



WIMMERA REGIONAL
CATCHMENT STRATEGY
2021–2027

- 
Water
- 
Land
- 
Biodiversity
- 
Community

“A healthy Wimmera catchment where a resilient landscape supports a sustainable and profitable community.”

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APPENDICES

Appendices can be downloaded from the publications page at www.wcma.vic.gov.au. **Appendix 1:** Policy context
Appendix 2: Threatened species in the Wimmera **Appendix 3:** Threatened vegetation communities in the Wimmera
Appendix 4: Statewide Regional Catchment Strategy Outcomes Framework

An Addendum to this Regional Catchment Strategy will provide a detailed plan that sets out how the Wimmera region will contribute to the Australian Government’s 5-year Outcomes and Investment Priorities under the Regional Land Partnerships Program.

WIMMERA REGIONAL CATCHMENT STRATEGY

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The contents and views expressed within this report are those of Wimmera CMA and do not necessarily reflect the views of the parties consulted.

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First Nations artwork supplied by Vernon Sultan.

Chair's foreword



We acknowledge the Traditional Owners and other Aboriginal and Torres Strait Islander peoples across the region and pay respect to Elders past, present and emerging.

Wimmera CMA is pleased to share with you the Wimmera Regional Catchment Strategy (RCS). The RCS is the overarching strategy for integrated catchment management (ICM) in the Wimmera. ICM recognises that land, water and biodiversity are all part of connected systems that span from the top of the catchment to aquatic environments. It relies on people working together to coordinate planning, investment and on-ground activities in an efficient and effective way to achieve a range of environmental, social, economic and cultural outcomes.

The RCS sets the long-term vision for ICM in the Wimmera and is based around four themes:



Water



Land



Biodiversity



Community

The RCS describes the importance of each theme to the region, discusses trends in condition and factors impacting on theme condition and values. The strategy outlines desired outcomes for the next twenty and six years and priority directions to achieve these outcomes. The RCS recognises the important role of community members and groups in achieving the outcomes through stewardship of land.

There is strong recognition throughout of the deep and continuing connection First Nations people have to the Wimmera's living cultural landscapes. There have been significant contributions by First Nations people to the content of the RCS. The RCS seeks to support ongoing collaboration and two-way learning in ICM.

Recognising that ICM is place based, the RCS describes the natural characteristics and threats in Local Areas and the outcomes local communities seek to achieve. These Local Areas are based around the local government areas in the Wimmera catchment management region. The aim of the RCS is to set outcomes and identify priority directions for ICM.

There are several additional themes that are integrated throughout the RCS including rural and regional liveability, community wellbeing, climate change, innovation and stewardship.

The RCS has been prepared by Wimmera CMA with and on behalf of the Wimmera community. In doing so it builds on the visionary leadership, community effort and practical on-ground outcomes characteristic of the Wimmera region.

I encourage the Wimmera community to familiarise themselves with the RCS and consider it when planning works and projects.

Peter Hilbig
Chair, Wimmera CMA



First Nations introduction

The Wimmera region includes the traditional lands of the Wotjobaluk peoples represented by the Barengi Gadjin Land Council Aboriginal Corporation and the Eastern Maar represented by Eastern Maar Aboriginal Corporation. Here is an introduction to people and Country in their own words.

Barengi Gadjin Land Council Aboriginal Corporation

Barengi Gadjin Land Council Aboriginal Corporation (BGLC) is the trustee for the Native Title rights and interests of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagulk peoples, collectively known as the Wotjobaluk peoples as recognised in the Consent Determination on 13 December 2005. BGLC's Registered Aboriginal Party (RAP) area under the *Victorian Aboriginal Heritage Act 2006* includes places such as Gurru (Lake Hindmarsh), Ngalpakatia/Ngelpagutya (Lake Albacutya), Pine Plains Lake, Lake Werringrin, Lake Coorong, Warracknabeal, Beulah, Hopetoun, Dimboola, Ouyen, Yanac, Hattah Lakes, Dyurrite (Mount Arapiles), Burrunj (Black Range) and the Barringgi Gadyin (Wimmera River).

Several significant places are outlined through our Country Plan,⁽¹⁾ but like all places across our Country, the river, the lakes, the swamps, and all other landscape features in this area are of high cultural significance. Our creation stories of these places are ours to sustain and we wish to tell our story as the knowledge holders of the traditional land management practices and the ancient narrative of this area. We wish to work collaboratively, honestly, and transparently with partners to heal Country by cultivating a deeper connection between it and all people.

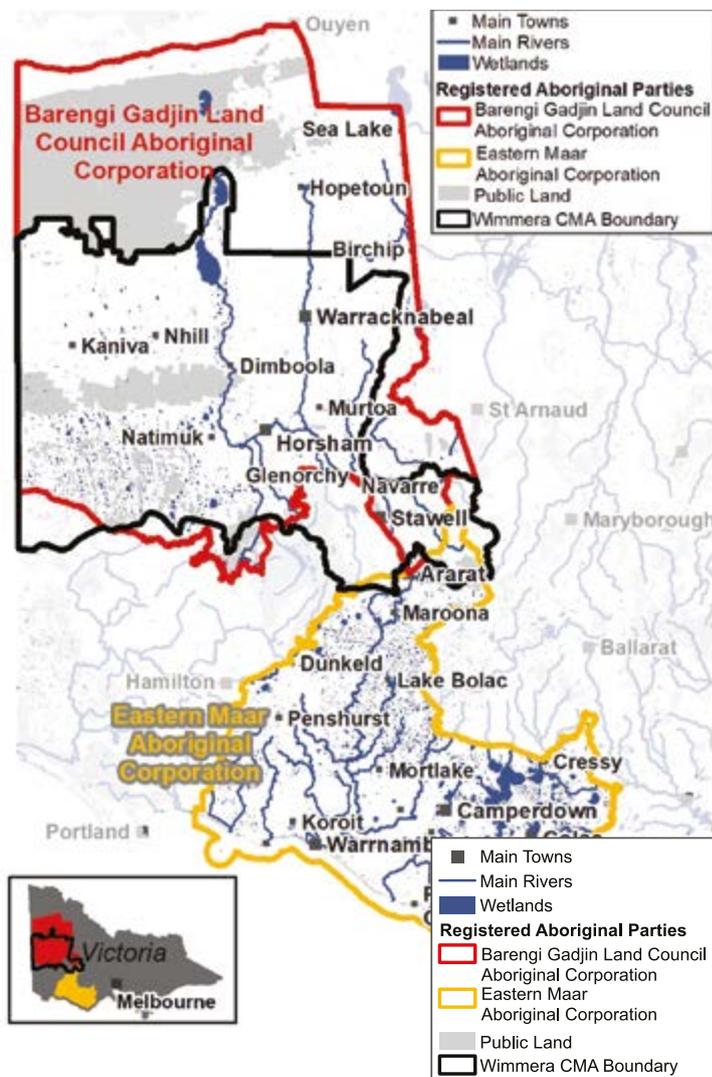
Our families have deep Ancestral connection to this region and are inherently invested in seeing the better management of the land and water so we can achieve greater outcomes for Country and those that live on it.

We are part of our Country and our Country is part of us. Bunjil the creator, made our land, waterholes, animals, and plants and gave the Bram-bram-bult brothers, sons of Druk the frog, the responsibility to finish the tasks he had set for himself. They had to bring order to the new world by naming the animals and the plants, and to make the languages and give the lore's. This is why Wotjobaluk peoples are obligated to look after Country and culture and keep it healthy and strong. Country heals us and connects us to our dreaming stories, to our ancestors and spirits. It is the foundation of our future. All parts of Country are connected and if our Country is treated with respect and care, then it will continue to sustain us and provide for us. It is vitally important that we continue and share our traditional land management practices so the land, waters and all living resources can thrive.

Eastern Maar Aboriginal Corporation

The following statement in a 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
 Meerreeng-ngeeye, pareeyt, nganpeeyan, weeyn, woortoot,
 poondeeya-teeyt
 Meerreeng-ngeeye, nhakateeyt, woorroong, leehnan,
 moorooop, keerray
 Meerreeng-ngeeye, thookay-ngeeye, pareeyt pareeyt ba
 waran waran-ngeeye,
 wangeeyarr ba wangeet - ngeeye, maar ba thanampool-
 ngeeye, Ngalam Meen-ngeeye, moorooop-ngeeye
 Meerreeng-ngeeye Maar, Maar meerreeng
 Wamba-wanoong yaapteeyt-oo, leerpeeneeyt-ngeeye,
 kooweekoowe-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
 Meerreeng-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.



Regional overview

“Our vision for the region is for a healthy Wimmera catchment where a resilient landscape supports a sustainable and profitable community.”

Water, land and biodiversity

The Wimmera region covers approximately 10% of Victoria and is the fifth largest catchment management region in Victoria, encompassing 2.3 million hectares.

The landscape is dominated by broadacre cropping, covering 1.2 million hectares or 53% of the region. The gross value of agricultural production in the Wimmera in 2015-16 was \$691 million. Farm cash income was \$378,000 in 2019-20 compared to \$184,000 in 2018-19. Median property size is 765 hectares and increasing. ⁽²⁾

The Wimmera’s waterways are oases in a relatively dry landscape. Major catchments include the Wimmera Basin and the eastern part of the Millicent Coast Basin. The Barringgi Gadyin (Wimmera River) is the largest Victorian river that does not flow to the sea, instead flowing to Victoria’s largest freshwater wetland, Gurru (Lake Hindmarsh), then into Ramsar listed Ngalpakatia/Ngelpagutya (Lake Albacutya) and beyond. Ramsar refers to the Convention of Wetlands of International Importance.

The Wimmera contains 25% of Victoria’s wetlands which are predominantly in the south west of the region. This area also contains a valuable groundwater resource, supporting a significant irrigation and grazing industry.

The Pyrenees Range, Gariwerd (Grampians National Park), Burrunj (Black Range State Park) and Dyurrite (Mt Arapiles) are predominant in the landscape. These reserves, along with the Little Desert National Park, are the largest in the region and are significant areas for biodiversity and recreation. Along

with the many small and medium bush and wetland reserves scattered throughout the region, they support regional liveability, health and wellbeing, and environmental, socio-economic and cultural values. Gariwerd (Grampians National Park) alone attracts approximately one million people per year and is the second most popular national park in Victoria.

People

The Wimmera’s population is approximately 50,000 with around one third of residents living on farms or in small townships with less than 2,000 people.

First Nations people are represented by Barengi Gadjin Land Council Aboriginal Corporation (BGLC) and Eastern Maar Aboriginal Corporation. There is a deep and continuing connection between First Nations people and Country with many significant features linking directly to creation stories.

Health and wellbeing are influenced by a range of catchment management factors including the health of the local environment, access to recreational opportunities and

connection with the community. The overall health status for the Wimmera community is poorer than the state average in many indicators. This is more pronounced in children and young people.

Wimmera Primary Care Partnership’s 2020 population health and wellbeing profile recognises there is a positive relationship between visits to green space and a range of health benefits. Residents of the Wimmera visited green space less than the state average. Despite this, residents in the Wimmera are more likely to attend community events and the meetings or social events of local clubs and groups than the state average. ⁽³⁾ Regional Landcare leaders have reported that volunteer numbers are generally steady overall but patchy and fluctuating at a local level. Some groups have increased volunteers while others have decreased indicating that the trends for Landcare may be different to other activities.

Sixty-three per cent of farmers work full-time on farm hours, and they manage 90% of the agricultural land. Approximately 32% of landholders are members of Landcare while 28% are members of agricultural commodity groups. ⁽⁴⁾

Figure 2: The Wimmera region



Local Areas

The five Local Areas in the Wimmera Regional Catchment Strategy focus on distinct parts of the region and explain how the themes come together and integrate in each place. The Local Areas are based around local government and catchment boundaries. This recognises the importance of local community ownership, participation and management and demonstrates integrated catchment management.

The Local Areas in this strategy are:

1. Hindmarsh
2. Horsham
3. West Wimmera
4. Yarriambiack and Buloke
5. Upper Catchment (including parts of Ararat, Northern Grampians and Pyrenees local government areas).

Opportunities and challenges

LIVEABILITY

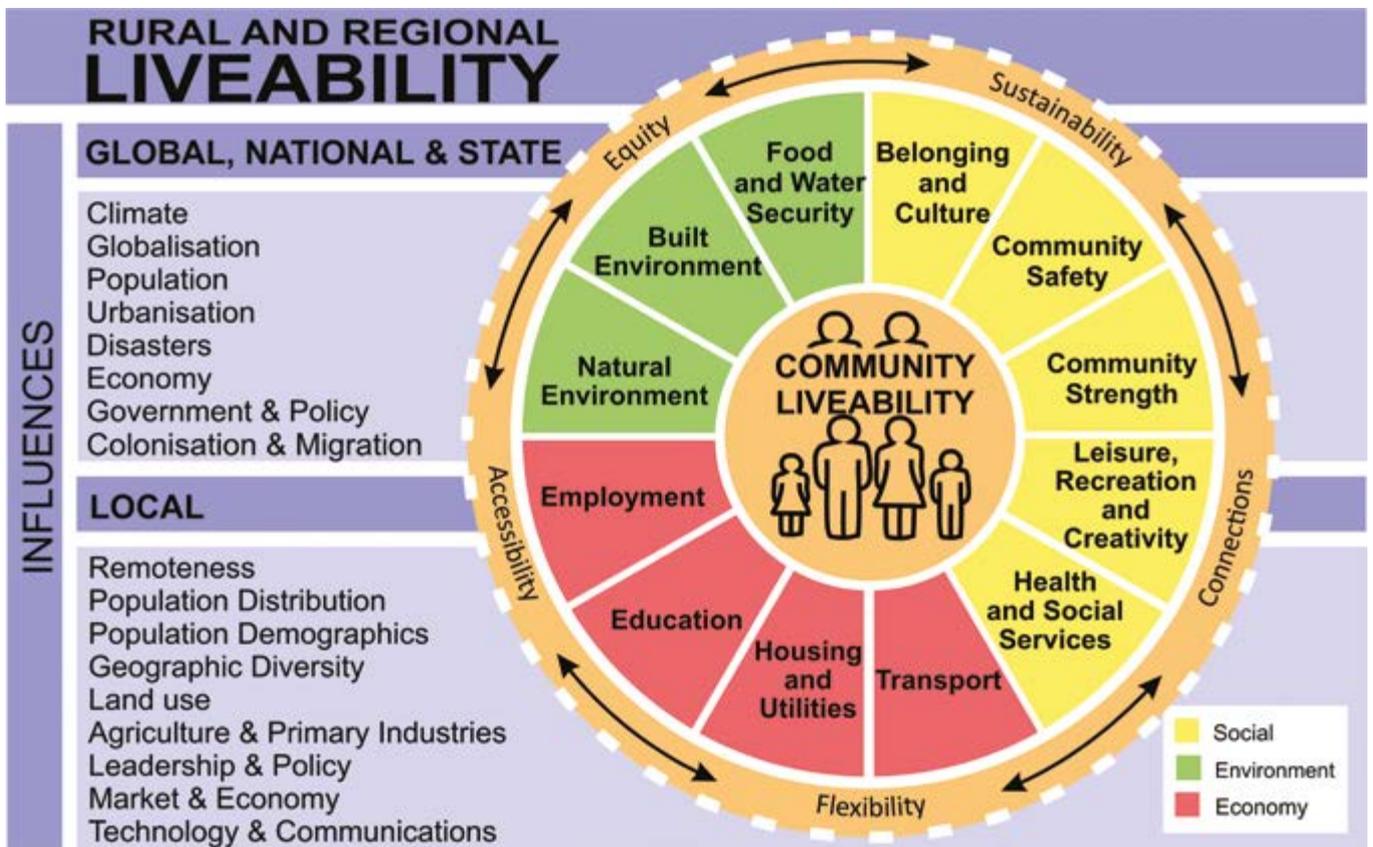
Integrated Catchment Management (ICM) plays an important role in improving the liveability of the region. ICM supports healthy functioning ecosystems and biodiversity.

This contributes to a range of liveability benefits, including clean water, healthy food, cooler towns, visual amenity and encouraging active living. Community participation in ICM creates social inclusion and empowerment.

ICM provides multiple outcomes beyond direct environmental outcomes. ICM practitioners working in collaboration with primary care service providers, local planners and the community can maximise liveability outcomes.

Figure 3 shows a range of influences affecting rural and regional community liveability.

Figure 3: The rural and regional community liveability concept developed in partnership by Wimmera Primary Care Partnership (PCP), South West PCP, Southern Grampians Glenelg PCP, Grampians Pyrenees PCP and Department of Families, Fairness and Housing as part of the Liveability Wimmera South West project.





CLIMATE CHANGE

Climate change will continue to shape the region. Many predicted consequences under various greenhouse gas emission scenarios have already been experienced. For example, the Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation have observed that in the Wimmera in the last 30 years:

- Annual rainfall has decreased by 9%.
- Dry years have occurred 12 times and wet years have occurred five times.
- Rainfall has decreased in the autumn and spring months.
- The autumn break is one to three weeks later (typically occurred in early to mid-May south of Horsham, and in late May to early June in the central and northern part of the region).
- More frosts have occurred and they are occurring later in growing season.
- There were more consecutive days above 40°C. ⁽⁵⁾

TRUTH TELLING COMMISSION

Prior to colonisation the Wimmera landscape was healthy and provided sustenance for the people and wildlife that lived here. With European settlement came foreign plants and animals and changed management practices which impacted the land and the people. First Nations people were forced out of the landscape and could not maintain their obligations to Country. The First Peoples Assembly of Victoria and the Victorian Government have made a shared commitment to truth telling through the Yoo-rrook Justice Commission. The Commission is expected to establish an official record of the impact of colonisation on First Peoples in Victoria and make recommendations about practical actions and reforms needed. This will guide integrated catchment management actions in the Wimmera into the future.

LANDHOLDER IDENTIFIED ISSUES

As most land in the region is privately owned and managed it is vital to support landholders so they can continue to contribute to improving the environment for the benefit of the whole community.

A survey of rural landholders found that the top three property related issues for landholders are:

- Impact of drought and/or changing rainfall patterns on property viability: 79%
- The impact of weeds and pest animals (including native species) on profitability: 66%
- Impact of poor management of pest plants and animals on public land: 61%

The top three district issues for landholders are:

- Impact of reduced water flows on the long-term health of rivers/streams/wetlands: 63%
- Reduced opportunities for recreation as lakes dry out: 61%
- Decline in soil health: 59% ⁽⁴⁾

NEW TECHNOLOGY AND INNOVATION

New technology and innovation are significant factors for managing challenges, maximising opportunities and improving the wellbeing and liveability of the region. New technology and innovation can change management practices, increase uptake of more sustainable and profitable farming and provide solutions to many ICM challenges.

MINING

The Wimmera's mining history has largely been focused on gold mining in the Upper Catchment which stretches back to 1850s. More recently the Wimmera has been recognised as a world priority area for mineral sands mining with several significant ventures in the early stages of development. It will be important to ensure that any mining development appropriately meets environmental, social and governance expectations. Specific consideration should be given to agricultural food production, tourism, public amenity and water availability.

ILLEGAL WASTE DUMPING

The illegal dumping of waste can impact on waterways and groundwater, contaminate soils and impact on wildlife and human health. Relevant agencies and the community need to be vigilant in observing, reporting and responding to illegal waste dumping.



Policy context

The Regional Catchment Strategy is the primary integrated planning framework for land, water and biodiversity in each of Victoria's ten catchment management authority regions.

The *Victorian Catchment and Land Protection Act 1994 (CaLP Act)* promotes and enables integrated catchment management across Victoria. The *CaLP Act* establishes Victoria's ten catchment management regions, Catchment Management Authorities (CMAs) and the requirement for CMAs to prepare a Regional Catchment Strategy (RCS) for their region.

This is the fourth iteration of the strategy since 1997. Each successive RCS has built on previous strategies, evolving over time.

The RCS supports, reinforces and integrates Australian Government and Victorian Government legislative and policy frameworks, and the relevant United Nations Sustainable Development Goals (Appendix 1). Figure 4 shows the RCS's relationship to Australian Government, Victorian Government, regional and local strategies and plans. A detailed list is included in Appendix 1. Figure 4 shows that the RCS:

- Is informed by a suite of Victorian and Federal Government legislation, policies and strategies,
- Gives regional context to state and federal legislation and policy,
- Complements, supports and informs local and regional strategies and plans related to economic, social, cultural and environmental wellbeing,
- Is an overarching succinct and high-level strategy, with reference to more comprehensive, targeted and detailed supporting information found elsewhere, including regional sub-strategies and action plans.

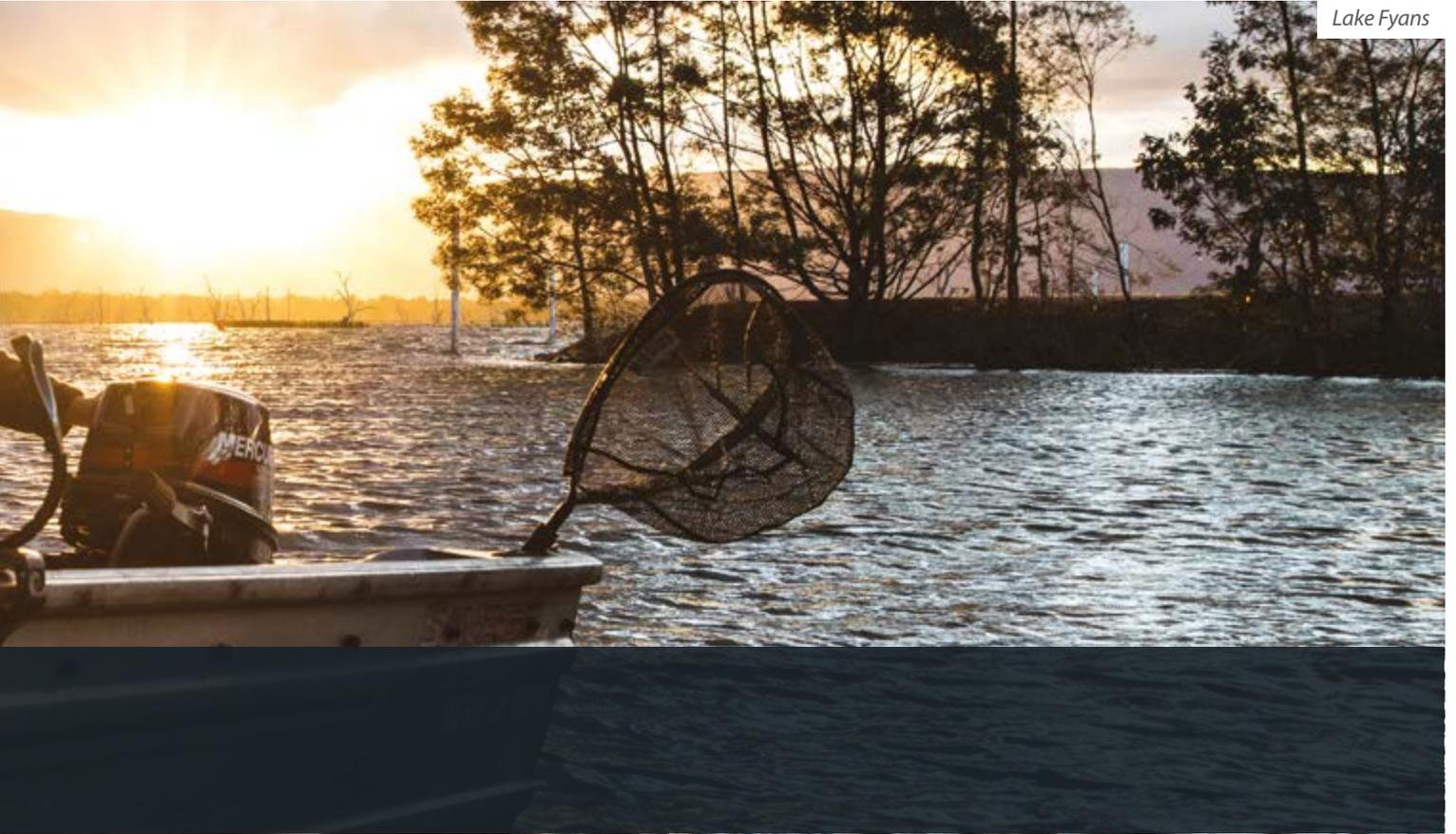
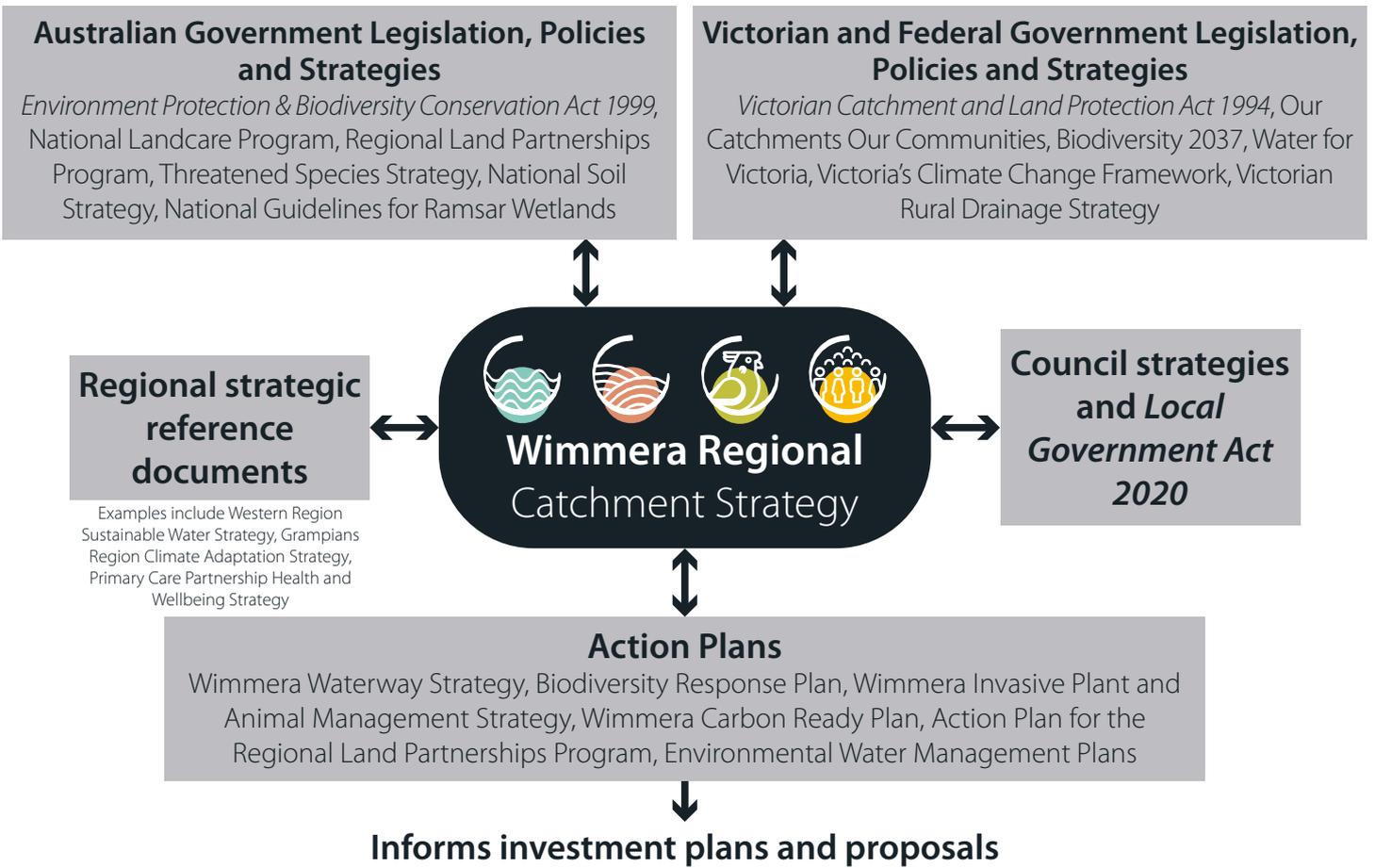


Figure 4: Policy context for the Wimmera Regional Catchment Strategy





Water



Land



Biodiversity



Community



Themes

The Wimmera Regional Catchment Strategy is based around four Themes:



Water



Land



Biodiversity



Community

These Themes are the building blocks of healthy and resilient environments and the focus of integrated catchment management.

