, 12%), Golden Bush-pea (8%), Yarra Gum (rare, 7%), Australian Sheep's Burr (6%), Bicolour Everlasting (6%), White Sunray (endangered, 34%), Turf Curly Sedge (rare, 30%), Salt-lake Tussock-grass (vulnerable, 25%), Clumping Leek-orchid (endangered, 24%), Grassland Sunorchid (endangered, 24%), Button Wrinklewort (endangered, 24%), Basalt Sun-orchid (endangered, 24%), Fragrant Leek-orchid (endangered, 23%), Spiny Peppercress (endangered, 21%).

According to DELWP's Habitat Distribution Models, the following reptiles have more than 5% of their Victorian range in the area: the Grassland Earless Dragon (critically endangered, 10%), Tussock Skink (vulnerable, 10%), Southern Grass Skink (least concern, 8%), Striped Legless Lizard (endangered, 7%), Corangamite Water Skink (critically endangered, 5%). The only bird to have 5% of their Victorian range in the area is the Brolga (vulnerable, 6%).

The following Ecological Vegetation Classes in the region are classified as endangered: Grassy Woodland, Plains Grassy Woodland, Damp Sands Herb-rich Woodland, Wetland Formation, Plains Sedgy Wetland, Sand Forest, Stream Bank Shrubland, Escarpment Shrubland, Alluvial Terraces Herb-rich Woodland, Swampy Riparian Woodland, Creekline Grassy Woodland, Plains Grassy Wetland, Riparian Woodland, Aquatic Herbland/Plains Sedgy Wetland Mosaic, Plains Grassland, Floodplain Riparian Woodland, Creekline Herb-rich Woodland, Grassy Woodland/Heathy Dry Forest Complex, Brackish Drainage-line Aggregate.

Land

Land clearing for farming, timber and fuel production, gold mining and other land uses in the late 1800s and early 1900s brought rapid reduction in the quantity and quality of vegetative cover in this landscape. During this period, hoofed animals were introduced and wetlands were drained for agricultural purposes. A significant change in the condition of soil and water resources was caused by these activities.

Relative soil productivity on private agricultural land in the Northern Uplands is highly variable, ranging inconsistently between low to high across the whole area. The area of lowest productivity is concentrated in the southeast corner, below the Brisbane Ranges National Park.

Taken from DELWP's Victorian Land Cover Time Series, the most common land cover classes in the Northern Uplands are non-native pasture, followed by native trees, native grass herb, pine plantation and dryland cropping. Over a 30-year period, non-native pasture decreased, from 58% to 51% of the total landscape system. Native tree coverage increased from 25% to 27%, and native grass herb increased from 4.5% to over 5% of the total area.

Dryland cropping has increased ten-fold since 1985, now occupying over 3% of the total Northern Uplands. Exotic woody vegetation has more than doubled to cover 1.3% of the total landscape system, and hardwood plantations experienced a six-fold increase, now covering 2% of total land area. Although still a tiny proportion of the landscape system (<1%), urban areas more than doubled. Native scattered trees and both seasonal and perennial wetlands all experienced small decreases. Irrigated horticulture has more than halved, now occupying under 1% of the total area.

Community

The Northern Uplands supports a population of over 27,500 – around 6.7% of the Corangamite region. The most densely populated areas of the Northern Uplands are around the townships of Gordon, Mount Helen and Buninyong.

Community based groups in this area include the Ross Creek Landcare Group, NapoleonsEnfield Landcare Group, Garibaldi Landcare Group, Meredith Bamganie Landcare Group, Upper Williamson's Creek Landcare Group, Moorabool Catchment Landcare Group, East Moorabool Landcare Group, Lal Lal Catchment Landcare Group and Wattle Flat/Pootilla Landcare Group. Many of these groups come under the umbrellas of the Leigh Catchment Group and Moorabool Landcare Network.

Other environmental groups:

- Back to Steiglitz Association
- Friends of Clarkesdale Bird Sanctuary
- Friends of the Union Jack Reserve
- Mount Buninyong Management Advisory Committee

Major threats and drivers of change

Most major threats are natural processes, albeit some are the consequences of land clearing, agricultural, forestry and urban development. The consequences of these threats impacting on land and agriculture have also become greater. For instance, built infrastructure has spread across wider areas with a larger proportion of the population served by various utilities, roads etc. A growing and expanding human population requires larger volumes of water. High value biodiversity, wetlands and cultural heritage sites are considered more significant and valuable as their number has declined.

Water

Much of the Leigh, Moorabool and Woady Yaloak rivers and their 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. Within river channels 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.

Within this area, increasing salinity, nutrients and turbidity are the dominant threats to the health of the waterways and water bodies.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Yarrowee-Leigh and Moorabool landscapes. These include:

- Establish terrestrial pest animal control – rabbit control
- Establish native indigenous vegetation
- Install riparian fencing

- Establish stewardship/management agreement
- Undertake woody weed control
- Implement best management practice on grazing properties
- Undertake assessment and management of fish barriers in the Barwon and Moorabool catchments (Moorabool River)
- 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 (Leigh River, 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 (Yarrowee River)
- Enhance the upstream reach in line with the Breathing Life back into the Yarrowee Project (Yarrowee River)
- Deliver current environmental water entitlement and develop long-term planning for environmental watering of the Moorabool River (EWMP) (Moorabool River, Moorabool River West Branch)
- Investigate impacts to environmental flows throughout the broader Moorabool catchment basin to secure and better manage environmental water where required (Moorabool River, East and West branches)
- Undertake an assessment of instream habitat (large wood) density (Moorabool River)
- Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate (Lal Lal Reservoir, Wilsons Reservoir, Moorabool Reservoir, Bostock Reservoir, Korweinguboora Reservoir)
- Develop land and gully stabilisation plan for the Eclipse Creek catchment (Moorabool River)
- Maintain Waterwatch groups collecting baseline data on waterway condition.

Biodiversity

Threats identified are illegal tracks, littering, barriers to on-ground management, inappropriate land use, water quality and quantity, native vegetation removal, urban encroachment, wildfire, *Phytophthora cinnamomi.*

Gorse (*Ulex europaeus)* and serrated tussock (*Nassella trichotoma*) are significant weeds and are known to adversely impact biodiversity, productivity and recreation. The European rabbit (*Oryctolagus cuniculus)* is also a threat in this landscape system. Willows (*Salix spp.*) are a Weed of National Significance and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, and reducing aquatic and riparian biodiversity. The red fox (*Vulpes vulpes*) was identified as a threat to significant bird species.

In the East and West branches of the upper Moorabool, highly regulated hydrology, with associated alteration of geomorphology, may have detrimentally impacted river function and ecology. Farm dams and irrigation diversions can also have a detrimental impact through alterations of flow regime and water quality. Lack of adequate flows or changes to the flow regime – including the timing, magnitude or frequency of flows at different times of the year – can pose a risk to biodiversity. Without provision of critical dry period low flows, there wouldn't be sufficiently deep pools of water to ensure survival of many aquatic species. Low flows during the drier months also provide minimum water velocity for mixing of pools, reducing the risk of stratification and poor water quality. Freshes, or small "pulses" of water, delivered in the wet period are critical to create spawning opportunities for fish and other fauna. Without adequate freshes, populations of species would reduce. An extended dry conditions flow regime is likely to result in localised extinctions of a number of these species, with severely reduced opportunities for spawning and reproduction for resident and migratory fish, Growling grass frog and macroinvertebrates.

Water quality parameters for these reaches were often outside of State Environment Protection Policy (SEPP) objectives. A knowledge gap exists for the current biological condition of the East Moorabool. Threats to native fish include exotic species such as Brown trout and Redfin.

DELWP's 2019/2020 Biodiversity Response Planning identifies the most cost-effective threat control actions for significant biodiversity improvement in the region. The most beneficial actions in this region are control of goats, pigs, rabbits and weeds, and permanent protection.

Land

Gully/tunnel erosion, sheet/rill erosion, wind erosion, landslides, soil structure decline, acid sulphate soils, secondary salinity and waterlogging present the major threats to soils and land use within this landscape (see Static Maps section for mapped soil threats).

Sheet and rill erosion threaten agricultural productivity through the removal of fertile topsoil. Once removed, this topsoil is often deposited in waterways, threatening water quality through sedimentation and nutrient inputs. Tunnel erosion impacts on agricultural land, water quality and infrastructure associated with residential development. Gully erosion is the ultimate result of both tunnel and rill erosion. Gullies are the most visually obvious representation of erosion in the landscape. In many areas, gully erosion is a legacy of past land use, particularly gold mining along creeks.

Acid sulphate soils naturally occur in the Corangamite Region. These soils have sediments containing iron sulphides below the soil surface. When these naturally occurring sulphides are disturbed and exposed to air, oxidation occurs and sulphuric acid is produced.

Waterlogging may be a natural condition of the soil, but can worsen with deterioration in soil structure. There is a strong relationship between high likelihood of soil structure deterioration and a high susceptibility to waterlogging. These susceptible areas are generally located on low-lying heavy duplex soils in higher rainfall areas and can lead to restricted root growth, reduced infiltration rates, increased likelihood of surface run-off, water erosion and surface ponding.

Community

The community of the Northern Uplands Landscape System is very robust with a good coverage through groups including Ross Creek Landcare Group, Napoleons Enfield Landcare Group, Garibaldi Landcare Group, Meredith Bamganie Landcare Group, Upper Williamson's Creek Landcare Group, Moorabool Catchment Landcare Group, East Moorabool Landcare Group, Lal Lal Catchment Landcare Group and Wattle Flat/Pootilla Landcare Group. Many of these groups come under the umbrellas of the Leigh Catchment Group and Moorabool Landcare Network.

Major threats to the community in this Landscape System are the expansion of the City of Ballarat and the change in land management. The changing demographic of the farming sector with the average age of full time farmers becoming older is of concern, with fewer younger people taking over the operation of farms. Farms changing their principal business is also an issue with wind farming and soft wood plantations becoming more prevalent.

The absorption and/or corporatisation of properties into conglomerates is also a threat to the communities within this landscape. Many of the smaller towns such as Meredith, Gordon, Scarsdale and Linton rely heavily on the agriculture sector.

Northern Uplands 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Northern Uplands Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. NorWO1

There is an improvement in riparian extent and condition of hydrological regimes and water quality in priority reaches defined in the Corangamite Waterway Strategy. NorWO2

Drinking water supply catchments are managed to provide quality water for urban water supplies. NorWO3

Improve waterway amenity through the implementation of the Kitjarra-dja- bul bullarto langi-ut Masterplan in the Northern Uplands Landscape System. NorWO4

Increase the community understanding and awareness of water values and management. NorWO5

Water quality values are defined and managed for. NorWO6

Ensure Wadawurrung people have a strong voice in the management of the Moorabool, Yarrowee and Leigh rivers and cultural values are incorporated. NorWO7

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Northern Uplands habitats across land and waterway environments through effective climate change adaptation strategies. NorBO1

Achieve a net gain where possible in suitable Northern Uplands habitat expected over 6 years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. NorBO2

Achieve a net gain where possible in all species with positive % change in suitable Northern Uplands habitat and improved species balance expected over 6 years from sustained improved public and private land management and community involvement including pest plant and animal control. NorBO3

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. NorBO4

Increase understanding and awareness of biodiversity values of the Northern Uplands Landscape System. NorBO5

Land

By 2027, compared to 2022 baselines land within the Northern Uplands is sustainably managed for a variety of purposes within its capability and suitability to maintain and improve its natural capital and to prevent both on and off-site impacts. NorLO1

Communities

By 2027, compared to 2022 baselines:

Northern Uplands communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. NorCO1

Northern Uplands communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. NorCO2

The increased capacity of the Eastern Maar and Wadawurrung Traditional Owner Groups enables their increased involvement in decision making that effects their Country. NorCO3

Northern Uplands 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Communities

Six year priority directions for the Northern Uplands are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

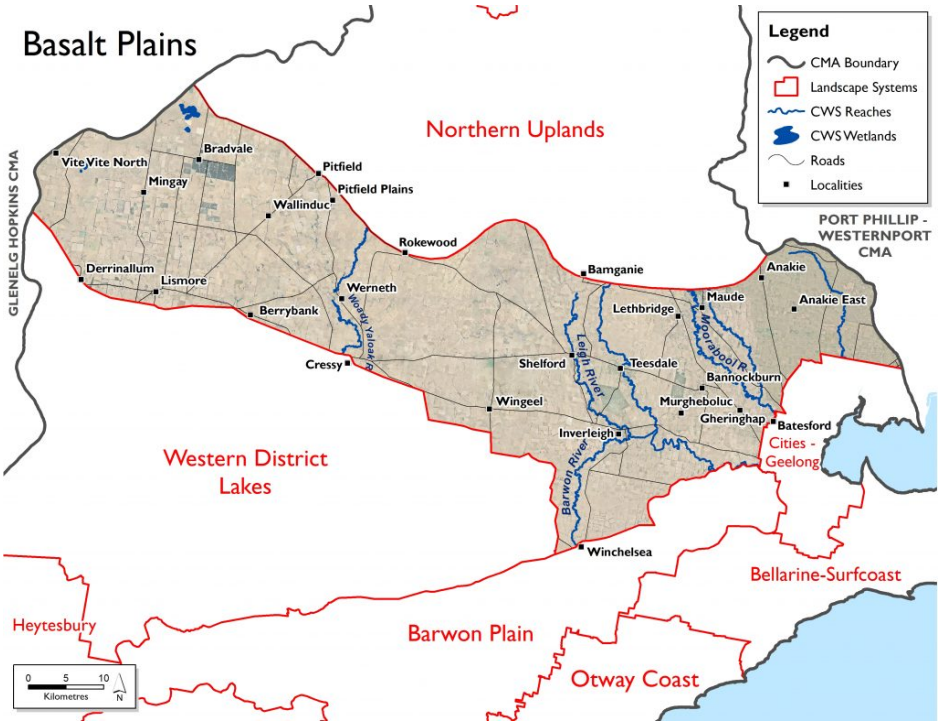
Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
NOR1	Northern Uplands landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.					CCMA	DELWP, BW, CHW, EPA, BCC, GPS, MSC, PV.
NOR2	Develop enduring partnerships with the Wadawurrung people to: 1) acknowledge and enhance Wadawurrung values of natural assets; 2) ensure the Wadawurrung people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung stories and history; and, 4) identify and implement opportunities for the Wadawurrung people to own and manage water on their country					CCMA	WTOAC, DELWP, BW, CHW, BCC, GPS, MSC
NOR3	Encourage landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities					CCMA	AgVic, DELWP, Landcare
NOR4	Best land management practices are also implemented across other Northern Uplands cohorts including agencies, developers, and the broader catchment community					CCMA	DJPR, PV, DELWP BCC, GPS, MSC
NOR5	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect cultural heritage					BCC, GPS, MSC	CCMA, DELWP
NOR6	Enhance riparian management within priority waterways of the Northern Uplands as defined in the Corangamite Waterway Strategy					CCMA	BW, CHW, Landcare
NOR7	Develop an integrated masterplan for Kitjarra-dja- bul bullarto langi-ut (Barwon River Parklands) and implement high priority projects					CCMA	CoGG, BW, PV, Tourism Greater Geelong and the Bellarine, WTOAC, DELWP, GPS, G21, DHHS, SRV, BC

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
NOR8	Ensure the assessment of applications for new or transfers of groundwater entitlements in the Bungaree and Cardigan Groundwater Management Areas takes into account the impact of extraction on connected waterways and Groundwater Dependent Ecosystems (GDEs)					SRW	CCMA
NOR9	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Central Highlands and Barwon Water Urban Water Strategies 2) priority projects identified by the Central Highlands and Barwon Water Integrated Water Management Forum; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy					CHW, BW	CCMA, DELWP
NOR10	Manage the current environmental water entitlement for the Moorabool River to maximise downstream benefit according to the recommendations of the Flows Study					CCMA	VEWH
NOR11	Investigate and implement opportunities to increase the environmental entitlement for the Moorabool River including implementing the outcomes of the 2021 Central and Gippsland Sustainable Water Strategy.					CCMA	BW, CHW, DELWP
NOR12	Identify opportunities for Cultural Burning and implement as appropriate					WTOAC	CCMA
NOR13	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.					CCMA	DELWP, BCC, GPS, MSC, BW, CHW
NOR14	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs					CCMA	Landcare, BCC, GPS, MSC
NOR15	Engage with the community on the need to mitigate and adapt to climate change and its impacts.					CCMA	DELWP, Landcare, BCC, GPS, MSC
NOR16	Action Plans are developed that leads to a 25% increase of non-government investment into the region to address high priority biodiversity actions					CCMA	DELWP, BCC, GPS, MSC, Landcare
NOR17	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027					CCMA	DELWP
NOR18	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans					DELWP	CCMA, PV, Landcare, BCC, GPS, MSC

Basalt Plains

Overview

Land Area	262,402 hectares
Population	15,512
Main Towns	Bannockburn Winchelsea Inverleigh Cressy Anakie Lismore
Climate	548 mm per annum at Berrybank 509 mm per annum at Bannockburn
Land Use	Sheep grazing Cropping
Main Industries	Agriculture Wind power generation
Natural Features	Barwon River Leigh River Moorabool River Woady Yaloak River Inverleigh Flora and Fauna reserve Mount Anakie



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

This landscape system is situated to the north and west of Geelong, and runs across the region south of the Northern Uplands area. Along its southern extremity it basically follows the Princes Highway to Birregurra before heading north to the Hamilton Highway. It then follows to the north of the Hamilton Highway to the region's western boundary. It includes the towns of Bannockburn, Winchelsea, Inverleigh, Cressy, Anakie and Lismore. This landscape includes portions of the Corangamite, Colac Otway, Surf Coast, Golden Plains and Greater Geelong local government areas. It includes part of the Wadawurrung traditional lands as well as a small portion of Eastern Maar country. It is predominantly in the Victorian Volcanic Plain bioregion and the vast majority of the land is in private ownership.

The landform of the Basalt Plain is generally flat to gently undulating, rising only up to 20 metres. The major rivers in this area include the Leigh, Moorabool and Woady Yaloak rivers (originating in the Northern Uplands) and the Barwon which flows from the Otways via the Barwon Plains landscape system. Other important waterways include Mia Mia, Five Mile and Warrambine creeks. Sections of the Barwon River and Hovell Creek occur to the east.

Key values identified in this landscape system 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.

Livelihood

Relative soil productivity on private agricultural land across the Basalt Plains is the lowest in the Corangamite region outside of Ballarat and Geelong cities. Relative soil productivity is low to moderate across the area, with some higher productivity patches scattered in the west, and the lowest productivity concentrated near the eastern boundary.

The land is generally used for agricultural purposes, including sheep grazing with some areas of cropping. Paddocks often feature piles of rocks and boulders that have been cleared out of the soil to increase cultivation. In recent years the Basalt Plains have seen the installation of a number of wind farms.

One of the major transformations to the Basalt Plains has been the removal of rocks from paddocks to enable them to be cultivated. This has substantially increased the productivity of primary production across the Basalt Plains but has had a major impact on native grasslands. Invasive plant species including Serrated Tussock and Chilean Needle Grass also present a major threat to both agriculture and native grasslands.

Lifestyle

The Basalt Plains has a population of over 15,500 – around 3.8% of the Corangamite region – and is the sixth most populous area of the region. Although the largest landscape system by area, the Basalt Plains has a low population density. The most densely populated area of the Basalt Plains is the township of Bannockburn.

The changing demographic of the farming sector is of concern, as the average age of full-time farmers increases with fewer younger people taking over the operation of farms. Farms changing their principal business is also an issue, with wind farming and soft wood plantations becoming more prevalent.

Subdivision of larger properties and a growth in hobby farms is notable, particularly in the east of the Basalt Plains, in closer proximity to Geelong around townships such as Inverleigh, Bannockburn and Anakie. The new demographic introduced by these lifestyle properties increases the need for education on appropriate land management practices.

Landcare groups in this area include the Maude and District, Corio, Brisbane Ranges, Batesford-Fyansford-Stonehaven, Barrabool Hills, Leigh District and Cundare Duverney groups.

Assessment of current condition and trends

The Basalt Plains ares dominated by exotic pasture/grassland, with scattered dryland cropping and native pasture/grasslands – the majority of the region's dryland cropping occurs here.

Water

Major waterways of the Basalt Plains include sections of the Woady Yaloak River and tributaries (flowing into the Western District Lakes), the Leigh, Barwon and Moorabool Rivers, and Hovell Creek in the east.

The Basalt Plains falls under three catchment basins – Lake Corangamite, Barwon River and Moorabool River Basins. Assessed in the Victorian Index of Stream Condition (ISC) in 2010, the overall condition of the Basalt Plains' waterways ranged from very poor to moderate, with no sites scoring as good or excellent condition, and ranging condition distributed randomly across the three basins. Generally, water quality across the Moorabool, Barwon and Corangamite basins was moderate despite their heavily modified environment.

For the waterways of the Lake Corangamite Basin, drought generally has a significant effect on flow stress, with the Gnarkeet chain of ponds reach among the most affected. Flow stress was particularly high in all three sites of the Woady Yaloak River, which suffered from summer stress with extended periods of low flow. Alternatively, Little Woady Yallock Creek exhibited flows in near natural condition.

Of the waterways assessed from the Barwon River Basin, two reaches from the Mia Mia Creek had highly modified hydrology. One third of the Barwon River Basin's assessed waterways showed summer stress and extended periods of low flows in summer.

For the waterway reaches tested from the Moorabool River Basin, flow regimes were the most highly modified of the whole Corangamite region. One of the reaches from the Basalt Plains, part of the Moorabool River, had an extremely modified flow regime and experienced extended periods of low flow in summer and winter, as well as zero flow periods in summer.

As the Barwon River flows from the upper catchment into the mid reaches from Winchelsea, through the rural farmlands of the plains to Geelong, the water source from the Leigh River provides additional flow. However, in data collected through citizen science program Waterwatch between 2005-2020 a decline in some water quality indicators is evident. Increases in salinity and phosphorus occur in a downstream direction and can be partially attributed to inflow from the Leigh River. All sites experience either excessive macrophyte or algal growth, particularly over the summer and autumn seasons, potentially creating dissolved oxygen peaks and troughs. This is supported by the macroinvertebrates present, the majority being pollution tolerant, indicating the waterway to be moderately to heavily impacted. Reduced native riparian vegetation – even complete removal of vegetation – lack of instream aquatic habitat and unrestricted stock access all impact on the water quality and the aquatic organisms present.

Where the Moorabool has its confluence with the Barwon, the water quality has declined, with increased salinity possibly associated with discharges from the Batesford quarry. The habitat quality is degraded throughout the Moorabool catchment. A lack of riparian vegetation, unrestricted stock access and poor aquatic habitat are evident. The implementation of environmental flows has improved the overall water quality in the Moorabool River, particularly the East Branch, whilst over time it appears dissolved oxygen levels have marginally declined.

As the Barwon River enters the city of Geelong the water quality is reasonably healthy for a lowland river, with the exception of phosphorus levels which are likely to stimulate algal blooms over the warmer seasons. The macroinvertebrate community supports this, displaying mild impacts.

Biodiversity

The highest biodiversity values in the Basalt Plains occur in the larger public land areas, such as Inverleigh Nature Conservation Reserve, the You Yangs State Park and across a small number of grassland reserves. The grasslands are the dominant vegetation community with scattered trees and shrubs.

Vegetation quality of the waterways from the Lake Corangamite Basin portion of the Basalt Plains is generally poor. For the waterways of the Barwon River Basin part, vegetation condition was generally poor or moderate. The waterways of the Moorabool River Basin from the Basalt Plains have generally moderate vegetation quality, although most sites have limited numbers of large trees.

The lower reach of the Moorabool, from She Oaks weir to the confluence with the Barwon river, contains eight species of native fish including Tupong, Southern pygmy perch, Australian grayling (listed as vulnerable under the EPBC Act 1999), Common galaxid and Spotted galaxid (ARI, 2015). There are nine weirs in this reach that are a significant barrier to fish. These barriers have increased the extent of slow flowing habitat and reduced habitat diversity in the lower reach of the Moorabool. However, recent scientific research has identified that high river flows in 2010-11 contributed significantly to recolonisation of migratory and estuarine fish species in the lower reach, highlighting the importance of high flows in creating habitat linkages between weirs in the Moorabool (ARI, 2015).

There are a number of endangered ecological vegetation classes within this landscape system including Creekline Grassy Woodland, Alluvial Terraces Herb rich Woodland, Plains Grassy Woodland, Plains Grassy Wetland, Grassy Woodland, Plains Grassland, Floodplain Riparian Woodland, Creekline Herb-rich Woodland, Red Gum Wetland, Plains Woodland/Plains Grassland Mosaic, Stream Bank Shrubland, Grassy Woodland/Heathy Dry Forest Complex, Plains Sedgy Wetland and Brackish Drainage-line Aggregate.

Land

Relative soil productivity on private agricultural land across the Basalt Plains is the lowest in the Corangamite region outside of Ballarat and Geelong cities. Relative soil productivity is low to moderate across the area, with some higher productivity patches scattered in the west, and the lowest productivity concentrated near the eastern boundary.

DELWP's Victorian Land Cover Time Series provides a snapshot of the changes in land cover types in five-year increments between 1985-2019. The most common land cover classes in the Basalt Plains are non-native pasture and dryland cropping, both occupying around 40% of the total area. Native grass herb is the next most common class, while exotic woody vegetation, native trees, native scattered trees and seasonal wetlands each constitute a moderate amount of the landscape system (each between 1-2% of the total area). Over the 30-year time period, non-native pasture decreased significantly, dropping from 67% to around 40%; the biggest decrease in this land cover class across all landscape systems of the Corangamite region. Conversely, dryland cropping has increased substantially, from 12% to almost 40% of the total Basalt Plains.

Community

The Basalt Plains has a population of over 15,500 – around 3.8% of the Corangamite region – and is the sixth most populous area of the region. Although the largest landscape system by area, the Basalt Plains has a low population density. The most densely populated area of the Basalt Plains is the township of Bannockburn.

Landcare groups in this area include the Maude and District, Corio, Brisbane Ranges, Batesford-Fyansford-Stonehaven, Barrabool Hills, Leigh District and Cundare Duverney groups. These are supported by the Lismore Land Protection Group, Leigh Catchment Group, Upper Barwon Landcare Network and Geelong Landcare Network.

Other environmental groups in the Landscape System:

- Friends of Bannockburn Bush
- Friends of Inverleigh Flora and Fauna Reserve
- Friends of Teesdale Grassy Woodlands
- Friends of the Brisbane Ranges
- Inverleigh Leigh River Public Open Space
- Lismore Land Protection Group

Major threats and drivers of change

Most major threats are natural processes, (albeit some are the consequences of land clearing, agricultural, forestry and urban development and on-going activity). The consequences of these threats impacting on land and agriculture have also become greater. For instance, built infrastructure has spread across wider areas with a larger proportion of the population served by various utilities, roads etc. A growing and expanding human population requires larger volumes of water. High value biodiversity, wetlands and cultural heritage sites are considered more significant and valuable as their number has declined.