The Water Theme includes the three sub-themes of Rivers and Streams, Wetlands and Groundwater. Each Theme and sub-theme section describe:

- The characteristics, values and importance of the Theme to the region,
- Current condition and significant trends,
- Major challenges, threats and drivers of change,
- Desired outcomes intended to be achieved over 20 years or more and 6 years, and
- Complementary plans that provide guidance on priority directions for achieving the outcomes.

Medium-term 6-year outcomes are intended to provide steppingstones towards achievement of the long-term 20-year outcomes.

The outcomes seek to be “SMART,” meaning they are:

- Specific about what the Wimmera’s stakeholders and community seek to achieve for the region’s land, water, biodiversity and community.
- Measurable. Progress towards achieving the outcomes will be measured over the life of the RCS. Indicators for measuring the outcomes are set out in a separate *Outcomes Monitoring Plan for the Wimmera RCS*.*
- Achievable. Outcomes are realistic and likely to be achieved given the realities of resources, community participation and climate change. Long term (20-year) outcomes are aspirational and some may require extra work beyond 20 years to be fully realised.
- Relevant, so that achieving the outcomes will contribute to the region’s Vision for “a healthy Wimmera catchment where a resilient landscape supports a sustainable and profitable community.”
- Timebound, in that the region will seek to achieve the outcomes over 6 and 20-year timeframes.

There are many important things to achieve for integrated catchment management in the Wimmera. The outcomes included in the RCS are considered the highest priorities for each Theme based on the best available science, and

knowledge and information contributed by stakeholders and the regional community. Outcomes included for some sections may also be relevant for other Themes or Local Areas. They have only been included in the sections where they are the highest priority. Each outcome is important, and they are not listed in any order of priority.

The Wimmera RCS does not contain targets that specify management outputs. Regional sub-strategies and action plans like the Wimmera Waterway Strategy and Carbon Ready Plan play an important role in setting out the specific management actions and priority locations for activities that will achieve the RCS’s outcomes. Current regional sub-strategies and actions plans are listed in Figure 4.

This gap will be filled by February 2022, with input from regional stakeholders, bringing together and consolidating existing regional planning work including Biodiversity Response Planning led by DELWP, Conservation Action Planning by Parks Victoria, and parts of the Carbon Ready Plan and Action Plan for the Regional Land Partnerships Program led by Wimmera CMA and describing how the RCS will contribute to and report on the targets set out in Biodiversity 2037.



*The Outcomes Monitoring Plan for the Wimmera RCS can be accessed on the Publications page of Wimmera CMA’s website at www.wcma.vic.gov.au.



Water

Rivers and streams, wetlands and groundwater all play an important part in providing economic, social, cultural and environmental benefits to the region.



Water

Water is the lifeblood of the Wimmera given the relatively dry climate and abundance of wildlife, amenity and recreational opportunities supported by the region's waterways. Rivers and streams, wetlands and groundwater all play an important part in providing economic, social, cultural and environmental benefits to the region.

Waterways provide habitat for much of the region's wildlife including endangered flora and fauna and important international migratory birds. For many years there has been significant investment and effort in protecting and enhancing the Wimmera's water resources and waterways. Whilst many threats and challenges are legacy issues from past land management practices, there continues to be new and often recurring challenges.

The region boasts a state-of-the-art water delivery system through the Wimmera Mallee Pipeline fed by water harvested from Gariwerd (Grampians National Park). Under climate change scenarios and land use change pressures there is a need to secure and manage water and waterways so that they support and balance natural ecosystem, human consumption and industry needs.

There is strong demand within the community for improved access to waterways for recreation and community activities. The Wimmera community understands that improved access to rivers and streams has benefits for their way of life, providing liveability outcomes, and improving the social and economic outcomes of the region. This needs to be done in a way that preserves environmental values.

Groundwater resources are extremely valuable, providing stock and domestic supply and irrigation in the west Wimmera. This resource needs careful management so it can be maintained into the future.

RIVERS AND STREAMS

Rivers and streams are iconic in the Wimmera, given it is a largely semi-arid region and many social, economic, cultural and environmental values are provided by the region's waterways. The catchment's rivers and streams are distinguished by a temperate to semi arid climate. Severe droughts and large floods make for variable hydrology and the adaption of unique and important riparian and aquatic ecosystems.

The Wimmera's two river basins are the Wimmera-Avon Basin comprising most of the region's east and the Millicent Coast Basin covering the western part of the region. The Wimmera basin comprises part of the Murray Darling Basin and extends north and east into the Mallee and North Central CMA regions.

The major waterway in the Wimmera-Avon Basin is the Barringgi Gadyin (Wimmera River) which is the largest river in Victoria that cannot flow out to the sea. It's catchment has numerous tributaries arising in Mount Buangor State Park, the Pyrenees range, Gariwerd (Grampians National Park) and the Black Range Scenic Reserve near Stawell. The Barringgi Gadyin (Wimmera River) flows through Glenorchy, Horsham, Quantong, Dimboola and Jeparit before entering Gurru (Lake Hindmarsh) (Figure 5).

During exceptionally wet periods, Gurru (Lake Hindmarsh) will fill and spill into Outlet Creek and onto Ngalpakatia/Ngelpagutya (Lake Albacutya), an internationally significant Ramsar-listed wetland. The catchment extends beyond Ngalpakatia/Ngelpagutya (Lake Albacutya) into the Mallee CMA region with numerous smaller lakes before reaching the Wirrengren Plain. Historic records show occasional flooding of lakes beyond Ngalpakatia/Ngelpagutya (Lake Albacutya), though they have not received floodwater since the 1970s.

The Barringgi Gadyin (Wimmera River) between Polkemmet and the Wirrengren Plain has been proclaimed a Victorian Heritage River due to its significant environmental, cultural and social values (*Heritage Rivers Act 1992*).

A notable feature of the system is the distributaries, Dunmunkle and Yarriambiack Creeks, which carry water from the Barringgi Gadyin (Wimmera River) during high flows and floods. Yarriambiack Creek flows from Longerenong through Jung, Warracknabeal and Brim and onto Lake Coorong near Hopetoun in the Mallee. The Dunmunkle Creek is a highly modified stream that carries water north from Glenorchy through Rupanyup, dissipating in the southern Mallee.

The Wimmera Basin also contains a few stand-alone streams that flow into wetlands, for example Natimuk Creek feeds Natimuk Lake and Lake Wyn Wyn.

The Millicent Coast Basin extends south into the Glenelg Hopkins CMA region and west into south-eastern South Australia. It is characterised by several streams that flow west. Mosquito Creek is an important stream as it flows from south-west of Edenhope through to the Bool and Hacks Lagoons Ramsar site near Naracoorte.

The Wimmera’s rivers and streams provide most of the water needed for towns and farms, especially via the Wimmera Mallee Pipeline. Many townships are located adjacent to rivers and streams for historic water supply, recreational and aesthetic purposes, so many have weirs to retain water levels through drier periods. Rivers and streams underpin local tourism and recreation. Camping, fishing, walking, canoeing, rowing, bird watching and swimming are popular activities that local residents enjoy. These attractions bring visitors to the region and significant tourism dollars.

The Wimmera’s rivers and streams also support significant local events such as fishing competitions, rowing regattas and festivals. A study into the socio-economic value of environmental water demonstrated that the Barringgi Gadyin (Wimmera River) alone generates around \$4.75 million a year and has additional health benefits for the community worth \$2.5 million annually.⁽⁶⁾

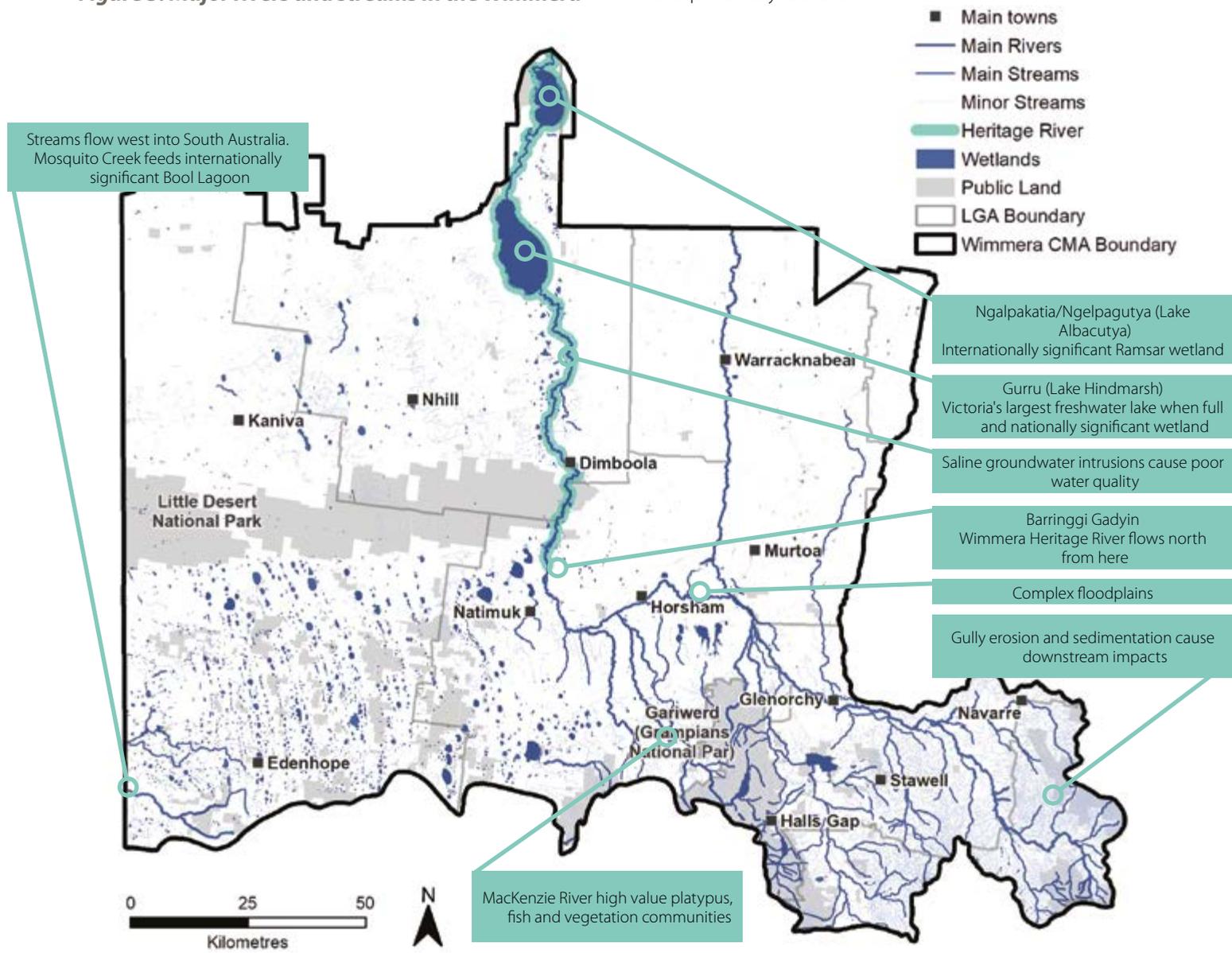
Rivers and streams support some irrigation of grape vines, pasture and annual crops. Water is also supplied to local industry, intensive agriculture and mining enterprises.

Rivers and streams form natural corridors in a largely agricultural landscape and a large variety of wildlife rely on them for habitat. Examples include freshwater catfish (*Tandanus tandanus*), river blackfish (*Gadopsis marmoratus*), western swamp crayfish (*Gramastacus insolitus*), rakali or water-rat (*Hydromys chrysogaster*) and platypus (*Ornithorhynchus anatinus*).

The corridors of native vegetation that parallel rivers (riparian corridors) provide vital habitat for a variety of bird life, vegetation and other species. For example, bird surveys have highlighted the importance of habitat adjacent to waterways with higher abundance and diversity of birds recorded. The north to south running corridors provided by the Wimmera River, Yarriambiack and Dunmunkle Creeks and some southern streams could play an important future role in facilitating the migration of species like nationally threatened regent parrots (*Polytelis anthopeplus*) and Major Mitchell’s Cockatoo (*Lophochroa leadbeateri*) to suitable southern habitats under hotter and drier climate change scenarios.

There is occasional flooding of towns across the Wimmera. Floods can severely disrupt communities by causing property damage, personal hardship, regional economic loss, injury and potentially loss of life.

Figure 5: Major rivers and streams in the Wimmera





Erosion control works in the upper Wimmera catchment

Assessment of current condition and trends

The major rivers and streams in the region are 'working rivers,' particularly the lower reaches. Working rivers, while they have been significantly modified through weirs, water harvesting and mining, retain high environmental, economic, social and cultural values.

Significant efforts by the community, with the support of government, have protected reaches in good condition and enhanced reaches in farming land through riparian vegetation management and erosion control works. Between 2015-16 and 2019-20, Wimmera CMA and landholders have established 663 kilometres of fence to protect rivers and streams.

These efforts are steadily reversing the negative outcomes of the past including impacts of historic drainage works, stock access, vegetation removal, gold dredging, water harvesting, pest and weeds. This is leading to improved water quality, aquatic and riparian habitat.

Substantial water savings have resulted over the past decade from replacing the historic stock and domestic water supply open channel system with pipelines and the buyout of irrigation entitlements. This has improved water availability for regulated rivers and streams. The combination of these efforts is building greater resilience so that rivers and streams can cope with natural disturbances like drought, floods, bushfires and climate change.

The Wimmera Mallee Pipeline has improved the availability of water for environmental outcomes and delivered flow-on economic, social and cultural benefits. Habitat restoration and fish stocking is improving the health of native fish and fishing opportunities.

These integrated catchment management efforts are creating positive benefits for rivers and streams. For example, there have been no major blue green algae outbreaks in the Barringgi Gadyin (Wimmera River) since 2010 despite a series of very dry years.

The combination of environmental water availability, improved habitat and threat management has seen some water-dependant species expand their range in the MacKenzie River and Burnt Creek, including the platypus (*Ornithorhynchus anatinus*), western swamp crayfish (*Gramastacus insolitus*), southern pygmy perch (*Nannoperca australis*) and obscure galaxias (*Galaxias oliros*). The same has unfortunately not occurred in upper catchment streams.

There have been significant fish stocking programs in the Barringgi Gadyin (Wimmera River) by the Victorian Fisheries Authority. Around 430,000 fish were released between 2017 and 2020. This has complemented other integrated catchment management efforts, achieving significant benefits for recreational fishing. The number and size of native fish caught by anglers continues to increase. Conversely carp (*Cyprinus carpio*) numbers remain comparatively modest with limited breeding events and increased predation of juveniles.

Water for the environment has contributed to cultural outcomes for First Nations people. For example water has been used to support events on the Barringgi Gadyin (Wimmera River) such as the Goolum Goolum Wimmera River challenge and has been used to improve environmental values at the Ranch Billabong in Dimboola which is a significant cultural place.

There is still a lot of work to do to improve the health of rivers and streams. There are ongoing issues with water quality, lack of flow, erosion and depleted riparian vegetation in many parts of the catchment.

Unregulated reaches in the Upper Wimmera and Millicent Coast catchments are experiencing less flow due to climate and land use change and water harvesting, including from farm dams. In the Upper Catchment this has resulted in loss of river blackfish (*Gadopsis marmoratus*) and platypus (*Ornithorhynchus anatinus*) in recent years.

Despite improved entitlements for water for the environment, the lower reaches of the Barringgi Gadyin (Wimmera River) and other streams are still not assured adequate supply due to climate and land use change leading to reduced river flows. This means that parts of the system are susceptible to high salinity levels and decreased water quality in low rainfall years. This impacts on social and economic outcomes as well as aquatic habitat and wildlife.

Wartook Reservoir has a high demand for water supply relative to its size and average inflows. The reservoir supplies water for the Horsham and Natimuk townships, parts of the Wimmera Mallee Pipeline and water for the environment for the MacKenzie River and Burnt and Bungalally Creeks. This high demand affects the reliability of supply particularly in a drying climate. When the storage is low there are trade-offs in water supply. Without supplementary water supply, communities will need to reduce water consumption if environmental values are to be maintained. For example, platypus habitat will be lost without regular water flows in the MacKenzie River.

Flood studies have been completed for most of the Wimmera's high-risk waterways, providing a strong basis for regional floodplain management planning and reduced risk for lives and property. Many of these studies have been incorporated into planning schemes allowing for sound planning decisions. The introduction of the Wimmera Floodplain Management Strategy 2017 and the implementation of the associated work plan will continue to drive improvements such as enhanced flood flow monitoring and warnings.

Major threats and drivers of change

Flow regimes of rivers and streams are being impacted by climate change and drought. The Victorian Water and Climate Change Initiative's research shows that rainfall has decreased significantly over the past 30 years in the upper catchment leading to reduced flows in rivers and streams. ⁽⁷⁾ This is magnified by harvesting of water from rivers and streams into dams and reservoirs for consumptive uses.

Land use changes such as transitioning from grazing to dryland cropping can also impact on flows where it captures and retains more water in the landscape. Lack of flows impacts on the community's ability to use water in rivers and streams for recreation or use because of inadequate water levels and poor water quality. More storms in summer have the potential to generate flows that may result in blackwater events. There are also impacts to aquatic life including fish and native vegetation. Drought refuges play an ongoing important role in supporting habitat for aquatic life during droughts so they can flourish when water returns.

Accelerated erosion of the bed and banks of rivers and streams can occur due to lack of adequate vegetation. Sediment and nutrients are entering rivers and streams because of runoff from land with inadequate ground cover, particularly in the Upper Catchment where bare soils are particularly prone to erosion. This movement of sediment can also cause infilling and smothering of waterholes downstream, reducing deep pool habitat and drought refuge pool capacity.

Salinity and rising water tables are intersecting with rivers and streams and can cause pollution of waterholes leading to fish deaths and loss of habitat for aquatic flora and fauna. In 2020 salinity levels in the Barringgi Gadyin (Wimmera River) downstream of Dimboola at Tarranyurk reached over 40,000 $\mu\text{S}/\text{cm}$ after 5 months without flow. In comparison, sea water is around 54,000 $\mu\text{S}/\text{cm}$ and water in the Wimmera's water supply systems for stock and domestic supply is around 500 $\mu\text{S}/\text{cm}$.

Carp continue to live and breed in many rivers and streams, causing turbidity and competing with native fish species.

Riparian vegetation provides vital habitat for many of native species. It can also be impacted by firewood harvesting and inappropriate recreation pressures, potentially impacting on habitat and cultural heritage.

Many natural processes that support aquatic life have been impacted because of instream infrastructure. For example, fish movement is hampered by weirs. In some cases, there is a lack of instream habitat for aquatic wildlife. This can also devalue fish stocking programs.

Many of the region's rivers and streams are not accessible to the community, meaning they cannot be used for recreation or cultural activities. This limits the community's ability to derive social, economic and cultural benefits. Many have inappropriate infrastructure to support sustainable access. The use of these areas needs to be carefully managed to ensure environmental values are not impacted.



Wimmera River upstream of Horsham

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. The knowledge and experience of First Nations people is informing water planning, management and delivery in the Wimmera.
2. The Wimmera Heritage River's values are maintained or improved.
3. The connectivity and condition of native vegetation along riparian corridors are improved.
4. Water quality is improved at important areas for water supply, environmental and recreational values.
5. Rivers and streams with high environmental, social, cultural and economic values are improving their value despite climate change.

Outcomes to be achieved in 6 years

1. Ongoing collaboration and two way learning in river and stream planning and management by supporting and strengthening partnerships with First Nations people.
2. Recreational participation numbers on the Barringgi Gadyin (Wimmera River) are increasing.
3. More river and stream reaches have improved management of and access for recreation.
4. Healthier rivers and streams enable more on Country activities for First Nations people.
5. Blue green algal blooms and fish deaths are prevented where possible in the Barringgi Gadyin (Wimmera River).
6. No new pest plants and animals are established beyond small, localised populations.
7. More rivers and stream reaches have less stock access.
8. More reaches have improved riparian width and connectivity.
9. More river reaches are permanently protected through management agreements.
10. Drought refuges are protected and retain water during drought.

11. Net rates of streamflow interception are stabilising.
12. Native fish and platypus are increasing their abundance and distribution.
13. Native fish numbers are greater than carp numbers in most fish surveys and fishing competitions.

Complementary plans

Wimmera Waterway Strategy

The Wimmera Waterway Strategy 2014-22 is an action plan for the Regional Catchment Strategy that details the actions required to achieve the long-term and short-term outcomes for Rivers and Streams. It identifies priority waterways and includes a detailed set of management targets for each priority. It will be reviewed to align with the RCS once the RCS is approved.

Wimmera Floodplain Management Strategy

The Wimmera Floodplain Management Strategy outlines priority actions designed to deliver floodplain specific outcomes outlined in the RCS.

Wimmera Strategic Directions Statement

The Wimmera Strategic Directions Statement outlines the priority integrated water management projects for the region. They are designed to improve the liveability of the region's towns and city by implementing improvements to the regional water cycle. It supports and complements the outcomes in the RCS.

Environmental Water Management Plans

The Environmental Water Management Plan for the Wimmera River System establishes environmental objectives for the Wimmera River, its regulated tributaries (lower Mt William Creek, MacKenzie River, Burnt Creek and Bungalally Creek) and Yarriambiack Creek. The plan sets out the environmental water requirements to attain the environmental objectives over a multi-year watering regime (assuming sufficient environmental water is available).

WETLANDS

The Wimmera has an abundance and diversity of wetlands and related natural values. There are over 3,000 wetlands in the region. This equates to roughly 25% of Victoria's individual non-flowing (not linked to rivers or streams) wetlands. Over 90% of the Wimmera's wetlands are on private land, so private landholders play a vital role in their management.

Most of the Wimmera's wetlands contain significant cultural value. They provide significant resources and spiritual value for First Nations people. This ongoing connection is still reflected today. For example, a study in 2017 of Ross Lakes near Ngalpakatia/Ngelpagutya (Lake Albacutya) reidentified two middens and nine scar trees. It also discovered 32 new scarred trees, a rare carved tree, clay balls and middens. The report concluded that Ross Lakes was an important meeting place. It is clear by the age of some of the sites that this connection has remained.

Wetlands are highly diverse in terms of their hydrology and salinity. The Wimmera includes a range of fresh, shallow, seasonal and periodically inundated wetlands, more permanent deep lakes and shallow and deeper groundwater-fed saline wetlands (Figure 6). This contributes to high wetland biodiversity, with the different categories of wetland supporting a highly diverse mix of plant, bird, macroinvertebrate and other wetland species.

Most of the Wimmera's wetlands are in the Millicent Coast Basin and dry up periodically. Only 1.5% of the region's wetlands are categorised as permanent. ⁽⁸⁾

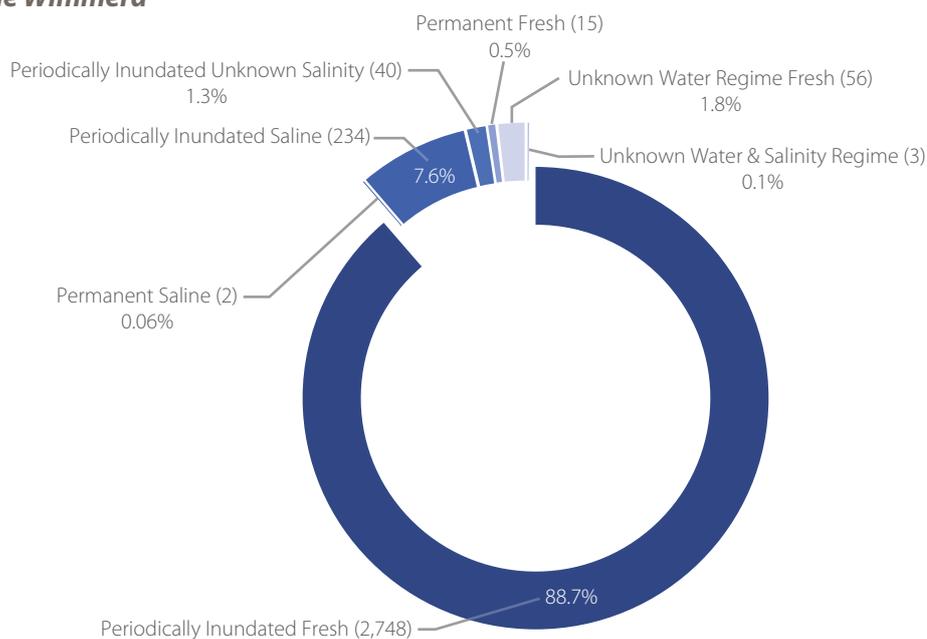
The Wimmera is home to many Seasonally Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains which are listed as a critically endangered ecological community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

Ngalpakatia/Ngelpagutya (Lake Albacutya) is recognised as an internationally significant wetland via the Ramsar Convention. Gurru (Lake Hindmarsh) is Victoria's largest freshwater lake and is listed as a nationally significant wetland. Both receive water from the Barringgi Gadyin (Wimmera River), via Outlet Creek for Ngalpakatia/Ngelpagutya (Lake Albacutya). The episodic nature of flows into these terminal lakes means that they can be empty for many years before floodwaters fill them for at least a couple of years, watering fringe vegetation and providing a haven for tens of thousands of migratory water birds. There are also several other downstream terminal lakes that rely on Ngalpakatia/Ngelpagutya (Lake Albacutya) filling that they have not received water for at least 40 years.

Others such as Lakes Fyans, Bellfield, Wartook, Taylors Lake and Lake Lonsdale are important water storages and can provide some environmental values as well as important water resources for the region and beyond. For example, at low water levels Lake Lonsdale supports abundant waterbirds who enjoy the shallow water habitat.

The Wimmera's wetlands support many plants and animals of international and national significance. Migratory birds are known to frequent the region to breed and the endangered regent parrot (*Polytelis anthopeplus*) inhabits the surrounds of Lakes Albacutya and Hindmarsh. Wetlands also play an important role in supporting waterbirds such as the plumed whistling duck (*Dendrocygna eytoni*) when there is drought in other parts of the country. They also support local bird migrations from the Victorian Coast to the Murray River and are home to endangered plants such as ridged water milfoil (*Myriophyllum porcatum*) and spiny lignum (*Duma horrida*).

Figure 6: Number and percentage of wetlands greater than one hectare in size in each wetland category in the Wimmera



Some wetlands, such as Pink Lake, Natimuk Lake, Oliver's Lake and White Lake, are considered to be ecologically of national significance.⁽⁹⁾

Many of the region's wetlands provide significant recreation opportunities, contributing economic and health benefits to the region when they contain water. Lake Fyans and Lake Wallace alone generate around \$2.5 million and \$1 million per year respectively for their local community through the events, tourism and recreation opportunities they provide.

Wetlands can be grouped into sub-regions or wetland systems based on similar geographic characteristics and management issues (Figure 7). The wetland systems and their key attributes include:

1. **Terminal lakes of the Barringgi Gadyin (Wimmera River)**

- Including internationally significant Ngalpaktia/ Ngelpagutya (Lake Albacutya) Ramsar site and nationally significant Gurru (Lake Hindmarsh)

2. **Natimuk-Douglas saline wetland system**

- Saline and freshwater lakes of global bird

conservation importance

- Eleven wetlands are nationally important

3. **South-west Wimmera wetland system**

- Major wetland complex, supporting high biodiversity
- EPBC Act listed Seasonal Herbaceous Wetlands (freshwater) of the Temperate Lowland Plains

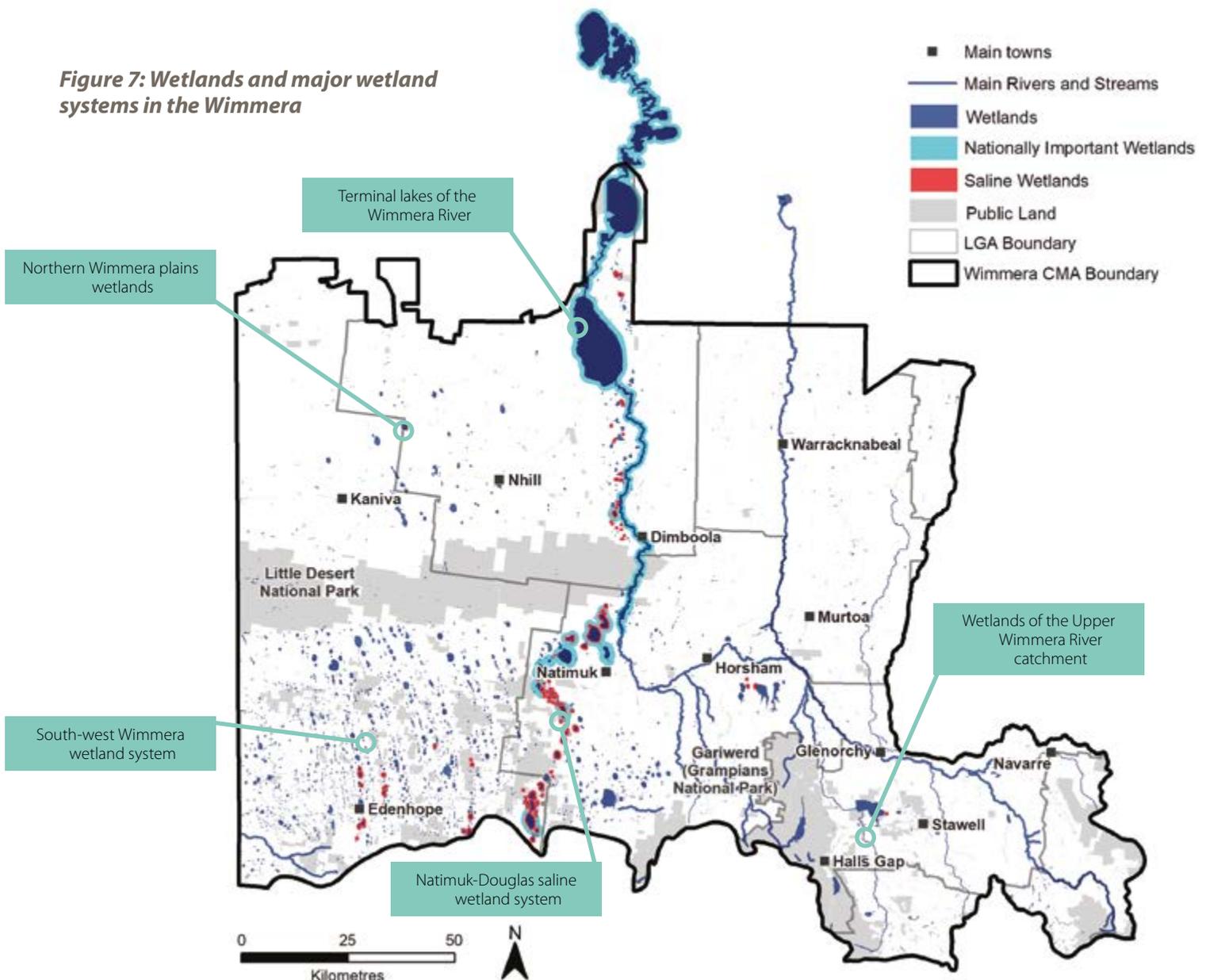
4. **Northern Wimmera Plains wetlands**

- Scattered wetlands in an intensively cropped landscape
- Pink Lake is nationally important

5. **Wetlands of the Upper Barringgi Gadyin (Wimmera River) catchment**

- Scattered wetlands, regionally important water supply storages and recreational lakes

Figure 7: Wetlands and major wetland systems in the Wimmera



Assessment of current condition and trends

There has been a large and concerted effort over the past 20 years to improve the management of wetlands so they can continue to provide economic, social, cultural and environmental values. Many landholders have entered long-term funding agreements to protect and enhance wetlands with the support of government. Others have voluntarily fenced their wetlands to limit stock access and have managed invasive plants and animals. Hindmarsh Shire has introduced planning provisions to provide conditions that ensure appropriate development within wetland catchments.

Significant wetlands on public land have been managed for typical threats such as weeds and pest but have benefited in investment that has improved sustainable accessibility to the community, thereby improving their environmental, economic and social value. For example, in 2019-20 financial year, Lake Marma at Murtoa, generated more income for the local economy than in previous years despite COVID-19 because of the introduction of cabin accommodation.⁽⁶⁾ Power upgrades at Lake Charlegrark near Minimay has enabled improved septic toilet management, reducing risks to water quality.

Despite this good work the condition of individual wetlands varies considerably. Many are in good to excellent condition, but large numbers have also been moderately to heavily degraded or lost. The trend in wetland modification is continuing but could be slowing. Analysis of data in 2017 shows that 23% of the region's wetlands have no modification compared to 2004 when this was 44%. Assessment of 985 select wetlands in 2004, 2011 and 2017 shows that 118, 262 and 268 wetlands were cropped respectively, indicating that cropping of wetlands had not materially increased to 2017.⁽¹⁰⁾

Freshwater meadows are under the highest threat, with almost 400 lost since the 1970s. An assessment of data from 2017 indicates that only 195 of the 1,005 freshwater meadows in the region have no modification. Most of these modifications are drains and dams.⁽¹¹⁾

Some wetlands are considered lost because they no longer function as wetlands, primarily due to being drained.⁽¹¹⁾ Condition assessments in 2005⁽¹²⁾ and 2009⁽¹³⁾ found wetland soils, hydrology and physical form to generally be in good condition. The condition of vegetation varied but a large proportion of wetlands were found to be in moderate condition. The wetland catchment was of highest concern, with 61% of assessed wetlands having catchments in poor to very poor condition, indicating poor 'buffer areas' immediately surrounding the wetlands and potential impacts from neighbouring land.

Nine per cent of the Wimmera's wetlands are considered summer refuges. These wetlands often hold water long enough for species to go through a breeding cycle in dry years. Most (8.5%) are freshwater, meaning they are suitable for amphibians.⁽⁸⁾ These wetlands are priorities for connectivity in the landscape in a drying climate.

An assessment in 2019 indicated that the relevant values of Ngalpakatia/Ngelpagutya (Lake Albacutya) were within the limit of acceptable change for its ecological character description despite not receiving flood water for many years and some decline in river red gum (*Eucalyptus camaldulensis*) health.⁽¹⁴⁾

Major threats and drivers of change

Changing hydrology is an issue with almost 63% of the region's wetlands altered by a dam, drain or bank. This is an increase of 3% since 2011.⁽¹⁰⁾ This changes the natural timing, duration and extent of flooding. These changes have occurred across the region, resulting in complete loss of some wetlands, while others are significantly altered.

Cropping can severely impact on wetland health by damaging wetland plants and impacting on water quality. Changes from traditional livestock management to cereal and legume cropping can decrease runoff and inflows to wetlands. Continual improvement to soil moisture retention techniques will likely increase this impact.⁽¹⁵⁾

Drought and drying climate leave wetlands susceptible to damaging activities like cropping and overgrazing. An assessment of climate change vulnerability for wetlands in Victoria found that, under worst case drying scenarios, the interval between wetland inundation events would increase from around once every one to two years to once every four years.⁽¹⁶⁾ However, wetlands should continue to persist in the landscape under other drying scenarios. Impacts on groundwater-fed wetlands are more challenging to predict, but a shift in water regime from seasonal to intermittent wetting is likely for at least some of these wetlands with consequent changes in wetland ecology. Wetland managers are unable to directly influence climate, but can influence activities that degrade dry wetlands, such as cropping and overgrazing.

Climate change can also impact the number of wetlands in chains that will be inundated. Depending on the speed of the change they may transition to a terrestrial ecosystem. For example, the Wirrengren Plain in the region's far north has transitioned from displaying mostly wetland to terrestrial characteristics.

Pest plants found in wetlands and their fringing areas include bridal creeper (*Asparagus asparagoides*), perennial veldt grass (*Ehrharta calycina*), African boxthorn (*Lycium ferocissimum*), phalaris (*Phalaris aquatic*), tall wheat-grass (*Lophopyrum ponticum*), spear thistle (*Cirsium vulgare*), Yorkshire fog (*Holcus lanatus*), Scotch thistle (*Onopodium acanthium*), dock (*Rumex spp.*), small nettle (*Urtica urens*) and other pasture grasses. Weed invasion can degrade wetlands by out-competing native plants and simplifying vegetation structure, providing harbour for pest animals such as the red fox (*Vulpes vulpes*) and rabbits (*Oryctolagus cuniculus*) and reducing aesthetic appearance.

Pest animals can negatively impact on native wetland plants and animals. Common wetland pest animals include predators like foxes, feral cats and dogs (*Canis lupus familiaris*); non native fish like carp and mosquitofish (*Gambusia holbrooki*) and grazing animals like rabbits and hares.

Grazing by stock commonly occurs in wetlands on private land. The impact on wetlands depends on the timing, intensity and frequency of grazing. In some cases, light well-timed grazing can benefit some types of wetlands. Overgrazing and poorly timed grazing can degrade wetlands, introduce manure and weeds and pugging, and compact and erode soils.

Because 90% of the Wimmera's wetlands are located on private land they are not accessible to the broader community for recreation or cultural activities. This limits the community's ability to maximise their social and economic benefit. There is also greater pressure on the wetlands on public land, many of which have inappropriate infrastructure to support sustainable access. For example, many lack formal tracks or access points.

Recreational impacts can impact wetlands. High intensity or inappropriate recreation can remove ground cover and cause erosion and sedimentation of wetlands and degraded water quality. This particularly impacts on deep permanent lakes that are popular for recreation. Litter can also impact on wetland habitat and reduce amenity.

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. The knowledge and experience of First Nations people is informing wetland planning, management and delivery in the Wimmera.
2. The values and condition of wetlands with recognised significance are maintained or improved.
3. Connectivity and condition along priority wetlands systems is improved.
4. Wetlands with high environmental, social, cultural and economic values are maintained or improved despite climate change.

Outcomes to be achieved in 6 years

1. Ongoing collaboration and two way learning in wetland planning and management by supporting and strengthening partnerships with First Nations people.
2. More privately owned wetlands have stock managed and cropping prevented.
3. The condition of more wetlands on public land is improved.
4. The rate of wetland modification and loss is reduced.
5. Wetlands are monitored to ensure the condition and values of Ramsar and nationally significant wetlands are maintained and potential new listings are identified.
6. No new pest plants and animals are established beyond small, localised populations.
7. More wetlands are permanently protected through management agreements.

8. More wetlands have improved management of and access for recreation.
9. Recreational participation numbers on wetlands are increasing.

Complementary plans

Wimmera Waterway Strategy

The Wimmera Waterway Strategy 2014-22 is an action plan for the RCS designed to deliver actions which deliver the long-term and short-term outcomes for Wetlands. It identifies priority wetlands and includes a detailed set of management targets for each priority.

Wimmera Strategic Directions Statement

The Wimmera Strategic Directions Statement outlines the priority integrated water management projects for the region. They are designed to improve the liveability and sustainability of the region's towns and city by implementing improvements to the regional water cycle. It supports and complements the outcomes in the RCS.

Lake Albacutya Ramsar Site Management Plan

The site management plan, developed in accordance with the Australian Ramsar Management Principles. The plan outlines the management actions, monitoring requirements and roles and responsibilities of various agencies, with an aim of maintaining and, if possible improving the ecological character of the site.

Ramsar wetlands

There are other wetlands in the Wimmera that may be eligible for listing under the Ramsar convention. During the lifetime of this RCS these wetlands will be assessed and recommended for Ramsar or national significance recognition and protection.

Environmental Water Management Plan

The Environmental Water Management Plan for the Wimmera Mallee Pipeline Wetlands sets out the multi-year watering objectives for 13 wetlands in the north-eastern part of the Wimmera region (assuming that sufficient environmental water is available for them).



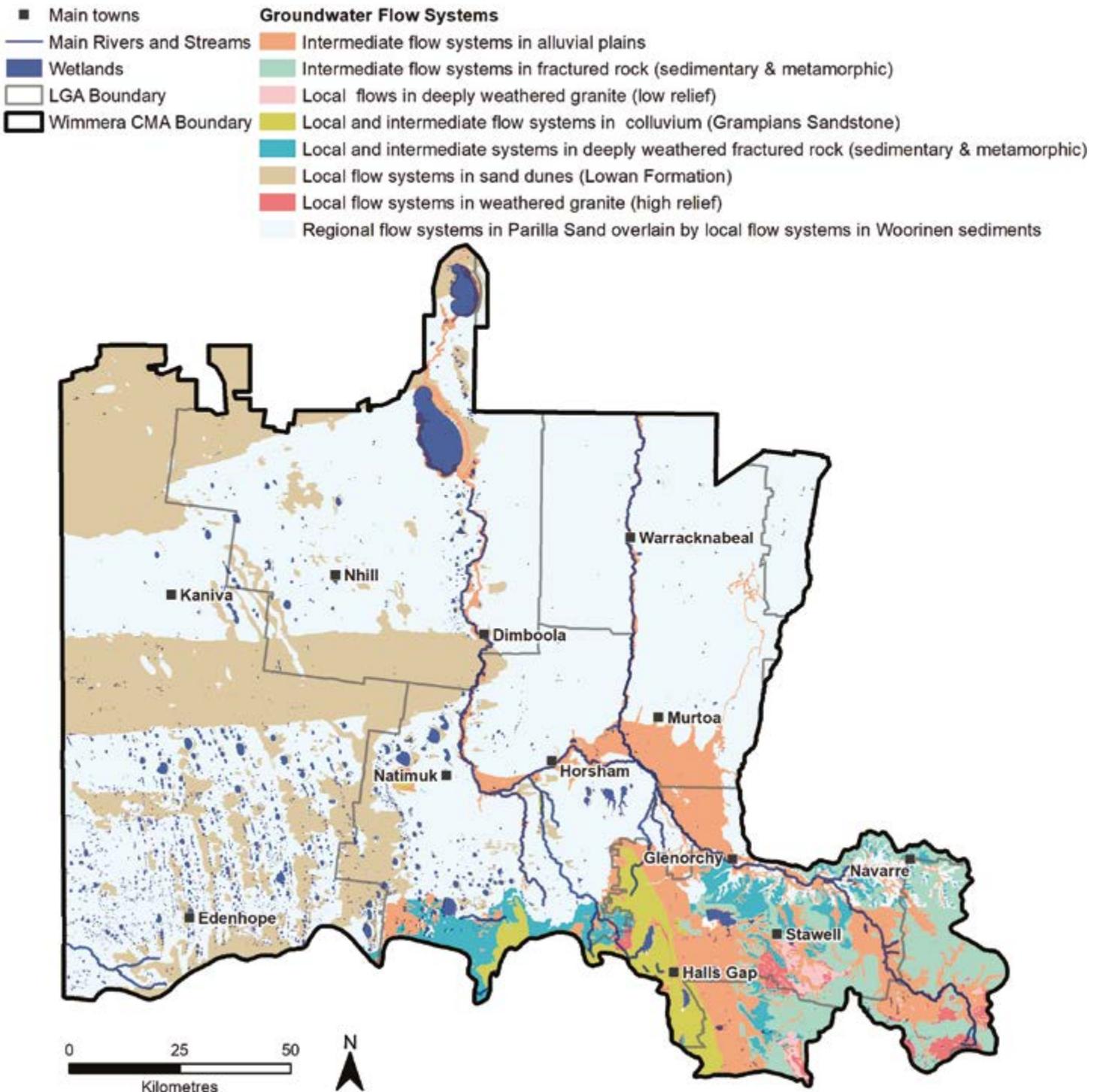
Jacka Lake, Toaan

GROUNDWATER

Groundwater provides a valuable resource particularly in the West Wimmera for irrigation and town water supply. Many farms in the west of the region rely on groundwater for stock and domestic supply. Mining companies often utilise groundwater for their operations.

The characteristics of groundwater in the Wimmera are a function of the underlying geology which in turn influences groundwater quality and yield. The Wimmera’s groundwater is contained in layers of sedimentary sands, gravels, clays, limestone and fractured rock. Groundwater systems can be grouped into groundwater flow systems based on their characteristics (Figure 8). In the Wimmera, groundwater flow direction mirrors that of surface water, generally flowing from the southeast to the northwest.

Figure 8: Groundwater flow systems in the Wimmera



For management purposes groundwater resources in the Wimmera are grouped into the following areas (Figure 9):

- West Wimmera Groundwater Management Area (GMA)
- Wimmera Catchment which includes the following groundwater management units:
 - Grampians East
 - Grampians West
 - Upper Wimmera
 - Wimmera Mallee Sedimentary Plains.

A 2009 West Wimmera socio-economic study investigated the value of groundwater for irrigated and intensive livestock systems. Combined with dryland systems reliant on groundwater for stock and domestic use, they were estimated to represent 40% of the value added in the agricultural sector of the West Wimmera GMA. The regional impact of the economic activity generated by using groundwater is in the order of \$121 million per year.

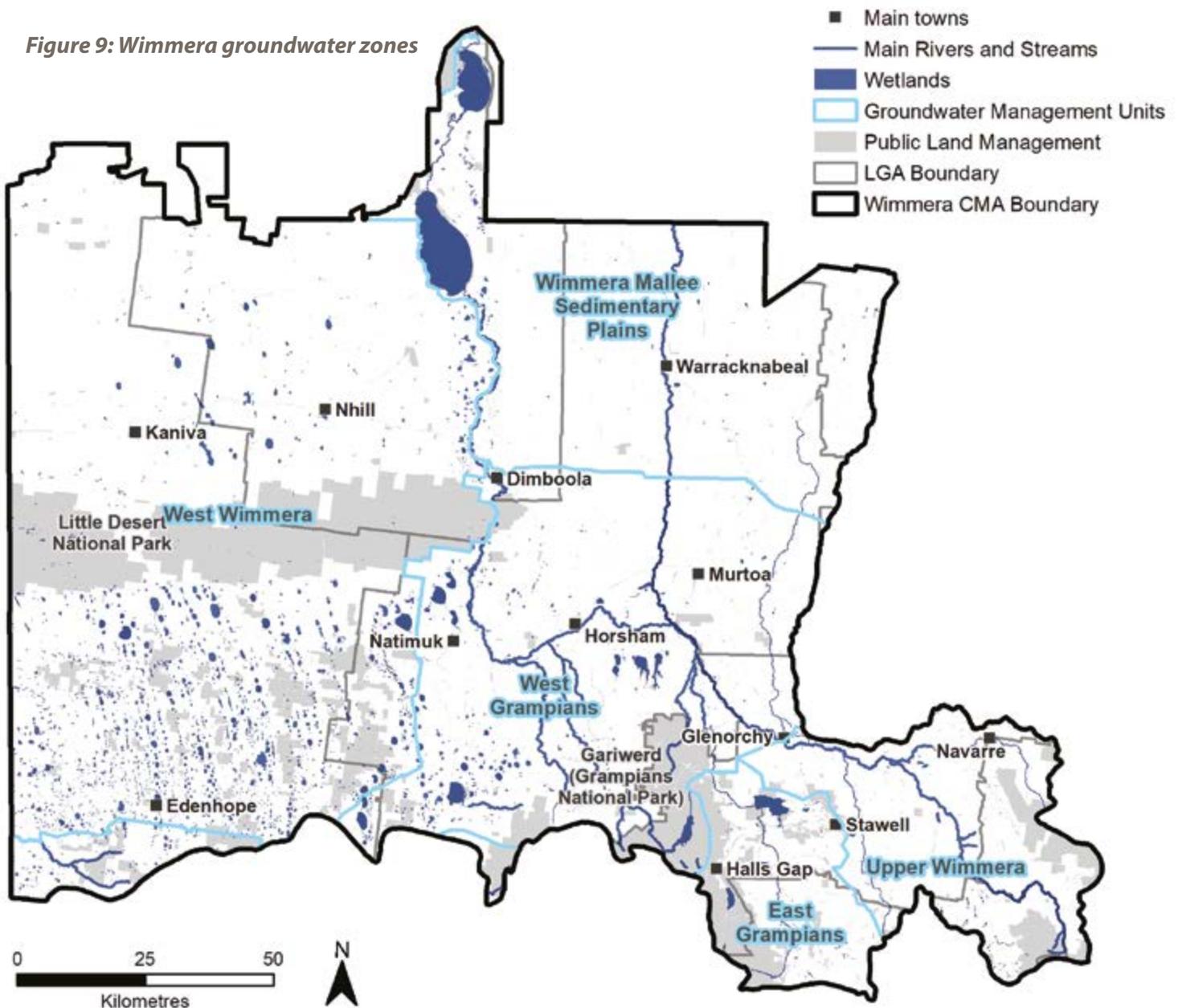
The analysis found that groundwater is an extremely important and valuable resource to the community of the West Wimmera GMA being the only significant source of water in the region. ⁽¹⁷⁾

Groundwater also provides water to groundwater dependent ecosystems such as saline wetlands in the Natimuk Douglas chain of lakes and rivers and streams where the groundwater meets the surface.

There is also good quality groundwater emanating out from Gariwerd (Grampians National Park).