Climate change and activities that modify natural flow such as drainage, diversion and extraction and agricultural runoff, along with agricultural impacts such as grazing and invasive species are major threats.

Water

The greatest threat to the Barwon and Moorabool River Catchments occurs from landuse and consumptive water extraction both within and up-stream of the Basalt Landscape System. For instance, the combined effects of groundwater extraction in the Upper Moorabool River catchment near Ballarat combined with water stored in farm dams and water extracted for town water supply, industrial and stock purposes has resulted in significantly reduced flows in the Moorabool Catchment. Similarly, water extracted for urban water supply and agricultural use in the Barwon Catchment has significantly impacted flows. The recent Long Term Water Resource Assessment showed that flows in the Barwon and Moorabool Rivers had declined by 11% and 20% since 2006 respectively and that the reductions in flow have disproportionally fallen on the environment relative to consumptive use. The declining trend in flows is predicted to continue due to the impacts of climate change.

Much of the Barwon, Leigh and Moorabool rivers and their 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 Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Mid-Barwon landscape. These include:

- Establish terrestrial pest animal control – rabbit control
- Establish native indigenous vegetation
- Install riparian fencing
- Establish stewardship/management agreement
- Establish non-woody and/or woody weed control
- Undertake assessment and management of fish barriers in the Barwon and Moorabool catchments
- Establish invasive species assessment and management
- Investigate stream instabilities
- Implement best management practice on grazing properties (Barwon River)
- Undertake an assessment of instream habitat (large wood) density
- Investigate and manage urban stormwater/water quality impacts in line with whole of water cycle management principles
- Implement the Barwon through Geelong Management Plan and Barwon River Parklands Strategy
- Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate (Wurdiboluc Reservoir)
- Maintain the discharge into the Moorabool River from Batesford Quarry as a beneficial environmental use – as per the Central Region Sustainable Water Strategy (Moorabool River)
- Maintain Waterwatch groups collecting baseline data on waterway condition.

Biodiversity

Major threats to biodiversity in this landscape system include inappropriate land use, water quality and quantity, native vegetation removal, urban encroachment, wildfire, *Phytophthora cinnamomi*.

Invasion by introduced plant species such as Serrated Tussock (*Nassella trichotoma)* and the impact of feral grazers such as rabbits have a major impact on native vegetation. Feral predators including foxes and cats have the major impact on native fauna. Willows (*Salix* spp.) are a Weed of National Significance and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, and reducing aquatic and riparian biodiversity. The red fox (*Vulpes vulpe*s) was identified as a threat to significant bird species.

The Moorabool is a highly regulated river, and changes to hydrology and geomorphology may have detrimentally impacted river function and ecology. Farm dams and irrigation diversions can also have a detrimental impact through alterations of flow regime and water quality. Lack of adequate flows or changes to the flow regime – including the timing, magnitude or frequency of flows at different times of the year – can pose a risk to biodiversity. Without provision of critical dry period low flows, there wouldn't be sufficiently deep pools of water to ensure survival of many aquatic species. Low flows during the drier months also provide minimum water velocity for mixing of pools, reducing the risk of stratification and poor water quality. Freshes, or small "pulses" of water, delivered in the wet period are critical to create spawning opportunities for fish and other fauna. Without adequate freshes, populations of species would reduce. An extended dry conditions flow regime is likely to result in localised extinctions of a number of these species, with severely reduced opportunities for spawning and reproduction for resident and migratory fish, Growling grass frog and macroinvertebrates. Exotic fish species such as Brown trout and Redfin also pose a threat to native fish species.

Land

One of the major transformations to the Basalt Plains has been the removal of rocks from paddocks to enable them to be cultivated. This has substantially increased the productivity of primary production across the Basalt Plains but has a major impact on native grasslands. Invasive plant species including Serrated Tussock and Chilean Needle Grass also present a major threat to both agriculture and native grasslands.

Gully/tunnel erosion, wind erosion, secondary salinity, water logging, acid sulphate soils, secondary salinity and soil structure decline present the greatest threat to soils and land use within this landscape (see Static Maps section for mapped soil threats). Gullies are the most visually obvious representation of erosion in this landscape. Areas where gully erosion is known to be prevalent in this landscape sytem include sites near Dereel, Rokewood, Linton and Lismore. Wind erosion generally occurs on fallowed areas in cropping country and has the potential to threaten agricultural production due to the removal of fertile topsoil, which may end up in waterways and cause water pollution.

Community

The changing demographic of the farming sector is of concern, with the average age of full time farmers increasing and fewer younger people taking over the operation of farms. Farms changing their principal business is also an issue, with wind farming and soft wood plantations becoming more prevalent.

Subdivision of larger properties and a growth in hobby farms is notable, particularly in the east of the Basalt Plains, in closer proximity to Geelong around townships such as Inverleigh, Bannockburn and Anakie. The new demographic introduced by these lifestyle properties increases the need for education on appropriate land management practices.

The absorption and/or corporatisation of properties into conglomerates is also a threat to the communities within this landscape. Many of the smaller towns such as Anakie, Bannockburn, Inverleigh, Derrinallum and Lismore rely heavily on the agriculture sector.

The Basalt Plains has a good coverage of Landcare groups including the Maude and District, Corio, Brisbane Ranges, Batesford-Fyansford-Stonehaven, Barrabool Hills, Leigh District and Cundare Duverney groups. These are supported by the Lismore Land Protection Group, Leigh Catchment Group, Upper Barwon Landcare Network and Geelong Landcare Network.

Basalt Plains 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

There is an improvement in riparian extent and condition and water quality in priority reaches in the Basalt Plains Landscape System as defined in the Corangamite Waterway Strategy. **BasWO1**

Improve waterway amenity through the implementation of the Kitjarra-dja- bul bullarto langi-ut Masterplan in the Basalt Plains Landscape System. **BasWO2**

Increase the community understanding and awareness of water values and management. **BasWO3**

Understand and enhance the Eastern Maar values of the Woady Yaloak River and Mia Mia Creek and their tributaries and ensure they have a strong voice in their management. **BasWO4**

Understand and enhance the Wadawurrung values of the Moorabool River, Barwon River, Leigh River and Woady Yaloak River and their tributaries and ensure they have a strong voice in their management. **BasWO5**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Basalt Plains habitats across land and waterway environments through effective climate change adaptation strategies. **BasBO1**

Achieve a net gain where possible in suitable Basalt Plains habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. **BasBO2**

Achieve a net gain where possible in all species with positive % change in suitable Basalt Plains habitat and improved species balance expected over six years from sustained improved public and private land management and community involvement where pest plant and animal control is also recognised. **BasBO3**

Increased effectiveness of interagency collaboration in their ability to respond to climate change, development pressures on biodiversity including improved management of weed control and burns on Victorian Volcanic Plains bioregion. **BasBO4**

Increase understanding and awareness of biodiversity values of the Basalt Plains Landscape System. **BasBO5**

Land

By 2027, compared to 2022 baselines:

Land in the Basalt Plains is suitably used within its capability and sustainably managed to maintain and improve its natural capital. **BasLO1**

Communities

By 2027, compared to 2022 baselines:

Basalt Plains communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **BasCO1**

Basalt Plains communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **BasCO2**

The increased capacity of the Eastern Maar and Wadawurrung Traditional Owner groups enables their increased involvement in decision making that effects their Country. **BasCO3**

Basalt Plains 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Communities

Six year priority directions for the Basalt Plains are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAS1	Basalt Plains landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.					CCMA	DELWP, Water Authorities, EPA, SCS, GPS, CoGG, CS, PV
BAS2	Develop enduring partnerships with the Wadawurrung and Eastern Maar people to: 1) acknowledge and enhance Wadawurrung and Eastern Maar values of natural assets; 2) ensure the Wadawurrung and Eastern Maar people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung and Eastern Maar stories and history; and, 4) identify and implement opportunities for the Wadawurrung and Eastern Maar people to own and manage water on their country					CCMA	WTOAC, EMAC, DELWP, Water Authorities, SCS, GPS, CS, CoGG
BAS3	Encourage Basalt Plains landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities					CCMA	AgVic, Landcare
BAS4	Best land management practices are also implemented across other Basalt Plains cohorts including agencies, developers, and the broader catchment community					CCMA	DJPR, PV, DELWP, SCS, GPS, CS, CoGG
BAS5	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect cultural heritage					SCS, CoGG, GPS, CS	CCMA, DELWP
BAS6	Enhance riparian management within priority waterways of the Basalt Plains as defined in the Corangamite Waterway Strategy including Yarrowee/Leigh, Moorabool and Woady Yallock Rivers					CCMA	GPS, CoGG, Landcare, Water Authorities

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAS7	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Central Highlands Water Urban Water Strategy 2) Barwon Water Urban Water Strategy 3) priority projects identified by the Barwon and Central Highlands Water Integrated Water Management Forums; and, 4) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy					Water Authorities	CCMA, DELWP, SCS, GPS, CS CoGG
BAS8	Manage the current environmental water entitlement for the Moorabool River to maximise downstream benefit according to the recommendations of the Flows Study					CCMA	BW, CHW, VEWH
BAS9	Develop an integrated masterplan for Kitjarra-dja- bul bullarto langi-ut (Barwon Rivers Parklands) and implement high priority projects					CCMA	CoGG, BW, PV, Tourism Greater Geelong and the Bellarine, WTOAC, DELWP, GPS, G21, DHHS, SRV, BC
BAS10	Help farmers prepare for a more variable and uncertain future by: 1) Supporting farmers with the information and tools to build resilience 2) Preparing farmers for a range of future scenarios 3) Helping farmers manage climate risk so they remain productive and profitable under a changed climate 4) Delivering the agriculture skills of the future					AgVic	CCMA, DELWP, SFS, Landcare
BAS11	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.					CCMA	DELWP, SCS, CS, GPS, CoGG, Water Authorities
BAS12	Design and deliver a comprehensive education program to engage new urban and peri-urban communities in the growth corridors to connect them with their local environment and empower them to participate in NRM activities.					CCMA	SCS, GPS, CS, CoGG, Landcare
BAS13	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs					CCMA	Landcare, SCS, CS, CoGG, GPS,
BAS14	Engage with the community on the need to mitigate and adapt to climate change and its impacts.					CCMA	DELWP, Landcare, SCS, GoGG, GPS, CS
BAS15	Integrate the understanding of new and emerging impacts such as wind farms and climate change.					DELWP	SCS, CoGG, GPS, CS
BAS16	Identify opportunities for Cultural Burning and implement as appropriate					WTOAC, EMAC	CCMA
BAS17	Action Plans are developed that leads to a 25% increase of non-Govt investment into the region to address high priority biodiversity actions					CCMA	DELWP, Landcare
BAS18	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027					CCMA	DELWP

Code	Priority Direction	Relevant Theme					
		Water	Biodiversity	Land	Community	Lead	Collaborators
BAS19	Engage with TO's to develop a method based on traditional knowledge that enables improved and sustained management of problem herbivores in priority locations.					DELWP	EMAC, WTOAC
BAS20	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans					DELWP	CCMA, Landcare, PV

Date printed: 29 July 2024

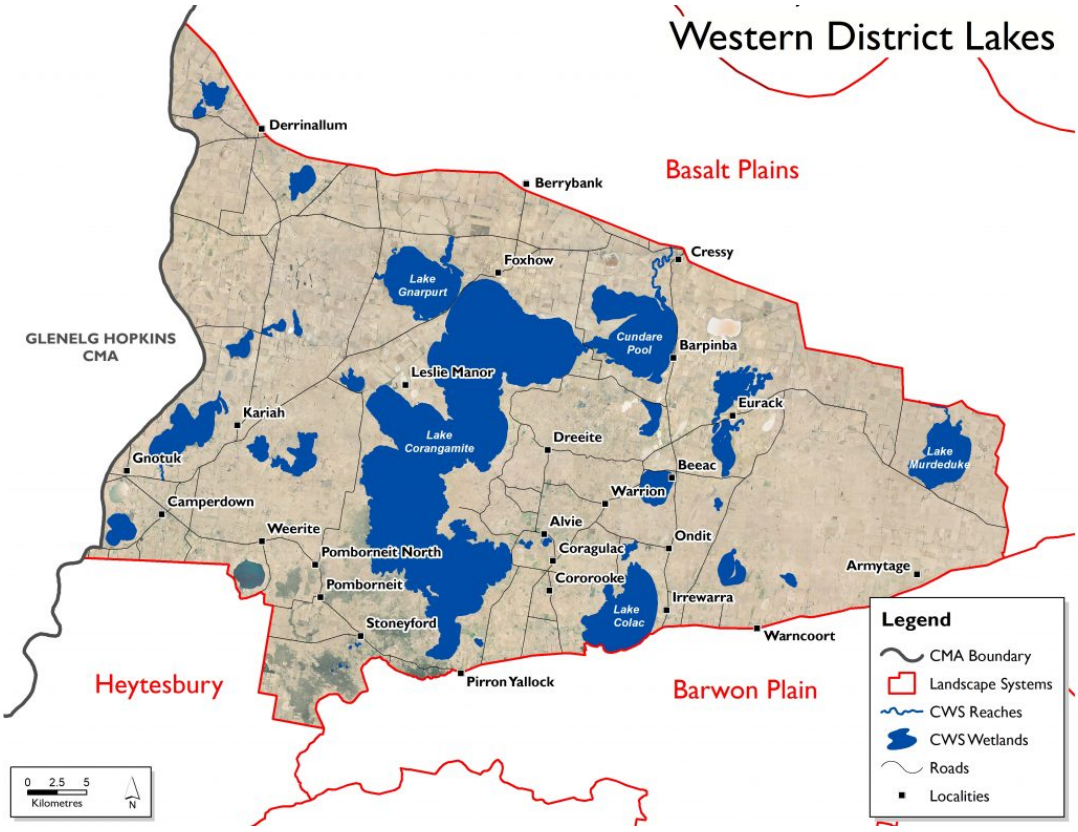
CORANGAMITE CMA

VICTORIA State Government

Western District Lakes

Overview

Overall Area	241,456 hectares
Population	7,197
Climate	781 mm per annum at Camperdown 608 mm per annum at Beeac
Main Towns	Camperdown Cressy Beeac
Land Use	
Main Industries	Agriculture
Main Natural Features	Western District Ramsar site Lakes and Wetlands Stony Rises Woady Yaloak River Pirron Yallock Creek



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

The Western District Lakes area is situated on the central western side of the Corangamite region. The major towns are Camperdown in the southwest and Cressy at the north. It borders the Basalt Plains to the north and east, and the Barwon Plains and Heytesbury to the south and southwest, respectively. The landscape is characterised by a large number of lakes and wetlands. The major municipalities are Corangamite and Colac Otway Shires, with a small portion of the Surf Coast municipality.

This landscape system is generally bounded by the Hamilton Highway to the north and the Princes Highway in the south. Its eastern boundary runs basically north from the Princes Highway near Birregurra to the Hamilton Highway between Cressy and Inverleigh (Wingeel). It contains the towns of Camperdown and Cressy within parts of the Colac-Otway and Corangamite Shires. The Traditional Owners are the Eastern Maar.

Within this landscape, lakes and wetlands have formed in volcanic craters, depressions due to lava collapse, and where drainage patterns have been interrupted by lava flows. 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.

The area's numerous lakes include nine listed under the Ramsar convention, the largest being Lake Corangamite. Lake Corangamite is the largest permanent saline lake in Australia, the largest natural lake in Victoria, a Ramsar listed wetland and a haven for migratory and non-migratory birds. The area also contains many other important Western District Ramsar site wetlands. The lakes are large, relatively shallow and dominated by open water. All of the lakes are saline except Lake Terangpom.

Undulating landscape of volcanic flows characterise the Stony Rises area, which represents the most recent volcanic activity in Australia. It 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.

The landscape system has a number of creeks and streams that terminate at Lake Corangamite. The Woady Yaloak River and Pirron Yallock Creek flow into Lake Corangamite. Lake Colac, is also a dominant lake in this landscape, is fed from streams to the south including the Barongarook and Deans creeks.

Livelihood

Relative soil productivity on private agricultural land across the Western District Lakes is highly varied. Most of the region is private agricultural land (the rest being bodies of water), and ranges from moderate to high relative productivity in the south west, to low to moderate around the central north and eastern boundaries.

Taken from DELWP's Victorian Land Cover Time Series (1985-2019), the most prevalent land cover classes in the Western District Lakes (excluding water) are non-native pastures, seasonal wetlands and, more recently, dryland cropping. Exotic woody vegetation, native grass herb, native trees and native scattered trees also each constitute a moderate proportion of land cover in the landscape system (each between 2-4% of the entire Western District Lakes).

Since 1985, non-native pasture has decreased in cover, dropping from 63% of the area to 53%. Dryland cropping, which occupied around 3% of the total landscape system in the 1985-90 epoch, has increased considerably, now comprising 13% of the total area.

Lifestyle

The Western District Lakes has a population of just under 7,200, and forms around 1.8% of the Corangamite region. This landscape system is the second least populated area of the region.

The smaller townships in this landscape provide it with a distinctively rural lifestyle, with Camperdown being the major population centre. Smaller townships such as Beeac, Cressy and Derrinallum support the local farming communities. The Western District Ramsar site is of significance to the community within this system with the myriad of wetlands defining the landscape. The stony rises are also a feature of this landscape and play a major role in defining the land use and lifestyle of the area.

Landcare groups in this Landscape are the Weerite, Leslie Manor, Cundare Duverney, Weering Eurack, Stony Rises, Leigh District, Irrewarra and Birregurra Landcare Groups.

Assessment of current condition and trends

Water

The Western District Lakes wetlands (Ramsar site no. 268), an iconic feature of the Corangamite region, was listed in 1982. It consists of nine large lakes on the Victorian Volcanic Plains between Winchelsea and Camperdown. Eight of these lakes are located within the Corangamite region, with Lake Bookar located in the adjacent Glenelg Hopkins CMA region. Eight of the nine lakes are saline (with Lake Terangpom being freshwater). Lake Corangamite is the largest wetland in the site.

The Western District Lakes area falls predominantly within the Lake Corangamite Basin, with all major waterways occurring within this basin. The eastern edge of the area, including Lake Murdeduke, falls within the Barwon River Basin. Although most of the reaches of the waterways that terminate in the major lakes exist outside this landscape system, the Western District Lakes includes reaches of the Pirron Yallock, Spring Gully, Dean and Barongarook Creeks in the south, and the Woady Yalaok River, Salt Creek, Mundy Gully and Gnarkeet chain of ponds in the north.

To the south of the landscape system, large areas of volcanic rock, formed from the most recent volcanic activity, are largely dominated by woodland interspersed with spring-fed freshwater wetlands, and have helped shaped the characteristic Stony Rises landscape. Many of these small wetlands are seasonal herbaceous wetlands (freshwater) of the temperate lowland plains, and are listed as under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999. Within the Stony Rises landscape zone, Lake Colongulac, Lake Beeac and Horseshoe Lake are included under the Western District Lakes Ramsar site.

Of the four reaches assessed as part of the Victorian Index of Stream Condition (ISC) during 2010, overall condition of the Western District Lakes area waterways ranges between very poor and poor, with one reach (of Woady Yaloak River) lacking sufficient information to determine overall condition. The reach of Salt Creek assessed was found to be in the worst overall condition, with lower reach of Mundy Gully and Pirron Yallock Creek assessed to be in poor condition.

There are two groundwater management units within the Lake Corangamite basin –Colongulac and Warrion, both upper basalt aquifers. While the rest of the basin is also largely basalt, salinity levels are higher and yield is lower outside of management areas. Groundwater is used for stock and domestic supply, as well as dairy, irrigation and industrial purposes. Within the Warrion Water Supply Protection Area (WSPA), the dairy industry is the dominant user. Groundwater resources, licensing and extraction in the Corangamite region are managed by Southern Rural Water, in line with the requirements of the *Water Act 1989* and associated government policies.

Groundwater levels measured in ten bores across the Warrion WSPA show a return to normal seasonal variation over the past few years, with many bores showing a seasonal variance of about 1 metre. While many lakes in the area have been identified as having a connection to groundwater, no reported concerns have been identified regarding the extraction of groundwater on groundwater dependent ecosystems.

Biodiversity

The lakes system supports a large number and diversity of bird species with records as high as 100,000+ birds at one time with certain wetlands recognised internationally for their values as bird habitat through the Ramsar convention. A total of 70 species of wetland birds have been recorded within the site. The list includes 20 species that are listed under international migratory agreements CAMBA, JAMBA, ROKAMBA and the Bonn Convention, and 26 species listed as migratory or marine under the EPBC Act.

The lakes also support number of federally listed threatened species, including the migratory shorebirds listed above, the Corangamite water skink, Spiny Peppercress *(lepidium ascersonii),* Salt-lake Tussock-grass *(poa sallacustrisis)* as well as many state-listed threatened species.

DELWP'S Habitat Distribution Models identify rare or threatened species with more than 20% of their Victorian modelled range. These include: Corangamite Water Skink *(Eulamprus tympanum marnieae)*, Spiny Peppercress *(Lepidium aschersonii)*, Wind-flattened Tussock-grass *(Poa physoclina)*, Salt-lake Tussock-grass *(Poa sallacustris)*, Clumping Leek Orchid *(Prasophyllum sp. aff. Occidentale)*, Leprechaun Greenhood Orchid *(Pterostylis conferta)*, Dense Greenhood Orchid *(Pterostylis sp. aff. bicolor (Woorndoo)*.

The landscape has over 15,100ha of threatened Ecological Vegetation Classes (EVC) with fragmented areas of endangered Plains Grassland, Plains Grassy Woodland, Plains Grassy Wetland and Plains Sedgy Wetland EVCs. Smaller amounts of Aquatic Herbland/Plains Sedgy Wetland Mosaic, Swamp Scrub and Plains Sedgy Wetland vegetation communities can also be found. Scoria Cone Woodland is also known to occur along the volcanic rises. The Victorian Biodiversity Atlas has records of 28 Federally protected species, 59 State protected species and 105 rare or threatened species on the Victorian Advisory List occurring within the landscape.

Vegetation along waterways in the Lake Corangamite Basin was the poorest across the entire Corangamite region. Among the poorest reaches were all four sites assessed in the Western District Lakes, which all scored badly in all parameters.

Land

Relative soil productivity on private agricultural land across the Western District Lakes is highly varied. Most the region is private agricultural land (the rest being bodies of water), and ranges from moderate to high relative productivity in the south west, to low to moderate around the central north and eastern boundaries.

Taken from DELWP's Victorian Land Cover Time Series (1985-2019), the most prevalent land cover classes in the Western District Lakes (excluding water) are non-native pastures, seasonal wetlands and, more recently, dryland cropping. Exotic woody vegetation, native grass herb, native trees and native scattered trees each constitute a moderate proportion of land cover in the landscape system (each between 2-4% of the entire Western District Lakes).

Since 1985, non-native pasture has decreased in cover, dropping from 63% of the area to 53%. Dryland cropping, which occupied around 3% of the total landscape system in the 1985-90 epoch has increased considerably, now comprising 13% of the total area. Exotic woody vegetation increased moderately, from 1.5% to 2.25% of the total landscape system. Urban areas more than doubled, but still constitute <0.5% of the landscape system. Although seasonal wetlands increased in coverage, the far less prevalent perennial wetlands decreased by almost half.

Community

The Western District Lakes has a population of just under 7,200 and forms around 1.8% of the Corangamite region. This landscape system is the second least populated area of the region. Although among the largest landscape systems by area, the Western District Lakes has the lowest population density of the Corangamite region. The single most densely populated area of the Basalt Plains is the township of Camperdown.

Landcare groups in this Landscape are the Weerite, Leslie Manor, Cundare Duverney, Weering Eurack, Stony Rises, Leigh District, Irrewarra and Birregurra Landcare Groups.

Landcare groups in this landscape are supported by the Heytesbury District Landcare Network, Lismore Land Protection Group, Leigh Catchment Group, Geelong Landcare Network and Upper Barwon Landcare Network.

Other environmental groups:

- Alvie Tree Planters
- Camperdown Timboon Rail Trail Committee of Management
- Friends of Mt Leura
- Mount Elephant Community Management
- Mt Leura and Mt Sugarloaf Reserves Committee
- Red Rock Reserve

Major threats and drivers of change

Water

The majority of this landscape system contains wetlands associated with the Western District Lakes Ramsar site which are fed by waterways including the Pirron Yallock, Spring Gully, Dean, Salt and Barongarook Creeks, along with the Woady Yalaok River and Mundy Gully and Gnarkeet chain of ponds. Many of the wetlands are also dependent on ground water flows. Some are naturally saline while others are fresh.

The major threats to waterways and wetlands in this landscape system generally relate to what is happening in the broader catchment. Any impacts on flow regimes will have an impact on not only the waterways but also the wetlands into which they drain. A major threat to naturally saline wetlands is invasion by introduced salt-tolerant species such as Tall Wheat Grass, whilst freshwater wetlands are susceptible to saline intrusions as a result of dryland salinity.

Climate change also represents a major issue for the wetlands of this landscape system. There is 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, especially those that are completely rainfall dependent. Wetlands that are dependent on groundwater will also be largely impacted by climate change though reduced inflows.

Biodiversity

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 Western District Lakes landscape system. Other weeds of concern include Gorse, Boxthorn and Blackberry while foxes, rabbits and wild pigs can be problematic.

DELWP's Biodiversity Response Planning includes Strategic Management Prospect (SMP) threat control actions which align with Protecting Victoria's Environment- Biodiversity 2037 targets. The following actions fall into the top 3% most cost-effective actions with the greatest net benefit to all biodiversity:

- rabbit control
- weed control
- permanent protection
- feral pig control
- domestic grazing control.

Land

The major threats to soil and land use in this landscape are secondary salinity, soil structure decline, water logging, soil nutrient decline and soil acidification (see Static Maps section for mapped soil threats).

Since the widespread land use change associated with European settlement, secondary salinity has developed in dryland agricultural areas within this landscape system. The salinity processes are associated with changes to the groundwater and/or soil hydrology.

Soil structure decline and associated compaction of soils generally resulting from livestock and/or machinery traffic under wet soil conditions can lead to water logging.

Maintaining a cost-effective balance of available plant nutrients is an important component of land management. Sustainable land use requires the replacement of extracted nutrients. Nutrients can also be lost from the soil through leaching into the deeper soil profile, in run-off or through soil movement leading to issues in plant growth and associated soil health problems.

Soil acidification is a process that is more common in sandier soils, where nitrogen/nitrate leaching occurs more readily and is most prevalent in areas of higher agricultural production. Low soil pH reduces the availability of essential nutrients such as phosphorous and molybdenum, and increases the availability of toxic elements such as aluminium and manganese. Low pH also makes the environment unsuitable for many soil microbes.

Community

Although among the largest landscape systems by area, the Western District Lakes has the lowest population density of the Corangamite region and does not have a good coverage of community groups. The large wetlands within the area create barriers between townships and and community connection.

The absorption and/or corporatisation of properties into conglomerates is also a threat to the communities within this landscape. There are not many large towns within this system, although Colac is in close proximity, which can impact on the farming community. Many of the towns such as Camperdown and Cressy rely heavily on the agriculture sector and the health of their communities can often be mirrored by the health of the sector.

The aging demographic of farmers within this landscape is also of concern, especially in relation to active community participation.

Western District Lakes 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The ecological characteristic of priority wetlands are improved. **WDLWO1**

Maintain or improve the ecological character of the Western District Lakes Ramsar site. **WDLWO2**

Maintain groundwater interaction with the priority wetlands. **WDLWO3**

Increase the community understanding and awareness of water values and management of the Western District Lakes system. **WDLWO4**

Understand and enhance the Eastern Maar values of the Western District Wetlands and tributary rivers and ensure a strong Eastern Maar voice in their management. **WDLWO5**

Improve waterway amenity of the Western District Lakes to enhance the user experience and connection to the natural landscape. **WDLWO6**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Western District Lakes habitats across land and waterway environments through effective climate change adaptation strategies. **WDLBO1**

Achieve a net gain where possible in suitable Western District Lakes habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. **WDLBO2**

Achieve a net gain where possible in all species with positive % change in suitable Western District Lakes habitat and improved species balance expected over six years from sustained improved public and private land management and community involvement. **WDLBO3**

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. **WDLBO4**

Increase understanding and awareness of biodiversity values of the Western District Lakes Landscape System. **WDLBO5**

Land

By 2027, compared to 2022 baselines, land is suitably used within its capability and sustainably managed to maintain and improve its' natural capital. **WDLLO1**

Communities

By 2027, compared to 2022 baselines:

Western District Lakes communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **WDLCO1**

Western District Lakes communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **WDLCO2**

The increased capacity of the Eastern Maar Traditional Owner Group enables their increased involvement in decision making that effects their Country. **WDLCO3**

Western District Lakes 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Communities

Six year priority directions for the Western District Lakes are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
WDL1	Western District Lakes landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.					CCMA	DELWP, Water Authorities, EPA, COS, CS, SCS PV.
WDL2	Develop enduring partnerships with the Eastern Maar people to: 1) acknowledge and enhance Eastern Maar values of natural assets; 2) ensure the Eastern Maar people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Eastern Maar stories and history; and, 4) identify and implement opportunities for the Eastern Maar to own and manage water on their country					CCMA	EMAC, DELWP, Water Authorities, COS, CS, SCS
WDL3	Best land management practices are implemented across farmers, agencies, developers, and the catchment community					CCMA	AgVic, Landcare
WDL4	Implement the Western District Lakes Ramsar Management Plan.					CCMA, PV	DELWP, COS, CS, SCS, EPA, SRW, GHCMA
WDL5	Landuse planning, works on waterways, floodplain management and water management decisions to take into account the potential impact of proposals on the natural function of floodplains, waterways and the riparian zone.					CCMA	COS, CS, SCS
WDL6	Ensure the assessment of applications for new or transfers of groundwater entitlements in the Warrion and Colongulac Groundwater Management Areas takes into account the impact of extraction on Groundwater Dependent Eco-systems (GDEs)					SRW	CCMA
WDL7	Help farmers prepare for a more variable and uncertain future by: 1) Supporting farmers with the information and tools to build resilience 2) Preparing farmers for a range of future scenarios 3) Helping farmers manage climate risk so they remain productive and profitable under a changed climate 4) Delivering the agriculture skills of the future					AgVic	CCMA, DELWP, Landcare

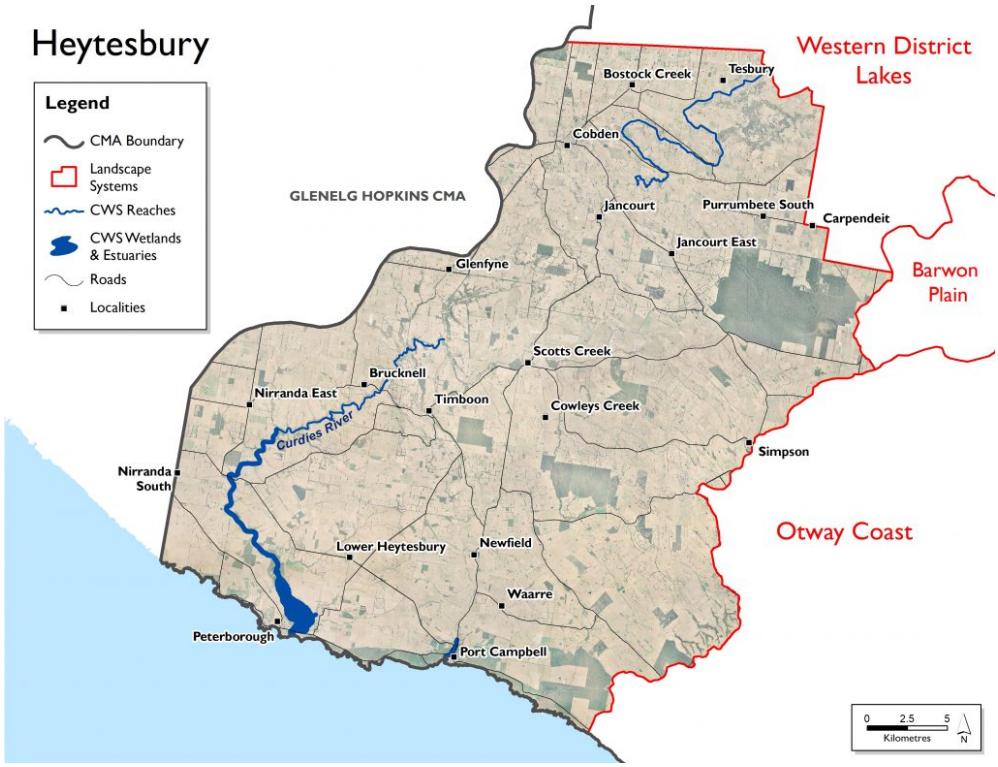
Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
WDL8	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect cultural heritage					COS, CS, SCS	CCMA
WDL9	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.					CCMA	DELWP, COS, CS, SCS, Water Authorities
WDL10	Apply responsible on-farm water management so that agriculture does not adversely impact wetlands					CCMA	AgVic, DELWP, Landcare
WDL11	Western District Lakes landowners have a greater appreciation for environmental values and benefits to agricultural production					CCMA	Landcare
WDL12	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs					CCMA	Landcare
WDL13	Engage with the community on the need to mitigate and adapt to climate change and its impacts.					CCMA	DELWP, Landcare, COS, CS, SCS
WDL14	Integrate the understanding of new and emerging impacts such as wind farms and climate change.					DELWP	
WDL15	Action Plans are developed that leads to a 25% increase of non-government investment into the region to address high priority biodiversity actions					CCMA	DELWP, COS, CS, SCS, Landcare
WDL16	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027					CCMA	DELWP
WDL17	Engage with TO's to develop a method based on traditional knowledge that enables improved and sustained management of problem herbivores in priority locations					DELWP	EMAC
WDL18	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans					DELWP	CCMA, Landcare, PV

Date printed: 29 July 2024

Heytesbury

Overview

Overall Area	112,802 hectares
Population	6,079
Climate	956 mm per annum at Timboon 836 mm per annum at Cobden
Main Towns	Cobden Timboon Peterborough Port Campbell Princetown
Land Use	Cattle grazing
Main Industries	Dairy Beef Tourism
Main Natural Features	The Twelve Apostles Loch Ard Gorge Bay of Islands Coastal Park Shipwreck Coast Port Campbell National Park Curdies River Curdies Estuary



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

The Heytesbury landscape system is located in the south west of the region and is bounded by Bass Strait to the south, Glenelg-Hopkins CMA to the west, the Otway Coast and Barwon Plains to the east with its northern boundary adjoining the Western District Lakes system. It contains the towns of Cobden, Timboon, Peterborough, Port Campbell and Princetown. The local governments covering this system are Colac-Otway and Corangamite Shires, with a small portion of Moyne Shire included around Peterborough (west of the Curdies River). The Eastern Maar are the traditional owners of this area.

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

The major waterway for this landscape system is the Curdies River and associated tributaries. Other significant waterways in the area include Port Campbell Creek and Sherbrook River. The waterways in the Heytesbury landscape system are largely valued for their environmental condition, social amenity and economic value to the community. The Curdies estuary is among the largest within the region that is a salt wedge estuary protected under the EPBC Act.

Livelihood

The Heytesbury region forms part of one of the largest milk producing regions in Australia. As many of the smaller towns in this landscape including Cobden and Timboon rely heavily on the dairy industry the viability of these communities is dependent on the viability of dairying.

The coastal communities of Port Campbell and Peterborough are also imacted on by coastal processes and utilisation. The area has become very popular to tourists and this again has an impact on the community.

Lifestyle

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

Parts of the Heytesbury were a soldier settlement established after World War 2. The scheme, established in 1960, involved the clearing of the Heytesbury Forest south of Colac and adjacent to the Otway Ranges to allow for the establishment of a dairy industry in the area. The scheme developed a strong community spirit among settlers that is still part of the character of the people who live in the Heytesbury area today.

The Heytesbury landscape system has the lowest population of the Corangamite region with a population of just over 6,000 with low density. The most densely populated area is the township of Cobden. Low population density can impact on the community, especially where farmers are becoming older and less active.

Landcare groups in this landscape include Bostocks Creek, Elingamite Cobrico, Curdies Valley and Newfield Valley Landcare Groups. They are supported by the Heytesbury District Landcare Network.

Key values identified in this landscape 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.

Assessment of current condition and trends

Water

Landcare groups have been running programs to improve the health of waterways, addressing issues including soil acidification, improving biodiversity on public and private land, controlling weeds, etc.

The waterways of the Heytesbury area fall within the Otway Basin. The major waterway of this area is the Curdies River and its associated tributaries. The Curdies River connects with the Peterborough Coastal Reserve, the Cooriemungle, Black Glen and Scotts Creeks to the east of the area. The Port Campbell Creek also flows in the south of the Heytesbury area. Many of the rivers and streams in this landscape system are small or intermittent.

In the Victorian Index of Stream Condition assessments during 2010, the waterways of the Heytesbury area were found to be in mixed condition. Of the Otway Basin (the highest scoring condition catchment basin in the Corangamite region), the Heytesbury area contains the waterways with lowest scoring condition, and no waterways in excellent condition. Port Campbell Creek's condition was assessed as good – the highest of the Heytesbury area. The highest and lowest reaches of the Curdies river were found to be in very poor condition, with the rest of the Curdies River and tributaries assessed to be in moderate condition. All waterways assessed showed elevated levels of phosphorus.

Drought has a significant impact on flow stress in the Otway Basin, with the reach of the Curdies River in the central part of Heytesbury landscape system among the most affected by drought. While much of the Otway Basin outside of the Heytesbury area had near natural flow regimes, the central and southern reaches of the Curdies River experience highly modified flows as an impact of farm dams and diversions. Additionally, the entire Curdies River exhibits summer stress and long periods of low flows.

Corangamite Waterwatch, a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment, including the Curdies and associated tributaries. Monitoring undertaken in the upper catchment of the Curdies River (2014 to 2017) indicates the waterway to be in marginal to moderate condition, whilst displaying low salinity and turbidity, and relatively healthy pH levels. Low oxygen levels on occasions potentially indicate high instream oxygen demand. Monitoring in Scotts Creek following rainfall events (2011 to 2014) indicate high sediment and phosphorus loads are carried in the runoff into this tributary during these times, likely linked to unrestricted stock access and reduced riparian vegetation along the waterway.

Further down the catchment, monitoring undertaken during the fish eDNA project (2019) suggests improvements occur with low salinity and turbidity, and improved oxygen levels indicating the waterway to be in moderate condition. All riverine sites indicate there to be high phosphorus inputs to the Curdies River, also likely associated with farming practices in the area. High phosphorus inputs can lead to excessive macrophyte and algal growth, whilst high sediment inputs can smother submerged aquatic vegetation and habitat for fish and aquatic macroinvertebrates.

In the Curdies River estuary (2014 to 2020) the water quality was moderate to good, displaying healthy oxygen and pH levels and mostly low turbidity. Being an intermittently open estuary, salinity levels varied throughout the estuary being fresh to brackish in the upper estuary and brackish to saltwater in the lower estuary. During most openings of the estuary mouth – usually in winter – the estuary is flushed of saltwater by increased freshwater river flows, tidal influences reintroduce salt water to the estuary and after a short period, as river flows decline, the estuary mouth closes.

Biodiversity

The majority of remaining native vegetation in the Heytesbury landscape system are classed as rare or vulnerable, with some areas classed as endangered. This is generally a reflection of the clearing that has taken place to enable agricultural production in this highly productive area. There are some areas of reserved public land in the area but these have been impacted by timber harvesting for a variety of purposes.

The Curdies estuary at Peterborough and adjoining shallow waters provide significant habitat that support the lifecycle of many fish species, including migration, spawning and rearing of juveniles. Yellow-eye mullet *(Aldrichetta forsteri)* juveniles will utilise seagrass beds in the estuary and Estuary Perch *(Macquaria colonorum)* and Black Bream *(Acanthopagrus butcheri)* use the estuary for all life stages. The shallow water adjoining the estuary provides important foraging habitat and a refuge for juvenile fish of many species. The Yarra Pygmy Perch *(Nanoperca obscura)* has also been recorded in the estuary and is listed as vulnerable at state and national level.

The Victorian Biodiversity Atlas identifies almost 40 bird species listed as rare or threatened on the Victorian Advisory List for the area, including 8 that are listed under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. These include: Curlew Sandpiper *(Calidris ferruginea)*, Eastern Curlew *(Numenius madagascariensis)*, Great Knot *(Calidris tenuirostris)*, Australasian Bittern *(Botaurus poiciloptilus)*, and Orange-bellied Parrot *(Neophema chrysogaster)*.

Important habitats for birds and other species vary with water levels and include:
- extensive areas of open water of varying depth
- mudflats
- vegetated areas
- sandy shores.

Several significant vegetation communities are represented at the Curdies River estuary, including at least 14 different Ecological Vegetation Classes (EVCs). A stand of Estuarine Wetland, which is noted as one of the largest in southeast Australia and is listed as depleted across the Warrnambool Plain bioregion is found at the estuary. Other vegetation classes of note include Swamp Scrub, which has a bioregional conservation status of 'endangered' – it is within this vegetation community that the nationally vulnerable Swamp Greenhood orchid *(Pterostylis tenuissma)* has been recorded. Similarly, a large population of the nationally vulnerable species Curly Sedge *(Carex tasmanica)* has been recorded in the Brackish Grassland EVC.

However, despite some significant EVCs and individual species, vegetation is predominantly degraded in estuarine areas, including along the Curdies River (around the Peterborough Coastal Reserve). The upper reach of the Curdies River also exhibits poor vegetation quality.

Land

Generally, soil health in the Heytesbury area is in the healthiest condition of the Corangamite region. Soil productivity on private agricultural land in the Heytesbury area is consistently the highest in the Corangamite region.

The Heytesbury region forms part of one of the largest milk producing regions in Australia.

DELWP's Victorian Land Cover Time Series provide a snapshot of the changes in land cover types in seven five-year increments between 1985-2019.

The most prevalent land cover class in Heytesbury is non-native pasture, followed by native trees. Non-native pasture cover has fallen over the 30 year period, from 85% of the total area, to 81%. Native trees, which constitute around 10% of total land cover, have remained constant over the time period. Irrigated horticulture, hardwood plantations and exotic woody vegetation (previously all <1%) now constitute a moderate proportion of land cover for the region, occupying 1.9%, 1.3% and 2.1% of the total area respectively. Urban areas have more than doubled to cover 0.8% of the Heytesbury landscape system. Both seasonal and perennial wetland land cover decreased slightly over the time series.

Coast and Marine

The condition of coastal waters is generally good, with low levels of nutrients, turbidity and bio-contaminants, and generally good light conditions. Wave energy along the coast is high with waves generated from the large incoming swells of the Southern Ocean.

Heytesbury has some spectacular and well recognised coastal landscapes that are integral to the identity of the state and its people, including the iconic offshore rock formations of the Twelve Apostles. The Twelve Apostles Marine National Park and The Arches Marine Sanctuary are along this coastline.

The Heytesbury marine area has high species richness and diversity. Marine species and communities are susceptible to a range of threats ranging from local to global scales. For example, long-lived fish species with limited reproductive potential are most susceptible to overfishing.

Large sections of the coastline within the Heytesbury landscape system are moderately erodible which can present some issues with maintaining not only the coastline itself but the impact of such events on other natural and built assets.

Key ecological vegetation classes that occur within this landscape system include Costal Dune Scrub/Grassland mosaic, Coastal Saltmarsh, Coastal Headland Scrub, Coastal Tussock Grassland and Coastal Alkaline Scrub.

Community

The Heytesbury landscape system has the lowest population of the Corangamite region with a population of just over 6,000 – around 1.5% of the total population. Its population density is also low, with the most densely populated area being the township of Cobden.

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 involves fencing off, revegetating and controlling weeds (including Willows) on a number of waterways.

Landcare groups in this Landscape include Bostocks Creek, Elingamite Cobrico, Curdies Valley and Newfield Valley Landcare Groups. They are supported by the Heytesbury District Landcare Network.

Other environmental groups:

- Friends of Cobden Lake
- Friends of Port Campbell National Park
- Friends of Timboon Rail Trail
- Port Campbell Biolinks
- Timboon Junior Rangers

Major threats and drivers of change

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 have been 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. Other waterways such as Cooriemungle, Scotts, Fentons, Wallaby, Spring, Squirrel, Whisky and Mosquito creeks are also important.

Water

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 are a threat in the upper reaches of the Curdies River and in the longer term their spread may compromise the condition of downstream reaches of the river system.

The Curdies River estuary intermittently opens or closes depending on the prevailing conditions, with estuary closure sometimes resulting in social and economic impacts through flooding of adjacent land. Artificially opening the estuary under certain conditions can result in adverse impacts to the surrounding environment and its associated species.

Projected sea level rise, temperature increase, reduction in rainfall and an increase in extreme natural events (i.e. flooding) are all expected to impact the ecology and dynamics of the waterways, wetlands and estuaries within this landscape system. The coastal impacts associated with climate change pose a significant threat to the Curdies River estuary. Sea level rise of 0.8-1.1m is forecast by 2100, as well as an increase in storm surge events. According to the Corangamite NRM Plan for Climate Change these influences, combined with a reduction in rainfall, create a high climate change risk for the Curdies estuary.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Heytesbury landscape. These include:

- Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program)
- Establish native indigenous vegetation (Curdies River, Curdies Inlet)
- Install riparian/wetland fencing (Curdies River, Curdies Inlet)
- Establish stewardship/management agreement (Curdies River, Curdies Inlet)
- Assess options for long-term management land subject to inundation (Curdies Inlet)
- Undertake woody weed control (Curdies River)
- Continue to adopt a risk-based approach to estuary mouth opening (Curdies Inlet)
- Review and update current estuary management plan – Curdies Inlet
- Maintain EstuaryWatch groups collecting baseline data on estuary condition (Curdies Inlet)
- Maintain Waterwatch groups collecting baseline data on waterway condition

Biodiversity

Increased usage of the Curdies estuary may have negative impacts if not carefully planned for and managed. Potential impacts may include littering, trampling of vegetation and habitat disturbance, bank erosion due to inappropriate access, the introduction and spread of weeds and illegal shooting and camping. Urban encroachment and inappropriate development around the estuary also has the potential to impact on the natural values of the estuary and the installation of hard infrastructure may restrict the ability for a more natural flood regime to be achieved; this too must be carefully managed and planned for.

Over 50 species of introduced flora have been reported at the Curdies River estuary, including a number of common agricultural weeds that dominate the landscape in places where native vegetation is cleared (DELWP 2016). Livestock grazing, resulting in the reduction of indigenous vegetation cover, spread of weeds, particularly Tall Wheat Grass *(Lophopyrum ponticum)* and pugging have been identified as the main threats to remnant estuarine vegetation at the Curdies. The encroachment of domestic garden plants into surrounding native vegetation has also been identified as a threat.
Infestations of weeds can out-compete native species, resulting in changes to the structure, species composition and abundance of native vegetation communities.

Willows (Salix spp.) are a Weed of National Significance and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, and reducing aquatic and riparian biodiversity. 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.

Land

Landslides, secondary salinity, acid sulphate soils, sheet/rill erosion and soil structure decline present the major threats to soil and land use (see Static Maps section for mapped soil threats).

The steepness of the slope is often a causal factor for landslides in this landscape system; high rainfall is also a trigger. How the land is being used and the introduction of infrastructure can also contribute to landslides with inappropriate agricultural practices or environmental works potentially increasing landslide risk.

If the soils in this landscape system become waterlogged, the lack of oxygen in pore spaces over sustained periods severely affects plant growth. In wet and compacted soil horizons, where the air porosity is low, poor soil aeration is exacerbated by the production of toxic compounds produced by soil micro-organisms. This can lead to soil structure decline and its associated risks.

Coast and Marine

The Victorian Marine and Coastal Policy identifies that the health of the marine and coastal environment is under threat from multiple sources, including climate change and growth in towns, cities and industries that interact with their local marine and coastal ecosystems.

These threats can lead to negative impacts on water quality and quantity, pollution and debris, invasive species, marine pests and diseases, disturbance and loss of plants and animals, and loss of access to beaches from the effects of sea walls, infrastructure and erosion. Degradation occurs over time and space, and the impacts in marine and coastal areas are varied and complex.

Climate change is increasing the pressure on the marine and coastal environment by exacerbating existing threats and introducing new ones, including:

• rising sea levels, leading to more inundation and erosion
• increased frequency and severity of storms and other extreme weather events
• changes in ocean temperatures, currents and acidification
• changes to waterway flows, levels and regimes
• changes in the range, distribution and abundance of both introduced and native plants and animals, taking advantage of a changed climate.

There are a number of locations along the Heytesbury coastline that are already susceptible to erosion, this will be increased under climate change scenarios, especially with the prediction of increased frequency of storms and extreme weather events. Sea level rise under climate change will have a major effect on low ling coastal areas, especially where there are estuaries.

Growth in resident populations and visitor numbers puts pressure on the health of the marine and coastal environment. Population growth also increases pressure on recreational infrastructure such as walking tracks and visitor facilities. This, in turn, leads to more demand for alterations to beaches, foreshores, wetlands and natural processes through groynes, sea walls and dredging to support use and development.

Community

The Heytesbury landscape system has the lowest population of the Corangamite region with a population of just over 6,000 with its population density also being low, with the most densely populated area being the township of Cobden. This in itself can impact on the community, especially where farmers are becoming older and less active. The Heytesbury District Landcare Network is active in this area and provides support to the community in managing the natural assets of the area.

The area is highly dependent on the dairy industry with profitability being directly aligned with commodity prices. As many of the smaller towns in this landscape including Cobden and Timboon rely heavily on the dairy industry, the viability of these communities is dependent on the viability of dairying.

The coastal communities of Port Campbell and Peterborough are also impacted on by coastal processes and utilisation. The area has become very popular to tourists and this again has an impact on the community.

Emergency events such as riverine flooding, flash flooding, storm surge, landslides and debris resulting from bushfire, as well as other events such as pollution, boating incidents and drownings pose a risk to those who live, use and enjoy the area.

Peterborough has a history of being impacted by flooding from the Curdies River when the mouth is closed, with impacts including flooding of the caravan park and dwellings and inundation of roads.