In parts of the Wimmera Groundwater Catchment, particularly in the north, groundwater can be viewed as a threat due to its high salinity and impacts on waterways and low-lying land. For this reason, it is not often used as a resource.

Figure 9: Wimmera groundwater zones



Assessment of current condition and trends

There has been a great deal of effort undertaken by Grampians Wimmera Mallee Water (GMMWater) to better understand groundwater resources in the Wimmera and to establish mechanisms that work towards sustainable management and use.

The Irrigation Development Guidelines – Wimmera are designed to manage any potential impact to the environment or third parties.

West Wimmera

Declining groundwater trends in the Murray Group Limestone Aquifer were observed in the early 2000s, particularly in the Neuarpuir zone of the West Wimmera GMA where there is concentrated extraction of groundwater for irrigation. Groundwater levels elsewhere were generally stable. The principal cause for the declines were extraction rates within Victoria and South Australia exceeding the rate of recharge or throughflow. It had been previously thought that the resource was replenished by modern recharge. However, research and observations over the years identified that, for much of the GMA, the resource is very old and recharge occurs at a slow rate. Recharge in some areas is less than the current rate of extraction.

The maximum volume of water that can be licensed for extraction in an area or water system like a GMA is known as a Permissible Consumptive Volume (PCV). The PCV is set by the Victorian Minister for Water. The PCV Order for the West Wimmera GMA outlines the total volume that may be taken in a zone or sub-zone. Domestic and stock use is not included in the PCV. Current entitlements total approximately 52,500 megalitres per year. Groundwater use has generally been less than half of the total entitlement volume.

In 2011 GMMWater published the West Wimmera Groundwater Management Strategy based on the understanding of the resource at the time. This strategy established local management rules aimed to ensure that groundwater is managed in an equitable manner to achieve the long-term sustainability of the resource. It aims to achieve a stable trend in groundwater level while maintaining the benefits that groundwater provides to the region. ⁽¹⁸⁾

In 2018 GMMWater commissioned a technical review of the West Wimmera Groundwater Management Strategy. The review assessed the resource condition and the effectiveness of the local management rules in delivering on the objectives of the strategy. It showed that the local management rules established in 2011 have been effective in showing some stabilising of groundwater levels. In response to recommendations from the review, the strategy's management rules have been consolidated into the West Wimmera Local Management Plan 2019, with some adaptations to improve their effectiveness in protecting the resource. ⁽¹⁹⁾ While some signs of stabilisation have been seen, any significant increase in the volume of groundwater extracted, may result in a further decline in groundwater levels. Climate change is also a significant risk due to reduced recharge and the potential to drive an increase in use because of reduced rainfall.

Wimmera Catchment

The Wimmera Catchment Surface Water and Groundwater Local Management Plan provides an outline for how GMMWater manages the groundwater and surface water resources as the delegated Authority under the *Victorian Water Act 1989*. ⁽²⁰⁾ The plan area has been split into four groundwater catchments to provide a more detailed summary of the groundwater resource. As groundwater has not been intensively developed, there has been no requirement for the declaration of a PCV for the Wimmera Catchment.



Pivot irrigation in the west Wimmera

Irrigation in the west Wimmera*Natimuk-Douglas chain of saline wetlands*

Grampians West

Relatively minor groundwater extraction has occurred in this area to date, with 19 groundwater licences totalling 7,700 megalitres per year.

There are no registered groundwater dependent ecosystems in the area. There are groundwater and surface water interactions in the stretch of the Barringgi Gadyin (Wimmera River) from Horsham to Dimboola. Saline groundwater continues to discharge into the Barringgi Gadyin (Wimmera River) at this location.

Groundwater levels vary according to rainfall patterns and associated recharge.

Groundwater quality is variable across the area with the best quality groundwater near the slopes of the Grampians mountain range.

Grampians East

Groundwater in the East Grampians area has been sparingly used as a water source due to the high availability of surface water throughout much of the year. There is 551 megalitres of groundwater entitlement licenced in the East Grampians area. Of that volume, GWMWater holds 220 megalitres for the Mount William wellfield for a supplementary urban supply to the townships of Willaura, Moyston, Lake Bolac and Wickliffe outside of the Wimmera region.

Aquifer recharge throughout this area is directly from rainfall and runoff. Evapotranspiration is a major contributor to groundwater loss.

Upper Wimmera

Groundwater in the Upper Wimmera area has not been used to any great extent due to the limited availability of water with relatively low salinity (<1,500 uS/cm) and general trend to preference the use of surface water. There is 474 megalitres of groundwater entitlement licenced in the Upper Wimmera area.

Evapotranspiration is a major contributor to groundwater loss where the groundwater is shallow.

Wimmera Mallee Sedimentary Plains

Groundwater use in the Wimmera Mallee Sedimentary Plains is very limited due to the high salinity of the groundwater. The main groundwater extractions in this area have been for heavy mineral sands mines located south and south-east of Ouyen (which have since ceased) and a salt production business on Lake Tyrell in the Mallee CMA region.

Groundwater quality is unsuitable for basic domestic and stock use throughout much of the Wimmera Mallee Sedimentary Plains area.

Major threats and drivers of change

Intensive development of groundwater can potentially impact on its sustainability and availability due to declining groundwater levels. Declining levels, if left unmanaged, may cause supply issues to domestic and stock users requiring deepening of bores or pumps to maintain supply.

The Department of Environment, Land, Water and Planning (DELWP) and GWMWater have a rigorous process for monitoring and managing licensed groundwater resources. DELWP record information on all registered groundwater bores. Specific bores are monitored throughout the region, collecting data on groundwater levels. This information is recorded in DELWP's Water Management Information System. This allows authorities and users to modify management to ensure the resource is maintained.

The groundwater resource can also be impacted by interstate management and use. For example, the groundwater resource in the West Wimmera is also used in (shared with) South Australia.

Climate change has the potential to impact on groundwater held in storage and groundwater levels. As the climate dries and heats up, less rainfall or surface water has the potential to recharge groundwater aquifers, due to less rainfall in general and increased evapotranspiration. The timing of rainfall, or lack of it, may also lead to an increase in groundwater extraction for use and the potential to result in a decline in groundwater levels.



Eva Drendel and Ellie the greyhound, Yarriambance, Jung

Land-use change can also impact on recharge to aquifers and drawdown water tables. For example, forestry plantations can intercept a greater volume of groundwater compared to pastures, preventing it from entering the water table. Plantations can also access more water from the water table as the root depth of large trees penetrate much deeper than that of pasture.

Increased extraction along with natural groundwater flow processes may lead to increasing salinisation of freshwater aquifers.

Landholders can maximise their water use efficiency by improving their ability to understand their systems. For example, a better understanding of soil moisture can mean that watering only occurs when and at the volumes required. New technologies can assist in these decisions and more efficient application of water.

The groundwater resource may be threatened by the presence of failed or failing groundwater bores, particularly where the fresher aquifer such as the Murray Group Limestone is overlain by the saline Parilla Sands aquifer. As the steel casing corrodes, it allows water from the saline Parilla Sands aquifer to enter the fresher limestone aquifer via the casing, resulting in contamination. Capping and decommissioning of old bores is important to protect the water quality and integrity of the groundwater resource.

Point source pollution is another issue threatening water quality in the Wimmera's groundwater systems. This can be experienced as leakage from septic tanks and underground petroleum storage systems or leaching from landfills and former industrial sites. Data concerning these issues is virtually non-existent, although its impact is believed to be small. More recently there have been concerns about the potential contamination of groundwater from illegal chemical dumping. While there is no evidence to suggest this form of dumping has led to the contamination of groundwater, the risk of this type of activity remains.

Drainage bores are also known to have been historically operated in some parts of the catchment. This involves bores being constructed to drain surface water from waterlogged areas into the subsurface mediums, most likely underlying aquifer systems. This has the potential to transport poor quality surface water into the groundwater system, introducing contaminants like sediments, farm chemicals and nutrients.

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. The knowledge and experience of First Nations people is informing groundwater planning, management and delivery in the Wimmera.
2. Stock and domestic users access to water supply is not impacted by licensed extraction.
3. Licensed groundwater users have access to water supply.
4. The quality of groundwater is protected.

Outcomes to be achieved in 6 years

1. Ongoing collaboration and two way learning in groundwater planning and management by supporting and strengthening partnerships with First Nations people.
2. Current management restrictions are maintained until there is evidence of groundwater levels stabilising.
3. The groundwater resource is understood in developing areas before it is allocated.
4. Landholders access better data and knowledge to inform water use decision making.
5. New groundwater irrigation proposals comply with the Wimmera Irrigation Development Guidelines.
6. Groundwater users manage risks to water quality by decommissioning unused groundwater bores.
7. Risks to groundwater from pollution are understood.
8. Groundwater monitoring, investigation and reporting is continually reviewed to identify opportunities for improvement.

Complementary plans

West Wimmera GMA Groundwater Management Strategy

This strategy was prepared as an adaptive management document to ensure that the groundwater resources in the West Wimmera are managed with the goal of long-term sustainability. The management rules from the strategy have been consolidated and updated within the West Wimmera GMA Local Management Plan. They seek to further define the management arrangements in response to improved understanding of groundwater resources and the criteria for assessing and implementing any new restrictions.



Land

Wimmera land and soils are important natural assets that underpin the region's agricultural industry and valued natural landscapes.



Land

This section focuses on land use and management and how it underpins soil health.

Almost 80% of the Wimmera's landscape supports a large agricultural industry which significantly contributes to the region's economy and food security at a global and national scale. ⁽²¹⁾ Grain production is the Wimmera and southern Mallee's biggest industry, providing 26% of Victoria's grains, being cereals, legumes and oilseeds. This is followed by 16% of Victorian sheep meat production and 17% of Victoria's wool production. ⁽²²⁾ Viticulture, olives and native flowers are also significant primary industries in the region. The Pyrenees region, divided between the North Central and Wimmera regions, supports a significant wine industry, producing \$56 million in outputs and a value add of \$11.5 million. ⁽²³⁾ The remaining 20% of land comprises national parks, crown land and urban areas. Figure 11 shows the coverage of different land use cover classes in the Wimmera.

Healthy soils have the physical, chemical and biological processes working together to support productivity, maintain environmental quality and promote plant and animal health. ⁽²⁴⁾

The management of soils influences the health of natural assets, such as native vegetation and waterways by providing a healthy foundation for plants and animals and acting as a buffer to prevent sediments entering waterways.

Informed land management decision-making is critically important for sustaining this finite, fragile and complex resource into the future.

First Nations people's connection to country is formed through a deep understanding and appreciation of the landscape. This provides a rich source of knowledge that can improve land and soil management policies and practices.

Wimmera soils have evolved over millions of years and can be grouped into four areas with common soil types and distinct landscape characteristics (Figure 10):

1. Upper catchment
 - Steep hillsides and valleys are covered (60% of the area) by alluvial and volcanic clays and texture contrast soils where sandy and loamy surface soils overlay heavy clay subsoils.
 - Supports a mixture of livestock and cropping.
 - Supports Gariwerd (Grampians) and Burrenjin (Black Range), many public reserves and important waterways.
2. North eastern plains
 - Characterised by hummocky dunes, flat plains, rises and lake lunettes. About 75% of the area is comprised of cracking and self-mulching clays that shrink and swell with changing moisture content.
 - Supports the largest area of cropping in the Wimmera plus important waterways.
3. North western plains
 - Regular, parallel dunes or ridges alternate with swales or depressions. Scattered lakes and lunettes are also present. Ninety per cent of the area is covered by sodic clays in the swales and siliceous dunefield sands.
 - Supports predominately cropping plus the Little Desert and scattered reserves and wetlands.
4. South west Wimmera
 - Predominantly ridge and swale systems. Eighty-seven per cent of the area is covered by sodic clays and texture contrast soils.
 - Supports a mixture of livestock and cropping plus a high density of wetlands and native vegetation.



Ray and Jake shift sheep, Laharum

Figure 10: Regional soil types and localised threats

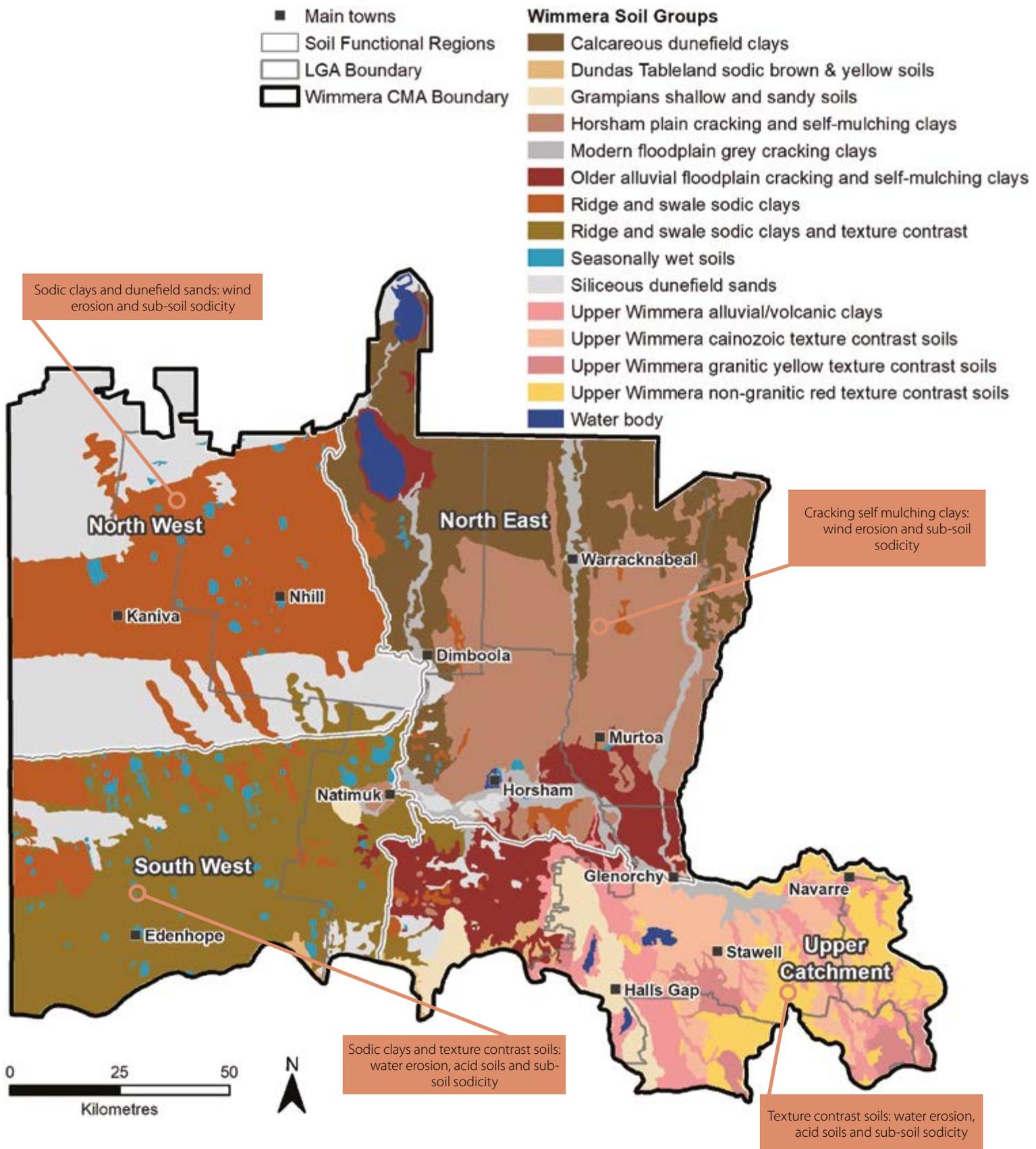
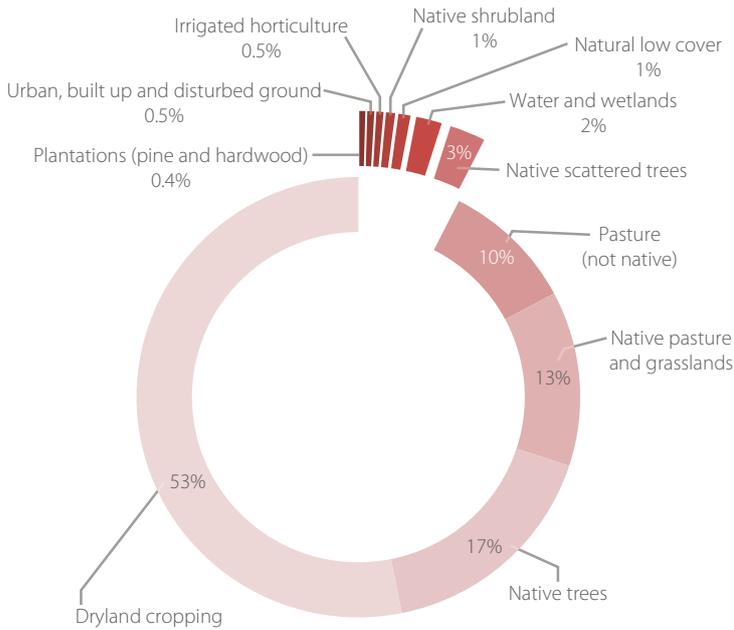


Figure 11: Percentage of land use cover classes in the Wimmera for the period 2015-2019 ⁽²⁵⁾



Assessment of current condition and trends

Wimmera farmers have been adapting farm management practices in response to climate change. In the 30 years from 1989 to 2018, the Wimmera has experienced a 9% decrease in annual rainfall, more frosts occurring later in the growing season and more hot days (>38°C). ⁽⁵⁾ In response, farmers are using new technologies such as soil moisture probes, precision agriculture, minimum tillage and stubble retention to better inform land management practices that boost productivity and conserve soil and soil moisture.

Social research indicates that over 50% of Wimmera farmers are well-versed in management practices such as grazing and cropping strategies to manage ground cover and minimise soil erosion. Close to 50% of farmers reported sound knowledge in the use of stock containment areas, and the

benefits of retaining native vegetation on properties. ⁽⁴⁾ This is substantiated by the 2019 Wimmera Land Use and Land Management Transect Surveys, where 15% of paddocks were recorded with exposed soil vulnerable to erosion, compared to 38% of paddocks in 1996. ⁽²⁶⁾ This is a positive trend that requires continued support to ensure it is maintained.

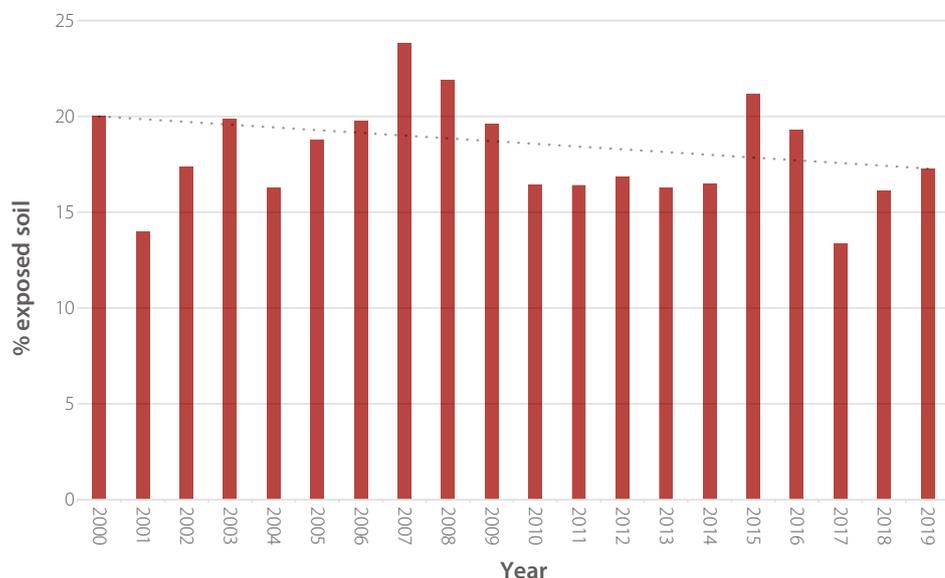
Social research has also indicated that farmers are concerned about the impact of drought and changing rainfall patterns on property viability. ⁽⁴⁾ Climate modelling predicts that the Wimmera will continue to experience a reduction in rainfall, as well as an increase in the number of hot days. ⁽²⁷⁾ These climate predictions present both challenges and opportunities.

Reduced growing season rainfall and rising temperatures will likely make agricultural productivity and profitability challenging. Management of soils must involve innovative strategies to improve soil health and resilience to climatic change. This challenge can be met by farmers, industry partners and researchers working together.

There is general understanding and continued practice of maintaining ground cover to reduce wind and water erosion amongst farmers. ⁽²⁾ This enables the retention and enhancement of healthy, productive soils and increases the amount of water available to plants to produce crops and pastures. These principles also apply to public land.

Established minimum tillage and stubble retention practices, maintenance of perennial pastures and ground cover, combined with climatic changes has likely led to a reduction in soil disturbance and erosion (Figure 12). The annual Wimmera Land Management and Land Use Transect Survey reports have tracked changes in land management trends since 1996. Over this time a 30% increase in the number of paddocks retaining stubble has been recorded in the northern Wimmera. There has also been a dramatic decline in large erosion events such as the 1983 dust storm that engulfed Melbourne. Such events cause highly valuable topsoil from the Wimmera and Mallee to be lost, which takes decades, if not centuries to renew. ⁽²⁸⁾

Figure 12: Annual percentage of exposed soil in the Wimmera over time ⁽²⁹⁾



There is a positive and increasing trend towards minimum tillage cropping practices, and an increase in retaining adequate ground cover across the farming landscape. There are also some seasons where decreases in this positive trajectory are observed.⁽²⁶⁾ This is largely due to seasonal challenges. Increased prevalence of pests such as mice, snails and slugs or increases in stubble biomass and stubble lodging, which makes inter row sowing of crops difficult are some examples. These seasonal challenges are often tackled using historical management practices, particularly stubble burning, leaving bare soil susceptible to erosion, moisture loss and a reduction in organic matter. Further work needs to be undertaken to promote innovation, technology and new approaches to address these seasonal challenges.

Bare ground leaves soil vulnerable to wind and water erosion. National ground cover thresholds have been developed for controlling erosion on agricultural land. The thresholds are 50% cover to control wind erosion and 70% cover to control water erosion.⁽³⁰⁾ Land management practices are consistently providing ground cover above the required thresholds across most of the catchment.⁽³¹⁾ However, satellite mapping has demonstrated that ground cover percentage levels decline in dry years, particularly from November to April when crops have been harvested and over-grazing is more likely to occur. It is likely that predicted climate variability will impact ground cover levels, particularly during droughts and low rainfall occurrences. Ground cover management will be particularly important during these times.

Lack of ground cover can also leave non-agricultural land, including national parks and public reserves, vulnerable to erosion. Bare ground vulnerable to wind and water erosion can result from fire, herbivores such as rabbits, deer and goats, and motorbikes and four wheel drives entering areas and removing vegetation.

The south west Wimmera has a long agricultural history of pastures and grazing. There has been a shift in recent years to also incorporate crops into farming enterprise mixes, which now appears to be stabilising.⁽²⁵⁾ Data from the 2019 Wimmera Land Use and Land Management Transect Surveys indicates an increase in stubble burning and cultivated fallow practices, which leaves soil vulnerable to erosion.⁽²⁶⁾

Use of perennial pastures has continued in the Upper Catchment and can be an effective way of maintaining ground cover and reducing soil erosion. Pasture research will need to continue to reflect the changing needs and challenges faced by farmers. Soil health gains can still be made by increasing the percentage of land with adequate ground cover. Practices such as the use of perennial pastures, fencing waterways, off-stream water points, stubble retention, stock containment areas and rotational grazing are all being used to retain ground cover.

The use of regenerative agricultural practices have been observed in the Wimmera. Regenerative agriculture intends to improve soil health and function, which in turn enhances water quality, vegetation and land productivity. Regenerative farm practices include multi species cover cropping,

increased use of organic fertilisers and amendments, as well as a reduction in the use of herbicides, insecticides and fungicides. Research is required to understand the potential benefits and challenges of regenerative farming principles and practices in the Wimmera, given lower rainfall and the need to retain soil moisture.

Some Wimmera soils are naturally acidic. Intensive farm practices, such as the use of nitrogen-based fertilisers, growing legumes in crop rotations and hay production accelerate soil acidification, which can lead to productivity decline. Modelling estimates indicate that the upper catchment, south-west Wimmera and parts of the north-west Wimmera are moderate to high-risk areas for soil acidification, accounting for 53% of Wimmera grazing areas.⁽³²⁾ Anecdotally, there is widespread use of lime to mitigate the impact of soil acidification. Soil pH monitoring has not been completed in Victoria since 1994. Comprehensive testing would be required to assess the current trend in acid soils within the Wimmera.

Sodic soils are naturally widespread in Wimmera subsoils. Dispersion of sodium in the subsoil can cause compaction and water logging, negatively impacting productivity and causing erosion. Testing and treating soils as required can limit decline in productivity and soil structure. Anecdotally, there is widespread use of gypsum to mitigate the impact of soil sodicity. Comprehensive testing would be required to assess the current trend in sodic soils within the Wimmera.

Salt has accumulated naturally in Wimmera subsoils over the last few million years and can remobilise due to rising groundwater levels bringing salt to the surface. Anecdotally dryland salinity appears to have stabilised across the

Lachie Green, multispecies cover crop, Mokepilly



catchment, most likely due to land management measures and the Millennium Drought where subsequent dry years resulted in groundwater levels falling. Waterlogging following drought years may increase the risk of dryland salinity, as groundwater systems recharge. Almost 22,000 hectares, or just over 1% of the region, is visibly affected to some degree by salinity. This includes almost 6,000 hectares of severely impacted land.⁽³³⁾

Major threats and drivers of change

Exposed soil, leading to wind and water erosion are significant threats to soil health and function in the Wimmera. Erosion negatively impacts soil fertility and productivity, biodiversity values, as well as human health. Bare soil is generally the result of land management practices such as cultivation, stubble burning and over grazing. Bare soil can also occur on public land following fire, overgrazing by herbivores and illegal vehicle activities. Wind erosion is a moderate threat across the catchment. Water erosion is a moderate threat in the Upper catchment and south west Wimmera. Exposed soil is slowly declining due to changed land management practices. A changing climate dominated by a declining average rainfall will likely provide challenging conditions in which to retain ground cover in some years. Continued research and extension will be required to increase and equip the number of land managers with the best tools and techniques to manage ground cover and minimise erosion.