Heytesbury 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

There is an improvement in riparian extent and condition and water quality in priority reaches as defined in the Corangamite Waterway Strategy. **HeyWO1**

Maintain or improve water quality of the Curdies River estuary compared to Index of Estuary Condition 2019. **HeyWO2**

Increase the community's understanding and awareness of water values and management in the Heytesbury Landscape System. **HeyWO3**

Ensure Eastern Maar people have a strong voice in the management of waterways in the Heytesbury Landscape System and cultural values are incorporated. **HeyWO4**

There will have been an increase in the Curdies River estuary in stream habitat for native fish and angling species compared to 2021 baseline. **HeyWO5**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Heytesbury habitats across land, waterway and coastal environments. **HeyBO1**

Achieve a net gain where possible in suitable Heytesbury habitat expected over six years from sustained, improved public and private land management and community involvement for threatened and culturally significant local species. **HeyBO2**

Achieve a net gain where possible in all species with positive % change in suitable Heytesbury habitat and improved species balance expected over six years from sustained improved public and private land management and community involvement. **HeyBO3**

Increase effectiveness of interagency collaboration in their ability to respond to climate change on biodiversity. **HeyBO4**

Increase understanding and awareness of biodiversity values of the Heytesbury Landscape System. **HeyBO5**

Increase capture of carbon to offset the negative impacts of climate change. **HeyBO6**

Land

By 2027, Land within the Heytesbury Landscape System is suitably used within its capability and sustainably managed to maintain and improve its natural capital compared to 2022 baselines. **HeyLO1**

Communities

By 2027, compared to 2022 baselines:

Communities of the Heytesbury Landscape System (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **HeyCO1**

Heytesbury Landscape System communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **HeyCO2**

The increased capacity of the Eastern Maar Traditional Owner group enables their increased involvement in decision making that effects their Country. **HeyCO3**

Coast and Marine

By 2027, compared to 2022 baselines, proactive management of the catchment by the community contributes to a net gain in the health and resilience of the region's highly valued coastal and marine environment. **HeyMO1**

Heytesbury 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Coast & Marine | Communities

Six year priority directions for the Heytesbury are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
HEY1	Heytesbury landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.						CCMA	DELWP, WW, EPA, PV
HEY2	Develop enduring partnerships with the Eastern Maar people to: 1) acknowledge and enhance Eastern Maar values of natural assets; 2) ensure the Eastern Maar people have a strong say in management of natural assets; 3) Identify and implement appropriate mechanisms for sharing Eastern Maar stories and history; and, 4) identify and implement opportunities for the Eastern Maar people to own and manage water on their country						CCMA	EMAC, DELWP, WW, CS, MC
HEY3	Encourage Heytesbury landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities						CCMA	AgVic, Landcare
HEY4	Best land management practices also implemented across other Heytesbury cohorts including agencies, developers, and the broader catchment community						CCMA	DJPR, PV, DELWP, CS, MC, GORCAPA
HEY5	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect and enhance marine and coastal values 4) protect cultural heritage						Local Govt	GORCAPA, CCMA, DELWP
HEY6	Enhance riparian management within priority waterways and improve in-stream habitat in along the Curdies River						CCMA	HDLN, WVD, OzFish, VRFish
HEY7	Ensure the assessment of applications for new or transfers of groundwater entitlements from the Paaratte Groundwater Management Area takes into account the impact of extraction on connected waterways and Groundwater Dependent Ecosystems (GDEs)						SRW	CCMA

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
HEY8	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Wannon Water Urban Water Strategy; and, 2) priority projects identified by the Great South Coast Integrated Water Management Forum						WW	CS, MC
HEY9	Manage upstream and local processes to maintain or improve estuary condition, enhance amenity values and increase resilience to climate change.						CCMA	DELWP, WW, EPA, Landcare
HEY10	Ensure estuary management is managed consistent with State policy to reduce impact on natural environment and mitigate risk to human related assets						CCMA, PV	CS, MC, GORCAPA, WW, DELWP
HEY11	Provide the public with clear guidance on episodes of poor water quality such as blue-green algae outbreaks						WW	CCMA, CS, MC, PV
HEY12	Help farmers prepare for a more variable and uncertain future by: 1) Supporting farmers with the information and tools to build resilience 2) Preparing farmers for a range of future scenarios 3) Helping farmers manage climate risk so they remain productive and profitable under a changed climate 4) Delivering the agriculture skills of the future						AgVic	DELWP, WVD, HDLN
HEY13	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.						CCMA	DELWP, CS, WW, PV, GORA
HEY14	Work with farmers to understand how to improve soil conditions and use nutrients efficiently to reduce off-site impacts.						AgVic	WVD, CCMA, HDLN
HEY15	Enhance the extent, connectivity and condition of remnant habitats including climate resilient species through protection and restoration						HDLN	CCMA, DELWP
HEY16	Develop and deliver information to raise the level of community awareness in the importance of biodiversity, the value of ecosystem services and effective land stewardship and encourage participation and investment in its protection and enhancement						CCMA	DELWP, HDLN
HEY17	Develop carbon sequestration opportunities that respond to the effects of climate change through improved productivity and creation of habitats that also enhance biodiversity						CCMA	DELWP, WVD, HDLN
HEY18	Develop a landscape specific approach to the control of feral animals						DELWP	AgVic, CCMA, PV
HEY19	Encourage the use of regenerative farming to increase and improve biodiversity						HDLN	AgVic, WVD, CCMA
HEY20	Within the Coastal and Marine environment 1) review targets in relevant strategies to identify and reduce stressors on coastal and marine environments 2) develop and implement a process for the provision of coastal erosion advice for long term planning, management and adaptation.						DELWP	CCMA, CS, GORCAPA, HDLN

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
HEY21	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs						CCMA	HDLN, CCMA, GORCAPA, CS, MC
HEY22	Engage with the community on the need to mitigate and adapt to climate change and its impacts.						CCMA,	CCMA, DELWP, HDLN, WVD, GORCAPA
HEY23	Action Plans are developed that leads to a 25% increase of non-government investment into the region to address high priority biodiversity actions						CCMA	HDLN
HEY24	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027						CCMA	DELWP
HEY25	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans						DELWP	CCMA, HDLN, PV

Date printed: 29 July 2024

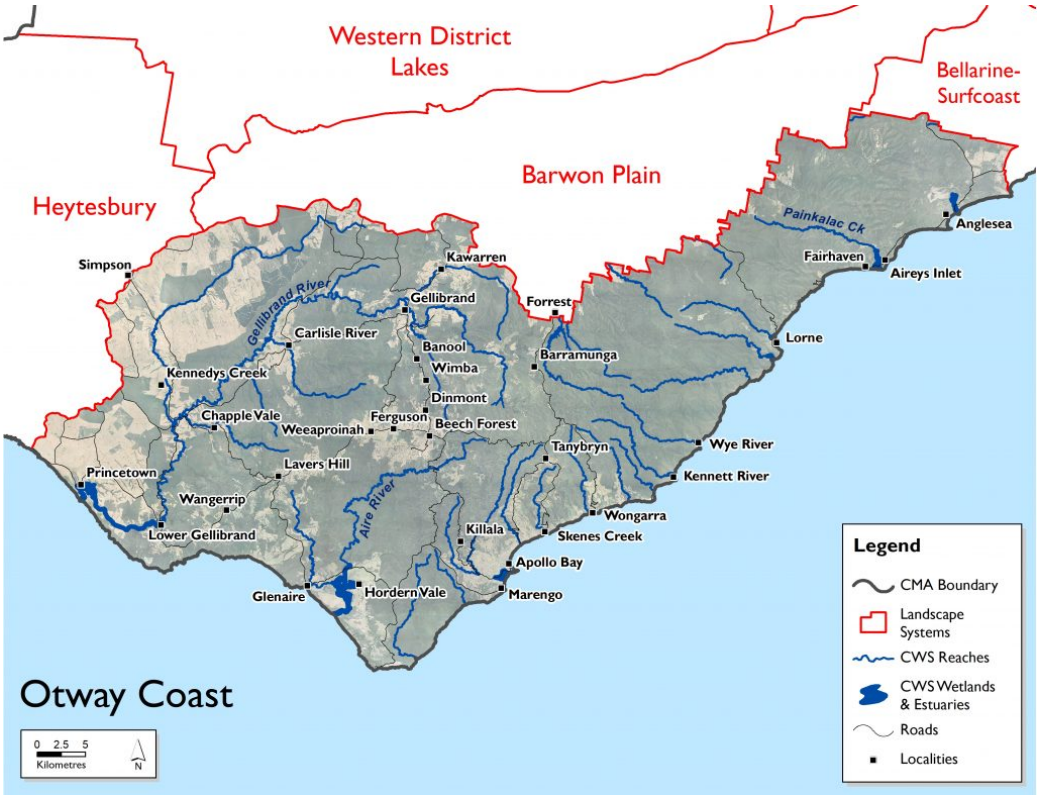
CORANGAMITE CMA

VICTORIA State Government

Otway Coast

Overview

Overall Area	256,247 hectares
Population	9,156
Climate	1,732 mm per annum at Beech Forest 1,078 mm per annum at Gellibrand 628 mm per annum at Aireys Inlet
Main Towns	Anglesea Lorne Apollo Bay
Land Use	Conservation Grazing of sheep and cattle Forestry
Main Industries	Tourism Agriculure Forestry Commercial fishing
Main Natural Features	Otway Ranges The Great Otway National Park Aire River Gellibrand River Barham River Anglesea River Various Smaller Coastal Rivers and Streams



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

The Otway Coast landscape system occurs along the southern edge of the region between the Geelong, Bellarine and Heytesbury landscape systems. To its north is the Barwon Plains system and it comprises part of the Otway Coast drainage basin and is within the Otway Ranges bioregion. It sits within the shires of Colac-Otway and Surf Coast ; the Traditional Owners are the Wadawurrung in the east and the Eastern Maar to the west of Painkalac Creek.

The Great Otway National Park extends across the landscape system 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.

Many of the major waterways in this system are drinking water sources (eg Gellibrand and Barham catchments) and they contain threatened native fish populations (Australian grayling, Australian mudfish and Yarra Pygmy Perch) as well as River blackfish in the Gellibrand catchment.(The latter is not yet considered threatened under legislation but has undergone significant population decline over recent decades.)

Of particular significance 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.

A number of important wetlands are sited along the coastal fringe near Hordern Vale west of Cape Otway including 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.

Key values identified in the Otway Coast landscape system 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.

Livelihood

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 system is under the management of Parks Victoria.

While the Otway Coast is predominantly public land, the soil productivity on private agricultural land is relatively high for the Corangamite region. Its few patches of relatively low soil productivity are around Anglesea on the coast on the eastern edge, while the western edge of the Otway Coast (bordering the Heytesbury area) is consistently of highest productivity.

The major threats to land and its use within this landscape system is landslides, soil structure decline, soil nutrient decline, water logging, soil acidification, sheet/rill erosion and gully/tunnel erosion.

The land use in this area is predominantly for conservation purposes and forestry with the majority of land managed for this purpose within national parks and reserves systems. Grazing of sheep and cattle is the major agricultural pursuit in this landscape zone followed by dairying. The major private land use is forestry with large plantations of pines and blue gums for commercial harvesting across the area.

As with a number of coastal areas, there is a high proportion of absentee land owners with many using this area as their holiday location. The large number of tourists that flock to the area also has a proportional impact on the wellbeing of these townships, with many geared towards servicing the tourism industry.

Lifestyle

The Otway Coast has a population of around 9,100 – around 2.25% of the total Corangamite region population and is the third least populated area. The most densely populated areas of the Otway Coast are along the coastline, in the townships of Apollo Bay, Lorne, Airey's Inlet and Anglesea.

The climate is relatively wet and cool with high rainfall (1050 mm over 125 days at Apollo Bay and 924 mm over 117 days at Lorne) and lower maximum temperatures (18^{o} max at Apollo Bay and Lorne, 11^{o} and 9^{o} min at Apollo Bay and Lorne respectively). The major towns are Anglesea, Lorne and Apollo Bay. Property prices play a key role in land ownership with the high values associated with purchasing in this area often prohibitive. This is also a trend with properties within the coastal hinterland, with larger properties being purchased for lifestyle purposes.

Landcare groups within this landscape include Princetown, Hordern Vale Glenaire, Otway Barham Catchment, Otway Coast Regenerative Farmers, Beech Forest Ferguson (The Ridge), Apollo Bay, Wye to Wongarra, Forrest, East Otway and Torquay Landcare Groups.

Assessment of current condition and trends

Water

The waterways of the Otway Coast fall predominantly within the Otway Coast Basin, with some of the waterways in the northwest of the area falling in the Barwon River Basin. This area contains the most individual waterways of the entire Corangamite region, flowing through the mostly forested Otway ranges. Major waterways for this region include the Gellibrand River in the west, Aire River in the centre and Painkalac Creek in the east.

The water quality in this landscape system is generally good as large portions of the area are national parks or forested. Some parts such as the Gellibrand River, Aire River, Barham River and associated tributaries have been subjected to grazing pressures with livestock accessing waterways causing damage and impacting on water quality.

The Anglesea River is also subject to acidification events which have a major impact on water quality and usability.

Water management activities compounding the impact of drought occur most notably for Painkalac Creek. The Otway Coast Basin also holds the greatest proportion of near natural flow regimes in the Corangamite region. Parts of the Gellibrand River show summer stress with long periods of low flows.

The West Barwon Dam is a significant water body within the Barwon River Basin area of the Otway Coast, and provides drinking water for greater Geelong. The Barwon River has been assessed as having flow regimes that were highly modified due to water off-takes.

The Gellibrand River estuary intermittently opens or closes depending on the prevailing freshwater river flows and tidal movements. Estuary closure can result in flooding of adjacent land which results in artificial estuary openings. However, this inundation is a natural process and plays an important role in the life cycle of many plant and animal species that reside or visit the estuary as well as the cycling of nutrients and deposit of sediments. In 2017 the Corangamite CMA developed the Gellibrand River Estuary Management Plan to guide management of the estuary and surrounding wetlands including the Latrobe Creek wetlands.

Corangamite Waterwatch, a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment. The water quality of the waterways in the Otways Coast were mostly healthy; salinity levels in the riverine sections of the waterways were mostly low, though marginally above the SEPP (Waters) objectives, whilst the oxygen levels in the water were marginally below the objectives. Turbidity levels were low and pH levels were mostly healthy; phosphorus levels in some waterways may be of concern. All waterways displayed a seasonal trend of increased electrical conductivity over the summer and autumn seasons resulting from reduced river flows. During these times dissolved oxygen levels were also lower though mostly remained within the healthy range.

In Wye River the water quality was mostly good displaying relatively low salinity and turbidity, healthy pH and oxygen levels, with phosphorus levels marginally high. The macroinvertebrate community indicates the catchment to be mostly healthy. In the estuary, mouth closures occur most years during the summer season and are generally short lived. As summer river flows decline, a salt wedge develops from tidal driven sea water entering the estuary. The water quality in the estuary was mostly very good, even though salinity stratification was evident. Oxygen remained within healthy levels. All water quality parameters remained mostly within the healthy range over the period monitoring was conducted.

In St George River, the water quality monitoring was undertaken in the estuary only during the summer to autumn season and captures a time after seasonal river flows have declined and the salt wedge had already developed. Significant salinity stratification resulted in very low dissolved oxygen levels (<10% saturation) in the bottom waters, particularly at the upstream site; these low levels would be harmful to salt water dependent species. At the most downstream site the stratification also resulted in lower dissolved oxygen levels in the bottom waters, though not as low as that observed upstream. During this time the pH remained mostly within the healthy range, with low turbidity.

In the Erskine River, on most occasions the water quality was good, displaying relatively low electrical conductivity, turbidity and phosphorus levels and healthy pH and dissolved oxygen levels. At the most downstream riverine site, increases in electrical conductivity were observed, likely due to reduced river flows and possibly due to estuarine influences. Increases in phosphorus over summer were also evident. The aquatic macroinvertebrate community (2016 survey) indicates the Erskine River catchment to be healthy. The estuary is mostly tidal dominated with a brief period over winter and spring when freshwater dominates – at these times oxygen levels are healthy. As the salt water penetrates the estuary, stratification occurs, resulting in lower levels. Over summer in the upper estuary the water column was stratified. This stratification resulted in very low oxygen levels (<10% saturation) in the bottom waters; these low levels may be harmful to salt water dependent species. Nearer the estuary mouth the water column was also stratified, however the bottom oxygen levels were much higher – this is due to tidal influences bringing freshly oxygenated sea water into the estuary on each high tide. During this time the pH remained mostly within the healthy range, with mostly low turbidity.

In the estuarine reaches, greater variability was observed, particularly over the summer and seasons when river flows decline and sea water moves up the estuaries. In many instances salinity stratification occurs, reducing the potential for oxygenation of the saline bottom waters – the further the distance from the estuary mouth and the deeper the estuary, the lower the oxygen levels. All of the estuaries intermittently close to the ocean with artificial openings common, particularly Painkalac Creek and Anglesea River.

The water quality in the freshwater reaches of Painkalac Creek was marginal (limited monitoring may not reflect the true condition of the water quality in Painkalac Creek); whilst displaying healthy pH and low phosphorus levels, oxygen levels were regularly below 50% saturation. The salinity was also marginally high for a stream in the Otway Ranges and turbidity levels indicate sediment movement possibly associated with unrestricted stock access and reduced riparian vegetation. Aquatic macroinvertebrate monitoring indicated the waterways to be mildly impacted.

The mouth condition assessments indicate the Painkalac estuary is closed to the ocean for most of the time. The longest duration of closure of the estuary mouth was from September 2014 to July 2016. Outside of this time the estuary mouth generally opens to the ocean once or twice per year, these openings are mostly artificial and are conducted due to the risk of inundation of built infrastructure on the estuary floodplain. Over the summer to autumn seasons, the water level within the estuary often reduces due to low or no freshwater inflows and increased evaporation. As river flows increase during winter and spring, the water level increases within the closed estuary.

The water quality in the Painkalac estuary was mostly good, though at times was marginal and displayed several seasonal trends. During winter and spring there is a short period of near freshwater dominance due to rainfall in the catchment and increased river flows. Following the opening of the estuary mouth, salt water penetrates up the estuary and stratification is evident with the bottom water salinity higher than the top water. For most of the time the estuary water is brackish. In 2013 salinity monitoring indicated the water to be hypersaline resulting from low inflows and evaporation. Due to the salinity stratification, dissolved oxygen levels in the bottom waters were at times critically low, particularly in the upper reaches of the estuary. On several occasions there was high potential for algal growth.

The pH levels in Painkalac estuary also displayed a seasonal trend with low levels (acidic conditions) occurring during late autumn and winter, usually at times of the first significant rainfall event, due to the release of acidic waters from the catchment following the dryer summer seasons. Very low levels (<6.0 pH units) occur most years at these times with the lowest recorded in April 2017 (4.3 pH units) and are likely to impact on the plants and animals present. Often the stratification of the water column contains the acidic conditions in the top waters. These conditions marginally improve as the waters move toward the estuary mouth, though they are evident throughout the estuary. The turbidity was mostly low, with higher levels recorded at times of increased river flows indicating sediments are being delivered to the estuary, likely due to land-use practices in the catchment.

The monitoring undertaken in the upper catchment of the Gellibrand River in Love Creek indicates the waterway to be in marginal to good condition, whilst displaying low salinity, turbidity, reactive phosphate and healthy pH levels. Llow oxygen levels on occasions potentially indicate high instream oxygen demand, particularly over summer when river flows are reduced. Macroinvertebrate monitoring identified several pollution sensitive bugs to be present; the complete community composition indicates the creek to be healthy.

Further down the catchment the Carlisle River joins the Gellibrand River. Monitoring of the water quality in the Carlisle River indicates it to also be in good condition, similar to Love Creek, with occasional low oxygen levels particularly during times of low river flow over summer and autumn.
Downstream from the confluence with the Carlisle River on the Gellibrand River, the water quality is maintained in good condition. Lower down the catchment the water quality, whilst mostly healthy, shows some decline with increased turbidity indicating increased sediment entering the waterway.

As the Gellibrand River enters the estuary at the Great Ocean Road approximately fourteen kilometres from the estuary mouth there is a slight increase in turbidity. This area of the estuary is shallow compared to further downstream and saline water has rarely been recorded at this site.
However over the next eight kilometres, declines in water quality are evident with decreases in pH levels indicating acid sulphate soils are likely in the area. Estuary flood plains are commonly associated with acid sulphate soils; disturbances such as channel drains used to reduce flooding often expose these soils which upon wetting release sulphuric acid into the waterway, lowering pH levels.

There is evidence the salt wedge penetrates this area some ten kilometres from the estuary mouth at times of low river flows. This results in stratification on a salinity gradient. The effects of stratification are also evident in Latrobe Creek at the township of Princetown. At times of estuary closures the effects of stratification particularly as river flows start to increase can impact the whole estuary as the saline bottom waters become separated from the surface, oxygen levels soon decrease to a level that can be lethal to saltwater dependent fish. Fluctuations in dissolved oxygen is a natural occurrence in salt wedge estuaries, such as the Gellibrand River estuary. The overall water quality in the Gellibrand River estuary is marginal to good. Eery year over the summer to autumn seasons the estuary mouth closes due to reduced river flows – it is during these times when the water quality is most variable.

Biodiversity

This is one of the region's more diverse landscapes containing three bioregions. It is dominated by Otway Ranges (about 60%), covering most the of the south coast and central area, Otway Plain is second most featured (about 30%), covering the north-eastern edge of the landscape system, the central north western area and small sections scattered on the coast. The Warrnambool Plain occurs on the western boundary and makes up about 10% of the landscape.

Within the Otway Coast landscape, the majority of waterways have excellent vegetation condition, with six reaches assessed as being in reference condition. However, some estuarine reaches in this area exhibit vegetation of poor condition. Dewing Creek's was found to be in reference condition, with three other reaches in near-reference condition.

The landscape has threatened Ecological Vegetation Classes (EVC) with Wet Forest bounded by areas of Shrubby Wet Forest and Shrubby Foothill Forest EVCs being the most dominant vegetation types. Cool Temperate Rainforest occurs largely within the gullies, while Wet Sands Thicket and Riparian Forest are found along with small patches of Wet Heathland EVCs. Along the coast Damp Sands Herb-rich Woodland and Coastal Headland Scrub can be found along with small sections of Sand Heathland at the eastern extent of the landscape. The Victorian Biodiversity Atlas has records of 37 Federally protected species, 69 State protected species and 173 rare or threatened species on the Victorian Advisory List occurring within the landscape.

DELWP's Habitat Distribution Models identify species with more than 5% of their Victorian range in the area, including notable plant species such as Pallid Sun-orchid (endangered, 100% of range), Large Plumeorchid (rare, 98% of range), Anglesea Leekorchid (endangered, 94% of range), Angahook Pink-fingers (endangered, 92% of range), Anglesea Grevillea (vulnerable, 76% of range), Otway Grey-gum (vulnerable, 76% of range).

Rare or threatened species with more than 20% of their Victorian modelled range in the landscape include: Dwarf Silver Wattle *(Acacia nano-dealbata)*, Ground spleenwort *(Asplenium appendiculatum subsp. appendiculatum)*, Tall Astelia *(Astelia Australiana)*, Coast Correa *(Correa backhouseana var. backhouseana)*, Slender Treefern *(Cyathea cunninghamii)*, Brooker's gum *(Eucalyptus brookeriana)*, Snowberry *(Gaultheria hispida)*, Bristly Shield-fern *(Lastreopsis hispida)*, Wrinkled Buttons *(Leiocarpa gatesii)*, Hairy Shepherd's Purse *(Microlepidium pilosulum)*, Goldy Wood *(Monotoca glauca)*, Satinwood *(Nematolepis squamea subsp. squamea)*, Dwarf Sickle Fern *(Pellaea nana)*, Rufous Bristlebird (Otway) *(Dasyornis broadbenti caryochrous)*, Pale Groundsel *(Senecio hypoleucus)*, Tasman Fan-fern *(Sticherus tener s.s.)*, Fairy Lanterns *(Thismia rodwayi)*.

One reptile, the Mountain Dragon Anglesea form, has 98% of its range in the region (data deficient). Two notable bird species with more than 5% of their Victorian range in the area are the Rufous Bristlebird (near threatened, 6%), and Rufous Bristlebird ((Otway) near threatened, 6%).

Land

While the Otway Coast is predominantly public land, the soil productivity on private agricultural land is relatively high for the Corangamite region. Its few patches of relatively low soil productivity are around Anglesea on the coast on the eastern edge, while the western edge of the Otway Coast (bordering the Heytesbury area) is consistently of highest productivity.

DELWP's Victorian Land Cover Time Series provide a snapshot of the changes in land cover types in seven five-year increments between 1985-2019.

The most prevalent land cover class in the Otway Coast landscape system is native trees, followed by non-native pastures and both hardwood and pine plantations. Over the 30-year period, native trees total area has increased marginally, constituting around 73% of the entire landscape system. Non-native pasture dropped from 19% of the total area, to 17%, while both hardwood and pine plantations increased, now occupying a combined 6% of the Otway Coast (from a previous 4.5%). Urban areas have experienced moderate growth, now occupying 0.5% of the area. Exotic woody vegetation land cover also occupies 0.5% of the total landscape area. Although constituting only a small proportion of the Otway Coast, native grass herb, and seasonal wetlands both decreased, more than halving their earlier size.

Coast and Marine

The Otway Coast coastline constitutes two bioregions, dominated mainly by Otway Plain and Otway Range; with the latter maintaining a majority of its original vegetation cover (81.6%). Within the this system the highest percentages of remnant vegetation is within public land (79.1% and 61.9% respectively). Most of the remnant coastal biodiversity in the system is reserved in national, state and other parks, state forests, and other public land reserves. including the Great Otway National Park and the Angahook-Lorne State Park.

The condition of coastal waters is generally good, with low levels of nutrients, turbidity and bio-contaminants, and generally good light conditions. Attention of nutrient and sediment fluxes in the catchments, and appropriate management of storm water and wastewater in coastal towns is essential to preserve this good condition.

Within this system there are a number of marine sanctuaries and national parks. These include the Marengo Reefs and Eagle Rock Marine Sanctuaries. The region also includes the Twelve Apostles Marine National Parks. South of Cape Otway is the Apollo Commonwealth Marine Park.

Community

The Otway Coast has a population of around 9,100 – around 2.25% of the total Corangamite region population and the third least populated area. The most densely populated areas of the Otway Coast are along the coastline, in the townships of Apollo Bay, Lorne, Airey's Inlet and Anglesea.

Landcare groups within this Landscape include Princetown, Hordern Vale Glenaire, Otway Barham Catchment, Otway Coast Regenerative Farmers, Beech Forest Ferguson (The Ridge), Apollo Bay, Wye to Wongarra, Forrest, East Otway and Torquay Landcare Groups.

These groups receive support from the Heytesbury District Landcare Network, Central Otways Landcare Network, Southern Otway Landcare Network, Upper Barwon Landcare Network and Surf Coast and Inland Plains Network.

Other environmental groups:

- ANGAIR (Anglesea, Aireys Inlet Society for the Protection of Flora and Fauna)
- Conservation Ecology Centre
- Friends of Aireys Inlet Coastal Reserve
- Friends of Allen Noble Sanctuary
- Friends of Eagle Rock Marine Sanctuary (FERMS)
- Friends of Eastern Otways (Great Otway National Park)
- Friends of Kennett River
- Friends Of Otway National Park

- Friends of the Hooded Plover – Otway Coast
- Friends of the Hooded Plover – Surf Coast
- Land and Water Resources Otway Catchment
- Lornecare
- Otway Agroforestry Network
- Otway Coast Committee Inc
- Otway Conservation Association
- Save the Painkalac Creek
- Skenes Creek Advancement Association
- Surf Coast & Inland Plains Network (SCIPN)
- Wye River Separation Creek Vegetation Restoration Committee
- Wye Weed Warriors

Major threats and drivers of change

Impacts predicted by climate change modelling are a major concern for this system and have been identified as the waterways in the region most vulnerable to climate change impacts (Corangamite NRM Plan for Climate Change). This includes sea level rise changing the dynamics and ecosystems of estuaries and built coastal environments; changes to rainfall patterns and increasing temperatures affecting water security and availability (loss of threatened fish habitat and restrictions to migratory species movement and loss of available water for human and stock consumption, noting that flows are already an issue in some rivers). The threat posed from a predicted increase to the frequency and intensity of bushfire is high for this system as a majority of it is forested.

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. Willows have been identified as a threat to a number of waterways in this landscape system especially the Barham and Aire rivers.

The high rainfall and steep terrain lead to high rates of erosion and potential for landslides; there are coastal acid sulphate soils in some areas; soil nutrient decline and water logging are the major threats to the soils and how land is used. Along waterways and drainage lines there are large tracts of willows and blackberry along with areas where stock can access frontage and contribute to erosion, sediment, pathogen and nutrient loads. Development pressures in some areas of this system are also of concern.

Water extraction from the rivers and streams for water supply purposes has the capacity to reduce flows over the summer months, impacting on their health. Other year round extraction for stock and domestic use also impact flows.

Urban growth, as experienced along the Erskine River in Lorne, the Barham River at Apollo Bay and the Anglesea River at Anglesea, 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 storm water 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 system 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.

Water

Parts of the Gellibrand, Aire and Barham Rivers and their associated tributaries 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 the Gellibrand Special Water Supply Catchment.

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.

Willows have been identified as a threat in the reaches of the Gellibrand, Aire and Barham Rivers and in the longer term dispersal may compromise the condition of waterways throughout these river systems.

All the estuaries within this landscape system intermittently open or close depending on the prevailing conditions. 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 these estuaries under certain conditions can result in adverse impacts to the surrounding environment and the species that live there.