Sub-soil sodicity has the potential to lead to a decline in soil structure, water logging, compaction and agricultural productivity losses. Sub-soil sodicity is considered a moderate threat across the Wimmera catchment.

Soil acidification can be accelerated by agriculture. Acid soils are associated with reduced plant growth and productivity, increases in the impact of toxic elements such as aluminium, and restricted soil biological activity. These impacts can ultimately lead to soil structure decline and erosion. Acid soils are considered a moderate threat in the south west and a high threat in the upper catchment.

Sub soil sodicity and acid soils are naturally occurring in the Wimmera. Monitoring and extension is required to minimise impacts to soil health and function.

The changing climate is a major driver of change in Wimmera land and soils. Climate forecasts predict a decrease in rainfall, along with an increase in temperature. This has implications across agricultural industries as researchers and farmers identify techniques to improve climate resilience into the future.

Support and collaboration between government, industry, research and farmer groups, and public land managers will be required to achieve the long and medium-term outcomes identified for land health.

Land and natural resource managers will be better placed to manage soil health when armed with reliable data. Up to date soil health data is required for physical, chemical and biological parameters across the catchment.

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. Healthy Wimmera soils support productive agriculture and a functioning natural environment.
2. The knowledge and experience of First Nations people is informing land planning, management and delivery in the Wimmera.

Outcomes to be achieved in 6 years

1. Ongoing collaboration and two way learning in land planning and management by supporting and strengthening partnerships with First Nations people.
2. Maintain ground cover at 70% or greater, annually.
3. Farmers adapt practices to a changing climate.
4. Increase land manager's knowledge of management practices that contribute to healthy productive soils.

Complementary plans

Wimmera Carbon Ready Plan

The Wimmera Carbon Ready Plan was developed by Wimmera CMA in 2016. It is a strategic planning document for the long-term management of Wimmera soils and other natural assets in the context of adapting to and mitigating the impacts of a changing climate. The plan emphasises the need to continue research and trials that test new ideas and demonstrates these to farmers.

Strong, Innovative, Sustainable: A new strategy for agriculture in Victoria

This ten-year strategy documents Agriculture Victoria's commitment to work with industry, community and trading partners to ensure that the Victorian agriculture sector is strong, innovative and sustainable.

Grampians Region Climate Adaptation Strategy 2021 – 2022

This plan outlines opportunities, barriers and actions to build resilience to and reduce the risk posed by climate change.

National Soil Strategy

The National Soil Strategy sets out how Australia will value, manage and improve its soil for the next 20 years.

The strategy highlights three overarching goals to prioritise soil health, empower soil innovation and stewards and strengthen soil knowledge and capability.



Biodiversity

The Wimmera is a biodiversity hotspot, supporting a range of habitats and species, nature-based tourism and local enjoyment.



Biodiversity

The Wimmera is a biodiversity hotspot. The region is the geographical and biological transition between temperate and arid Australia. The Great Dividing Range that defines so much of Australia's climate and biodiversity concludes at Dyurrite (Mount Arapiles) and with it, the distribution of numerous 'temperate' species, like the smoky mouse (*Pseudomys fumeus*), southern brown bandicoot (*Isodon obesulus*) and long-nosed potoroo (*Potorous tridactylus*).

At the foothills of Gariwerd (Grampians National Park) the temperate montane forest and woodlands give way to the Wimmera plains to the north and the grassy woodlands and wetlands of the south-west. Formerly dominated by grassy woodlands, these areas are famed for their agricultural productivity but also support important biodiversity assets like the Wimmera grasslands, internationally significant wetlands and habitat for the critically endangered south-eastern red-tailed black cockatoo (*Calyptorhynchus banksii graptogyne*).

First Nations people moved across these landscapes seasonally, accessing plants and animals for food, fibre and medicine and employing cultural burning and other techniques to keep a mosaic of vegetation cover.

Where Dyurrite (Mount Arapiles) signifies the end of the mountains, the Little Desert National Park represents the start of Australia's arid interior. The Little Desert region supports a vast array of biodiversity: 670 or 24% of all Victoria's vascular plant species, more than 220 bird species and 80 nationally threatened fauna and flora species.⁽³⁴⁾

The Little Desert National Park is the largest contiguous patch of remnant native habitat in the Wimmera, protecting just over 130,000 hectares. Across the landscape there are several medium-sized remnants, such as the northern slopes of Gariwerd (Grampians National Park) and Burrunj (Black Range State Park), Dyurrite (Mount Arapiles) along with the Tooan State Park block, Jilpanger Nature Conservation Reserve, Tallageira Nature Conservation Reserve, Gurru (Lake Hindmarsh) and Ngalpakatia/Ngelpagutya (Lake Albacutya).

Between these medium and large parks and reserves, agricultural land dominates the Wimmera landscape. Importantly, a mosaic of small stands of native vegetation and habitat patches, strips and features remain interspersed within the agricultural matrix, such as:

- Small public land reserves and wetlands,
- Roadside, waterway and railway corridors, and
- Remnant vegetation, coarse woody debris, rocks, and scattered paddock trees.

These small patches of habitat are extremely important in supporting and maintaining biodiversity across the Wimmera region. Not only do they provide habitat for some biodiversity, but they also act as steppingstones and pathways for biodiversity to move through the landscape between patches of suitable habitat.

At a finer scale, the biological diversity of the Wimmera is demonstrated by the sheer number (618) and diversity of Ecological Vegetation Classes (EVC). In the upper catchment there are alpine and cool temperate rainforest vegetation communities, such as Montane Rocky Shrubland and Wet Forest, respectively. The lower catchment contains the inverse, Semi-arid Chenopod Woodland and Heathy Mallee, characteristic of the Mallee vegetation communities.

There have been 3,974 species recorded within the Wimmera region, including 3,169 plants, 61 invertebrates and 744 species of vertebrate fauna.⁽³⁵⁾ Of these species, 766 are introduced, 124 are endemic to the Wimmera and 232 have more than 75% of their modelled habitat distribution within the catchment.⁽³⁶⁾ Twelve species are officially listed as extinct or regionally extinct in the Wimmera. This figure may be higher as there are no complete records of the Wimmera's biodiversity prior to European colonisation. A further 600 species (14%) are listed as rare or threatened with extinction⁽³⁵⁾ under Victoria's *Flora and Fauna Guarantee Act 1988 (FFG Act)* new Threatened List.^{(35) (37)} Additionally, 95 Wimmera species are identified as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Appendix 2 available on the Wimmera CMA website provides a full list of the Wimmera's threatened species.

Functional biodiversity and ecosystems of the Wimmera are of fundamental importance to the region. Functioning habitats and ecosystems provide significant tourism opportunities. For example, tourism in the Grampians region generates an estimated \$295 million in direct economic output for the five surrounding local government areas.⁽³⁸⁾ Agriculture is the dominant land use in the Wimmera and plays an important role in Victoria's economy and Australia's food security. The Wimmera needs healthy biodiversity and ecosystems to support these critical economic and social industries.

Assessment of current condition and trends

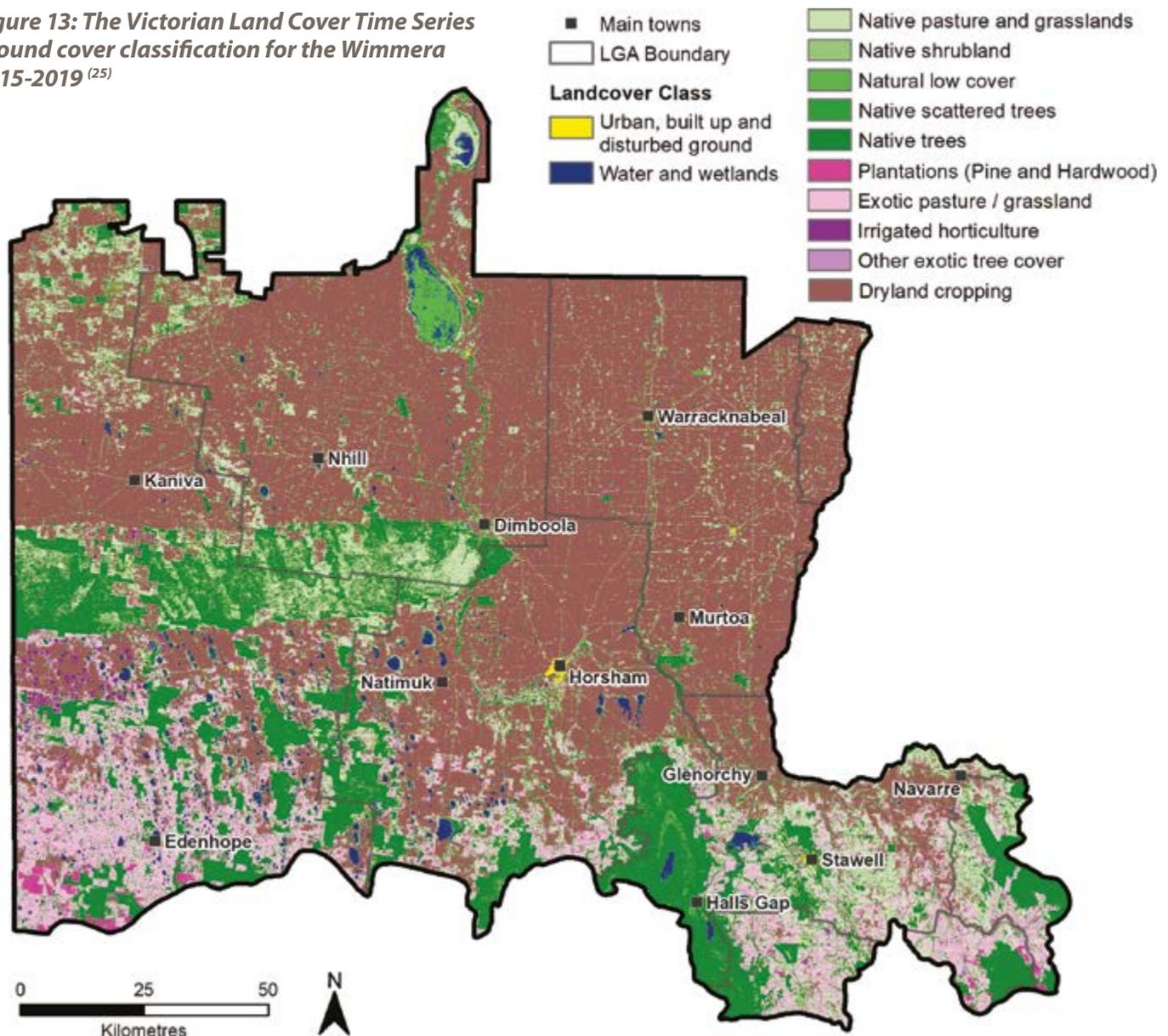
The remaining biodiversity within the Wimmera has been extraordinarily resilient with a large part of it cleared and modified for agriculture following European colonisation (Figure 13). Since 2000, the Wimmera has experienced a decade long drought, catchment-wide floods and fires that have impacted large areas of the national parks and reserves system. Despite these challenges, the Wimmera continues to support a vast array of regionally and nationally significant flora, fauna and ecological communities.

The extent and quality of habitat is a defining factor in the condition and trend of biodiversity and ecosystems. Habitat can be classified and described in a variety of ways. In general terms, thirty-one per cent of the Wimmera's 2.3 million hectares is covered by natural habitat. Fifty-one per cent of this remaining natural habitat is public land protected within the National Reserves System, leaving 49% of the Wimmera's native vegetation occurring on private land. ⁽³⁹⁾ ⁽⁴⁰⁾

In Victoria, Bioregions and Ecological Vegetation Classes (EVCs) are the standard unit for classifying habitats and vegetation types at larger scales. ⁽⁴¹⁾ The bioregions and EVCs that support arable soils have been highly modified. For example, the Wimmera Bioregion covered 65% of the Wimmera region in 1770 compared to only 13% in 2005. There are 593 EVCs in the Wimmera and over half (55%) are listed as Endangered or Vulnerable under Victoria's *FFG Act*. The *FFG Act* lists three Wimmera ecosystems as threatened and the Commonwealth *EPBC Act* identifies another six threatened ecological communities in the Wimmera. Appendix 3 available on Wimmera CMA's website www.wcma.vic.gov.au lists these communities.

Natural ground cover, a measure of natural habitat, continues to decline in the Wimmera. The Victorian Land Cover Time Series ⁽²⁵⁾ shows that between 1985 and 2019 natural ground covers declined by 162,000 hectares (6.9%). This includes a decline of 42,118 hectares (1.8%) in the last five-year time-period between 2015-2019.

Figure 13: The Victorian Land Cover Time Series ground cover classification for the Wimmera 2015-2019 ⁽²⁵⁾



Common spadefoot (*Neobatrachus sudelli*)

The Wimmera has a long and successful history of protecting and managing habitat on private land, restoring habitat and connectivity through revegetation. Project Hindmarsh was well ahead of its time when in 1997 it set about connecting the Big Desert and Little Desert by revegetating on roadsides and private land. At a larger scale, Habitat 141 has been working across the Wimmera-Mallee region and beyond to restore habitat connectivity at a continental scale.

Since the establishment of on-title conservation covenants, Trust for Nature has permanently protected 16,355 hectares of native vegetation on private land.⁽⁴³⁾ This is one of the highest figures in Victoria and equates to about 5% of all native vegetation on private land in the Wimmera. From 2013 to 2020, 19,840 hectares of native vegetation on private land has been protected through 47 permanent and 1,047 long-term conservation management agreements.

At an individual species scale, habitat can have a more specific meaning. For example, an orchid's habitat may be a soil type, aspect and light level. 'Habitat complexity' on the ground, such as coarse woody debris, rocks, grasses and shrubs, are important for terrestrial animals and small birds. Regardless of the scale, habitats and their quality are influenced by many factors, such as vegetation cover, land use, fire regimes, weeds and pest animals.

Critical fine scale habitat, such as large habitat trees and on-ground habitat complexity, continues to be lost across the landscape. The 2019 Environmental Report Card for the Wimmera⁽²⁹⁾ indicates woody vegetation or tree cover was down nearly 2% in the past two years. There are several reasons for this loss:

- Large habitat trees are generally old and subject to natural attrition, with live trees dying or dead 'stag' trees falling over.
- Wildfire and planned burning have a significant impact on large hollow trees and coarse woody debris on both public and private land by removing these critical habitat resources from the landscape.

- The conversion from grazing to dryland cropping introduce new threats to scattered paddock trees from stubble burning and spray drift and contribute to the decline in coarse woody debris.
- Both legal and illegal native vegetation removal and firewood harvesting contributes significantly to the loss of large habitat trees and coarse woody debris on both private and public land. Much of this illegal clearing and firewood harvesting goes unreported. In the Grampians region for example, illegal firewood removal has increased significantly where it appears to be highly organised and coordinated, including the felling and removal of large old habitat trees within the public land estate⁽³⁷⁾

Two coordinated, large-scale, cross-tenure fox control programs are being delivered in the Gariwerd (Grampians National Park) and Little Desert regions. Collectively, they deliver fox baiting across nearly 380,000 hectares, conduct targeted fox trapping programs and both have commenced small-scale targeted cat control programs. Monitoring programs have demonstrated that foxes and cats remain widespread and readily detected at nearly all monitoring sites.^{(44) (45)}

Feral and over-abundant native herbivores are having a significant impact on biodiversity and habitat in the region. Rabbits (*Oryctolagus cuniculus*) and brown hare (*Lepus europaeus*) are a perennial threat to ground flora. There has been an increase in deer populations across Victoria⁽⁴⁶⁾, with a similar trend seen in the Wimmera with red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) populations appearing to expand across the region. Goats (*Capra hircus*) and pigs (*Sus scrofa*) are also an issue in some places.

Through the Victorian Government's Biodiversity Response Planning process, Parks Victoria has implemented significant programs controlling deer and goats, implementing both aerial and ground control techniques in Gariwerd (Grampians National Park) and Burrunj (Black Range State Park). The program has removed 344, 287 and 133 animals over the past three years and appears to have had some level of success however, these species have not been eradicated and ongoing funding is required to maintain biodiversity benefits. There is also concern about the deliberate release of some species for recreational hunting, for example pigs and goats.

The impact of overabundant native herbivores (kangaroos and wallabies) is now being identified as a significant risk to biodiversity.⁽⁴⁷⁾ This is evident at the interface of public reserves and agricultural land where pasture and artificial water sources sustain higher than natural macropod populations. During 2020, DELWP undertook aerial surveys for kangaroos across Victoria. For the local government areas that make up the Wimmera catchment the eastern (*Macropus giganteus*) and western grey kangaroo (*Macropus fuliginosus*) population were estimated at between 126,100 and 387,800 individuals. In the upper catchment eastern kangaroo densities are high, estimated at 12.9 individuals per square kilometre.⁽⁴⁸⁾ Currently DELWP sets a cap on kangaroo harvesting at 10% of the estimated population.⁽⁴⁹⁾

Weed control is conducted sporadically across the catchment with land managers implementing relatively conservative annual weed control programs. The extent and focus of significant weed control efforts is largely driven by short-term funding availability. For instance, Parks Victoria was funded for 3 years (2018-21) via the Victorian Government's Biodiversity Response Planning process to deliver sallow wattle (*Acacia longifolia*) control in the north of the Gariwerd (Grampians National Park) region. Likewise, DELWP regionally was funded for 2020-21 to target boneseed (*Chrysanthemoides monilifera subsp. Monilifera*) in the region. Ongoing funding is required to continue this good work and maintain the biodiversity benefit achieved by this work.

Fire is an important ecological process in the Australian environment. Fire shapes habitat, ecosystems and the biodiversity that lives within them. Over the past 20 years the Wimmera has had many significant wildfires resulting in large parts of the National Parks and Reserve system being burnt. In the Little Desert National Park for example, there is a lot of recently burnt vegetation and not much old growth vegetation. This lack of variation in vegetation age class is not ideal for ecosystem health, many species require a diversity of vegetation ages to provide the habitat and food resources they require.

The 10-year period from the 2000s on saw unprecedented wildfires across the region. Approximately 90% of the Grampians National Park was burnt and a large extent of the Little Desert National Park. Subsequently, there has been a reprieve in large wildfires allowing DELWP and Forest Fire Management Victoria to implement their planned burning program. A key component of which is to introduce fire into the large fire scars to break up the large patches of single age classes, provide variety across the landscape and implement fire breaks to help prevent future large fires.

Fire and land managers in the Wimmera are increasingly using alternative burning techniques to improve biodiversity and cultural outcomes. For example, cool burns are being implemented in south-eastern red-tailed black cockatoo (*Calyptorhynchus banksii graptogyne*) habitat to reduce negative impacts of fire on the cockatoo's food resources. Similarly, Traditional Owners led by BCLC have conducted cool mosaic burns to help improve habitat quality and provide an alternative to hotter and more uniform fuel reduction burning.

There are various flora and fauna monitoring programs in the Wimmera collecting data, for a variety of purposes, that can be used to provide an indication of species, habitat and ecosystem trend and condition. These monitoring programs are providing evidence to inform the management of some Wimmera species and ecosystems:

- South-eastern red-tailed black cockatoo (*Calyptorhynchus banksii graptogyne*) annual flock counts. Bird numbers remain relatively stable however recruitment of new individuals into the population is relatively low compared with historical data.⁽⁵⁰⁾
- Malleefowl (*Leipoa ocellata*) mound activity monitoring indicates the Malleefowl population is relatively stable and 'varies up to +/- 50% per year'.⁽⁵¹⁾
- Platypus (*Ornithorhynchus anatinus*) live trapping and environmental DNA surveys have shown a slight increase in the range of platypus in the MacKenzie River. Genetic analysis shows the population is very small and has extremely low genetic diversity.⁽⁵²⁾
- Gariwerd (Grampians National Park) long-term small mammal surveys have shown significant swings in species richness and abundance that appears to be driven by rainfall.⁽⁵³⁾ In 2019, long-nosed potoroo (*Potorous tridactylus*) were not detected in one of their last known refuges⁽⁵⁴⁾, with the last known detection occurring in 2014.
- Small mammals and reptiles surveys in the Little Desert have shown higher abundance of species inside a predator-proof fence indicating invasive predators are having an impact on local biodiversity.⁽⁵⁵⁾

Major threats and drivers of change

Biodiversity and ecosystems are dynamic by nature however there are several major threats that could drive significant changes in the biodiversity of the Wimmera. The continued pressure of long-term threats (habitat loss, fragmentation and pest plants and animals) and the emergence of new threats (a changing climate, high-intensity bushfires, increasing grazing pressure) collectively mean the biodiversity of the Wimmera faces a challenging future.

Rainfall averages and soil moisture are declining, and the number of hot days is increasing⁽⁵⁾. These changes can threaten Wimmera habitats and ecosystems by driving shifts in vegetation composition and structure.⁽⁵⁶⁾

Declining average rainfall and soil moisture is enabling large-scale land use change, primarily a shift from grazing to dryland cropping. The area used for dryland cropping has increased by over 44,000 hectares since 2015.⁽²⁵⁾ The conversion of native and introduced pastures to dryland cropping removes fine scale habitat from paddocks and exacerbates fragmentation. Generally, there is a diversity of fine scale habitat within a paddock used for grazing including paddock trees, shrubs, coarse woody debris, rocks, a diversity of ground flora, depressions and wet areas that enable wildlife to either live within or move through a paddock. Therefore, when land traditionally used for grazing get converted to dry land cropping, most fine scale habitat features are lost.

More hot days and declining rainfall averages and soil moisture are facilitating more frequent and more intense bushfires. Following the Millennium Drought there were multiple, large-scale, high intensity wildfires in Gariwerd (Grampians National Park) and the Little Desert National Park that have driven significant changes in vegetation structure and composition. The World Weather Attribution investigates the link between bushfire risk and climate change in Australia and found there is, at minimum, a 30% increase in the chance of severe fire conditions because of climate change in Australia.⁽⁵⁷⁾

Both planned and unplanned fire can drive significant changes in important habitat values. Large hollow trees and coarse woody debris, critical to the ecology of many native species, are very susceptible to wildfire and planned burns on both public and private land. Extreme weather events such as storms and floods can also impact on biodiversity and habitat.

At the landscape scale, scattered paddock trees provide connectivity for animals and genetic connectivity for tree populations. At the local scale they provide a distinct microclimate, increased soil nutrients, plant species richness and structural complexity, and provide habitat for many animals.⁽⁵⁸⁾ Scattered trees help maintain biodiversity throughout largely cleared parts of the landscape.⁽⁵⁹⁾ Large, scattered trees are being lost for several reasons including natural attrition, stubble burning, spray drift, legal and illegal clearing.

In a highly fragmented landscape like the Wimmera the density and distribution of small patches of remnant native vegetation between the larger more intact reserves are critically important to maintaining functional ecosystems. They provide habitat for a vast array of species and enabling mobile species to migrate between the larger patches. This provides gene flow and re-colonisation opportunities that is critical to maintain viable populations in fragmented landscapes. Consequently, the loss of scattered paddock trees, vegetation on roadside reserves and other small patches of habitat are likely to be a major threat to biodiversity conservation in the Wimmera.

The introduced red fox (*Vulpes vulpes*) and feral cat (*Felis catus*) have long been implicated in the decline of many of Australia's native fauna species and extinction of at least 34 mammal species.^{(60) (61)} In the Wimmera, introduced pests are implicated in the ongoing decline of species like the Mitchell's hopping mouse (*Notomys mitchellii*), southern brown bandicoot (*Isodon obesulus obesulus*) and plains wanderer (*Pedionomus torquatus*). They are also contributed to the regional extinction of species like the white-footed rabbit-rat (*Conilurus albipes*), western quoll (*Dasyurus viverrinus*) and western barred bandicoot (*Parameles notina*).

Within the region there are two well-funded, best practice, large-scale, cross-tenure fox control programs centred around Gariwerd (Grampians National Park) and Little Desert National Park. The former has been running since 1996 and despite this effort, 'foxes and cat occupancy remains very high across the sites surveyed, indicating that they are present at most, if not all of the sites sampled for at least part of the year'⁽⁶²⁾ Introduced predators will continue to be a significant driver of the trend and condition of fauna populations in the Wimmera until an effective management strategy can be established.

Introduced and native herbivores can directly threaten biodiversity by direct browsing pressures, driving changes in floristic and structural composition, and contributing to erosion and weed dispersal.

DELWP has designed a new modelling tool called Strategic Management Prospects (SMP) to help land managers consider and compare the most effective management actions to protect biodiversity. SMP is a modelling tool that compares the cost and benefit to local biodiversity of implementing different management actions.⁽⁶³⁾

In the Wimmera, SMP has suggested 89 actions across 236,039 hectares to best protect the Wimmera's biodiversity. Fifty-five of these management actions recommend controlling introduced and overabundant-native herbivores across 225,935 hectares or 95.7% of the total proposed works. Thirteen management actions recommend weed control across 8,668 hectares or 3.7% of the proposed works.

Pest plant and animals work aimed at improving habitat quality constitutes 99.9% of the total area of proposed works. This suggests that over-abundant herbivores and invasive weeds are the major threat and driver to the Wimmera's habitats, ecosystems and species. Interestingly, in the SMP analysis, invasive predator management does not rank

Lake Lascelles, ruby saltbush (*Enchylaena tomentosa*)



amongst the top 3% of priority actions and only constitutes a small proportion of the top 10% priority actions – 17% of actions and 7% of area.⁽⁶³⁾

Invasive plants threaten the region's biodiversity primarily by outcompeting and displacing native species. Many invasive plants are well-established in the region and ongoing management is required to keep them contained.