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 storm-water run-off and degraded water quality, soil disturbance, bank erosion and degradation of native vegetation including estuarine vegetation.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Otway landscape. These include:

- Establish native indigenous vegetation
- Install riparian/wetland fencing
- Establish stewardship/management agreement
- Continue to adopt a risk-based approach to estuary mouth opening (Painkalac Creek, Anglesea River, Barham River, Erskine River, Princetown wetlands, Gellibrand River)
- Establish non-woody weed control
- Undertake woody weed control (Barham River East Branch, Wye River, Kennett River, Gellibrand River, Kennedys Creek, Chapple Creek, Love Creek)
- Investigate sediment sources and sinks – particularly in Upper Gellibrand (including Love and Lardner catchments)
- Review and update current estuary management plan – Gellibrand River
- Investigate options to address summer low flow shortfalls – as identified under the Western Region Sustainable Water Strategy (Gellibrand River)
- Modify outlet waterway structure/rock ramp (Barham River East Branch)
- Modify culvert crossing/baffles in fishway (Barham River East Branch)
- Remove fish barrier by replacing existing crossing with clear span bridge (Barham River East Branch, St George River)
- Investigate and manage urban stormwater/water quality impacts in line with whole of water cycle management principles (Erskine River)
- Implement the Anglesea estuary management plan – Anglesea River
- Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk (Anglesea River)
- Investigate impacts to environmental flows throughout the broader Otway Coast catchment basin to secure and better manage environmental water where required (St George River, Gellibrand River)
- Investigate stream bed instabilities (Painkalac Creek)
- Assess options for long-term management of land subject to inundation (Gellibrand River)
- Conduct monitoring and maintenance to ensure that waterway remains in current condition (Grey River, Carisbrook Creek, Smythes Creek, Erskine River, Kennedys Creek, Sandy Creek, Carlisle River, Gum Gully Creek, Lardner Creek)

- Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate (West Gellibrand Reservoir)
- Maintain EstuaryWatch groups collecting baseline data on estuary condition
- Maintain Waterwatch groups collecting baseline data on waterway condition.

Biodiversity

Threats to biodiversity in this region include native vegetation removal, barriers to on-ground management, water quality and quantity, rising sea levels, littering, and inappropriate land use.

Willows (Salix spp.) are a Weed of National Significance and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, and reducing aquatic and riparian biodiversity. The red fox (Vulpes vulpes) was identified as a threat to significant bird species.

DELWP's 2019/2020 Biodiversity Response Planning identifies the most cost-effective threat control actions for significant biodiversity improvement in the region. The most beneficial action in this region is permanent protection. Control of pigs, rabbits, overabundant kangaroos, deer and weeds are the next most beneficial management actions, when considering net benefit to all flora and fauna.

Land

The major threats to land and its use within this landscape system are landslides, soil structure decline, soil nutrient decline, water logging, soil acidification, sheet/rill erosion and gully/tunnel erosion (see Static Maps section for mapped soil threats).

Landslides are particularly a problem in those areas that are steep, have high levels of rainfall and have been cleared. This is particularly the case around the lower Gellibrand River and its tributaries and the Johanna River as well as the upper Aire River valley, the West Branch of the Ford River, and the lower Aire River in the Hordern Vale district. There is also potential for landslides around Eastern View, Wye River, Separation Creek, Kennett River, Lorne and the hinterland of Apollo Bay including Wongarra, Wild Dog Creek valley, Tanybryn and the Barham River valley.

Areas around Kennedys Creek and the Gellibrand River are susceptible to gully erosion.

Land used for dairy farming is highly susceptible to water logging.

Coast and Marine

The Victorian Marine and Coastal Policy identifies that the health of the marine and coastal environment is under threat from multiple sources, including climate change and growth in towns, cities and industries that interact with their local marine and coastal ecosystems.

These threats can lead to negative impacts on water quality and quantity, pollution and debris, invasive species, marine pests and diseases, disturbance and loss of plants and animals, and loss of access to beaches from the effects of sea walls, infrastructure and erosion. Degradation occurs over time and space, and the impacts in marine and coastal areas are varied and complex.

Climate change is increasing the pressure on the marine and coastal environment by exacerbating existing threats and introducing new ones, including:

• rising sea levels, leading to more inundation and erosion
• increased frequency and severity of storms and other extreme weather events
• changes in ocean temperatures, currents and acidification
• changes to waterway flows, levels and regimes
• changes in the range, distribution and abundance of both introduced and native plants and animals, taking advantage of a changed climate.

Growth in resident populations and visitor numbers puts pressure on the health of the marine and coastal environment. Population growth also increases pressure on recreational infrastructure such as walking tracks and visitor facilities. This, in turn, leads to more demand for alterations to beaches, foreshores, wetlands and natural processes through groynes, sea walls and dredging to support use and development.

Community

The Otway Coast has a population of around 9,100 and is the third least populated landscape of the Corangamite region. The most densely populated areas are along the coastline, in the townships of Apollo Bay, Lorne, Airey's Inlet and Anglesea. Large areas of public land and national parks serve to define the communities.

As with a number of coastal areas there is a high proportion of absentee land owners with many using this area as their holiday location. The large number of tourists flockung to the area also has a proportional impact on the wellbeing of these townships, with many geared towards servicing the tourism industry.

Property prices play a key role in land ownership, and the high values associated with purchasing in this area are often prohibitive. This is also a trend for larger properties being purchased for lifestyle purposes within the coastal hinterland.

To the west of this landscape there are active landcare groups including Princetown, Hordern Vale Glenaire, Otway Barham Catchment, Otway Coast Regenerative Farmers, Beech Forest Ferguson (The Ridge), Apollo Bay, Wye to Wongarra along with the Otway Agroforestry Network supporting the communities of these areas. There is more full time agriculture conducted in these areas with the value of profitability versus land prices always being a tension.

Otway Coast 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Otway Coast Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. OtwWO1

There is an improvement in riparian extent and condition, hydrological regime and water quality in Otway Coast priority waterways as defined in the Corangamite Waterway Strategy. OtwWO2

Urban areas will have identified waterway amenity values to enhance user experience and connection to the natural landscape. OtwWO3

Drinking water supply catchments are protected to provide quality water for urban water supplies. OtwWO4

Increase the community understanding and awareness of water values and management for the Otway Coast. OtwWO5

Understand and enhance Eastern Maar values of the main waterways and ensure Eastern Maar People have a strong voice in their management. OtwWO6

Water quality in the Gellibrand River, Aire River and Anglesea River are maintained or improved, compared to index of estuary condition 2019. OtwWO7

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Otway Coast habitats across land and waterway environments through effective climate change adaptation strategies. **OtwBO1**

Achieve a net gain where possible in suitable Otway Coast habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. **OtwBO2**

Achieve a net gain where possible in all species with positive % change in suitable Otway Coast habitat and improved species balance expected over six years from sustained improved public and private land management and community involvement. **OtwBO3**

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. **OtwBO4**

Increase understanding and awareness of biodiversity values of the Otway Coast Landscape System. **OtwBO5**

Land

By 2027, compared to 2022 baselines, land within the Otway Coast is sustainably managed for a variety of purposes within its capability and suitability to maintain and improve its natural capital and to prevent both on and off-site impacts. **OtwLO1**

Coast and Marine

By 2027, compared to 2022 baselines, proactive management of the catchment by the community contributes to a net gain in the health and resilience of the region's highly valued coastal and marine environment. **OtwMO1**

Communities

By 2027, compared to 2022 baselines:

Otway Coast communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **OtwCO1**

Otway Coast communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **OtwCO2**

The increased capacity of Eastern Maar and Wadawurrung Traditional Owner groups enables their increased involvement in decision making that effects their Country. **OtwCO3**

Otway Coast 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Coast & Marine | Communities

Six year priority directions for the Otway Coast are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

		Relevant Theme	

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
Code	Priority Direction	Water	Biodiversity	Land	Community	Coast and Marine	Lead	Collaborators
OTW1	Otway Coast landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.						CCMA	DELWP, Water Authorities, EPA, COS, CS, SCS, GORCAPA, PV
OTW2	Develop enduring partnerships with the Wadawurrung and Eastern Maar people to: 1) acknowledge and enhance Wadawurrung and Eastern Maar values of natural assets; 2) ensure the Wadawurrung and Eastern Maar people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung and Eastern Maar stories and history; and, 4) identify and implement opportunities for the Wadawurrung and Eastern Maar people to own and manage water on their country						CCMA	WTOAC, EMAC, DELWP, Water Authorities, COS, CS, SCS, GORCAPA
OTW3	Within the Coastal and Marine environment 1) review targets in relevant strategies to identify and reduce stressors on coastal and marine environments 2) develop and implement a process for the provision of coastal erosion advice for long term planning, management and adaptation.						DELWP	CCMA, GORCAPA
OTW4	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect and enhance marine and coastal values 4) protect cultural heritage						COS, CS, SCS	CCMA
OTW5	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics						CCMA	DELWP COS, CS, SCS, Water Authorities, GORCAPA, PV
OTW6	Best land management practices are implemented across farmers, agencies, developers, and the catchment community						CCMA	AgVic, Landcare
OTW7	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans						DELWP	CCMA, PV, Landcare

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
OTW8	Encourage landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities						CCMA	AgVic, DELWP, Landcare
OTW9	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Barwon Water and Wannon Water Urban Water Strategies 2) priority projects identified by the Barwon and Great South Coast Integrated Water Management Forums; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy						BW, WW	CCMA, DELWP, COS, CS, SCS
OTW10	Protect the drinking water supply catchments from activities which could influence runoff and source water quality						BW, WW	CCMA, Landcare
OTW11	Ensure estuary management is managed consistent with State policy to reduce impact on natural environment and mitigate risk to human related assets						CCMA, PV	COS, CS, SCS, GORCAPA, Water Authorities, DELWP
OTW12	Manage upstream processes to mitigate impacts on the coastal and marine environments.						CCMA	COS, CS, SCS, PV, EPA, Landcare, DELWP
OTW13	Explore carbon sequestration opportunities to deliver both climate and catchment/biodiversity benefits.						Deakin Uni	DELWP, PV, CCMA
OTW14	Maintain community access on public coastal land where biodiversity can be protected, and avoid exclusive private use of public land						DELWP	GORCAPA, PV
OTW15	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs						CCMA	Landcare
OTW16	Engage with the community on the need to mitigate and adapt to climate change and its' impacts.						CCMA	DELWP, Landcare, GORCAPA
OTW17	Build awareness and understanding of cultural landscape management in the Great Otway National Park through increased connection of agencies, authorities, community groups and Traditional Owner Groups.						PV	DELWP, Landcare, GORCAPA

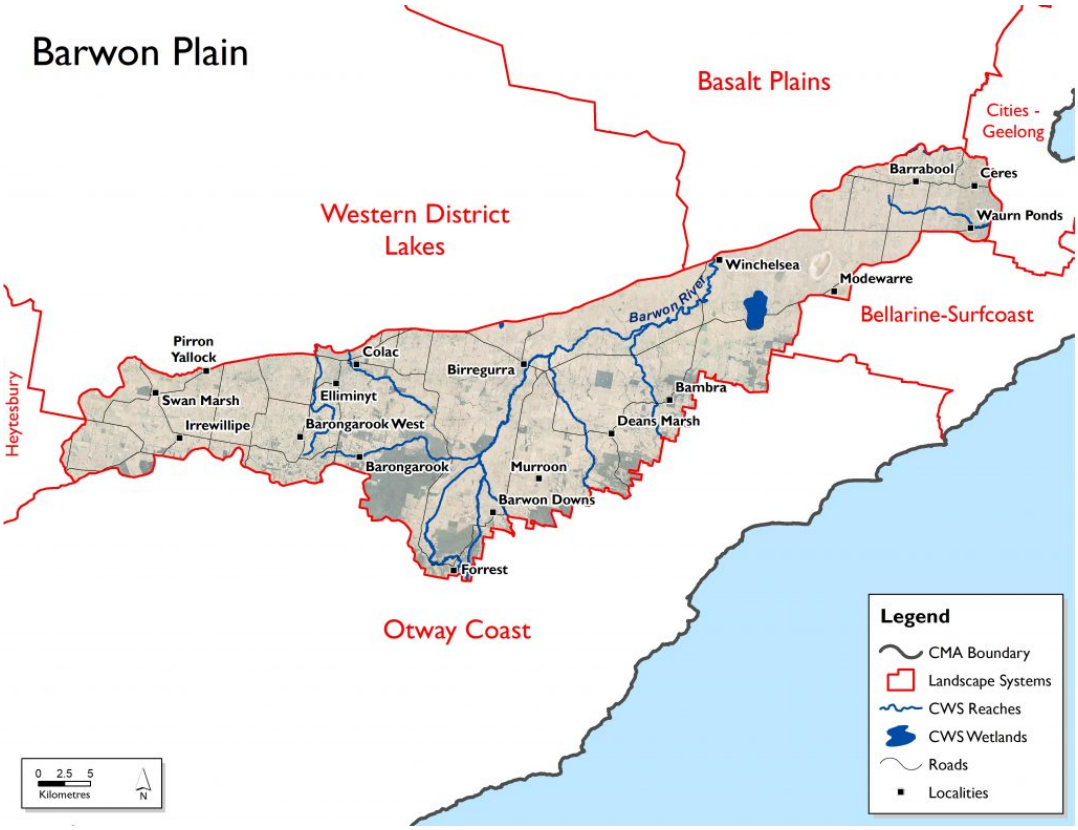
Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
OTW18	Action Plans are developed that leads to a 25% increase of non-government investment to supplement current Government investment into the region to address high priority natural resource management actions						CCMA	DELWP, COS, CS, SCS, Landcare
OTW19	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027						CCMA	DELWP

Date printed: 29 July 2024

Barwon Plain

Overview

Overall Area	118,524 hectares
Population	19,053
Climate	780 mm per annum at Barwon Downs 666 mm per annum at Birregurra 550 mm per annum at Winchelsea
Main Towns	Colac Birregurra Winchelsea Forrest
Land Use	Mixed farming Cattle grazing for both dairy and beef production Cropping
Main Industries	Agriculture Tourism
Main Natural Features	Barwon River Barongarook Creek Waurn Ponds Creek



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

The Barwon Plain landscape system is situated between the Otway Coast, Heytesbury, Western District Lakes, Basalt Plains and Geelong-Bellarine areas. Its northern boundary is generally the Princes Highway while to the south it is the Otway Ranges. Major towns include Colac and Winchelsea, with the Colac-Otway and Surf Coast Shires being the main municipalities. Most of the landscape system is within the Eastern Maar area, but it also includes part of the Wadawurrung traditional lands.

The Barwon River is the main water course running through this area with the flood-plains of the Barwon River and its tributaries extending from the foothills of the northern side of the Otway Ranges to the basalt plains near Winchelsea. Significant water bodies in this landscape include the Wurdiboluc Reservoir, which supplies potable water to Geelong, Anglesea, Torquay and the Bellarine Peninsula. Mixed farming and cattle grazing for both dairy and beef production are the main agricultural industries. The soils also show a gradual transition from acid, freely drained profiles to heavier neutral soils as the influence of basalt-derived alluvium increases towards the north. Key values identified in the Barwon Plains landscape system include:

- known rare and threatened species and platypus
- significant Ecological Vegetation Classes
- significant bird species and important bird habitat
- significant native fish and amphibian species including galaxias
- recreation, including fishing, picnicking, walking tracks
- areas of drought refuge
- urban and rural township water storages.

Livelihood

Grazing for livestock (beef, sheep and dairy) and forestry are key land uses in this area. Soil productivity on private agricultural land in the Barwon Plain ranges from high relative productivity to moderate, and is higher than the northern and eastern parts of the Corangamite region. The Barwon Plain is constituted of predominantly private agricultural land, with the highest relative productivity soils found on the western side, gradually transitioning to moderate in the east.

Lifestyle

The Barwon Plain has a population of just over 19,000 – constituting around 4.7% of the Corangamite region – and is the fifth most populous area of the region. The most densely populated area of the Barwon Plain is the township of Colac.

The community within the Barwon Plain is quite robust and well supported by Landcare and other community groups. As with a number of other systems, the changing demographic of the farming sector is of concern, with the average age of full time farmers increasing, and fewer younger people taking over the operation of farms.

There has also been a growth in hobby farms, especially in the east of the Barwon Plain in closer proximity to Geelong around the Barrabool Hills and Moriac areas, and around other larger centres including Colac and Winchelsea.

Landcare groups include Barongarook, Gerangamete Flats, Murroon, Birregurra, East Otway, Wurdale, Modewarre Buckley, and Barrabool Hills Landcare Groups.

Assessment of current condition and trends

Water

The Barwon Plain landscape system's main waterways are the Barwon River and its tributaries, as well as a few creeks in the west that terminate at the wetlands of the Western District Lakes, and Waurn Ponds creeks at its eastern boundary. The Barwon Plain technically sits within three catchment basins: Lake Corangamite, Barwon River and Otway Basin, but no major waterways are situated in the Otway Basin.

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.

Data collected between 2005 and 2020 by the Corangamite citizen science Waterwatch program shows water quality in the upper Barwon River declines as the river descends through the rural catchment, partially due to inputs from smaller creeks entering the Barwon River. Seasonal trends are evident in most indicators and many are influenced by varied river flows. Many of these tributaries have intermittent flows and are therefore likely to have greater variability in the measured water quality parameters.

The Victorian Index of Stream Condition (ISC) conducted during 2010 found the overall condition of the waterways in the Barwon Plain to be in poor to moderate condition, with the exception of the reach of Waurn Ponds Creek that was rated very poor.

While water quality across the Lake Corangamite and Barwon River Basins was generally moderate (despite a heavily modified environment), many reaches assessed showed elevated levels of phosphorus. However, Boundary Creek reach (situated in a heavily forested area of the Barwon River Basin) displayed significantly low pH. This may indicate very acidic conditions due to acid sulphate soils in the catchment. During drier times the creek becomes more acidic.

One of the waterways assessed from the Lake Corangamite Basin, a reach of Barongarook Creek, scored poorest in the basin for flow stress, due to extreme modification. One third of reaches tested in the Barwon River Basin display summer stress and experience long periods of low flow. Additionally, three reaches of the Barwon River experience extended periods of low flows during winter, which can be attributed to rainfall patterns, diversions, and catchment modifications.

The Dewings Creek citizen science monitoring site displayed high dissolved oxygen maximum values on several occasions, indicating possible excessive macrophyte or algae growth at times. This may also be promoted by the high reactive phosphate values observed. Downstream of the confluence with Dewings Creek on the Barwon River, low pH was recorded at times, possibly influenced by discharge from Boundary and Dewings Creeks.

Biodiversity

Vegetation quality for the waterways assessed from the Barwon River Basin were either in poor or moderate condition, while the Lake Corangamite Basin's reaches generally showed the poorest vegetation condition. Although there are still some areas of native bush land within this landscape, the majority of the area has been cleared for agriculture due to its high productivity.

The Upper Barwon has an Environmental Entitlement, which is typically about 1000 megalitres of water a year. However, this current entitlement is not enough to meet the functional and ecological requirements of the river. The most critical aspects of the flow regime for the survival of valued species are low flows delivered during the dry period. These flows provide essential habitat for aquatic fauna, and provide moisture to instream and emergent macrophyte vegetation. Continuous flows through the dryer months of summer and autumn provide refuges for species such as Platypus, Growling grass frog, fish and macroinvertebrates. Additionally, fish and other fauna rely on freshes, or small "pulses" of water, during the wet period as a migratory cue. This is important for migratory fish in the Upper Barwon reaches, including Tupong, Short-finned eel, Australian smelt, Common jollytail, Spotted galaxias and Australian grayling. These events also provide moisture for floodplain vegetation, such as the culturally significant River red gum and Manna gums. They also play an important role in promoting sediment deposition, carbon exchange and organic matter supply.

River blackfish (*Gadopsis marmoratus*), endemic to South Eastern Australia, are found in the East and West branch of the Upper Barwon, and lower reaches outside of this landscape system.

Land

Soil productivity on private agricultural land in the Barwon Plain ranges from high relative productivity to moderate, and is higher than the northern and eastern parts of the Corangamite region. The Barwon Plain is constituted of predominantly private agricultural land, with the highest relative productivity soils found on the western side, gradually transitioning to moderate in the east.

DELWP's Victorian Land Cover Time Series (1985-2019), indicates that the most common land cover class in the Barwon Plain is non-native pasture, covering 80% of the landscape area. Over the time series, non-native pasture cover has decreased (previously 82% of total land cover). Native trees cover almost 9% of the Barwon Plain. There have been relatively small changes in the land cover proportions of the Barwon Plain over the 30-year period. However, urban land cover has almost doubled, and now occupies around 1.5% of the total area. Dryland cropping more than doubled from <0.5% to over 1%, and hardwood plantation has increased eight-fold since 1985-1990, now occupying over 1.5% of the Barwon Plain. Exotic woody vegetation tripled in cover to 3%, becoming the third most prevalent land cover. Native shrub and perennial wetlands have almost halved (despite covering only a tiny proportion of the Barwon Plain), and seasonal wetlands have dropped by around a third, to under 2% of the total landscape system.

Community

The Barwon Plain has a population of just over 19,000, constituting around 4.7% of the Corangamite region and is the fifth most populous area of the region. The most densely populated area of the Barwon Plain is the township of Colac.

Landcare groups include Barongarook, Gerangamete Flats, Murroon, Birregurra, East Otway, Wurdale, Modewarre Buckley, and Barrabool Hills Landcare Groups.

These groups are supported by the Upper Barwon Landcare Network, Geelong Landcare Network and Surf Coast and Inland Plains Network.

Other environmental groups include:

- Australian Agroforestry Foundation
- Australian Plants Society – Colac-Otway
- Brolga Recovery Group – Birregurra
- Friends of Colac Botanic Gardens
- Friends of the Barwon
- Friends of the Forrest Tiger Rail Trail

- Friends of Waurn Ponds Creek
- Otway Agroforestry Network
- Joseph Paastch Nature Reserve – Barongarook
- Winchelsea Land and River Care Group

Major threats and drivers of change

The population of Geelong is expanding with residential developments occurring along the Barwon River corridor; to a lesser extent this is also the case at Winchelsea. 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 storm-water run-off and degraded water quality, soil disturbance, bank erosion and degradation of native vegetation.

Degraded riparian vegetation and reduced flows resulting in impacts to environmental (including threatened fish species), social and economic assets are of concern across this landscape. Fish barriers and pest species (rabbits and foxes) also present threats that further impact on values. The landscape is highly modified with high intensity land use – predominately grazing.

Higher land prices increase the impacts to landholders of giving up land for environmental outcomes. Flow and channel constrictions in the upper Barwon have also also been identified as a critical element.

Water

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 in-stream woody habitat. Willows have been identified as a threat in a number of waterways.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Upper Barwon landscape. These include:

- Establish native indigenous vegetation
- Install riparian/wetland fencing
- Establish stewardship/management agreement
- Establish non-woody and/or woody weed control
- Undertake an assessment and management of fish barriers in the Barwon and Moorabool catchments
- Establish invasive species assessment and management (Barwon River East Branch)
- Undertake stabilisation works downstream of Cape Otway Rd (Retreat Creek)
- Implement best management practice on grazing properties (Barwon River)
- Undertake an assessment of instream habitat (large wood) density (Barwon River)
- Investigate potential processes impacting acid sulfate soil issues and methods to minimise further risk (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 River (EWMP)
- Investigate impacts to environmental flows and (where required) identify opportunities to secure and better manage environmental water
- Conduct monitoring and maintenance to ensure that waterway remains in current condition (Barwon River West Branch and Dewing Creek)

- Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate (West Barwon Dam)
- Maintain Waterwatch groups collecting baseline data on waterway condition.

Biodiversity

The red fox (Vulpes vulpes) was identified as a threat to significant bird species. Willows (Salix spp.) are a Weed of National Significance and are known to adversely impact waterways through reducing water quality and availability, increasing erosion and flooding potential, and reducing aquatic and riparian biodiversity. There are many identified in-channel flow constriction points along the Upper Barwon, predominantly due to willow and Glyceria infestations. These choke points hinder the delivery of environmental water, through the Upper Barwon Environmental Entitlement, to meet ecological outcomes. The choke points also cause flooding. The CCMA is working towards managing these restrictions to remove them from the system.

Another key risk to biodiversity is a lack of adequate flows or changes to the flow regime, including the timing, magnitude or frequency of flows at different times of the year. Without critical dry period low flows, there wouldn't be sufficiently deep pools of water to ensure survival of many aquatic species. Low flows during the drier months also provide minimum water velocity for mixing of pools, reducing the risk of stratification and poor water quality. Freshes, or small "pulses" of water, delivered in the wet period are critical to create spawning opportunities for fish and other fauna. Without adequate freshes, populations of species would reduce.

Climate change will pose a risk to biodiversity, especially in drier or drought years with very limited water reserves due to low in-flow. Culturally important species such as River blackfish, native trout and Platypus would have limited opportunities for movement between pools, reducing availability of food, reproduction of the species and migration to new habitats. While eels are resilient and can survive in reduced water levels, they do require higher flows to allow migration to and from the estuary for breeding. An extended dry conditions flow regime is likely to result in localised extinctions of a number of these species, with severely reduced opportunities for spawning and reproduction for resident and migratory fish, Growling grass frog and macroinvertebrates. A priority-based regime would attempt to avoid multiple loss of fauna and flora.

Land

In the upper reaches of the Barwon Plains landscape system, landslides, sheet/rill erosion, gully/tunnel erosion, secondary salinity, soil nutrient decline and soil structure decline present the greatest threat to soil and land use. Soil nutrient decline, soil acidification, gulley/tunnel erosion and water logging present problems further down the system (see Static Maps section for mapped soil threats).

Water erosion is an issue within the catchments of the Wormbete Creek, Yan Yan Gurt Creek and the Barwon River. Landslides have occurred along the western flanks of the Barwon River valley, south of Birregurra.

Susceptibility to waterlogging mostly occurs in the Gerangamete-Barwon Downs area.

Cropping land and dairy land are highly susceptible to soil structure decline.

Community

The community within the Barwon Plain is quite robust and well supported by landcare and other community groups. As with a number of other systems the changing demographic of the farming sector is of concern, with the average age of full time farmers increasing, and fewer younger people taking over the operation of farms.

There has also been a growth in hobby farms especially in the east of the Barwon Plain in closer proximity to Geelong around the Barrabool Hills and Moriac areas, and around other larger centres including Colac and Winchelsea. Many of the people who live on these lifestyle properties would benefit from education and support with around appropriate land management practices.

Many of the smaller communities such as Winchelsea, Birregurra, Deans Marsh and Forrest are also reliant on the revenue that farming brings to their townships. Many of these towns are geared to servicing primary producers.