Over recent years there has been new and emerging species of concern to the region's biodiversity. Invasive grasses including Chilean needle grass (*Nassella neesiana*) and serrated tussock (*Nassella trichotoma*) continue their migration west. If they become established they pose a significant ecological threat and could negatively impact the local agricultural economy.

Sallow wattle (*Acacia longifolia*) has become well-established in Gariwerd (Grampians National Park) with its spread exacerbated by recent fire. This species has the capacity to drastically change ecosystems by outcompeting native plants. Significant resources are currently being invested in Gariwerd (Grampians National Park) to protect assets from the threat of sallow wattle and continued investment is required to maintain this good work.

The community has a strong desire to access public natural areas such as bushland, lake and stream reserves. This access has the potential to impact on biodiversity and needs to be managed so it does not reduce environmental condition or amenity.

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. The biodiversity of the Wimmera is thriving because ecosystems are restored, habitat has been recreated and missing species have been returned.
2. The knowledge and experience of First Nations people is informing biodiversity planning, management and delivery in the Wimmera.

Outcomes to be achieved in 6 years

1. Ongoing collaboration and two way learning in biodiversity planning and management by supporting and strengthening partnerships with First Nations people.
2. Increase the extent, quality and protection of habitat on private land in the Wimmera.
3. Improve habitat quality on public land in the Wimmera.
4. Ecosystems are being restored and species are being conserved by translocating locally extinct and vulnerable species within the Wimmera.
5. A coordinated regional scale monitoring program is providing up-to-date data on habitat, ecosystem and species trend and condition.
6. Vulnerable Wimmera vegetation communities and species have been identified and a strategic plan has been developed and management actions to mitigate threats are being implemented.

Complementary plans

A coordinated and strategic regional approach to biodiversity conservation will be required if the Outcomes for biodiversity are to be achieved. Several organisations have developed strategic plans or prioritisation processes that encompass elements of the Wimmera's landscape and biodiversity. There is no overarching document that takes a holistic view of the Wimmera, setting targets and priorities for biodiversity conservation and management. This gap will be filled by February 2022, with input from regional stakeholders, bringing together and consolidating existing regional planning work including Biodiversity Response Planning, Conservation Action Planning, and parts of the Carbon Ready Plan and Action Plan for the Regional Land Partnerships Program and describing how the RCS will contribute to and report on the targets set out in Biodiversity 2037.

Protecting Victoria's Environment - Biodiversity 2037

The state-wide Biodiversity 2037 strategy is Victoria's plan to stop the decline of native plants and animals and improve the natural environment. The plan establishes a long-term vision and goals for biodiversity in Victoria. Specific targets have been developed to deliver on these goals. Through a Biodiversity Response Planning process, the Department of Environment, Land, Water and Planning are working with all relevant partners and stakeholders to identify and implement on-ground actions that will best contribute to the Plan's targets. Actions taken to achieve the outcomes of this RCS will also contribute to the Plan's targets.⁽⁶⁶⁾

Wimmera Carbon Ready Plan

This action plan under the RCS details the actions required for the management of native vegetation, soils and other natural assets in the context of adapting to and mitigating the impacts of a changing climate.

Action Plan for the Regional Land Partnerships Program

This addendum to the RCS sets out how the Wimmera region will contribute to the Australian Government's 5 year Outcomes and Investment Priorities under the Regional Land Partnerships Program.

Wimmera Invasive Plant and Animal Management Strategy

This action plan under the RCS outlines an approach to setting priorities for coordinated management of invasive plants and animals in the region.

Trust for Nature's State-wide Conservation Plan

This Plan defines the Trust for Nature's conservation priorities and priority areas. Taking a statewide perspective of the value of private land for healthy ecosystems, the Plan provides a baseline for achieving conservation targets across the state.⁽⁶⁵⁾

Wimmera Parks Conservation Action Plan

The Conservation Action Plan for parks and reserves managed by Parks Victoria Wimmera focuses on the resilience of natural assets and maintaining ecosystem services.⁽³⁴⁾

Habitat 141

Habitat 141 is a long-term, collective response to habitat fragmentation and climate change along the 141st longitude. This biodiversity hotspot stretches from the coast of South Australia, along the Victorian border, and up to the rangelands of New South Wales.

South eastern red-tailed black-cockatoo (Calyptorhynchus banksii graptogyne)





Community

Active local people and communities are vital for ensuring the Wimmera's land, water and biodiversity have a healthy future.



Community

Catchment health is underpinned by the community's capacity and interest in caring for land, water and biodiversity. The Wimmera's large geographical area and small population means active stewardship, sharing of knowledge and resources and collaborations between organisations, community groups and individuals is vital to support continued action over time.

Every person and business that lives, works, recreates or has a special interest in the Wimmera uses and influences the natural environment. Human activity has the biggest influence on catchment condition. It is important that the region's community is knowledgeable, skilled, motivated and informed.

This section focuses on supporting individuals and groups to connect to nature and care for the Wimmera's land, water and biodiversity. Everyone has a role to play in effective environmental stewardship.

Organisations, groups and individuals in the Wimmera community have expressed the following as important:

- Maintaining and improving the region's liveability and wellbeing, including economic wellbeing.
- Improving the region's natural assets and leaving them in better condition for the next generation.
- Providing opportunities for all the community to connect to nature.
- Supporting a strong volunteering culture that improves outcomes for people, communities, and the natural environment they live, work or recreate in.

- Ensuring communities are better prepared to mitigate the adverse impacts of climate change, drought, flood and other natural hazards.

From time to time there will be polarising views and vigorous debate on certain topics. Respectful and considered communications will ensure that the Wimmera's strong foundations of cooperation and collaboration continue.

Groups and individuals with particularly strong interests and influence in caring for the Wimmera's natural environment include:

- First Nations people
- Landcare, "Friends of" and other groups involved in environmental volunteering
- Primary producers
- Non-commercial farmers and rural landholders
- Corporate farming businesses
- Mining and resource industry businesses
- Schools and young people
- Residents
- Nature based user groups like anglers, birdwatchers, field naturalist, hunters and camera clubs
- Wimmera-based businesses linked to the agricultural and eco-tourism sectors

These groupings are themselves diverse, constantly changing and often have shared or complementary values.



Planting at the Wimmera River near Horsham



Earth oven

First Nations

The Wimmera is a living cultural landscape rich in values, heritage and kinship. Since creation, the custodial responsibilities to care for Country sat with First Nations people who lived in harmony with the environment and each other. Land management practices and the knowledge of plants, animals and the seasons were passed down from generation to generation through dance, songs, art, action and language.

Country, and caring for Country goes beyond the physical elements of the natural environment and is fundamental to First Nations identities. Aboriginal Places (including known archaeological sites) such as oven mounds, scarred trees, stone quarries, fish traps and artefact scatters sit alongside stories, places of creation, lore and cultural knowledge. First Nations communities bring diverse life experiences and connections to cultural landscapes and special places. Integrated catchment management can be a platform for activities that contribute to self-determination by First Nations communities. While partnership-based activities have a direct benefit in themselves in terms of rehabilitating particular places, these activities also have broader impact of highlighting the role and responsibilities of First Nations peoples in managing Country and contributing to the health and wellbeing of the environment and the community.

Cultural heritage protection is one very important aspect of integrated catchment management, but it is just one aspect. First Nations communities' interests in participation and engagement in integrated catchment management and partnerships with CMAs and other organisations across this sector are much broader than just cultural heritage protection.

Two-way learning and ongoing collaboration in planning and management across the Wimmera will strengthen partnerships between First Nations people, landholders, volunteer groups and other organisations and result in better outcomes for the region.

Landcare and volunteer groups

The Wimmera has a positive legacy of stewardship and collective action by many landholders, volunteer groups and other organisations. These efforts have influenced every area of the catchment, and demonstrate how coordinated collective action, and the support of committed partners, can result in productivity, environmental and social benefits.

Landcare networks and groups support a grassroots movement of volunteerism across the region. There are more than 60 community-based groups in the Wimmera engaging with approximately 1,400 members and volunteers. Landcare groups cover about 80% of the region's privately-owned land.

Groups are supported by overarching Landcare Networks or other partnership arrangements that employ support staff and assist in planning, funding and implementing larger projects. The focus of the networks and individual groups varies according to member's interests and includes sustainable agriculture, soil health, weeds, pest animals, revegetation, water quality, threatened species and wetland protection. Landcare groups across the catchment actively raise public awareness and promote diverse and inclusive partnerships with many other organisations.

The hard work of Wimmera Landcarers has been recognised and celebrated with multiple state and national Landcare awards since the movement began in 1986.

Primary producers

Many individual landholders choose to champion local Landcare principles and practices on their properties outside of formalised group structures.

Many Wimmera residents volunteer their time and energy to assist others. This means Landcare and environmental volunteering is in competition with many other commitments and important areas of need.

Major threats and drivers of change

At a regional scale Landcare, like most other volunteer-driven community organisations in the Wimmera, has seen traditional membership rates decline. Changing demographics in rural communities and the overall shift to larger farm businesses are among trends reducing potential for community involvement in natural resource management. There is considerable variation across the region.

At the same time, with the growth of social media and new communication technologies, the number of online communities across the region is growing. These tools and technological capacity provide new opportunities to connect issues and people, especially young people and the region's growing culturally and linguistically diverse communities. There is also increased potential to increase community participation and engagement in catchment management, such as through citizen science.

There is anecdotal evidence of an increasing focus in school communities and curriculums on sustainability and land, water and biodiversity management.

The above trends carry risks as well as new possibilities. Strategic outcomes for community participation and engagement in regional integrated catchment management need to be developed with an awareness of both.

Population decline is an ongoing issue. Attracting, retaining and sustaining resident populations is a key concern for most towns and rural communities across the Wimmera. They seek to achieve this by increasing the liveability and appeal of their communities. The places where people live, learn, work and play have an important role in shaping health and wellbeing, including economic wellbeing. Integrated catchment management is one of several policy domains influencing liveability.

In town settings, for example, 'greenspace' near workplaces and residences provides opportunities for recreation and active lifestyles. Connecting with nature has been shown to benefit physical and mental health, improve quality of life and generate economic benefits. This access needs to be managed to protect biodiversity values from impacts like trampling, erosion, weed dispersal and littering.

The farming sector on which the region's communities depend is diversifying as new technologies and practices are being adopted to adapt to global economic and climate changes. There is a need for new technology that accelerates positive change at scale, and there are opportunities to continue to build digital connectivity and embrace innovation that links and contributes to building drought and climate resilience.

Pressures on the region's natural resources can limit the viability of food and fibre businesses and the prospects of sustainable intensification.

Wimmera farmers and communities have a proven capacity to adapt and have been managing a wide range of risks including climate variability and drought for many years. Drought is an enduring, regular feature of the Wimmera. It

is predicted that drought conditions will intensify beyond current lived experience, becoming more frequent and longer, with more pronounced impacts. ⁽²⁷⁾

Prolonged effects on profit and farm viability have reached well beyond the actual event of drought. The Australian Bureau of Agricultural and Resource Economics (ABARES) estimates that changes in climate since 2000 have reduced average annual profits for the region's approximate 2,628 farm businesses by 35% or \$64,400 (controlling for non-climate factors). ⁽⁶⁷⁾

ABARES results suggest that, without farmer innovation and adaptations to continue to reduce the sensitivity of farms to dry conditions over time, hits to profitability would have been approximately 49% for cropping farms (compared to 1990 technology). Increased risk of financial and social distress to the sector was also linked to significant impacts on mental health and well-being.

Other important capacity-building pillars to advance integrated catchment management in the Wimmera include institutional coordination and collaboration, robust volunteering infrastructure, and leadership. Expanding and enduring partnerships can drive progress.

There are many different forms of volunteering and the benefits reported by volunteers varies considerably. The Wimmera's volunteering sector is being asked to evolve and grow by the community. This is coupled with an increase in the demand for the services that volunteers provide. Place-based services, such as Landcare group and network support services and larger volunteer support organisations provide the critical infrastructure required for safe, effective and sustainable volunteering. They are responsible for the promotion, resourcing and support of volunteers in local communities, and assist groups across the region to recruit, retain and manage their volunteers.

Participation and leadership are closely connected. Leadership requires a strong and enthusiastic participant base just as participation requires the direction and structure of strong leadership. Both play an important role in the development of community capacity.

The net loss of young people from the region threatens the Wimmera's community leadership base. Gaining the interest of the next generation of young leaders in natural resource and catchment management is crucial for maintaining the ranks of volunteer networks and professionals. Young people who are successfully engaged need mentorship and guidance.

Natural resource and catchment management presents a potential growth area for employment for regional Victorians to continue to plan for a future of prosperity.

COVID-19 has the potential to influence volunteerism via health restrictions and concerns. There is also potential for the population and volunteer base to increase as people look to live in regional Victoria.

Desired outcomes for the future

Outcomes to be achieved in 20+ years

1. Integrated catchment management provides a platform for activities that contribute to self-determination by First Nations communities.
2. All Wimmera residents and visitors have access to nature experiences that enhance health and wellbeing.
3. Wimmera people are active stewards taking action to care for land, water and biodiversity.

Outcomes to be achieved in 6 years

1. First Nations communities are able to develop stronger connections between the RCS and their own strategies and plans where appropriate and to implement relevant actions.
2. More members of the Wimmera community value and experience the region's natural assets.
3. Stewardship increases, with more people taking action to care for land, water and biodiversity.
4. New and emerging leaders in integrated catchment management are supported.
5. Cultural landscapes are better understood.
6. Integrated catchment management contributes to health, wellbeing and economic development (liveability).

Complementary plans

Landcare Network and Group Plans

A range of local Landcare networks and groups have strategic plans or group action plans. These plans articulate a shared vision about the future of a local group area, highlight tasks that need to be completed to realise the group's shared vision, and identify who will carry these out. The Project Platypus Strategic Plan, for example, outlines the history and vision of the network of eleven Landcare groups.

Landcare and Community Participation Plan

Wimmera CMA's Landcare and Community Participation Plan is an operational plan for engaging Landcare and the community in regional scale natural resource management and the design and delivery of projects that acknowledge local conditions and align regional community priorities with Australian and Victorian Government priorities. The plan aligns with the strategic directions of the Victorian Government's Landcare Program and Environmental Volunteering Plan, which outlines four focus areas to address the challenges and issues currently experienced by the sector and offers ways to overcome barriers to attracting new volunteers.

Aboriginal Participation Guideline

The Aboriginal Participation Guideline for Victorian Catchment Management Authorities establishes a statewide approach for use by CMAs to respond to regional variations in cultural diversity, experience in working with Traditional Owners and Aboriginal communities, and natural resource management priorities. The guideline provides a framework for how CMAs can strengthen the effectiveness of their engagement and partnerships with Traditional Owners and Aboriginal communities. It recognises that each CMA region is different and that each will take its own approach in engaging with the diversity of Traditional Owners and Aboriginal communities within its region and provides Traditional Owners and Aboriginal communities with an entry point for engaging with CMAs.

Supporting local volunteers

Partner organisations such as the Centre for Participation operate strategic plans focused on supporting local volunteerism across sectors including the natural resource management sector. These plans establish the value of regional collaborations and partnerships to ensure we focus our resources for maximum impact and effectively empower smaller community organisations and volunteer-involving organisations to do their work.

Keeya and Leonie birdwatching in the Stawell ironbarks





Lisa and Lottie, Grampians Rail Trail



Local Areas

The five Local Areas in the Wimmera Regional Catchment Strategy focus on distinct parts of the region and explain how the themes come together and integrate in each place. The Local Areas are based around local government and catchment boundaries.

The Local Areas recognise the importance of community-driven outcomes, participation and management. They:

- Highlight the knowledge and priorities of local communities,
- Recognise that the characteristics of land, water, biodiversity and community vary across the region,
- Integrate the themes of land, water and biodiversity in a way that is meaningful and relevant for local communities, and
- Identify opportunities for organisations and communities to partner and collaborate to achieve local outcomes.

The Wimmera region overlaps with large and small portions of eight local government areas. This strategy groups local government areas where part of their area is in the Wimmera and they have similar integrated catchment management characteristics. Figure 14 shows the Local Areas as:

1. Hindmarsh
2. Horsham
3. West Wimmera
4. Yarriambiack and Buloke
5. Upper Catchment (including parts of Ararat, Northern Grampians and Pyrenees local government areas).

Each Local Area section describes:

- Land, water and biodiversity characteristics and values,
- The condition of land, water and biodiversity and significant trends,
- Major challenges, threats and drivers of change,
- Desired outcomes for the future, and
- Priority directions required to achieve the outcomes, focussing on priorities for integrated catchment management involving partnerships and collaborations with stakeholder organisations, community groups and individuals.

Like the Theme sections, each Local Area section identifies the medium and long-term integrated catchment management outcomes the region is seeking to achieve for water, land, biodiversity and community. The outcomes seek to be “SMART;” meaning they are Specific, Measurable, Achievable, Relevant and Timebound.

The Local Area sections do not contain targets that specify management outputs. Regional sub-strategies and action plans will set out the specific management actions and priority locations for activities that will achieve the RCS’s outcomes.

There are many important things to achieve for integrated catchment management in each Local Area. The outcomes and priority directions included in the RCS are considered the highest priorities for each Local Area based on the best available science, and knowledge and information contributed by stakeholders and the regional community. Outcomes and priority directions included for some sections may also be relevant for other Themes or Local Areas. They have only been included in the sections where they are the highest priority. Each outcome is important, and they are not listed in any order of priority.

Figure 14: Local Areas in the Wimmera





Hindmarsh

	Land area	484,819 hectares
	Population	5,700 (approximate). ⁽⁶⁸⁾ Second lowest population density in Victoria
	Population trend	Declining. Aging population
	Main towns	Nhill, Dimboola, Rainbow, Jeparit
	Climate	Semi-arid. Summer temperatures can reach over 40 degrees and regular frosts are experiences in winter. Average rainfall is around 400 mm.
	Land use	70% of the area is dryland broadacre cropping ⁽²⁵⁾
	Main industries	Agriculture: cropping, wool and sheep meat, major producer and exporter of hay Health services Agricultural manufacturing: duck processing, grain handling businesses, silo and grain handling equipment Tourism is an emerging industry
	Main natural features	29% of the area is covered by native vegetation and waterways ⁽²⁵⁾ <ul style="list-style-type: none"> - Little Desert National Park - Wimmera Heritage River - Gurru (Lake Hindmarsh), Outlet Creek and Ngalpakatia/Ngelpagutya (Lake Albacutya)

Hindmarsh is bounded by the Little Desert National Park in the south and Wyperfeld National Park to the north. The Barringgi Gadyin (Wimmera River) together with Gurru (Lake Hindmarsh), Outlet Creek and Ngalkapatia/ Ngelpagutya (Lake Albacutya) provide a natural corridor that connects the two parks as it traverses through a productive cropping landscape.

The Project Hindmarsh revegetation initiative connects the Little and Big Desert National Parks via roadsides, the Lawloit and Propadollah Ridges and the Barringgi Gadyin (Wimmera River). Commencing in 1998, the Project Hindmarsh planting weekend is a flagship of the Hindmarsh Landcare Network and the longest running event of its kind in Australia. The Hindmarsh Landcare Network is a passionate and active group, providing valuable support to Landcare groups in the region.

First Nations cultural values are very significant. The high abundance of scar trees and middens is testimony of the profound indigenous connection to Barringgi Gadyin (Wimmera River) and lakes. In the Antwerp area alone, there are over 250 registered scarred trees (possibly the highest concentration in Victoria). The river was a source of freshwater, plant foods, mussels, fish and bird life. The river continues to influence the cultural landscape today and is an important area for connecting to Country.

In 2005 Barengi Gadjin Land Council and the Australian and Victorian Governments entered into an Indigenous Land Use Agreement. Wotjobaluk people were recognised as having native title rights over the Barringgi Gadyin (Wimmera River), Outlet Creek, Gurru (Lake Hindmarsh), Ngalkapatia/ Ngelpagutya (Lake Albacutya), Wail State Forest and parts of the Little Desert National Park.

The river and adjacent land support a rich variety of riparian vegetation and aquatic species. River red gum and black box communities form a vital corridor for wildlife habitat and movement through the landscape.

The Barringgi Gadyin (Wimmera River) along with Gurru (Lake Hindmarsh), Ngalkapatia/ Ngelpagutya (Lake Albacutya) and Outlet Creek is recognised as the Wimmera Heritage River under the Victorian *Heritage Rivers Act 1992*. This recognises the important nature conservation, scenic, recreational and cultural values of these waterways.

The river regularly contains water, but only intermittently fills Gurru (Lake Hindmarsh) and beyond, relying on very large floods to generate sufficient flows. When full, Lakes Hindmarsh and Albacutya attract visitors to enjoy water skiing, fishing, yabbying, bird watching and camping. Ngalkapatia/ Ngelpagutya (Lake Albacutya) is an internationally significant wetland under the Ramsar Convention, supporting tens of thousands of waterbirds when flooded, the nationally threatened regent parrot (*Polytelis anthopeplus*) and a unique salt tolerant river red gum.⁽⁴¹⁾ Both lakes are considered nationally important wetlands.⁽⁶⁹⁾

The Barringgi Gadyin (Wimmera River) and lakes system's Heritage River status recognises the important nature

conservation, scenic, recreational and cultural values. There is a strong desire by the Hindmarsh Shire Council supported by the community to build a 103 kilometre Wimmera River Discovery Trail linking Dimboola, Jeparit, Gurru (Lake Hindmarsh), Rainbow and Ngalkapatia/ Ngelpagutya (Lake Albacutya). This will be a valuable addition to the region's visitor economy.

Hindmarsh's four main towns, Nhill, Dimboola, Rainbow and Jeparit, are co-located with rivers and lakes, reflecting their importance to the liveability of local communities. Waterways support popular annual drawcard events. A study into the socio economic value of recreational and environmental water estimated that the Barringgi Gadyin (Wimmera River) and Nhill Lake contributed \$2.1 million to the local economy with more than 41,000 participants in 2019-20.⁽⁶⁾

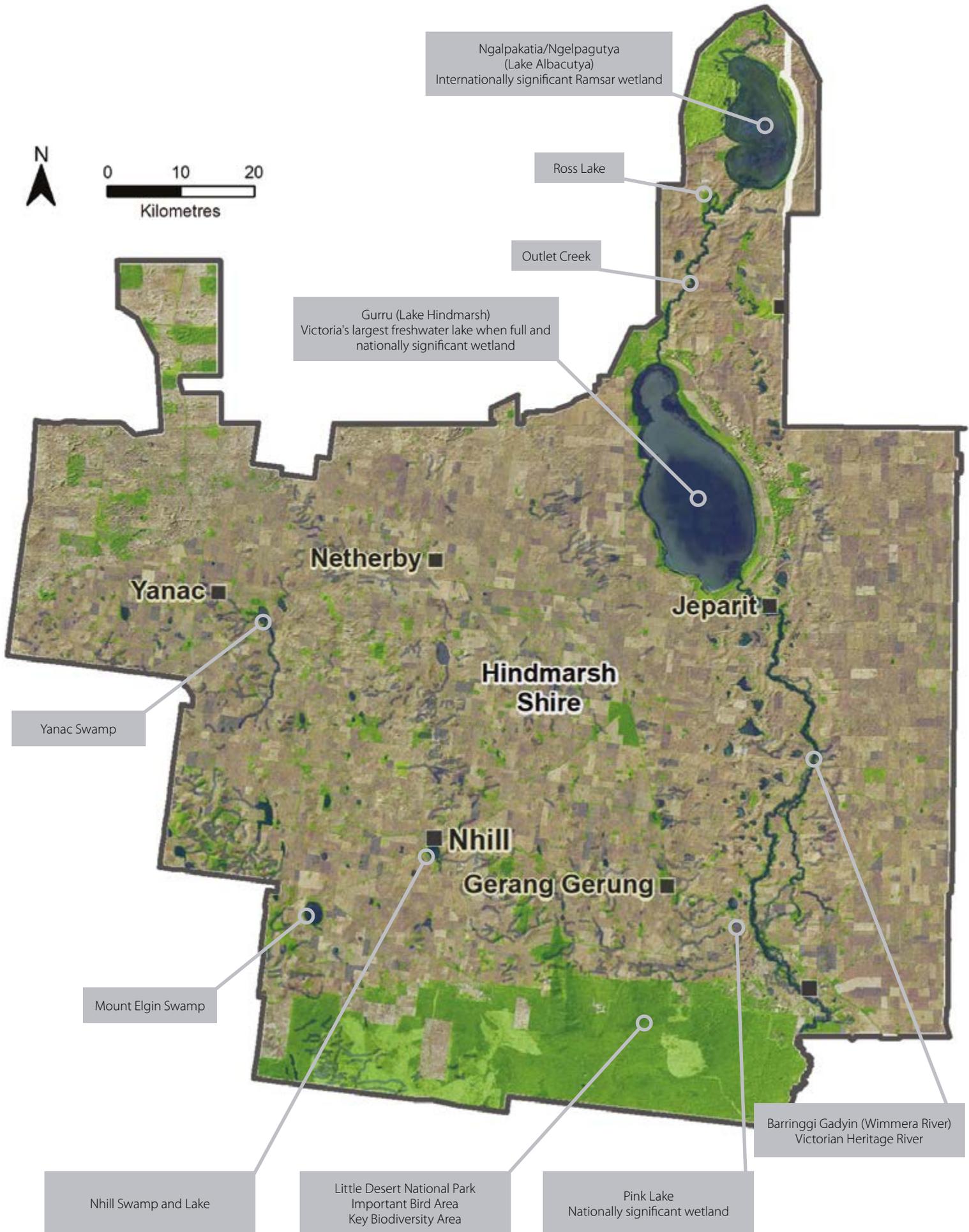
The Local Area contains 281 wetlands ranging in size from Victoria's largest freshwater lake, Gurru (Lake Hindmarsh), through to small shallow seasonal wetlands. Many wetlands are important to local communities, often containing abundant bird, wildlife and recreational opportunities. Notable wetlands include Pink Lake, Ross Lake, Nhill Lake, Nhill Swamp, Mount Elgin Swamp, Yanac Swamp and Woorak Swamp.

The Little Desert National Park supports a diverse variety of plants and animals. Birds Australia lists it as an Important Bird Area and one of Australia's Key Biodiversity Areas.⁽⁷⁰⁾ There are numerous species across the park, including the nationally threatened Malleefowl (*Leipoa ocellata*), rare native orchids, western pygmy possum (*Cercartetus concinnus*), silky mouse (*Pseudomys apodemoides*) and fat-tailed dunnart (*Sminthopsis crassicaudata*).⁽⁷¹⁾ Around 50,000 people visit annually, attracted by Spring wildflowers, walking, camping, four-wheel driving, bird and wildlife watching opportunities.⁽⁷²⁾

Small patches of native vegetation including endangered remnant Buloke woodlands are scattered throughout the agricultural landscape. Some small remaining areas of native grasslands around Nhill support the critically endangered golden sun moth (*Synemon plana*).



Benno Muir (Wimmera CMA) with Daniel Clarke and Darren Griffin (BGLC), Bark Canoe event, Dimboola





ASSESSMENT OF CURRENT CONDITION AND TRENDS

Rivers and streams



Condition is strongly influenced by rainfall, runoff and streamflow. During dry periods, river flows and water quality decline and the river becomes a series of disconnected pools. Salinity levels rise as saline groundwater enters the river and there are insufficient flows to dilute and flush salt into the terminal lakes.

During the Millennium Drought in the 2000s, streamflow declined significantly, and river health was very poor. Salinity levels in some pools approached concentrations well in excess of seawater levels.

Since the end of the drought and large floods in 2010 and 2011, careful management of environmental flows has enabled water quality to be managed by timely flushing with freshwater, filling up and connecting pools, maintaining habitat and refuges, and enhancing instream vegetation. River health parameters have shown gradual improvement over time, except for during droughts (2014-15 and 2018 to 2020-21) when dry conditions saw water flows and quality decline again.

While water quality usually fails to meet State Environment Protection Policy objectives, it has been good enough in most years to support native fish populations, visitor enjoyment of the river, recreational activities and events like fishing competitions and rowing regattas.

Annual fish monitoring results indicate that native fish populations are improving. Carp and other introduced species remain a threat due to their feeding behaviour and propensity to breed in large numbers when conditions are suitable. The improvement in native fish populations and associated surveys indicates that carp impacts are not increasing.

Most of the riparian zone is Crown land managed by Parks Victoria. The river runs through a heavily cropped landscape. Few farmers with access to riparian areas have stock so stock impacts on the river are isolated. There are issues around the number and condition of informal vehicle tracks which creates erosion and facilitates rubbish dumping and illegal firewood collection.

Parks Victoria, Barengi Gadjin Land Council, Landcare and Wimmera CMA have collaborated in recent years to reduce rabbits and problem weeds like bridal creeper, boneseed (*Chrysanthemoides monilifera*), horehound (*Marrubium vulgare*), prickly pear (*Opuntia spp.*) and wheel cactus (*Opuntia robusta*). This requires ongoing effort to ensure pests stay in check and weeds are not spread downstream by birds, other wildlife or floods where they could impact on the values of Gurrul (Lake Hindmarsh) and Ngapakatia/Ngelpagutya (Lake Albacutya). Riparian vegetation is mainly continuous and a few small, dispersed areas would benefit from revegetation, particularly in salt affected areas given the lack of ground cover.

The health of culturally significant trees vary from good to poor health due to water quality and availability. More needs to be done to understand and manage these important places.

Wetlands



Ngalpakatia/Ngelpagutya (Lake Albacutya) last filled in 1983 and Gurru (Lake Hindmarsh) in 1996. These lakes naturally fill episodically, and ecologists expect that the values the lakes hold when full would return if they filled today.

Parks Victoria, Wimmera CMA and Baringi Gadjin Land Council have collaborated over several years to reduce the impacts of rabbits, motor bikes and four-wheel drive vehicles at Ngalpakatia/Ngelpagutya (Lake Albacutya). This work is facilitating regeneration of endangered Pine-Buloke woodlands and protecting sensitive dune vegetation and cultural heritage.

Other large wetlands like Nhill Swamp, Yanac Swamp and Mount Elgin Swamp are in very good environmental condition and are known to support a vast number and diversity of birds when they contain water.⁽⁷³⁾ Other wetlands are scattered throughout a heavily cropped landscape. One third of the Hindmarsh Local Area's 281 wetlands are unmodified by dams, drains, crops and levees, with 189 wetlands (67%) impacted by one or more of these modifications. The number of wetlands wholly or partially covered by a crop doubled between 2004 and 2017 to 126 wetlands affected, potentially causing substantial impacts to the condition of the vegetation and other biota.

Land



The gross value of agricultural commodities in Hindmarsh in 2015-16 was \$103 million of which \$62 million was generated from cropping and \$41 million from livestock or livestock products. This compares with \$186 million (total), \$146 million (cropping) and \$39 million in 2010-11.⁽²⁾

Farmers have adapted to less annual rain by improving land management to maintain soil health and improve productivity, resulting in profound changes over the last few decades. Last century's farming practices relied on cultivating or tilling soil or burning stubbles, leaving soils bare and exposed after harvest in summer and autumn. The loss of valuable topsoil by wind erosion was a major issue in the Hindmarsh Local Area. Almost 90% of farmers now use minimum-till farming practices, with the vast majority leaving stubble in place over summer. Ground cover fluctuates from year to year but between 2014 and 2019 it ranged from 72% to 95%.

Dryland cropping has gradually increased by 27,000 hectares, covering 70% of the land area.

Past rises in saline water tables have brought salt to the surface, decreasing the productivity of some areas of farmland, particularly west of the Baringgi Gadyin (Wimmera River) corridor. This is a historic occurrence that is not

currently worsening as drought and drier climate have seen saline water tables stabilise or fall. Management approaches are seeing saline land reclaimed for production by planting saltbush.

Biodiversity



Analysis of land cover shows that since 1985⁽²⁵⁾:

- Native cover has reduced.
- Native grassland or pasture has decreased by 8,000 hectares but has plateaued in the last decade.
- Native shrub cover has halved, decreasing by 5,000 hectares and continues a downward trend.
- Native tree cover has declined by 5,000 hectares but is steady.
- Native scattered trees remain steady at over 3,500 hectares.

Scattered patches of remnant native vegetation are protected in parks and reserves. This includes endangered Buloke woodlands and native grasslands.

Much of the Little Desert's vegetation is recovering from wildfire and habitat structure is simplified, making it easier for foxes and cats to prey on native species and browsing and grazing animals to impact on regenerating vegetation. Age class diversity is low because of recurrent fire and there are few areas of older aged mature vegetation. Herbivores like rabbits, kangaroos and wallabies have widespread impacts on vegetation, red deer have expanded into the Hindmarsh Local Area from the Little Desert's western block and goats are potentially an emerging issue.



Lake Hindmarsh

MAJOR THREATS AND DRIVERS OF CHANGE

The Hindmarsh Local Area is reliant on agriculture for its economic prosperity. Climate change puts this at risk and farmers are continuing to adapt their businesses as they continue to invest in techniques and technology that focus on soil moisture retention because of reduced rainfall.

Climate change is having a major impact on natural assets in the Hindmarsh Local Area. More hot days coupled with reduced rainfall in the Barringgi Gadyin (Wimmera River)'s headwaters have led to reduced water flows in the Barringgi Gadyin (Wimmera River). Water harvesting higher up the catchment for rural and urban water supply, farm dams have also reduced flows to the lower Barringgi Gadyin (Wimmera River). This in turn impacts on habitat availability, connectivity along the river, and reduced water quality with salinity increasing as flow declines.

Saline groundwater entering the lower Barringgi Gadyin (Wimmera River) is a major threat to water quality and the health of fish, aquatic communities and riparian vegetation. This is especially a problem when river flow is low, enabling groundwater to intrude more readily and better-quality flushing flows are absent.

These threats also impact on aesthetics, recreational values and community wellbeing. For example, healthy weir pools at Dimboola and Jeparit are important for maintaining liveability, supporting recreation, tourism and community events. A healthy river is essential for Wotjobaluk people to facilitate wellbeing and more time On Country in places along the river where they have a deep spiritual and cultural connection.

These factors are driving change in management approach with river managers focusing on ways to protect and maintain the environmental, community and Wotjobaluk values of the river with less water. For example, exploring the viability and opportunities available to deliver water to weir pools, drought refuge pools and the culturally significant Billabong at Dimboola via pipelines or other means.

European carp (*Cyprinus carpio*) are a threat competing for habitat and resources with native species, stirring up sediment and increasing turbidity and nutrient levels through their feeding actions. Carp comprise a significant biomass in the river although fish surveys are showing steady improvements in the number of native fish compared to carp since the end of the Millennium Drought. ⁽⁷³⁾

The condition of Ngalpakatia/Ngelpagutya (Lake Albacutya), Gurru (Lake Hindmarsh), Outlet Creek and Ross Lakes is also threatened by lack of streamflows. The wet periods and extremely large flood events required for water to flow to the terminal lakes system are likely to occur less frequently under dry climate scenarios.

Like the Barringgi Gadyin (Wimmera River) and terminal lakes system, the Hindmarsh Local Area's 281 wetlands are threatened by climate change causing reduced filling regimes, impacting on vegetation and wildlife and waterbirds that rely on water being present. Lack of regular water has left many shallow seasonal wetlands susceptible to being cropped and drained. The ongoing threat of this affecting large numbers of previously uncropped wetlands may be low as the driest wetlands are likely to have been cropped already.

Weeds like boneseed (*Chrysanthemoides monilifera subsp. Monilifera*), African boxthorn (*Lycium ferocissimum*), bridal creeper (*Asparagus asparagoides*) and olives can impact on the integrity of riparian and wetland vegetation and require ongoing monitoring and management to prevent their spread. Floods can act as a vector to further spread weeds along the river system. Rabbits are an ongoing issue threatening the condition of riparian vegetation along the Barringgi Gadyin (Wimmera River), Outlet Creek and beside the lakes and wetlands, particularly in the sandy dune areas characteristically present on the north-eastern side of many wetlands.

The Little Desert National Park and surrounding areas are also subject to rabbit impacts. An overabundance of herbivores including rabbits, hares (*Lepus europeus*), kangaroos and wallabies are impacting on native vegetation. Red Deer (*Cervus elaphus*) have expanded from the park's western block further east. Goats are an emerging issue, also expanding into the eastern block from the west.

A major threat to the integrity of the Little Desert National Park's vegetation and habitat quality is fire that occurs too frequently. This is reducing the diversity of native vegetation age classes within the park, simplifying habitat and making it easier for predators like foxes and cats to prey on native wildlife. It is also making it easier for browsing and grazing pest animals to invade and impact on native vegetation.

Increased access by the community to natural areas has the potential for impacts like erosion, vegetation loss, rubbish, damage to cultural heritage such as middens. The activities of visitors to natural areas will need to be carefully managed and impacts monitored to ensure that their values are protected and continue to provide benefits to all users and wildlife.

DESIRED OUTCOMES FOR THE FUTURE

Outcomes to be achieved in 20+ years

1. The social, environmental, cultural and economic values and condition of waterways and parks that have formally recognised significance are maintained. This includes:
 - a. Little Desert National Park
 - b. Wimmera Heritage River
 - c. Ngalpakatia/Ngelpagutya (Lake Albacutya) (Ramsar)
 - d. Gurru (Lake Hindmarsh) and Pink Lake (nationally important wetlands)
 - e. Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (*EPBC Act* listed)
2. Habitat condition and connectivity are enhanced between the Little Desert National Park, Wyperfeld National Park and the Big Desert and along the Barringgi Gadyin (Wimmera River) system.
3. The ecological character of the Ngalpakatia/Ngelpagutya (Lake Albacutya) Ramsar Site is maintained.
4. Soils support productive agriculture and healthy, functioning natural environments.

Outcomes to be achieved in 6 years

1. More habitat enhancement and revegetation occur in and connecting the Little Desert National Park, large blocks of vegetation and along waterways and roadsides.
2. Ecosystem function in the Little Desert National Park is improved:
 - a. Habitat for Malleefowl and small mammals is improved.
 - b. Pest animal impacts are reduced.
 - c. Significant vegetation is protected and expanded, including orchids.
 - d. Small mammals are reintroduced.
3. Opportunities for delivering water to drought refuge pools, weir pools, scarred trees and wetlands to maintain species and provide community benefits are explored and implemented.
4. Water quality in the Barringgi Gadyin (Wimmera River) supports fish populations, recreation and important community events.
5. More farm trials explore improved practices that contribute to soil health, productivity and less off-farm impacts.
6. Most paddocks have at least 80% ground cover maintained throughout the year.

7. Visitor numbers to high value natural places are maintained or improved, including the Barringgi Gadyin (Wimmera River) at Dimboola and Jeparit and the Little Desert National Park.
8. More natural areas have improved access and are managed to prevent potential impacts associated with access.
9. Carp numbers and impacts do not get worse.
10. No new pest plants and animals are established beyond small, localised populations.

PRIORITY DIRECTIONS

Integrated catchment Management in this area will focus on:

- Community groups, Barengi Gadjin Land Council Aboriginal Corporation (BGLC), Hindmarsh Shire Council, Wimmera CMA and government agencies working together to improve the opportunities the Barringgi Gadyin (Wimmera River) provides to the community. This will include a combination of environmental improvements and improved management of recreation, access and associated impacts.
- The Victorian Environmental Water Holder, BGLC, Parks Victoria, GWMWater, Department of Environment, Land, Water and Planning (DELWP) and Wimmera CMA working together to deliver water for the environment to drought refuges in the lower Barringgi Gadyin (Wimmera River).
- BGLC, farmers, Landcare groups, government agencies, Wimmera CMA and stakeholder organisations working together to build corridors of well-managed vegetation between private and public land, particularly along the Barringgi Gadyin (Wimmera River), Little Desert National Park, wetlands and remnant native vegetation.
- Farming groups, farmers and BGLC working together to improve techniques that balance ground cover, farm profitability and improved environmental outcomes.
- Birdlife Australia, BGLC, Parks Victoria, Wimmera CMA, DELWP and volunteers working to improve the understanding and management of threats to Malleefowl (*Leipoa ocellata*).
- Landcare groups, Parks Victoria, Wimmera CMA, BGLC, Hindmarsh Shire Council collaborating to protect the values of Lake Albacutya, Lake Hindmarsh and Outlet Creek particularly reducing grazing pressure on native vegetation, managing visitor activities that impact on natural assets, habitat and cultural heritage.





Horsham



Land area

377,913 hectares



Population

19,600 (approximate) ⁽⁶⁸⁾



Population trend

Growing. Expected to be 21,794 by 2031 ⁽⁷⁴⁾



Main towns

Horsham, Natimuk, Jung, Pimpinio, Laharum, Wail, Dadswells Bridge, Toolondo



Climate

Semi-arid. Summer temperatures can reach over 40 degrees and regular frosts are experienced in winter. Average annual rainfall is around 450 mm



Land use

70% of the area is dryland broadacre cropping ⁽²⁵⁾



Main industries

Agriculture: cropping, wool and sheep meat, major producer and exporter of hay
 Agricultural manufacturing: grain handling businesses, silo and grain handling equipment
 Health services
 Tourism



Main natural features

27% of the area is covered by native vegetation and waterways ⁽²⁵⁾

- Dyurrite (Mount Arapiles) and Burrunj (Black Range State Park)
- Wimmera Heritage River, MacKenzie River, Burnt Creek
- Natimuk-Douglas chain of lakes

The Horsham Local Area has the largest population of any municipality in the Wimmera, most of which reside in the Horsham township.

First Nations communities retain a strong connection between the land and water. The creation story of the Barringgi Gadyin (Wimmera River) continues to be told and there are significant sites associated with the Barringgi Gadyin (Wimmera River) in Horsham. In Dyurrite (Mount Arapiles) there are examples of local rock art, nationally significant stone tool making site and quarry sites. There are many scar trees and artefact scatters associated with woodland communities.

There are strong industry and community support networks aimed at improving natural resource management outcomes for the region. Examples include:

- Agriculture groups with members in the area, for example Victorian No-Till Farmers Association, Birchip Cropping Group, Wimmera Farming Network
- Landcare groups
- Friends of Groups, for example Wimmera River Improvement Committee
- Committees of management for example Natimuk Lake Foreshore Committee

This is a largely agricultural landscape with dryland cropping making up 60% of the area. ⁽²⁵⁾ As a result grain production is the main economic industry. There is also a significant grazing industry where stock are incorporated into grazing systems. Dedicated pastures are more prevalent in the south. There are also niche agricultural industries like olives and cut native flowers.

The area has many important waterways. The MacKenzie River supports a small population of platypus (*Ornithorhynchus anatinus*), while Burnt Creek supports the threatened western swamp crayfish (*Gramastacus insolitus*) and the most southern known population of the Peron's Tree Frog (*Litoria peronii*). The Barringgi Gadyin (Wimmera River) is fringed by riparian vegetation which meanders through

an agricultural landscape and provides a significant social, economic, cultural and environmental asset to the region. The Barringgi Gadyin (Wimmera River) weir pool in Horsham is a magnet for recreation and has attracted on average 81,000 participants per year between 2016 and 2020. Events like the annual Horsham fishing competition are a major drawcard. In 2019-20 visitors spent around \$843,927 in the local economy. ⁽⁶⁾

The Horsham Local Area contains 531 functioning wetlands, including 177 shallow freshwater marshes and 154 freshwater meadows. In the south and west there are diverse and a high density of wetlands. Most are on private land. Many provide significant habitat and recreational opportunities. The Natimuk-Douglas chain of lakes is a unique chain of salt and freshwater wetlands that are important for migratory birds.

The local community and visitors enjoy the many waterways throughout the Horsham Local Area. There is a desire to improve sustainable access to waterways to improve the local economy and health outcomes.

There is a small but valuable groundwater resource to the north of Gariwerd (Grampians National Park) that is only used in extreme drought to augment Horsham's water supply.

A range of endangered plants and animal communities live here. Pine-Buloke Woodlands exist west of Gariwerd (Grampians National Park). There are remnant Salt Paperbark communities on the edges of some salt lakes and in some of these the rare Bead Glasswort (*Halosarcia flabelliformis*) can be found. Small patches of Grey-box woodlands are scattered throughout. Platypus (*Ornithorhynchus anatinus*) are in the upper MacKenzie River and are an iconic species that is under threat. Examples of endangered species include striped legless lizard (*Delma impar*), bush stone-curlew (*Burhinus grallarius*), brolga (*Grus rubicunda*), Grampian's duck orchid (*Paracaleana disjuncta*), and Wimmera bottlebrush (*Callistemon wimmerensis*).

Significant areas are managed in reserves for example the Dyurrite (Mount Arapiles) and Tooan State Park and the Burrunj (Black Range State Park).



Josh Griffiths with Maddie, MacKenzie River



ASSESSMENT OF CURRENT CONDITION AND TRENDS

Rivers and streams



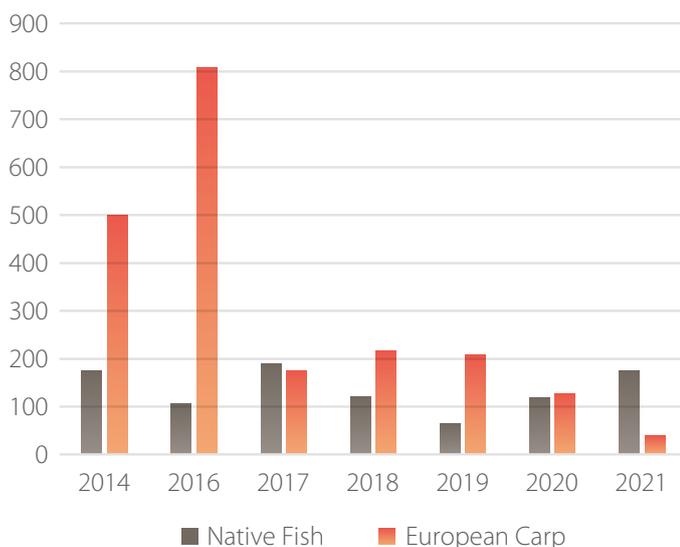
There has been a concerted effort to improve runoff water quality into the Barringgi Gadyin (Wimmera River) in Horsham over the past 10 years, with more to do. Most of the Barringgi Gadyin (Wimmera River)'s water quality issues stem from erosion in the upper catchment. The Barringgi Gadyin

(Wimmera River) at Horsham regularly fails to meet water quality targets in the State Environment Protection Policy for phosphorus, nitrogen, turbidity and pH. Despite this the water quality in Horsham's weir pool has been good enough to prevent algal blooms and allow for recreation. This has been assisted by water for the environment. In 2019 platypus surveys showed that environmental flows were helping improve the distribution of platypus in the MacKenzie River.

Socio-economic research has shown that participation at the Horsham weir for recreation has increased from 78,300 participants in 2016-17 to over 84,000 in 2018-19 and 2019-20. This is likely to be attributed to the additional walking tracks and boating facilities that have been installed and emergence of new activities such as the Horsham Park Run which uses the new walking tracks.

Annual surveys and Horsham Fishing Competition results have indicated that European carp (*Cyprinus carpio*) numbers in the Barringgi Gadyin (Wimmera River) reduced and then stabilised (Figure 14). This is likely to be because of healthy native fish populations due to fish stocking, environmental water delivery, carp removal programs and water quality efforts.

Figure 14: Horsham fishing competition total catch from 2014 to 2020⁽⁷⁵⁾



Wetlands



Of the 538 wetlands located in the Horsham Rural City, 170 are free from modifications such as dams, drains, cropping or levees. In 2017, 140 wetlands were cropped compared to 75 in 2004 indicating there is a continued impact on wetlands.

Many wetlands do not contain water for as long as they once did. For example, Lake Natimuk has been shown to be at risk of a changed hydrologic regime due to climate change and improved agricultural practices to retain soil moisture.⁽¹⁵⁾

The recreational use of some of the Local Area's significant water bodies is influenced by several factors. Green Lake is frequently impacted by blue-green algae. When it has been clear of algal blooms its value increases. For example, in 2016-17 over 10,000 participants used Green Lake compared to 2018-19 and 2019-20 when the participation was 2,000 and 1,700 as a result of algae outbreaks. Taylors Lake continues to maintain a healthy participation rate as its volume is maintained at a level that is suitable for recreation and its water quality is relatively good. Toolondo Reservoir's participation rates are dependent on water levels. Since 2017-18 participation rates have dropped from 3,340 to 358 in 2019-20 due to declines in water levels and quality.

Land



Australian Bureau of Statistics data reveals that the gross value of agricultural commodities in the Horsham Local Area in 2015-16 was \$160.9 million of which \$99.99 million was from cropping.⁽²⁾ This compares with \$217 million and \$161 million in 2010-11 respectively.⁽²⁾ Variations are likely to be due to seasonal conditions effecting yield and commodity prices.

With the introduction of no-till and minimum till cropping practices the area susceptible to wind erosion has declined from times when conventional farming practices prevailed. Cropping transect surveys in autumn indicate that the percentage of land vulnerable to erosion fluctuates. For example, in 2016 there was 100% ground cover recorded while in 2018 there was 88.3% cover.

Victorian Land Cover Time Series mapping indicates that between 2005-10 and 2015-19 dry land cropping increased in the area by around 16,000 hectares. This mirrors 18,000 hectares of native grassland loss. This is likely to be because of cropping expanding to the south.⁽²⁵⁾

Biodiversity



The Victorian Land Cover Time Series also indicates that the area of native trees has remained at around 50,000 hectares between 2005 and 2019 indicating that revegetation efforts are keeping up with clearing.

There have been observations of paddock trees being lost but the extent has not been determined.

After significant contractions during the Millennium Drought the platypus's range has gradually extended down the MacKenzie River. Surveys and environmental DNA sampling have found that the entire reach from Dad and Dave Weir to Distribution Heads is now colonised. Although the population distribution has expanded, the genetic diversity and viability remains low. ⁽⁷⁶⁾

There have been several incentives programs conducted where landholders have been funded to protect and manage buloke (*Allocasurina luehmannii*) and grey box (*Eucalyptus macrocarpa*) woodlands. There have also been numerous weed and pest control activities aimed at reducing threats to native plants and animals.

MAJOR THREATS AND DRIVERS OF CHANGE

Climate change is a significant impact on the Horsham Local Area. Climate change is impacting on water availability to waterways including the Barringgi Gadyin (Wimmera River), MacKenzie River, Burnt Creek, Mount William Creek, Bungallally Creek and its many wetlands for example Natimuk Lake and Lake Toolondo. This can impact on water quality and cause impacts to recreational environmental values. In rivers and streams it can impact on native animals. For example the Burnt Creek once had river blackfish (*Gadopsis marmoratus*) down its entire length.

The impact of climate change is magnified by the high demands on Wartook Reservoir for water supply for Horsham and the environment. This means that during dry times authorities' ability to supply water can be compromised meaning social, economic and environmental outcomes are traded off. For example, platypus and river blackfish cannot extend their range to the Barringgi Gadyin (Wimmera River) and Horsham's residents and businesses are impacted by water restrictions.

Currently Horsham's region is reliant on agriculture for its economic prosperity. Climate change puts this at risk and farmers are continuing to adapt their businesses as they continue to invest in techniques and technology that focus on soil moisture retention because of reduced rainfall.