Barwon Plain 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Barwon Plain Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. **BarWO1**

There is an improvement in riparian extent and condition, hydrological regime and water quality in Barwon Plain priority waterways as defined in the Corangamite Waterway Strategy. **BarWO2**

Improve condition of wetlands and groundwater dependant ecosystems (GDEs) including those adversely impacted by historical groundwater pumping. **BarWO3**

Urban areas will have identified waterway amenity values to enhance user experience and connection to the natural landscape. **BarWO4**

Increase the community understanding and awareness of Barwon Plain Landscape System water values including wetlands, waterways and groundwater. **BarWO5**

Understand and enhance the Eastern Maar values of the Upper Barwon River and tributaries and ensure the Eastern Maar People have a strong voice in their management. **BarWO6**

Understand and enhance the Wadawurung values of the Mid-Barwon River and its tributaries and ensure the Wadawurrung People have a strong voice in their management. **BarWO7**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity, diversity and condition of Barwon Plain habitats of threatened flora and fauna across land and water environments. **BarBO1**

Achieve a net gain where possible in suitable Barwon Plain habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. **BarBO2**

Achieve a net gain where possible in all species with positive % change in suitable Barwon Plain habitat expected over six years from sustained improved public and private land management and community involvement. **BarBO3**

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. **BarBO4**

Increase understanding and awareness of biodiversity values of the Barwon Plain Landscape System. **BarBO5**

Land

By 2027, compared to 2022 baselines, land within the Barwon Plain is sustainably managed for a variety of purposes within its capability and suitability to improve its natural capital and prevent both on and off-site impacts. **BarLO1**

Communities

By 2027, compared to 2022 baselines:

Barwon Plain communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **BarCO1**

Barwon Plain communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **BarCO2**

The increased capacity of the Eastern Maar and Wadawurrung Traditional Owner groups enables their increased involvement in decision making that effects their Country. **BarCO3**

Barwon Plain 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water Biodiversity Land Communities

Six year priority directions for the Barwon Plain are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAR1	Barwon Plain landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.					CCMA	DELWP, Water Authorities, EPA, SCS, CoGG, COS, PV

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAR2	Develop enduring partnerships with the Wadawurrung and Eastern Maar people to: 1) acknowledge and enhance Wadawurrung and Eastern Maar values of natural assets; 2) ensure the Wadawurrung and Eastern Maar people have a strong say in management of our natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung and Eastern Maar stories and history; and, 4) identify and implement opportunities for the Wadawurrung and Eastern Maar people to own and manage water on their country					CCMA	WTOAC, EMAC, DELWP, Water Authorities, SCS, COS, CoGG
BAR3	Encourage Barwon Plains landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities					CCMA	AgVic, Landcare
BAR4	Best land management practices are also implemented across other Barwon Plains cohorts including agencies, developers, and the broader catchment community					CCMA	DJPR, DELWP, Local Govt
BAR5	Map current and desirable waterway amenity along urban waterways and define actions to achieve the desired waterway amenity values including improving facilities and/or environmental condition					CCMA	COS, SCS
BAR6	Enhance riparian management within priority waterways of the Barwon Plains as defined in the Corangamite Waterway Strategy.					CCMA	COS, CoGG, SCS
BAR7	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect cultural heritage					COS, CoGG, SCS	CCMA, DELWP
BAR8	Ensure the assessment of applications for new or transfers of groundwater entitlements in the Gerangamete and Gellibrand Groundwater Management Areas takes into account the impact of extraction on connected waterways and Groundwater Dependent Ecosystems (GDEs)					SRW	CCMA
BAR9	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Barwon Water Urban Water Strategy 2) priority projects identified by the Barwon Integrated Water Management Forum; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy					BW	CCMA, COS, CoGG, SCS, SRW
BAR10	Manage the current environmental water entitlement for the Upper Barwon River to maximise downstream benefit according to the recommendations of the Flows Study					CCMA	BW, VEWH
BAR11	Implement Barwon Water's "Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan" to mitigate the impacts of historical groundwater pumping on groundwater dependent ecosystems					BW	CCMA

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAR12	Help farmers prepare for a more variable and uncertain future by: 1) Supporting farmers with the information and tools to build resilience 2) Preparing farmers for a range of future scenarios 3) Helping farmers manage climate risk so they remain productive and profitable under a changed climate 4) Delivering the agriculture skills of the future					AgVic	CCMA, DELWP, SFS, Landcare
BAR13	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.					CCMA	DELWP, COS, CoGG, SCS, BW
BAR14	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs					CCMA	Landcare, COS, CoGG, SCS
BAR15	Engage with the community on the need to mitigate and adapt to climate change and its impacts.					CCMA	DELWP, Landcare, COS, CoGG, SCS
BAR16	Design and deliver a comprehensive education program to engage new urban and peri-urban communities in the growth corridors to connect them with their local environment and empower them to participate in NRM activities.					CCMA	COS, SCS, Landcare
BAR17	Action Plans are developed that leads to a 25% increase of non-Govt investment into the region to address high priority biodiversity actions					CCMA	DELWP, COS, CoGG, SCS, Landcare
BAR18	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027					CCMA	DELWP
BAR19	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans					DELWP	CCMA, PV

Date printed: 29 July 2024

This information was correct at the time of printing. The Corangamite Catchment Management Authority takes no responsibility for information that is inaccurate or out of date. To view the current Corangamite Regional Catchment Strategy go to https://corangamite.rcs.vic.gov.au/.

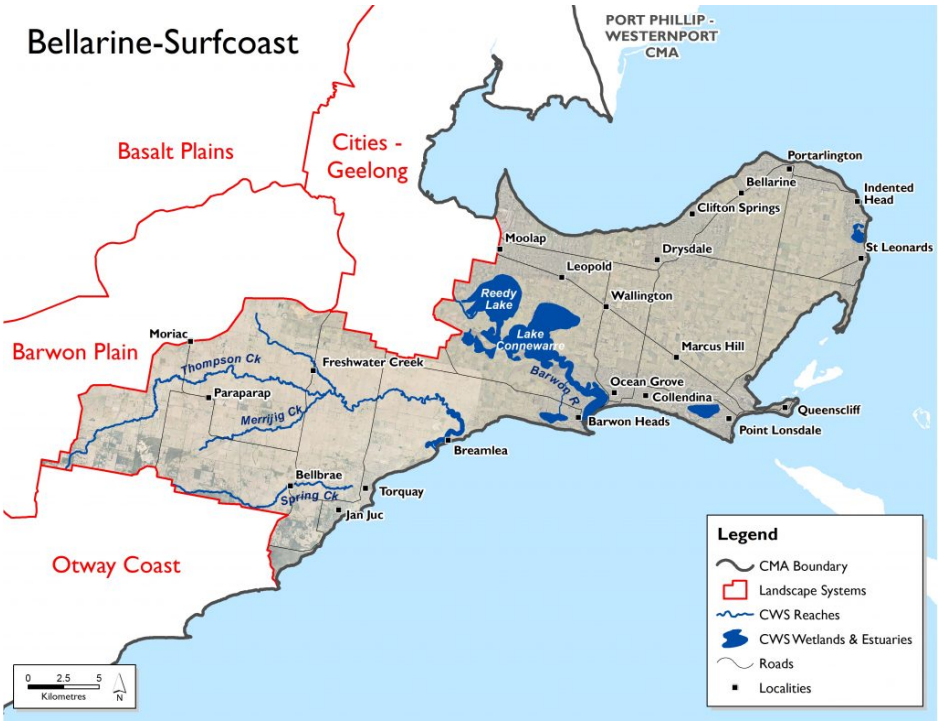
CORANGAMITE CMA

VICTORIA State Government

Bellarine and Surf Coast

Overview

Overall Area	68,124 hectares
Population	79,167
Climate	627 mm per annum at Drysdale
Main Towns	Leopold Torquay Ocean Grove Barwon Heads Point Lonsdale Portarlington Drysdale Queenscliff Indented Head St Leonards
Land Use	Viticulture Horticulture Sheep and Cattle Grazing
Main Industries	Tourism Hospitality Agriculture
Main Natural Features	Coast Swan Bay Lake Connewarre Reedy Lake Lake Victoria Barwon River Barwon Heads Bluff Ocean Grove Spit Edwards Point Wildlife Reserve



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

The Bellarine and Surf Coast is one of the smaller landscape systems, and is located in the south eastern corner of the Corangamite region. It is bounded by the bass strait to the south, and around into Port Phillip Bay. Geelong City and its surrounding urban areas is situated to the north, with the Barwon Plains and Otway Coast wrapping around the western edge.

This Landscape System contains the area south of the city of Geelong and the Bellarine Peninsula that is primarily for habitation and recreation, it does not include the urban area of Geelong. It is an area of very productive broadacre agriculture, intense horticulture and lucrative viticulture as well as a variety of other industries. Much of this landscape is also used for habitation and lifestyle purposes. The townships of Leopold, Torquay, Ocean Grove, Barwon Heads, Point Lonsdale, Portarlington, Drysdale, Queenscliff, Indented Head and St Leonards are in this area. It also contains parts of the City of Greater Geelong, all of the Borough of Queenscliffe, parts of Surf Coast Shire and Golden Plains Shire local government areas. The Traditional Owners are the Wadawurrung.

Very little remnant vegetation remains within this area, with most of it occurring along linear reserves such as roads and waterways. There are areas of high value intensive agriculture including vineyards, market gardens, orchards and groves.

The area has high visitation rates, given its proximity to Melbourne and Geelong, with an extensive, readily accessible coastline. Many of the residents within this area either work in the area or commute to Geelong or Melbourne for employment. The area has a history of industrialisation, but this has changed substantially within recent years to a more service-based and commercial focus.

Other natural values include significant native fish, such as Yarra pygmy perch, amphibians including the Growling grass frog and a range of bird species including the Hooded Plover and the Orange Bellied Parrot. The Bellarine Peninsula Ramsar sites are also highly significant.

Livelihood

Relative soil productivity on private agricultural land on the Bellarine and Surf Coast is highly variable. The lowest relative productivity is located near coastal areas and around the Lake Connewarre Complex wetlands, and is moderate to higher towards the west.

There are a variety of land uses across this landscape system with a variety of different sized holdings producing a variety of commodities. Grazing for cattle and sheep is a major agricultural pursuit in this area. Viticulture and horticultural industries are also well established with numerous vineyards and market gardens evident.

Tourism, hospitality and recreational pursuits are also major industries within the Bellarine and Surf Coast area. The summer holiday period is the peak time for visitation as well as public and school holidays and weekends, given its close proximity to Geelong and Melbourne.

Lifestyle

The Bellarine and Surf Coast is also known for its stunning coastline and beautiful beaches attracting large numbers of tourists annually, with the population more than doubling in the warmer months. It is known for its attractive rural hinterland, boutique wineries and artisan producers. With historic towns such as Queenscliff, Drysdale and Portarlington and popular holiday destinations such as Torquay, Ocean Grove and Barwon Heads, all with excellent beaches, it is a tourism and recreation destination.

The Bellarine and Surf Coast has a population of just under 80,000 – almost 20% of the total region population. This landscape system is the second most populated area of the Corangamite region after Geelong City. This is the third smallest landscape system by area, with numerous towns throughout. The most densely populated areas are in and around the coastal townships of Torquay, Barwon Heads, Ocean Grove, Point Lonsdale/Queenscliff and Portarlington, as well as Drysdale and Leopold further inland.

Recreation including swimming, surfing, fishing, game hunting, picnicking, sightseeing, walking tracks and motor and non-motor boating are key pursuits in this area.

The main Landcare groups in this area are Torquay, Bellarine, and Connewarre Landcare Groups.

Assessment of current condition and trends

Water

High value natural assets within this landscape system include Ramsar wetlands, the Barwon River and other waterways, estuaries, coasts and beaches. The Karaaf wetlands are also of particular importance as they contain coastal saltmarsh, a nationally vulnerable ecological community. The Port Phillip (Western Shoreline) and Bellarine Peninsula Ramsar complex is a key asset within this Landscape System.

The waterways in the Bellarine and Surf Coast landscape system are largely valued for their environmental condition, with internationally significant wetlands scattered throughout the landscape.

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.

The waterways of the Bellarine and Surf Coast fall within the Otway Basin to the west and Barwon River Basin to the east. Major waterways include the lower Barwon River, flowing into the Lake Connewarre Complex, part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. Major waterways in the area from the Otway Basin include Spring Creek and Thompson Creek and its tributaries (including Merrijig Creek), both flowing into the Bass Strait.

The Victorian Index of Stream Condition (ISC), assessed in 2010, found the Bellarine and Surf Coast to be in mixed condition, ranging from very poor to moderate. Spring Creek's reaches were the healthiest of the area, in moderate condition, with most of Thompson Creek and tributaries in poor condition, and the lower Barwon River around the Lake Connewarre Complex in very poor condition. The reaches of Spring Creek and Thompson Creek exhibit elevated levels of phosphorus.

Corangamite Waterwatch, a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment. As the Barwon River enters the estuary at the lower breakwater the water quality is relatively healthy. During winter flooding, flows in the catchment completely flush the estuary of saltwater and it becomes freshwater dominated. High turbidity occurs at this time, however is short-lived and the tidal salt wedge pushes back up the estuary. Occasionally over summer, as river flow declines and saltwater dominates, the effect of evaporation increases the salinity above that of seawater (hypersaline) in the upper reaches of the estuary in Lake Connewarre. Also over summer there can be an increase in algal growth in the surface waters and on the bottom substrate particularly. As the river flows into the shallow Lake Connewarre this effect is increased; at times the bottom waters become super saturated with dissolved oxygen, likely due to benthic algal mats photosynthesising. As the river exits Lake Connewarre, there is evidence of salt wedge development with salinity stratification at times. Water quality is generally good, though potential algal growth may increase dissolved oxygen levels over summer and autumn. Turbidity levels are likely influenced by tidal movement out of Lake Connewarre, particularly over summer.

As the river nears the estuary mouth to Bass Strait the water quality is very good. During seasonal high river flows the water presents as freshwater for a brief period; most of the time the water presents as seawater due to the strong tidal influence.

The salinity of the waters of the Spring Creek estuary indicate it to be mostly brackish. There is a seasonal trend of lower electrical conductivity mostly in winter and spring, resulting from increased freshwater river flows. Depending on the river flow, not all salt water is flushed from the estuary at these times. As river flows decline, tidal sea water re-enters the estuary and stratification is evident. In the closed estuary stratification is greatly reduced. At times when the estuary is stratified, the oxygen levels in the bottom waters become lower than that observed in the top waters; the further up the estuary the lower the oxygen levels in the bottom waters. On several occasions high oxygen levels were observed, indicating potential algal growth in the water column. Whilst oxygen levels fluctuated, they were mostly in the healthy range. The pH levels were mostly in the healthy range, and turbidity levels were mostly low with higher levels occurring in the bottom waters than the top on many occasions, indicating possible tidal related disturbance of the bottom substrate.

In the freshwater reaches of Thompson Creek, the water quality was marginal to poor, displaying relatively healthy pH and low turbidity. Marginally low oxygen levels, high salinity and phosphorus levels reduce the water quality. High salinity at times of low or no river flow indicates potential intrusion of saline groundwater.

Water quality monitoring in the estuarine reaches of Thompsons creek indicate the estuary is mostly tidal dominated and occasionally closes to the ocean. The water level within the estuary fluctuates depending on tidal influences and river flow; at times of estuary closure and no river flow over summer the water level lowers due to evaporation. This results in an increase in salinity in the estuary and a hypersaline environment. The large spread of the estuary wetland system and shallow depth of the estuary also contribute to this. Outside of these times, the estuary is mostly brackish with a short period of near freshwater at times of increased river flows during winter and spring. Nearer the estuary mouth, the salinity commonly represented that of sea water due to good tidal exchange. Mild stratification was only evident during times of increased freshwater flows in winter.

Biodiversity

Key values identified within the area include known rare and threatened species, significant Ecological Vegetation Classes, significant bird species and important bird habitat, significant amphibian species, significant fish species and areas of drought refuge. The highest biodiversity values are in the public land blocks, the thin shoreline strip and the wetlands.

The lower Barwon River, north of the Lake Connewarre Complex displays some of the worst condition vegetation of the entire Barwon River Basin. The lower reach and estuarine area of Thompson Creek both rate poorly in terms of vegetation condition.

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. 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 Barwon River Estuary is also an important ecosystem for water birds including migratory species.

Swan Bay contains a variety of ecosystems that make it environmentally important for waterbirds and migratory waders. These include salt marsh, intertidal mudflats and vast seagrass beds on which almost everything living in the bay relies for food. Although much of the surrounding land is farmland, some remnant woodland survives in the adjoining Edwards Point Nature Reserve and Swan Bay itself. The bay has been recognised as having international importance and the Port Phillip Heads Marine National Park almost entirely occupies the bay.

DELWP's Habitat Distribution Models identify 27 species with more than 5% of their Victorian range in this landscape area. This includes 17 plants with more than 5% of their Victorian range in the area. Notably, Bellarine Yellow-gum (endangered, 67%), Eel-grass (poorly known, 61%), Australian Grass-wrack (rare, 24%), Tasman Grass-wrack (rare, 22%), Coast Wirilda (rare, 20%). There are also nine bird species with more than 5% of their Victorian range in the area. Notably, Orange-bellied Parrot (critically endangered, 39%), Whimbrel (vulnerable, 6%), Sanderling (near threatened, 6%), Black-faced Cormorant (near threatened, 6%).

The Bellarine Yellow Gum *Eucalyptus leucoxylon subsp. bellarinensis* is an important species that is listed as threatened under the *Flora and Fauna Guarantee Act 1988* occurring in the Grassy Woodland Ecological Vegetation Class that currently occupies only 2% of its former range. Endangered Ecological Vegetation Classes in the landscape system are: Plains Grassy Woodland, Plains Grassland, Coastal Saltmarsh/Mangrove Shrubland Mosaic, Damp Sands Herb rich Woodland, Wetland Formation, Grassy Woodland, Plains Sedgy Wetland, Estuarine Wetland, Swampy Riparian Woodland, Grassy Forest, Floodplain Riparian Woodland.

Land

Relative soil productivity on private agricultural land on the Bellarine and Surf Coast is highly variable. The lowest relative productivity is located near coastal areas and around the Lake Connewarre Complex wetlands, and is moderate to higher towards the west.

DELWP's Victorian Land Cover Time Series provide a snapshot of the changes in land cover types in seven five-year increments between 1985-2019.

The most common land cover class in the Bellarine and Surf Coast landscape system is non-native pasture. Urban, native trees, irrigated horticulture and seasonal wetlands also constitute moderate proportions of the total land cover.

In the last 30-year period, non-native pasture decreased moderately, but still dominates the area, dropping from 60% to around 55%. Native trees, originally the second most common land cover, increased slightly from 6% to 7% of the total area, and urban areas increased significantly from around 4.5% to almost 8%, becoming the second most prevalent land cover type. Dryland cropping and exotic woody vegetation increased from 1% to over 3%, and exotic woody vegetation from over 1% to 3.5%. Irrigated horticulture decreased from around 7% to 5% of the total landscape system. Native grass herb and seasonal wetlands also decreased slightly, while saltmarsh increased in coverage a small amount.

Coast and Marine

Visitation to the Surf Coast increased at a rate of 7.5% per annum over the period of 2011-12 to 2015-16 (Source: Surf Coast Shire Visitor Insights, Australian Bureau of Statistics). Similar patterns could be expected for the rest of the Corangamite region's coastline. Coupled with extensive housing development and an increasing population in the region, coastal habitats are under sustained and increasing pressures.

Community

The Bellarine and Surf Coast has a population of just under 80,000 – almost 20% of the total region population. This landscape system is the second most populated area of the Corangamite region, after Geelong City. This is the third smallest landscape system by area, with numerous towns throughout the area. The most densely populated areas are in and around the coastal townships of Torquay, Barwon Heads, Ocean Grove, Point Lonsdale/Queenscliff and Portarlington, as well as Drysdale and Leopold further inland.

Recreation, including swimming, fishing, game hunting, picnicking, sightseeing, walking tracks and motor and non-motor boating are key pursuits in this area.

The main Landcare groups in this area are Torquay, Bellarine, and Connewarre Landcare Groups. They are supported by the Surf Coast and Inland Plains Network and the Bellarine Catchment Network.

The Geelong Environment Council (GEC) was formed in 1972 to assist in the protection of the environment in and around Geelong.

Geelong Sustainability is a community group focused on sharing information, building community resilience, advocating for the environment and supporting effective action.

Other environmental groups:

- Barwon Estuary Project
- Barwon Heads Association
- Bellarine Bayside Foreshore COM
- Bellarine Landcare Rabbit Action Group
- Birdlife Australia – Bellarine Peninsula
- Breamlea Coast Action
- Caring For Our Bays
- Clifton Springs Curlewis Coastcare
- Drysdale/Clifton Springs Community Association- Foreshore
- Festival of the Sea
- Fishcare Victoria Inc – Geelong and Bellarine
- Friends of Begola Wetlands
- Friends of Buckley Park
- Friends of Edwards Point Nature Reserve
- Friends of Manerim Memorial Indigenous Garden
- Friends of Mud Island
- Friends of Ocean Grove Nature Reserve
- Friends of Point Addis Marine National Park
- Friends of Point Richards Flora and Fauna Reserve
- Friends of Taylor Park
- Friends of the Bellarine Rail Trail
- Friends of the Bluff
- Friends of the Hooded Plover – Bellarine

- Friends of the Hooded Plover – Breamlea
- Friends of The Lobster Pot
- Friends of Yellow Gums Ocean Grove
- Geelong Field Naturalists' Club
- Greater Torquay Alliance (GTA)
- Jan Juc Coast Action
- Marine and Freshwater Discovery Centre
- Ocean Grove Coastcare Group
- Ocean Grove Park Inc
- Point Lonsdale Sand Monitoring Program
- Queenscliffe Community Plant Nursery
- Surf Coast Rabbit Action Network
- Surfers Appreciating Natural Environment
- Surfrider Foundation – Surf Coast Branch
- Swan Bay Environment Association
- Torquay Coast Action

Major threats and drivers of change

The population of the Bellarine-Surf Coast is expanding fast with residential developments occurring in most towns in this system, principally 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.

The natural and agricultural landscape of the Bellarine and Surf Coast has continually been encroached upon by residential development and use over time. This has led to consideration of interventions such as the two Distinctive Areas and Landscapes process in this landscape system. Threats linked to urban development and increased recreational use includes storm water run-off and degraded water quality, soil disturbance, bank erosion and degradation of native riparian and estuarine vegetation.

Emerging issues include lack of connectivity and access for community along the length of the Barwon River and the wetlands, and potential conflict with hunting activities in the Connewarre game reserve. A lack of integrated landscape scale planning across the Bellarine-Surf Coast has been identified as an issue by community in the past (Barwon MAC 2019). There are also a number of waterways, including Yarram Creek and Frederick Mason Creek, that flow into and have the potential to impact the Ramsar-listed Swan Bay. Water quality and flows within Thompson Creek have an effect on the salt marsh at Breamlea and the functioning of the estuary.

The proximity of the Bellarine and Surf Coast landscape system coast to both Geelong and Melbourne places high levels of stress by visitation on the natural resources of this area, particularly over summer. There is also a high level of demand for land within this area especially by residential land development that has seen a shift of land use away from agricultural towards residential. This has resulted in further stress on the land, biodiversity, waterways and wetlands within this area due to the higher footprint presented by urban and peri-urban development.

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.

Additional threats identified include rising sea levels, littering, inappropriate land use, invasive species, coastal erosion, dogs, fire timing, wildfires, illegal tracks, increased visitation, and mining of shell grit.

Water

The population of the Bellarine and Surf Coast is expanding fast with residential developments occurring in most towns within this system.
Urban growth has placed pressure on existing infrastructure and land use, with the potential for associated impacts to adversely affect the water values of the area. Threats linked to urban development and increased recreational use include storm-water run-off and degraded water quality, soil disturbance, bank erosion and degradation of native riparian and estuarine vegetation.

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.

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

Some of the estuaries in this landscape system intermittently open or close depending on the prevailing conditions, such as freshwater flows, weather vagaries, and tidal movements. Estuary closures 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 estuaries under certain conditions can result in adverse impacts to the surrounding environment and the species that live there. To address these impacts, a careful risk based approach needs to be taken to manage the intermittent opening of estuaries.

Serrated tussock (*Nassella trichotoma*) is known to adversely impact waterways through outcompeting other species and reducing aquatic and riparian biodiversity.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Lower-Barwon and Thompson Creek landscapes. These include:

- Establish terrestrial pest animal control – rabbit control (Thompson Creek, Duneed Creek, Merrijig Creek)
- Establish terrestrial pest animal control – fox control (as part of a large scale coordinated program) (Barwon River, Hospital Swamp, Reedy Lake, Lake Connewarre, Lake Murtnaghurt, Thompson Creek)
- Establish native indigenous vegetation
- Install riparian/wetland fencing
- Establish stewardship/management agreement
- Implement best management practice on grazing properties (Reedy Lake)
- Ensure acid sulfate soils are considered in land use planning, works on waterways and water management decisions (Hospital Swamp, Reedy Lake, Lake Connewarre)
- Undertake non-woody weed control – spartina (Lake Connewarre, Salt Lagoon, 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) (Barwon River, Reedy Lake, Hospital Swamp)
- Continue to adopt a risk-based approach to estuary mouth opening (Thompson Creek)
- Investigate freshwater flows from adjoining land use (Lake Murtnaghurt)
- Establish estuarine vegetation management plan (Barwon River)
- Undertake an assessment of instream habitat (large wood) density (Barwon River)
- Establish non-woody weed control (Thompson Creek, Spring Creek)
- Establish woody weed control – gorse (Duneed Creek)
- Undertake an assessment and management of fish barriers (Thompson Creek)
- Investigate and manage tidal barrage structural integrity (Barwon River)
- Implement the Barwon River Parklands Strategy for management of the lower Barwon River corridor
- Adopt 'whole of water cycle management' principles for new and existing developments (Barwon River)
- Fill knowledge gaps relating to impacts of water management at Reedy Lake and Hospital Swamp
- Investigate and manage urban stormwater/water quality impacts (Barwon River, Hospital Swamp, Reedy Lake, Lake Connewarre)

- Maintain EstuaryWatch groups collecting baseline data on estuary condition
- Maintain Waterwatch groups collecting baseline data on waterway condition

Biodiversity

Spartina (Spartina spp.) has been identified as a threat in a number of wetlands in this landscape. Spartina invades and alters plant communities, notably saltmarsh vegetation communities, with both species in Victoria known to be a very serious threat. Serrated tussock and Chilean Needle Grass have been identified as a threat in a number of locations in this landscape system.

The red fox (Vulpes vulpes) and cats (both feral and roaming domestic) are a threat to significant native fauna species. Rabbits also present a major threat to native vegetation.

DELWP's 2019/2020 Biodiversity Response Planning identifies the most cost-effective threat control actions for significant biodiversity improvement in the region. The most beneficial actions are control of rabbits, weeds, foxes and cats.

The diversity and abundance of fauna in Reedy Lake, particularly waterbirds, is threatened by poor diversity of vegetation due to the historic lack of variation in water levels. Due to the continually high-water levels that were in place for many years until 2016-17, several vegetation communities that rely on low water levels or periodic inundation, including the nationally vulnerable coastal saltmarsh, may have been outcompeted by tall reeds, however further assessment is required to confirm this. Wetting and drying cycles support a diversity of habitats and species. Periods of both higher and lower water levels will ensure the variety of species dependent on the seasonally fluctuating range of water levels within the wetlands can be protected for future generations.

Land

Acid sulphate soils, gully/tunnel erosion, sheet/rill erosion, wind erosion, soil structure decline, nutrient decline, water logging, secondary salinity and soil acidification are the major threats to soil and land use in this landscape (see Static Maps section for mapped soil threats).

Infrastructure and coastal assets are threatened by landslides along the northern coast of the Bellarine Peninsula. especially at Clifton Springs. They also occur along the coastline south of Jan Juc.

There is a high potential for acid sulphate soils mostly in coastal and estuarine wetlands of the lower Barwon River and estuary, the Breamlea wetlands and lower Thompson Creek.

Wind erosion is a threat, mostly in the Wallington, Drysdale, Bellarine, Indented Head and St Leonards areas. Coastal dune movement is prevalent in the Queenscliff, Point Lonsdale, Ocean Grove and Barwon Heads areas.

Grazing land and cropping land with sandy soils (developed on the marine sands of Pliocene age) on the Bellarine Peninsula are highly susceptible to nutrient decline under agricultural production and are also susceptible to soil acidification.

Nearly all of the land used for agriculture in this landscape system is highly susceptible to soil structure decline.

The vast majority of grazing lands in the low elevation landscapes of the Moolap Sunkland along the lower Barwon River estuary are susceptible to water logging. Alluvial soils in the low-lying. poorly-drained landscape positions are also very highly susceptible to waterlogging.

Land that is susceptible to soil erosion by water occurs on agricultural land, almost all of which is grazing land on the edges of elevated parts.

Coast and Marine

The Victorian Marine and Coastal Policy identifies that the health of the marine and coastal environment is under threat from multiple sources, including climate change and growth in towns, cities and industries that interact with their local marine and coastal ecosystems.

Victoria has experienced record population growth over the past decade (DELWP 2018), with suburbs and towns around Port Phillip Bay, and within two hours' drive of Melbourne, including the Bellarine Peninsula and Surf Coast, recording big increases in both population size and density.

These threats can lead to negative impacts on water quality and quantity, pollution and debris, invasive species, marine pests and diseases, disturbance and loss of plants and animals, and loss of access to beaches from the effects of sea walls, infrastructure and erosion. Degradation occurs over time and space, and the impacts in marine and coastal areas are varied and complex.

Climate change is increasing the pressure on the marine and coastal environment by exacerbating existing threats and introducing new ones, including:

• rising sea levels, leading to more inundation and erosion
• increased frequency and severity of storms and other extreme weather events
• changes in ocean temperatures, currents and acidification
• changes to waterway flows, levels and regimes
• changes in the range, distribution and abundance of both introduced and native plants and animals, taking advantage of a changed climate.

Growth in resident populations and visitor numbers puts pressure on the health of the marine and coastal environment. Population growth also increases pressure on recreational infrastructure such as walking tracks and visitor facilities. This, in turn, leads to more demand for alterations to beaches, foreshores, wetlands and natural processes through groynes, sea walls and dredging to support use and development.

A key challenge within this landscape system into the future will be inundation of large areas of low lying areas under sea level rises driven by climate change. This is especially the case in areas including Portarlington, Indented Head, Saint Leonards, Swan Bay, Point Lonsdale, Queenscliff, Ocean Grove, Barwon Heads and Breamlea.

Community

This landscape system is well represented by a range of community organisations, especially the Bellarine Catchment Network and the Surf Coast Inland Plains Network. There are also a number of other community based natural resource management organisations playing a key role in engaging with the local community including Coastcare, Waterwatch and others. Maintaining participation and capacity into the future will be a key issue.

The area is also becoming more and more urbanised and the ability to engage urban communities in caring for their landscape is an emerging issue, especially in a predominantly residential area. Having an informed community is key to ensuring appropriate consideration is given to the way they access and use the natural assets within their immediate area and within the broader environment.

Peri-urban land owners often need appropriate guidance on how to manage their little patch of paradise; the need for a variety of sources of information for this segment of the community is becoming more apparent.

Large areas of public land within this landscape system are managed by committees of management. This public land is within close proximity to the coast and has both natural and built assets. Engaging with these committees, their managers and staff will be a key issue going forward, especially with regard to their Marine and Coastal Management Strategies and the way that they interact with the general community in their areas.

Bellarine and Surf Coast 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Bellarine and Surf Coast Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. **BSCWO1**

The hydrological regime of Reedy Lake and Hospital Swamp is managed to achieve the outcomes of the review of the ecological flow study supporting the ecological character of the Ramsar site. **BSCWO2**

There is an improvement in riparian extent and condition and water quality in priority reaches as defined in the Corangamite Waterway Strategy. **BSCWO3**

Improve waterway amenity through the implementation of the Kitjarra-dja- bul bullarto langi-ut Masterplan in the Bellarine and Surf Coast Landscape System. **BSCWO4**

Maintain or improve the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar complex. **BSCWO5**

Improve the condition of other important wetlands of the Bellarine and Surf Coast Landscape System. **BSCWO6**

Increase the community understanding and awareness of water values. **BSCWO7**

Understand and enhance the Wadawurrung values of the Bellarine and Surf Coast Landscape System waterways and ensure the Wadawurrung People have a strong voice in their management. **BSCWO8**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Bellarine and Surfcoast habitats across land, waterway and coastal environments. **BSCBO1**

Achieve a net gain where possible in suitable Bellarine-Surfcoast habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. **BSCBO2**

Achieve a net gain where possible in all species with positive % change in suitable Bellarine-Surfcoast habitat and improved species balance expected over six years from sustained improved public and private land management and community involvement. **BSCBO3**

Improve flows in Bellarine lake systems to enhance biodiversity values. **BSCBO4**

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on Bellarine and Surfcoast biodiversity. **BSCBO5**

Improve understanding of integrated catchment management with regard to Bellarine lake system biodiversity. **BSCBO6**

Increase understanding and awareness of biodiversity values of the Bellarine and Surf Coast Landscape System. **BSCBO7**

Land

By 2027, compared to 2022 baselines land within the Bellarine and Surf Coast is sustainably managed for a variety of purposes within its capability and suitability to maintain and improve its natural capital and to prevent both on and off-site impacts. **BSCLO1**

Coast and Marine

By 2027, compared to 2022 baselines proactive management of the catchment and the coast by all stakeholders contributes to a continued improvement in the health and resilience of the region's highly valued coastal and marine environment. **BSCMO1**

Communities

By 2027, compared to 2022 baselines:

Bellarine and Surf Coast communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **BSCCO1**

Bellarine and Surf Coast communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **BSCCO2**

The increased capacity of the Wadawurrung Traditional Owner group enables their increased involvement in decision making that effects their Country. **BSCCO3**

Bellarine and Surf Coast 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Coast & Marine | Communities

Six year priority directions for the Bellarine and Surfcoast are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
BSC1	Bellarine and Surf Coast landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.						CCMA	DELWP, EPA, CoGG, SCS, PV, GORCAPA, BB, BC, BW
BSC2	Develop enduring partnerships with the Wadawurrung people to: 1) acknowledge and enhance Wadawurrung values of natural assets; 2) ensure the Wadawurrung people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung stories and history; and, 4) identify and implement opportunities for Wadawurrung people to own and manage water on their country						CCMA	WTOAC, DELWP, BW, CoGG, SCS, GORCAPA, BB, BC
BSC3	Encourage Bellarine Surfcoast landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable ag/land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities						CCMA	AgVic, Landcare
BSC4	Best land management practices are also implemented across other Bellarine Surf Coast cohorts including agencies, developers, and the broader catchment community						CCMA	DJPR, PV, DELWP CoGG, SCS, GORCAPA

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
BSC5	Continue to implement the 2018 Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan including monitoring actions from the Ramsar site MERI Plan.						CCMA	CoGG, DELWP, PV, PPWCMA, ARI, BLA, MW
BSC6	Enhance riparian management within priority waterways of the Bellarine & Surf Coast as defined in the Corangamite Waterway Strategy and improve in-stream habitat in priority areas along the Lower Barwon River and tributaries.						CCMA	CoGG, PV, Landcare, OzFish, VRFish, RRV
BSC7	Ensure estuary management is managed consistent with State policy to reduce impact on natural environment and mitigate risk to human related assets						CCMA, PV	CoGG, SCS, GORCAPA, BC, BW
BSC8	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect and enhance coastal and marine environments 4) protect cultural heritage						CoGG, SCS	CCMA, DELWP, PV
BSC9	Ensure the assessment of applications for new or transfers of groundwater entitlements from the Jan Juc Groundwater Management Area takes into account the impact of extraction on connected waterways and Groundwater Dependent Ecosystems (GDEs)						SRW	CCMA
BSC10	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Barwon Water Urban Water Strategy 2) priority projects identified by the Barwon Integrated Water Management Forum; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy						BW	CCMA, DELWP, COGG, SCS
BSC11	Plan and deliver the approved annual hydrological regime for Hospital Swamp and Reedy Lake to deliver outcomes within the FLOWS study and formal reviews.						CCMA	VEWH
BSC12	Develop an integrated masterplan for Kitjarra-dja- bul bullarto langi-ut (Barwon River Parklands) and implement high priority projects						CCMA	CoGG, BW, PV, Tourism Greater Geelong and the Bellarine, WTOAC, DELWP, GPS, G21, DHHS, SRV, BC
BSC13	Help farmers prepare for a more variable and uncertain future by: 1) Supporting farmers with the information and tools to build resilience 2) Preparing farmers for a range of future scenarios 3) Helping farmers manage climate risk so they remain productive and profitable under a changed climate 4) Delivering the agriculture skills of the future						AgVic	CCMA, DELWP, Landcare

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
BSC14	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.						CCMA	DELWP, CoGG, SCS, BW, PV, GORCAPA, BB, BC
BSC15	Build research and knowledge, including Traditional Owner knowledge of coastal / marine systems and threatening processes to inform adaptive management and mitigation.						DELWP	GORCAPA, BB, BC, CCMA, PV, CoGG, SCS, WTOAC, Universities
BSC16	Explore carbon sequestration opportunities to deliver both climate and catchment/biodiversity benefits.						Deakin Uni	DELWP, PV, CCMA
BSC17	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs						CCMA	Landcare, COGG, SCS
BSC18	Engage with the community on the need to mitigate and adapt to climate change and its impacts.						CCMA	DELWP, Landcare, GORCAPA, BB, BC, COGG, SCS
BSC19	Design and deliver a comprehensive education program to engage new urban and peri-urban communities in the growth corridors to connect them with their local environment and empower them to participate in NRM activities.						CCMA	CoGG, SCS, Landcare
BSC20	Action Plans are developed for each of the Landscape Systems that leads to a 25% increase of non-Govt investment into the region to address high priority biodiversity actions						CCMA	DELWP, CoGG, SCS, Landcare
BSC21	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027						CCMA	DELWP
BSC22	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans						DELWP	CCMA, PV, CoGG, GORCAPA, BB, BC
BSC23	Within the Coastal and Marine environment 1) review targets in relevant strategies to identify and reduce stressors on coastal and marine environments 2) develop and implement a process for the provision of coastal erosion advice for long term planning, management and adaptation.						DELWP	CCMA, CoGG, SCS, GORCAPA, BB, BC

Geelong City

Overview

Overall Area	28,382 hectares
Population	172,976
Climate	548 mm per annum at Geelong
Main Towns	Geelong Lara
Land Use	Residential Industry Commercial Grazing cattle sheep and horses
Main Industries	Manufacturing Education Services Agriculture Tourism
Main Natural Features	Barwon River Moorabool River Hovells Creek Waurn Ponds Creek Corio Bay Coastal Wetlands

Click on map to access Natural Resource Management Portal interactive mapping

Landscape

Geelong is the largest urban centre within the region with a population of over 250,000 and is forecast to be nearly 400,000 by the early 2040s. This landscape system extends south from Windemere Road, is enclosed by Corio Bay to the east as far as Point Henry and extends to the south, incorporating the Armstrong Creek growth area. To the west the designated growth areas are included. It contains parts of the City of Greater Geelong. The Traditional Owners are the Wadawurrung.

Limeburners Lagoon, which forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, is within this system, as are reaches of the Barwon River, Moorabool River, Waurn Ponds Creek and Hovells Creek which provide linear corridors for recreational and environmental values.

The Geelong landscape system encompasses the urban area of Geelong as well as the identified growth areas. A key area of responsibility for the Corangamite CMA is the management of a large stretch of the Barwon River for both environmental and recreational purposes. Other key issues for the CMA include flood plain and waterway statutory responsibilities. The CMA also has responsibility for the management of some key built assets, including the Barwon River barrage.

Livelihood

The Geelong City is principally an area for manufacturing, education, service provision, retail, tourism and residential activities. There is also limited agriculture, viticulture and horticulture occurring in the peri-urban areas around Geelong.

Lifestyle

Geelong City landscape system supports the largest population of the Corangamite region, with over 250,000 people, over 40% of the total population. Its population is concentrated in the urban areas of Geelong, as well as in the township of Lara.

Water

The Geelong City area is split between the Moorabool River Basin in the northern half, and the Barwon River Basin in the south. The area contains part of the lower Moorabool River, connecting with the Barwon river near Fyansford, west of Geelong's urban centre. The Barwon River stretches south, with Waurn Ponds creek meeting the Barwon River in the south of the area. The Geelong City area also contains part of Hovells Creek separate to its other major waterways, flowing from the north past the town of Lara, into Limeburners Lagoon State Nature Reserve (part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site), into Corio Bay. All the waterways in the Geelong City area were assessed as being in very poor condition in the Index of Stream Condition in 2010.

The Geelong landscape system has part of the Barwon River flowing through it, which is part of a globally important bird conservation habitat, as well as habitat for Growling grass frog (nationally endangered).

The very poor condition of hydrology in the lower Barwon River and of the Barwon River Basin is attributed to reservoir operations in the Upper Barwon and Upper Moorabool areas that supply water to Geelong, Ballarat and neighbouring basins, and to the presence of the tidal barrage downstream of the reach.

The Moorabool River's reach in the area has an extremely modified flow regime, often experiencing extended periods of low flow throughout summer and winter, as well as zero flow periods during summer.

Corangamite Waterwatch, a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment. Data collected shows that as the Barwon River makes its way into Geelong after the confluence with the Moorabool River, the water quality is marginally degraded. High dissolved oxygen levels over summer indicate potential algal growth. In the past this section of the Barwon River through Geelong often experienced algal blooms over summer. The Jerringot and Pakington St wetlands on the banks of the Barwon River receive urban stormwater runoff. High phosphorus levels are common and may encourage macrophyte and algal growth which potentially creates oxygen troughs over the summer to autumn seasons and raises pH levels and ammonia toxicity. Macroinvertebrates indicate the water quality to be moderately impacted. The Waurn Ponds Creek, a tributary of the Barwon River, also displays poor water quality and at times of low flows has the potential for saline groundwater intrusion. The creek also has high phosphorus and turbidity levels. At the site there is a good cover of riparian vegetation, however there is potential for further bank erosion in this incised stream and the instream habitat for aquatic organisms is degraded. Macroinvertebrates indicate the creek is mildly impacted.

As the Barwon River enters the estuary at the lower breakwater the water quality is relatively healthy. During winter flooding, flows in the catchment completely flush the estuary of saltwater and becomes freshwater dominated. High turbidity occurs at this time, however is short lived and the tidal salt wedge pushes back up the estuary. Occasionally over summer as river flow declines, saltwater dominates.

The water quality in Hovells Creek over time was relatively healthy for an urban stream, maintaining low salinity, stable pH and mostly low turbidity. In recent times turbidity levels have increased, particularly in 2019, indicating an increase in sediment entering the stream – possibly due to unrestricted stock access, greatly reduced riparian vegetation in the catchment and urban development around Lara. Increases in sediment can smother habitat for aquatic macroinvertebrates and reduce the amount of light penetrating the water for submerged aquatic vegetation. Low dissolved oxygen levels indicate the waterway is impacted by high instream oxygen demand. A notable increase in nutrients such as phosphorus is also evident at times of increased turbidity. This is likely linked to urban runoff during times of high rainfall and farming practices in the catchment, whereby the phosphorus is imported to waterways attached to soil particles; when this makes its way into the waterways it has the potential to increase the growth of aquatic plants and even stimulate algal blooms. These have the potential to impact on the environment downstream.

The water quality in Cowies Creek was marginal. Urban development in the catchment may have contributed to this. , At times of reduced river flow over summer, salinity levels increase, possibly due to the ingression of saline ground water. At times of high rainfall and increased river flow, salinity reduces – however during these times turbidity and phosphorus levels increase. Turbidity and phosphorus levels have remained relatively low since 2014. This is common in urban waterways as pollutants enter via stormwater runoff during high rainfall events. The impact of increased nutrient levels within the creek can result in excessive aquatic macrophyte and potential algal growth. The dissolved oxygen levels in the water suggest this is occurring particularly over the warmer months. Low dissolved oxygen levels indicate there to be high instream oxygen demand at times. In Cowies Creek, the frequency of monitoring has reduced, but shows an overall improvement since 2014.

Biodiversity

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site is located on the western shoreline of Port Phillip Bay. One of its six distinct wetland areas, Limeburners Bay, which is part of the coastal strip from Point Wilson to Limeburners Bay, falls into the Geelong City landscape system. Limeburners Lagoon (Hovells Creek Flora and Fauna Reserve) is a nature conservation reserve managed by Parks Victoria, and Limeburners Lagoon (State Nature Reserve) is managed by the City of Greater Geelong.

Nationally threatened ecological communities are present in this area, including 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.

Subtropical and temperate coastal saltmarsh (coastal saltmarsh) also occur within the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. 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. 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.

The lower reach of the Moorabool, from She Oaks weir (in the Northern Uplands landscape system) to the confluence with the Barwon River, contains eight species of native fish including Tupong, Southern pygmy perch, Australian grayling (listed as vulnerable under the EPBC Act 1999), Common galaxid and Spotted galaxid (ARI, 2015). Weirs in this reach are a significant barrier to fish. These barriers have increased the extent of slow flowing habitat and reduced habitat diversity in the lower reach of the Moorabool. However, recent scientific research has identified that high river flows in 2010-11 contributed significantly to recolonisation of migratory and estuarine fish species in the lower reach, highlighting the importance of high flows in creating habitat linkages between weirs in the Moorabool (ARI, 2015).

The Barwon River supports a range of significant riparian and waterway birds, and fish: Magpie Goose (Anseranas semipalmata), Eastern Great Egret (Ardea modesta), Lewin's Rail (Rallus pectoralis), Australasian Bittern (Botaurus poiciloptilus), Caspian Tern (Hydroprogne caspia, Nankeen Night Heron (Nycticorax caledonicus), Yarra Pygmy Perch (Nannoperca obscura), Australian Grayling (Prototroctes maraena), Australian Mudfish (Neochanna cleaveri).

It is a diverse landscape a with a mix of salt dependent / salt tolerant / non-salt tolerant vegetation communities with the highest biodiversity values being in the public land blocks, the thin shoreline strip and the wetlands.

Land

Relative soil productivity on private agricultural land in the Geelong City area is the lowest of the Corangamite region.

DELWP's Victorian Land Cover Time Series provides a snapshot of the changes in land cover types in seven five-year increments between 1985-2019. The two cities in the region, the Geelong and Ballarat city landscape systems, are dominated by urban land cover, followed by non-native pasture as the second most prevalent land cover. Across both landscape systems, urban areas have increased from around 26% to almost 34% over the time period, whilst non-native pasture decreased from around 31% to 22% today. Dryland cropping, and native grass herb also each constitute 12% and 8% respectively, Dryland cropping has increased in land area by >50% since the 1985- 1990 epoch, overtaking native grass herb in total area covered (which has remained constant).

Both seasonal and perennial wetland types dropped by nearly 25% each, although seasonal wetlands occupy ten times the area of perennial wetlands. Mangroves and Saltmarsh in the Geelong City landscape system stayed constant over the time period.

Coast and Marine

Most of the coastline within the Geelong City landscape system is built or substantially modified to accommodate the Port of Geelong. Corio Bay is used for a variety of purposes including recreation, transport and industry with a history of heavy industries including refineries, manufacturing and port facilities within its immediate area. Corio Bay is also surrounded by heavy areas of residential and commercial development.

Community

Geelong City landscape system supports the largest population of the Corangamite region, with in excess of 250,000 people, over 40% of the total population. Its population is concentrated in the urban areas of Geelong, as well as in the township of Lara.

Batesford-Fyansford-Stonehaven, Barrabool Hills, Corio and Avalon Landcare Groups operate within the Geelong landscape system and are supported by the Geelong and Bellarine Landcare Networks.

The Geelong Environment Council (GEC) was formed in 1972 to assist in the protection of the environment in and around Geelong.

Geelong Sustainability is a community group focused on sharing information, building community resilience, advocating for the environment and supporting effective action.

Other environmental groups:

- Australian Plants Society – Geelong
- Dog Rocks Flora and Fauna Sanctuary
- Geelong Field Naturalists' Club
- Fishcare Victoria Inc – Geelong and Bellarine
- Friends of Buckley Falls
- Friends of Geelong Botanic Gardens
- Geelong Environment Council Inc
- Greening Geelong West Inc
- Serendip Sanctuary Volunteers
- St Luke's Uniting Church Environment Action Group
- Victorian Serrated Tussock Working Party
- Wathaurong Aboriginal Community Co-op

Major threats and drivers of change

Urban growth has placed pressure on existing infrastructure, water resources 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 storm water run-off and degraded water quality, soil disturbance, bank erosion and degradation of native riparian and estuarine vegetation.

Water

The greatest threat to the Barwon and Moorabool Rivers flowing through the Geelong City Landscape system occurs from up-stream landuse and consumptive water extraction. The combined effects of groundwater extraction in the Upper Moorabool River catchment near Ballarat combined with water stored in farm dams and water extracted for town water supply, industrial and stock purposes has resulted in significantly reduced flows in both the Moorabool and Barwon Rivers. The recent Long Term Water Resource Assessment showed that flows in the Barwon and Moorabool Rivers had declined by 11% and 20% since 2006 respectively. The declining trend in flows is predicted to continue due to the impacts of climate change. Furthermore, agriculture and land clearing in the catchments causes increased river turbidity and nutrient loads resulting in algal blooms and reduced fish habitat.

The increase in population for the Greater Geelong area to a predicted 400,000 by 2040 will add significant pressure to water resources in an already flow stressed system. The greater Geelong region's drinking water is sourced mainly from forested catchments on the upper Barwon and Moorabool rivers. During dry conditions, additional water can be drawn from the Victorian water grid via the Melbourne to Geelong Pipeline, and from an underground aquifer in Anglesea. The Central and Gippsland Sustainable Water Strategy currently in development will set out the plan to address the increasing water demand resulting from a rapid population growth combined with a decreasing supply resulting from climate change.

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.

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 invasive flora and fauna.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Geelong landscape. These include:

- Establish terrestrial pest animal control – fox control (Hovells Creek, Limeburners Lagoon)
- Establish native indigenous vegetation (Hovells Creek, Limeburners Lagoon)
- Install riparian/wetland fencing (Hovells Creek, Limeburners Lagoon)
- Undertake non-woody weed control (Limeburners Lagoon)
- Establish stewardship/management agreement (Hovells Creek, Limeburners, Lagoon)
- Implement best management practice on grazing properties (Hovells Creek, Limeburners Lagoon)
- Investigate and manage urban stormwater/water quality impacts (Hovells Creek, Limeburners Lagoon, Barwon River)
- Investigate options for and management of weir under Old Melbourne Road (Limeburners Lagoon)
- Implementation of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan
- Undertake assessment and management of fish barriers in the Barwon and Moorabool catchments
- Establish invasive species assessment and management
- Investigate stream instabilities
- Undertake an assessment of instream habitat (large wood) density
- Implement the Barwon through Geelong Management Plan and Barwon River Parklands Strategy
- Maintain the discharge into the Moorabool River from Batesford Quarry as a beneficial environmental use – as per the Central Region Sustainable Water Strategy (Moorabool River)
- Maintain Waterwatch groups collecting baseline data on waterway condition

Biodiversity

Disturbance to migratory shorebirds from recreational activities is a key threat to shorebirds in and around Limeburners Lagoon and along coastal wetlands. Other threats include native vegetation removal, barriers to on-ground management, water quality and quantity, rising sea levels, littering and inappropriate land use.

There are a number of endangered Ecological Vegetation Classes in this landscape system including Coastal Saltmarsh, Plains Grassy Woodland, Creekline Grassy Woodland, Plains Grassland, Coastal Saltmarsh/Mangrove Shrubland Mosaic and Natural Damp Grasslands of the Victorian Coastal Plains.

Land

Land use change is a major issue within the Geelong City landscape system, especially with the designated growth areas expanding into areas that were previously used for agriculture.

Coast and Marine

The Victorian Marine and Coastal Policy identifies that the health of the marine and coastal environment is under threat from multiple sources, including climate change and growth in towns, cities and industries that interact with their local marine and coastal ecosystems.

These threats can lead to negative impacts on water quality and quantity, pollution and debris, invasive species, marine pests and diseases, disturbance and loss of plants and animals, and loss of access to beaches from the effects of sea walls, infrastructure and erosion. Degradation occurs over time and space, and the impacts in marine and coastal areas are varied and complex.

Climate change is increasing the pressure on the marine and coastal environment by exacerbating existing threats and introducing new ones, including:

• rising sea levels, leading to more inundation and erosion
• increased frequency and severity of storms and other extreme weather events
• changes in ocean temperatures, currents and acidification
• changes to waterway flows, levels and regimes
• changes in the range, distribution and abundance of both introduced and native plants and animals, taking advantage of a changed climate.

There are a number of locations along the Geelong City coastline that are already susceptible to erosion, including high use areas such as Rippleside and Eastern Beach. This will be increased under climate change scenarios, especially with the prediction of increased frequency of storms and extreme weather events. Sea level rise under climate change will have a major effect on low lying coastal areas, particularly around Limeburners Lagoon and Moolap. This has led the City of Greater Geelong to introduce a Land Subject to Inundation Overlay into its planning scheme to manage development in affected areas.

Growth in resident populations and visitor numbers puts pressure on the health of the marine and coastal environment. Population growth also increases pressure on recreational infrastructure such as walking tracks and visitor facilities. This, in turn, leads to more demand for alterations to beaches, foreshores, wetlands and natural processes through groynes, sea walls and dredging to support use and development.

Community

Geelong City landscape system supports the largest population of the Corangamite region, withover 250,000 people, being over 40% of the total population of the Corangamite region.

The Geelong Landcare Network and Bellarine Catchment Group are the primary support organisations for land and water management in this system. There are also a number of other environmental based organisations within the city and surrounds. A key issue for these organisations is maintaining membership and preventing member burn out.

Geelong City 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Geelong City Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. GeeWO1

There is an improvement in riparian extent and condition, hydrological regimes and water quality of the lower Moorabool and Barwon rivers. GeeWO2

The efficiency of consumptive water use from our priority waterways will be improved though use of cost effective alternative water sources and demand management strategies within the Geelong City Landscape System. GeeWO3

Improve waterway amenity through the implementation of the Kitjarra-dja- bul bullarto langi-ut Masterplan. GeeWO4

Maintain or improve the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar complex. GeeWO5

The impact of urban development on riparian buffers, water quality and flow in the Barwon River and its tributaries within the Geelong City Landscape System will have been reduced. GeeWO6

Understand and enhance the Wadawurrung values of the Barwon River and tributaries and ensure the Wadawurrung People have a strong voice in their management. GeeWO7

There will have been an increase in the Barwon River in-stream habitat for native fish and angling species compared to 2021 baseline. GeeWO8

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Geelong habitats across land, waterway and coastal environments. GeeBO1

Achieve a net gain where possible in suitable Geelong habitat expected over six years from sustained improved public and private land management and community involvement for threatened and culturally significant local species. GeeBO2

Achieve a net gain where possible in all species with positive % change in suitable Geelong habitat expected over six years from sustained improved public and private land management and community involvement. GeeBO3

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. GeeBO4

Increase understanding and awareness of biodiversity values of the Geelong City Landscape System. GeeBO5

Land

By 2027, compared to 2022 baselines, land is suitably used within its capability and sustainably managed to maintain and improve its natural capital. GeeLO1

Coast and Marine

By 2027, compared to 2022 baselines, proactive management of the catchment by the community contributes to a net gain in the health and resilience of the region's highly valued coastal and marine environment. GeeMO1

Communities

By 2027, compared to 2022 baselines:

Geelong City communities (and visitors) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. GeeCO1

Geelong City communities (and visitors) have an increased awareness and understanding of the connection between human activities and impacts on the environment. GeeCO2

The increased capacity of the Wadawurrung Traditional Owner Group enables their increased involvement in decision making that effects their Country. GeeCO3

Geelong City 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links:

Water | Biodiversity | Land | Coast & Marine | Communities

Six year priority directions for Geelong City are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
GEE1	Geelong City landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.						CCMA	DELWP, BW, EPA, CoGG, PV
GEE2	Develop enduring partnerships with the Wadawurrung people to: 1) acknowledge and enhance Wadawurrung values of natural assets; 2) ensure the Wadawurrung people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Traditional Owner stories and history; and, 4) identify and implement opportunities for the Wadawurrung people to own and manage water on their country						CCMA	WTOAC, DELWP, BW, CoGG
GEE3	Best land management practices are implemented across peri-urban land managers, agencies, developers, and the catchment community						CCMA	AgVic, Landcare, CoGG
GEE4	Enhance riparian management within priority waterways of the Geelong system as defined in the Corangamite Waterway Strategy and improve in-stream habitat in priority areas along the Lower Barwon River.						CCMA	CoGG, BW, PV, OzFish, VRFish

Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
GEE5	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect and enhance coastal and marine environments 4) protect cultural heritage						CoGG	CCMA
GEE6	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Barwon Water Urban Water Strategy 2) priority projects identified by the Barwon Integrated Water Management Forum; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy						BW	CCMA, CoGG, DELWP
GEE7	Continue to implement the 2018 Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan including monitoring actions from the Ramsar site MERI Plan.						CCMA	CoGG, DELWP, PV, PPWCMA, ARI, BLA, MW
GEE8	Provide the public with clear guidance on episodes of poor water quality such as blue-green algae outbreaks in waterways such as the Barwon River through Geelong						CCMA	CoGG, BW
GEE9	Develop an integrated masterplan for Kitjarra-dja- bul bullarto langi-ut (Barwon River Parklands) and implement high priority projects.						CCMA	CoGG, BW, PV, Tourism Greater Geelong and the Bellarine, WTOAC, DELWP, GPS, G21, DHHS, SRV, BC
GEE10	Investigate the water balance of the lower Barwon River considering development implications, runoff and future management implications.						CCMA, CoGG	DELWP
GEE11	Encourage landowners to apply best practice land management by: 1) using property management planning; 2) use of Landcare networks; 3) actively researching and facilitating market drivers that promote sustainable agriculture /land management practices; and, 4) designing and delivering a comprehensive engagement program to support and empower farming communities						CCMA	AgVic, DELWP, Landcare
GEE12	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.						CCMA	DELWP, CoGG, BW, PV
GEE13	Manage upstream processes to mitigate impacts on the coastal and marine environments.						CCMA	EPA, CoGG, DELWP, Landcare
GEE14	Explore carbon sequestration opportunities to deliver both climate and catchment/biodiversity benefits.						Deakin Uni	DELWP, PV, CCMA

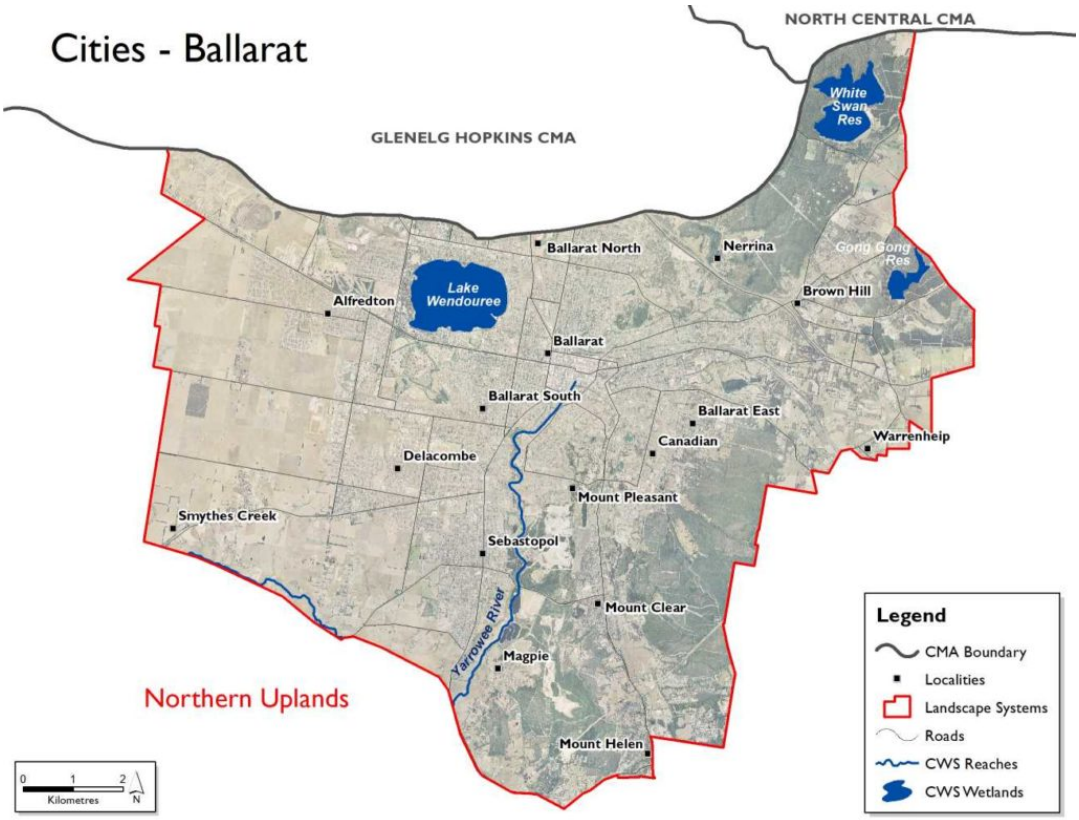
Code	Priority Direction	Relevant Theme					Lead	Collaborators
		Water	Biodiversity	Land	Community	Coast and Marine		
GEE15	Within the Coastal and Marine environment 1) review targets in relevant strategies to identify and reduce stressors on coastal and marine environments 2) develop and implement a process for the provision of coastal erosion advice for long term planning, management and adaptation.						DELWP	CCMA, CoGG,
GEE16	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs.						CCMA	CoGG, Landcare
GEE17	Engage with the community on the need to mitigate and adapt to climate change and its impacts.						CoGG	CCMA, DELWP
GEE18	Design and deliver a comprehensive education program to engage new urban and peri-urban communities in the growth corridors to connect them with their local environment and empower them to participate in NRM activities.						CoGG	CCMA
GEE19	Action Plans are developed that leads to a 25% increase of non-government investment to supplement current Government investment into the region to address high priority natural resource management actions						CCMA	DELWP, CoGG, Landcare
GEE20	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027						CCMA	DELWP
GEE21	Implement 90% of recommendations within the Barwon River Masterplan by 2027						CCMA	CoGG, BW
GEE22	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans						DELWP	CCMA, CoGG, PV

Date printed: 29 July 2024

Ballarat City

Overview

Overall Area	13,977 hectares
Population	76,948
Climate	672 mm per annum at Ballarat
Main Towns	Ballarat
Land Use	Residential Manufacturing Commercial Education Agriculture
Main Industries	Manufacturing Commercial Education Agriculture Tourism
Main Natural Features	Lake Wendouree Woowookarung Regional Park Yarrowee River



Click on map to access Natural Resource Management Portal interactive mapping

Landscape

Ballarat is the second largest urban centre within the region and has a population of around 110,000 and is forecast to grow to be approximately 150,000 by the early 2030s. The Traditional Owners are the Wadawurrung.

An important asset to Ballarat is Lake Wendouree, a man-made lake covering 200 hectares, located a couple of kilometres west of the town centre. Lake Wendouree 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.

An important waterway within the Ballarat landscape system is the Yarrowee River, a key tributary to the Leigh River, which feeds into the Barwon. Part of the Yarrowee River flows through Ballarat's central business district and was directed underground through a bluestone-lined channel.

The Ballarat City landscape system covers the urban centre of Ballarat, the largest inland city within Victoria and the second largest city within the Coragamite CMA region. Surrounded entirely by the Northern Uplands to the west, south and east, its northern border is the edge of the CCMA boundary. Ownership is mostly private urban land, but there are a number of small public land parcels within the urban area – many of which are public reserves for recreation. Main parks and reserves are the Mullawallah Wetlands Nature Conservation Reserve to the north west, the Woowookarung Regional Park to the southeast and Lake Wendouree in central Ballarat.

Livelihood

Like Geelong, Ballarat is principally an area for manufacturing, education, service provision, retail, tourism and residential activities. There is also limited agriculture, viticulture and horticulture occurring in the peri-urban areas around the city.

Lifestyle

As this landscape system is contained entirely within the Ballarat local government area, the majority of the community is urban based. Ballarat is the most densely populated, and smallest landscape system by area in the region. The portion of population of the urban Ballarat City area within the Corangamite region is over 71,000 (other portions occur in the Glenelg Hopkins and North Central regions).

There is extensive peri-urban settlement surrounding the City of Ballarat.

Assessment of current condition and trends

Water

The Ballarat City region's waterways fall within the Barwon River Basin. The Yarrowee River, beginning near Ballarat's urban centre and stretching through the south of the Ballarat city region, is the only major waterway in the area. Its condition was assessed as very poor in Victoria's third Index of Stream Condition (ISC) in 2010, reflecting the regional trend of poor waterway health in proximity to urban areas.

The Yarrowee River was assessed as having highly modified hydrology, scoring amongst the worst in the Barwon River Basin. The very poor health of this waterway is attributed to its hydrology being affected by nearby treated effluent disposal and mine dewatering.

Corangamite Waterwatch , a citizen science volunteer program, regularly monitors water quality parameters at many sites across the catchment, including at Lake Wendouree. Lake Wendouree is an urban constructed lake that receives stormwater runoff from Ballarat. On most occasions the water quality was reasonably healthy displaying low salinity, turbidity and phosphorus. Oxygen levels within the lake often varied between sites and sampling events, but was mostly healthy. At some sites variable oxygen levels were observed, likely associated with aquatic vegetation. Oxygen levels in waterways with an abundance of aquatic vegetation often display diurnal fluctuations as a result of photosynthesis, therefore results are likely influenced by the time of day when monitoring occurred. At the times of monitoring (biannual – spring and autumn) high pH levels (>9 pH units) were observed at several sites. The high pH is likely due to excessive aquatic plant or algal growth decreasing the CO2 levels during photosynthesis. Increases in pH in water increases ammonia toxicity and can be toxic to aquatic life if an abundance of nitrogen is present. Low dissolved oxygen levels were also observed and are likely due to the consumption of oxygen by oxygen dependant organisms and microbial decay of organic matter.

Biodiversity

Being a major city, the landscape system's biodiversity values have been highly impacted firstly through the effects of the gold rush and also associated urban development since then. As a result of this, most remnant vegetation is found on the less fertile sedimentary soils in the hills, and along creek corridors and gullies. Species such as the Yarra Gum are rare or threatened. The Brush-tailed Phascogale is under threat and is heavily dependent on Eucalyptus trees for foraging opportunities and tree hollows. Growling grass frogs which are listed as vulnerable under the EPBC Act occur in permanently or temporarily inundated water bodies, with emergent and submerged aquatic vegetation. Its range has been severely reduced due to land clearing, agriculture, degraded water quality and altered hydrological regimes.

The Yarrowee and Leigh river system supports significant ecological values including the endangered Growling grass frog and iconic Platypus. Macroinvertebrates provide a food source for these species, along with resident freshwater and migratory fish, including Dwarf galaxias, Yarra & Southern Pygmy perch, Tupong, Short-finned eel, Australian smelt, and common jollytail. These rivers have relatively few major fish barriers, with only two posing the threats to fish passage. Greater flow variability in the reach will allow native fish populations to build, and could potentially reduce exotic fish populations such as gambusia and carp, which thrive in regulated flow regimes.

This landscape also supports a range of common flora and fauna species that are highly valued by the community, as they make a significant contribution to the amenity of the area. Koalas, Echidnas, Eastern Grey Kangaroos, Black Wallabies, Brushtail and Ringtail Possums can be found. Birds such as the Crimson Rosella, Kookaburra, Tawny Frogmouth and Southern Boobook Owl are common. Various Eucalypts, Acacias, and native tussock grasses also provide valuable habitat.

Lake Wendouree, a man-made lake, has many native species including: aquatic Water-milfoil (Miriophyllum salsugineum) commonly called 'Lakeweed'; Water Ribbon (Triglochin procera), which provides food for Black Swans; and the Tall Spike-rush (Elocharis sphacelata). Other common plants include the Spiny Rush, Common Reed, Duckweed, and Sedges, which are generally found on the periphery of the lake. There are known to be approximately 170 bird species frequenting the lake. Common water bird species include Cormorants, Ibis, Moorhens, Coots, and Ducks. Common land birds include Magpies, Eastern Rosellas, Blackbirds, Swallows, Cockatoos, Magpie-larks, Ravens, Wattlebirds, Swamp Harriers, Fantails, Sparrows and Starlings. The lake is stocked with trout, as a popular recreational fishery. The main fish species in the lake are Rainbow Trout, Brown Trout, Mosquito Fish and Carp. The Rakali *(Hydromys chrysogaster)* or water rat, is a native rodent that can be found in and around the lake at night.

Land

Relative soil productivity on private agricultural land in the Ballarat City area is the second poorest in the Corangamite region. It ranges from low around the central urban area to moderate further out from the city centre, with the highest relative productivity located on the western boundary.

DELWP's Victorian Land Cover Time Series provide a snapshot of the changes in land cover types in seven five-year increments between 1985-2019.

The two cities in the Region, the Geelong and Ballarat city landscape systems, are dominated by urban land cover, followed by non-native pasture as the second most prevalent land cover. Across both landscape systems, urban areas have increased from around 26% to almost 34% over the time period, whilst non-native pasture decreased from around 31% to 22% today. Dryland cropping, and native grass herb also each constitute 12% and 8% respectively, Dryland cropping has increased in land area by >50% since the 1985- 1990 epoch, overtaking native grass herb in total area covered (which has remained constant). Both seasonal and perennial wetland types dropped by nearly 25% each, although seasonal wetlands occupy ten times the area of perennial wetlands.

Community

As this landscape system is contained entirely within the Ballarat local government area, the majority of the community is urban based. The Ross Creek Landcare Group cover part of this area, supported by the Leigh Catchment Group.

Ballarat is the most densely populated, and smallest landscape system by area in the region. The portion of population of the urban Ballarat City area within the Corangamite region is over 71,000.

Ballarat Environment Network was formed in 1993 as an initiative arising from the 1991 Ballarat Region Conservation Strategy.

The Friends of the Yarrowee River is a community group that aims to work actively to restore and protect the Yarrowee River, its environs and tributaries.

Other environmental groups:

- Australian Plants Society – Ballarat District
- Ballarat Sebastopol Cycling Club
- Birdlife Australia – Ballarat
- Field Naturalists' Club Ballarat
- Fishcare Victoria Inc – Central Highlands
- Friends of Canadian Corridor
- Friends of Yarrowee River
- Sparrow Ground Friends Group

Major threats and drivers of change

Water

Population growth is likely to add significant pressure to local water resources in an already flow stressed. Most of the water for Ballarat's water supply is extracted from the Yarrowee/Leigh River system and the Upper Moorabool River system. With a population of the greater Ballarat region predicted to increase to approximately 144,000 by 2036, increased extraction for urban water supply combined with decreased flows due to climate change is likely to result in reduced environmental flows. Furthermore, water quality issues including nutrient loads from urban stormwater and wastewater discharges will limit the ecological condition of the Yarrowee River.

The Corangamite Waterway Strategy 2014-2022 outlines priority management activities to address water quality threats in the Yarrowee-Leigh landscape. These include:

- Establish native indigenous vegetation
- Install riparian fencing
- Establish stewardship/management agreement
- Undertake woody weed control
- Implement best management practice on grazing properties (Yarrowee River)
- Maintain the function of an urban wetland (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 (Yarrowee-Leigh rivers)
- Adopt whole of water cycle management principles to reduce the impact of stormwater run-off on the health of Yarrowee Leigh and downstream waterways (Yarrowee River)
- Enhance the upstream reach in line with the Breathing Life back into the Yarrowee Project (Yarrowee River)
- Comply with bulk entitlements, monitor and maintain waterway condition and implement risk management plans as appropriate (White Swan Reservoir, Gong Gong Reservoir)
- Maintain Waterwatch groups collecting baseline data on waterway condition.

Biodiversity

Ongoing residential development in the area, including subdivision and housing developments, will reduce the extent of native vegetation and tree cover. This may lead to a reduction in the value of the area for wildlife habitat and movement.

Threats to native fish include limited flow variability that comes with a regulated flow regime. Regulated flows allow exotic fish populations like gambusia and carp to thrive. Targeted management of exotic fish species will assist in system recovery and allow native species to flourish.

Exotic weeds such as willows, blackberry, and reed sweet grass can influence flow and channel form, reducing suitable habitat for fish, platypus, and other fauna. Managed removal of exotic species and the revegetation of the riparian zone with native species will support the values of the system and the attainment of the objectives sought through the provision of environmental water.

Cinnamon Fungus (*Phytophthora cinnamomi*) is a soil borne pathogen (a water mould) that can infect the root systems of a range of susceptible plant species. One of the key susceptible indicator species within the Ballarat landscape is Austral Grass-tree (*Xanthorrhoea australis*), which is a highly valued feature of the local bushland. Cinnamon Fungus can also infect many other understorey species.

Water quality and flows are vulnerable to future change from climate change and from increased urbanisation. Erosion is also a potential issue, particularly in cleared areas, or where waterways pass through sites disturbed by past gold mining. The degradation of riparian corridors can be attributed to past clearing and ongoing inappropriate grazing pressure.

Land

The major threat to land use in this system is the ongoing residential development in the area, including subdivision and housing developments. Ballarat is another area where people are wanting to live in peri-urban areas where they can have a rural property in close proximity to a major centre. This has led to a landscape change from what was previously agricultural land to semi-residential.

Changing to more intensive land use can have impacts on the land itself and other assets off site with issues such as soil compaction, erosion and acidification being more likely on these smaller holdings. Increased run-off through more hard surfaces is also an issue, especially where nutrients end up in waterways.

Another issue is the community's desire for more active recreation within reasonable proximity to Ballarat City. The need for more land to be dedicated to this also has a direct impact due to changed land use and other indirect impacts such as weed spread and introduced pests if appropriate management regimes are not implemented. This is particularly the case when developers manage parkland initially before handing it over to Council.

Community

The ability to engage urban communities in caring for their landscape is an emerging issue, especially in a predominantly residential area. Having an informed community is a key to ensuring appropriate consideration is given to the way they access and use the natural assets within their immediate area and within the broader environment overall.

Peri-urban land owners often need appropriate guidance on how to manage their little patch of paradise with a need for a variety of sources of information for this segment of the community becoming more apparent.

Ballarat City 6 Year Outcomes

Water

By 2027, compared to 2022 baselines:

The efficiency of consumptive water use in the Ballarat City Landscape System will be improved through the use of cost effective alternate water sources and demand management strategies that results in less take from source water. BalWO1

Increase the extent of riparian management in priority reaches of the Yarrowee River. BalWO2

The implementation of the Gippsland and Central Region Sustainable Water Strategy will have provided for sustainable use of the Yarrowee River for urban supply and agricultural use in a drying climate. BalWO3

Improve waterway amenity through the implementation of the Yarrowee River and Tributaries River Corridor Master Plan. **BalWO4**

The impact of urban development on riparian buffers, water quality and flow in the Yarrowee River, tributaries and wetlands will have been reduced. **BalWO5**

Understand and enhance the Wadawurrung values of the Yarrowee River and tributaries and ensure the Wadawurrung People have a strong voice in their management. **BalWO6**

Biodiversity

By 2027, compared to 2022 baselines:

Achieve a net gain in the overall extent, connectivity and condition of Ballarat habitats across land and waterway environments. **BalBO1**

Achieve a net gain in suitable Ballarat habitat expected over six years from sustained improved public and private land management for threatened and culturally significant species. **BalBO2**

Achieve a net gain where possible in all species with positive % change in suitable Ballarat habitat expected over six years from sustained improved public and private land management and community involvement. **BalBO3**

Increase effectiveness of interagency collaboration in their ability to respond to climate change and development pressures on biodiversity. **BalBO4**

Increase understanding and awareness of biodiversity values of the Ballarat Landscape System. **BalBO5**

Land

By 2027, compared to 2022 baselines, land within the Ballarat landscape system is managed and developed appropriately for a variety of purposes within its capability and suitability. Such management and development will retain and enhance land's natural capital, provide social, cultural and health benefits and prevent both on and off-site impacts. **BalLO1**

Communities

By 2027, compared to 2022 baselines:

Communities (local, new and visitor) are encouraged, educated and enabled to further connect with and responsibly care for the natural environment. **BalCO1**

Communities (local, new and visitor) have an increased awareness and understanding of the connection between human activities and impacts on the environment. **BalCO2**

The increased capacity of the Wadawurrung Traditional Owners enables their increased involvement in decision making that effects their Country. **BalCO3**

Ballarat City 6 Year Priority Directions

Six year regionally applicable priority directions have been developed for each of the Themes and are applicable to this landscape System, these can be accessed via the following links

Water | Biodiversity | Land | Communities

Six year priority directions for Ballarat City are provided in the following table. Where these priority directions apply to a theme this is indicated by the relevant shading. To access definitions of terms and acronyms click on the following link.

		Relevant Theme	

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
Code	Priority Direction	Water	Biodiversity	Land	Community	Lead	Collaborators
BAL1	Ballarat City landscape partners and the community collaborate to deliver a coordinated approach to natural resource management to build resilience and successfully respond to changing circumstances with clear roles and responsibilities communicated.					CCMA	CHW, DELWP, BCC
BAL2	Develop enduring partnerships with the Wadawurrung people to: 1) acknowledge and enhance cultural heritage values of natural assets; 2) ensure the Wadawurrung people have a strong say in management of natural assets; 3) identify and implement appropriate mechanisms for sharing Wadawurrung stories and history; and, 4) identify and implement opportunities for the Wadawurrung people to own and manage water on their country					CCMA	WTOAC, DELWP, CHW, BCC
BAL3	Best land management practices are implemented across peri-urban land managers, agencies, and the catchment community					CCMA	AgVic, Landcare, BCC, PV, CHW, DELWP
BAL4	Enhance riparian management within priority waterways of the Ballarat system as defined in the Corangamite Waterway Strategy.					CCMA	BCC, CHW
BAL5	Ensure development planning considers, minimises and where possible avoids adversely impacting floodplains, biodiversity, land and water assets including encouraging water sensitive urban design and use of integrated water management principles and requiring developers to: 1) protect and enhance native vegetation and habitat 2) protect and enhance floodplain function 3) protect cultural heritage					BCC	CCMA, CHW, DELWP
BAL6	Implement actions in the City of Ballarat's Masterplan for the Yarrowee River and Tributaries to achieve the desired waterway amenity values including improving facilities and/or environmental condition.					BCC	DELWP, CCMA, Tourism Authorities
BAL7	Ensure the assessment of applications for new or transfers of groundwater entitlements within the Cardigan and Bungaree Groundwater Management Areas takes into account the impact of extraction on connected waterways and Groundwater Dependent Ecosystems (GDEs)					SRW	CCMA, CHW
BAL8	Explore and implement cost effective water efficiency measures including demand reduction initiatives and alternative water sources by implementing the following plans and strategies: 1) Barwon Water Urban Water Strategy 2) priority projects identified by the Barwon and Great South Coast Integrated Water Management Forums; and, 3) relevant actions from the 2021 Central and Gippsland Sustainable Water Strategy					CHW	CCMA, DELWP
BAL9	Ensure community education and engagement activities are grounded in the most recent and relevant social research available and target local demographics.					CCMA	DELWP, BCC, CHW
BAL10	Identify public land parcels in urban and peri-urban areas and identify how they can be better used for conservation, recreation, social, health and cultural benefits.					DELWP	BCC
BAL11	Target urban areas adjoining sites with high biodiversity values/potential for action including information, education, and awareness to prevent impact on these areas.					BCC	DELWP

Code	Priority Direction	Relevant Theme				Lead	Collaborators
		Water	Biodiversity	Land	Community		
BAL12	Encourage and enable community participation (volunteering) 1) in on-ground environmental works to restore and protect environmental assets 2) citizen science programs					CCMA	Landcare, BCC
BAL13	Engage with the community on the need to mitigate and adapt to climate change and its' impacts.					CCMA	DELWP, Landcare, BCC
BAL14	Design and deliver a comprehensive education program to engage new urban and peri-urban communities in the growth corridors to connect them with their local environment and empower them to participate in NRM activities.					CCMA	Landcare, BCC
BAL15	Action Plans are developed that leads to a 25% increase of non-government investment into the region to address high priority biodiversity actions					CCMA	DELWP, BCC, Landcare
BAL16	Develop best practice management actions to achieve an overall net gain of 'Suitable Habitat' for priority species by 2027					CCMA	DELWP
BAL17	Engage with Wadawurrung people to develop a method based on traditional knowledge that enables improved and sustained management of problem herbivores in priority locations.					CCMA	WTOAC
BAL18	Implement additional areas of sustained predator, herbivore and weed control in priority locations, reflecting Biodiversity Response Planning outputs, Strategic Management Prospects and other regional plans					DELWP	CCMA, PV

Date printed: 29 July 2024