Land use change can impact on the value of natural assets. Cropping or modification of wetlands can reduce their ability to provide recreational opportunities or environmental value.

This is a particular issue in the Horsham Local Area as the majority (177) are shallow freshwater wetlands that often dry out. Converting land from grazing to cropping can impact on the health and persistence of paddock trees. This needs to be factored in when making decisions about water availability.

The community has a strong desire to access public areas in the municipality for recreation, in particular waterways. This access contributes to improved liveability by improving opportunities for active living but also provides opportunities to improve the economy through tourism and recreation. This access needs to be managed so it is safe and does not impact on the biodiversity, water quality and amenity of these sites. This has been a focus area for Wimmera CMA, Horsham Rural City Council and community groups over the past four years.

In some areas south of Horsham inappropriate fire management of stubble burning has occurred causing the destruction of paddock trees. Stubble burning can also remove ground cover, increasing the risk of wind erosion of topsoil. Fire needs to be understood and managed to ensure the farm profitability and conservation outcomes are both possible.

Horsham's rivers and wetlands provide essential corridors for wildlife and can also be vectors for invasive plants and animals. These areas require ongoing management by land managers to ensure they continue to maintain their values.

Erosion and sediment movement in waterways in the Upper Wimmera catchment can impact on the water quality in the Barringgi Gadyin (Wimmera River) particularly in the Horsham weir pool. Slowing water movement and improving ground cover on the banks of the river can reduce turbidity of waterways.

DESIRED OUTCOMES FOR THE FUTURE

Outcomes to be achieved in 20+ years

1. The community's health and wellbeing has improved.
2. The Barringgi Gadyin (Wimmera River) is maintained in a state that continues to support social, environmental, cultural and economic values.
3. The Natimuk-Douglas Chain of lakes values retain their national significance.
4. MacKenzie River, Burnt and Bungallally Creeks run more often to the Barringgi Gadyin (Wimmera River).
5. Platypus and river blackfish extend their range.
6. Native vegetation extent and connectivity has increased.
7. More wetlands are under improved management.
8. Soils support productive agriculture and healthy, functioning natural environments.



Outcomes to be achieved in 6 years

1. Waterway user participation numbers are maintained or improved on average in the Barringgi Gadyin (Wimmera River).
2. More water security by developing and implementing a business case for a supplementary water supply for Horsham and MacKenzie River, Burnt and Bungalally Creeks.
3. More areas are permanently protected for biodiversity with a priority given to Shallow Seasonal Wetlands, grasslands and Woodlands.
4. Increased weed, herbivore and pest predator control in priority locations.
5. More revegetation in priority locations.
6. Stubble is retained in at least 80% of cropping paddocks over summer.
7. Land managers adapt practices and technologies to a changing climate.
8. Increase land manager knowledge of management practices that contribute to healthy productive soils.

PRIORITY DIRECTIONS

Integrated catchment management in the northern portion of the Horsham Local Area including the Barringgi Gadyin (Wimmera River) will focus on:

- Community groups, Barengi Gadjin Land Council (BGLC), Horsham Rural City Council and government agencies working together to improve the opportunities the Barringgi Gadyin (Wimmera River) provides to the community. This will include a combination of environmental improvements and improved management of recreation, access and impacts.
- Farmers, Landcare groups, BGLC, government agencies and stakeholder organisations working together to build corridors of well-managed vegetation between private and public land particularly along the Barringgi Gadyin (Wimmera River).
- Farming groups, farmers and BGLC working together to improve techniques that balance ground cover, farm profitability and improved environmental outcomes.

Integrated catchment management in the southern portion of the Horsham Local Area including the MacKenzie River and wetlands will focus on:

- Farmers, Landcare groups, BGLC, government agencies and stakeholder organisations working together to build corridors of well-managed vegetation between private and public land particularly the MacKenzie River, Burnt Creek, the Barringgi Gadyin (Wimmera River) and wetlands.
- Farming groups, farmers and BGLC working together to improve techniques that balance ground cover, farm profitability and improved environmental outcomes.



Upper Catchment

	Land area	368,851 hectares
	Population	9,000 (approximate) ⁽⁶⁸⁾
	Population trend	A slight decrease around Stawell and Halls Gap and a slight increase for the Ararat region including Pomonal and Moyston ⁽⁷⁷⁾
	Main towns	Stawell, Halls Gap, Great Western, Moyston, Pomonal, Landsborough, Glenorchy, Navarre
	Climate	Semi-arid. Summer temperatures can reach over 40 degrees and regular frosts are experienced in winter. Average annual rainfall is around 532 mm
	Land use	40% of the area is agricultural, comprising non-native pasture (21%) and cropping (19%) ⁽²⁵⁾
	Main industries	Agriculture, especially wool and lamb production, cropping and viticulture Gold mining, manufacturing and tourism
	Main natural features	58% of the area is covered by native vegetation and waterways ⁽²⁵⁾ <ul style="list-style-type: none"> - Gariwerd (Grampians National Park) - Barringgi Gadyin (Wimmera River) and tributaries including Mount William Creek and Mount Cole Creek - Pyrenees range - Lake Lonsdale, Lake Fyans and Lake Bellfield

The Upper Catchment Local Area includes portions of the Northern Grampians and Pyrenees Shires and Ararat Rural City Council. The area comprises the upper catchment of the Barringgi Gadyin (Wimmera River), the northern section of Gariwerd (Grampians National Park) in the west and the Pyrenees range in the east. The country between the mountain ranges supports wool and fat lamb production and cropping in the alluvial valley floors. The area is also known for its vineyards, tourism and gold mining. Gariwerd (Grampians National Park) is one of the most significant parks in Victoria. "It is a symbolic Aboriginal cultural landscape, an ecological wonderland and an important visitor attraction for the region owing to beautiful vistas, natural features, remoteness and stunning flora and fauna".⁽⁷⁸⁾ Over one million people visit Gariwerd (Grampians National Park) annually for recreation and tourism.

The Upper Catchment Local Area is a living cultural landscape with deep and continuing connections from Wotjobaluk people and Eastern Maar people. The *Victorian Aboriginal Heritage Act 2006* recognises two Registered Aboriginal Parties, Barengi Gadjin Land Council Aboriginal Corporation and Eastern Maar Aboriginal Corporation, as the primary guardians, keepers and knowledge holders of Aboriginal Cultural Heritage for areas of the Upper Catchment. Connections between First Nations people and Country are reflected in many ways including artefacts, rock art, scar trees and creation stories featured around Gariwerd (Grampians National Park), the Pyrenees range, Lake Lonsdale, Lake Fyans and other waterways.

The population of the Upper Catchment Local Area is approximately 9,000 people. The upper catchment has committed Landcare Groups of mostly older members supported by the Project Platypus Landcare Network. Perennial Pasture Systems is a dynamic farmer group, carrying out research and providing information and support to local graziers and working collaboratively within the Landcare network.

The Barringgi Gadyin (Wimmera River)'s headwaters are in the Pyrenees Range at Mount Cole. Numerous tributaries arise in the steep hill country around Navarre, the Black Range Scenic Reserve, northern Gariwerd (Grampians National Park) and the western Pyrenees ranges.

Some streams flow into large water storages like Lake Bellfield, Lake Wartook and Lake Lonsdale, providing a regionally important source of water for a vast network of towns and farms distributed via the Wimmera Mallee Pipeline. Several streams also provide water for townships like Elmhurst, Buangor and Moyston. Lake Bellfield and nearby lakes and water storages are also major tourist destinations and recreational assets.

Waterways with particularly high environmental, social and economic value include the Barringgi Gadyin (Wimmera River), Glenlofty Creek, Mount Cole Creek, Concongella Creek, Mount William Creek, Fyans Creek, Millers Creek and the upper MacKenzie River.

The Upper Catchment comprises about 222 wetlands, a relatively small figure compared to the rest of the Wimmera region. More than a third are deeper lakes, while the remainder are shallow seasonal wetlands. Large lakes such as Lake Lonsdale, Lake Wartook, Lake Bellfield and Lake Fyans are hubs for recreation and tourism, particularly fishing. Lake Fyans attracts around 28,000 recreational users every year with expenditure around \$2.5 million annually.

Groundwater on the eastern slopes of Gariwerd (Grampians National Park) is generally of better quality than elsewhere in the upper catchment and can discharge at the base of foot slopes.

The upper catchment's large areas of native habitat are in Gariwerd (Grampians National Park) and other reserves, often on steep hill country. Most remnant native vegetation within agricultural areas is along waterways and road reserves. Much of the remnant native vegetation on private land is fragmented into smaller disconnected areas and is often found on sites with skeletal soils or otherwise low capability for agriculture. Vegetation beside waterways is predominantly River Red Gum overstorey, while Box Ironbark occurs elsewhere until the Grampians with its higher rainfall forests.

Gariwerd (Grampians National Park) supports a range of habitat types from montane habitat to gullies, wetlands, creeks, rocky outcrops, woodlands, heathlands and forests. This range of habitats supports extremely high diversity of habitats and species, including one third of Victoria's native flora species and approximately 17% of Victoria's wildlife species. This includes rare or endangered species and many endemic species found only in Gariwerd (Grampians National Park).⁽⁷⁸⁾

The landscape between Gariwerd (Grampians National Park) and the Pyrenees ranges supports a diversity of habitats with six bioregions meeting within its extent. The area contains the western most and southern most extent of vulnerable box ironbark forest that extends across the inland slopes of Victoria and are important beyond the Wimmera catchment.⁽⁷⁹⁾ Box Ironbark forests are notable for their species richness. The varied tree species produce abundant nectar and pollen throughout the year, supporting many birds and other animals.

Threatened plants and animals in this Local Area include native orchids, southern brown bandicoot (*Isoodon obesulus*), smoky mouse (*Pseudomys fumeus*), mountain dragon (*Rankinia diemensis*), swift parrot (*Lathamus discolor*), plains rice-flower (*Pimelea spinescens subsp. spinescens*), button wrinklewort (*Rutidosia leptorhynchoides*) and western swamp crayfish (*Gamastacus insolitus*). Grey box grassy woodlands and derived native grasslands of south-eastern Australia and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland are nationally threatened ecological communities largely located on private land.



ASSESSMENT OF CURRENT CONDITION AND TRENDS

Rivers and streams



Stream condition varies considerably, with reasonably intact streams in parks and state reserves, while many in agricultural landscapes have eroding banks and beds. Rivers and streams located in Gariwerd (Grampians National Park) including the upper MacKenzie River, Fyans Creek and Golton Creek

are generally very healthy and provide good quality water. The MacKenzie River supports the last remaining known population of platypus in the Wimmera region. Riparian zones provide important habitat and corridors for wildlife through the agricultural land lying between the parks and reserves.

After the creeks come out of the large public land reserves, they flow through agricultural land and are used as a water source for stock and domestic purposes and irrigating grapevines or perennial pastures. Many of the creeks have highly erosive soils, reduced vegetation cover and steep hills lead to fast flowing runoff that erodes creek banks and beds in a number of locations. This erosion incises and widens creeks, often creating deep gullies and creating impacts downstream in the Barringgi Gadyin (Wimmera River). Eroded sediment in fills deep pools in the Barringgi Gadyin (Wimmera River) and increases water turbidity and nutrient levels.

Stabilisation works over the past two decades has seen many highly eroding streams become more stable and riparian zones improved. Erosion control works are targeted at sites with the greatest potential to reduce sediment loads into streams. ⁽⁸⁰⁾ Complementary work by Landcare, the Perennial Pasture Group and farmers to buffer waterways and retain ground cover on neighbouring paddocks has also seen improvements in many areas. Preventing erosion is a big task and there is more work to do to stabilise soils, reduce impacts on the Barringgi Gadyin (Wimmera River) and improve riparian areas.

Water quality problems are compounded in parts of the catchment by reduced flows in waterways due to the significant number of stock and domestic dams and larger irrigation dams (mainly for viticulture) that capture runoff upstream. Saline groundwater trickling into creeks during dry conditions also contributes to poor water quality in some streams. European carp (*Cyprinus carpio*) and mosquitofish (*Gambusia holbrooki*) also impact on water quality as well as native fish populations.

Wetlands



Of the 222 wetlands located in the Upper Catchment, about 30% are free from modifications such as dams, drains, cropping or levees. Impacts have increased since a 2004 survey was completed:

- The number of wetlands containing a dam has more than doubled, increasing from 44 to 97 wetlands impacted.
- The number of wetlands containing a drain has also doubled, increasing from 26 to 52 wetlands affected.
- Thirty-three wetlands were cropped in 2017 compared to only 12 in 2004.
- Fifty-four wetlands contain a levee.

The recreational use of some of the Local Area's significant water bodies provide a significant contribution to the local economy.

Land



The steep hills of the Pyrenees ranges and Ararat Hills have red texture contrast soils that may be sodic, containing high sodium content, where rainfall is lower. These soils have characteristically light, sandy-loamy surface soils overlaying heavy clay subsoils that tend to be

compacted with limited drainage. The dispersion of sodium in the subsoil can cause tunnel erosion and contribute to gully erosion, compaction and waterlogging. The steep gradients and soil types in the hill country are prone to water erosion, particularly if ground cover is low and the soil is exposed. Retaining adequate ground cover on paddocks to protect soils from eroding during rainfall or wind events is critical for retaining important topsoil, sustaining agricultural productivity and improving water quality in streams.

Partnerships between organisations like Perennial Pasture Systems, Project Platypus, Wimmera CMA and Agriculture Victoria have seen significant improvements in ground cover levels in the Upper Catchment. Over many years, these groups have facilitated increased adoption of perennial pasture establishment, land-class fencing of hill country and waterways, stock containment areas, whole farm planning and dry matter management.

A landholder survey conducted periodically since 2002 found that there was a consistent increase over time in respondent's reported knowledge levels related to establishing perennial pastures and using stock containment areas to manage stock in drier seasons. ⁽⁴⁾



Mt William Creek, Mokepilly

Members of Perennial Pasture Systems, who manage approximately 143,000 hectares (38%) of the Upper Catchment, have continued sowing perennials where seasonal conditions allow and integrated the use of grazing cereals and stock containment areas to provide year-round feed while maintaining ground cover. There has also been greater adoption of no-till methods of cropping.⁽⁸¹⁾

The Southern Wimmera Cropland Management Survey undertaken since 2015 has observed that the cropped area with stubble burning and cultivation in autumn fluctuates, declining after dry seasons and increasing following wet seasons due to challenges associated with heavy stubble loads.⁽⁸²⁾ Anecdotally, growers remove stubble to manage weeds (particularly herbicide resistant weeds) and control slugs prior to sowing canola. Growers also remove stubble when loads are heavy and provide a physical hindrance to sowing and crop establishment and to manage stubble-borne crop diseases.

Stubble removal in the Upper Catchment during the risky autumn months has been very low since the transect commenced in 2015. It was 10% and 13% of the surveyed area in 2017 and 2018 respectively, with virtually no stubble removal observed in the other survey years.

Salt at depth in the soil profile was mobilised by rising water tables following sustained wet years in the mid-1970s, causing dryland salinisation, impacting plant growth and exposing soil to erosion. Decreasing annual average rainfall and recharge control measures employed over the last 30 years have seen water table levels generally stabilised or falling and ongoing land salinisation is currently not a big issue.

A farmer survey conducted periodically since 2002 found that, among respondents⁽⁴⁾:

- There were fewer full-time farmers and more part-time and hobby farmers;
- More respondents generated income off-property;
- The medium property size owned and managed by farmers has decreased.

The fringes of Gariwerd (Grampians National Park) and the Pyrenees ranges are popular with “tree changers” and there is increasing pressure for residential development of rural living zones. This sometimes presents land management challenges, with people’s different levels of skills and knowledge around land management, particularly managing weeds, rabbits and foxes. Some Upper Catchment Landcare groups have benefited from the influx of tree changers while others struggle to maintain membership. It will be important to balance the retention of prime agricultural land with the expansion of developments such as housing and industry, both of which can bolster regional communities and economies.

Biodiversity



The Victorian Land Cover Time Series⁽²⁵⁾ shows that over the period 2015-19, about 40% of the Upper Catchment comprised agricultural land uses (21% pasture, 19% dryland cropping). Native vegetation covered 55% of the land area, comprised of native trees (31%), native scattered trees (5%) and native grass herb (19%).

The main changes in land use since 1985 include:

- Native cover has decreased by almost 40,000 hectares (16%), mostly attributed to the loss of native grass herb cover. Native scattered trees have also declined by about 1,600 hectares. Native tree cover has increased by 5% or almost 6,000 hectares.
- Dryland cropping has more than doubled, increasing by 37,000 hectares.

The total area covered by non-native pasture has stayed comparatively stable for the last ten years, covering around 78,000 hectares.

Extensive revegetation efforts to stabilise hillsides and saline groundwater levels, improve habitat connectivity

and improve riparian areas along waterways have added to vegetation cover over recent decades. The bioregional significance of the Upper Catchment's native vegetation has led to a collaborative effort by a broad group of stakeholders to develop the Grampians to Pyrenees Biolink Plan. This Plan is guiding efforts to improve connectivity and corridors between large blocks of vegetation. ⁽⁸³⁾

Plains grasslands and plains woodland and forest vegetation communities have been heavily impacted by past and current land management practices. Compared to their original extent before European settlement they have only 0.8% and 16.5% area remaining respectively.

Grey box (*Eucalyptus macrocarpa*), grassy woodlands and derived native grasslands of south-eastern Australia are a nationally threatened ecological community because of clearing for agriculture and fragmentation. The remnants of this vegetation community are largely located on private land, in flat to undulating landscapes or drainage depressions on relatively productive soils.

Since 1998 Agriculture Victoria's long-term rabbit monitoring sites at Ararat recorded a 95% reduction in numbers and 88% reduction in active warren entrances per hectare. ⁽⁸⁴⁾ Rabbit contribution to tunnel erosion and exposed soils has consequently decreased.

Foxes and cats have damaged populations of small native mammals, such as bandicoots, inside and outside Gariwerd (Grampians National Park) and state forests. The Grampians Ark landscape scale fox baiting project continues with approximately 20,000 baits laid per year across Gariwerd (Grampians National Park), Burrunj (Black Range State Park) and DELWP-managed state forests. Strategic trapping of foxes is undertaken around sites of particularly high conservation value such as the brush-tailed rock-wallaby (*Petrogale penicillata*) site and remaining southern-brown bandicoot (*Isodon obesulus*) and long-nosed potoroo (*Potorous tridactylus*) habitat.

Gariwerd (Grampians National Park) has been the first site in Victoria to undertake an operational program using the approved Curiosity® cat bait for feral cat control.

Feral herbivores such as rabbits, goats and deer are an increasing issue in the National Park and other vegetated areas.

Weed control is critical to biodiversity and resilience of native vegetation communities. There has been some success in reducing gorse (*Ulex europaeus*) and blackberry (*Rubus spp*), however other weeds continue to present control challenges including serrated tussock, St Johns wort (*Hypericum perforatum*), spiny rush (*Juncus acutus*), cape tulip (*Moraea miniate*), broom (*Genista monspessulana*), boneseed (*Chrysanthemoides monilifera subsp. Monilifera*), bridal creeper (*Asparagus asparagoides*), sallow wattle (*Acacia longifolia*) and horehound (*Marrubium vulgare*). Emerging weeds are gladioli

(*Gladiolus carneus*), Yarra burgan (*Kunzea leptospermoides*) and Chilean needle grass (*Nassella neesiana*). ⁽⁸⁵⁾ Project Platypus is helping to improve public awareness and identification through the Landcare network. Feedback from land management groups indicated that pest and weed control needed to be prioritised ahead of revegetation work. ⁽⁴⁾

MAJOR THREATS AND DRIVERS OF CHANGE

Climate change poses a significant ongoing threat to the Upper Catchment Local Area, increasing the risk of drought, bushfire and increased rainfall intensity. Climate change impacts on rainfall and runoff to waterways including the Barringgi Gadyin (Wimmera River), Mount William Creek, Mount Cole Creek, Fyans Creek and Glenlofty Creek as well as important lakes like Lake Lonsdale, Lake Bellfield, Lake Fyans and Lake Wartook. This impacts on water flow and quality and reducing access to recreational opportunities and enjoyment and impacting on the availability of habitat for native fish and animals. For example, platypus was once present in streams across the Upper Catchment.

Dry climate also impacts on pasture growth, feed availability for stock and ground cover levels during Summer and Autumn. The risk of paddock topsoils and river beds and banks eroding during rainfall events increases substantially when ground cover is low. Many farmers have improved the way they manage paddocks to retain ground cover, including replacing annual pastures with perennial varieties and using stock containment areas during dry periods.



Six Mile Creek fencing and revegetation, Joel South



Climate change also poses a significant risk to vineyards in the Upper Catchment. Reduced rainfall and hotter temperatures can contribute to a change in phenology, which can impact the quality and quantity of grapes. ⁽⁸⁶⁾

Bed, bank and gully erosion and sediment movement along waterways in the Upper Catchment can impact on water quality in the Barringgi Gadyin (Wimmera River) and reduce habitat availability when sediment settles in pools. Slowing water movement by retaining ground cover in paddocks and on the banks of the river and tributary streams can reduce these impacts.

Changing land use can impact on the health of natural assets. Converting land from grazing or other uses to cropping can impact on the health and persistence of native trees in paddocks.

The community has a strong desire to access natural areas for recreation, in particular waterways, forests and Gariwerd (Grampians National Park). Access to natural areas improves liveability by providing opportunities to enjoy active outdoor recreation and to improve the economy through tourism and recreation. It is important to manage this access so that it is safe and does not impact on the biodiversity, water quality and amenity of natural areas. This has been a focus area for Wimmera CMA, councils and community groups in recent years.

The Upper Catchment's rivers can be vectors for weeds and pest animals. These areas require ongoing management by land managers to ensure that problem weeds like boneseed, bridal creeper, boxthorn, sallow wattle, serrated tussock, Chilean needle grass, gladioli and African weed orchid (*Disa bracteata*) do not spread and thrive. Climate change increases the risk of new incursions of problem weeds into the Local Area. It will be important to monitor and act quickly to prevent new problem weeds becoming established.

DESIRED OUTCOMES FOR THE FUTURE

Outcomes to be achieved in 20+ years

1. Soils support productive agriculture and healthy, functioning natural environments.
2. Less soil is lost through erosion.
3. Habitat condition and connectivity is enhanced between the Pyrenees range and Gariwerd (Grampians National Park) and along waterways.
4. The Barringgi Gadyin (Wimmera River), its tributaries and important lakes like Fyans, Lonsdale, Bellfield and Wartook continue to support social, environmental, cultural and economic values.
5. Opportunities for water delivery to Upper Catchment waterways are explored.

Outcomes to be achieved in 6 years

1. More eroding waterways are stabilised.
2. Most paddocks have at least 70% ground cover maintained throughout the year.
3. The extent of native streamside vegetation is increased.
4. No new pest plant and animals are established beyond small localised populations.
5. More habitat enhancement and revegetation occurs in and around Gariwerd (Grampians National Park), large blocks of vegetation and along waterways.
6. More grey box grassy woodland remnants are protected and enhanced.
7. Water for the environment maintains or improves habitat values in Mount Cole Creek.
8. More farm trials explore improved practices that contribute to soil health, productivity and less off-farm impacts.

PRIORITY DIRECTIONS

Integrated catchment Management in the Upper Catchment Local Area will focus on:

- First Nations people, landholders, Landcare, Agriculture Victoria, Wimmera CMA and Perennial Pasture Systems working together to improve ground cover on farms and vegetation in the bed and banks of rivers and streams to reduce erosion and improve water quality.
- GWMWater, local government, Wimmera CMA and the community working together to improve the opportunities water storages provide to the community. This will include a combination of environmental improvements and improved management of recreation and access.
- First Nations people, farmers, Landcare groups, government agencies, Wimmera CMA and stakeholder organisations working together to build and improve corridors of well managed vegetation between private and public land, particularly the Barringgi Gadyin (Wimmera River), Pyrenees range and Gariwerd (Grampians National Park).
- Landcare groups, Perennial Pastures Systems, Wimmera CMA, Agriculture Victoria, First Nations people and farmers working together to improve knowledge and techniques that balance ground cover, farm profitability and improved environmental outcomes.
- GWMWater, the Victorian Environmental Water Holder, Wimmera CMA and First Nations people working together to seek opportunities to deliver water for the environment to areas for environmental, cultural, social and economic benefit.



West Wimmera



Land area

708,149 hectares ⁽²⁵⁾



Population

3,500 (approximate) ⁽⁶⁸⁾



Population trend

Declining. Aging population



Main towns

Edenhope, Kaniva, Harrow, Serviceton, Goroke, Apsley



Climate

Semi-arid in the north with higher rainfall in the south. Summer temperatures can reach over 40 degrees and regular frosts are experienced in winter

Average annual rainfall ranges from 475 mm in the north and 615 mm in the south



Land use

38% of the area is dryland broadacre cropping, 16% is non-native pasture for grazing ⁽²⁵⁾



Main industries

Agriculture: cropping, irrigated clover and vegetables, wool and sheep meat

Hardwood and softwood timber production

Tourism is an emerging industry



Main natural features

44% of the area is covered by native vegetation and waterways ⁽²⁵⁾

- Little Desert National Park
- Extensive wetland system
- Native forest parks and reserves on crown and private land

The West Wimmera Local Area lies in western Victoria on the South Australian border, about halfway between Melbourne and Adelaide. It is the largest Local Area in the Wimmera. Edenhope is the largest town followed by Kaniva.

Given the abundance of wetlands and remnant native vegetation and associated wildlife that remains across the West Wimmera there is a strong connection between Country and First Nations people. First Nations people are increasingly involved in traditional burning practices across the area in collaboration with fire authorities. The Country Plan identifies the Little Desert and Big Desert National Parks as areas where there is a desire to establish joint management with Parks Victoria.

The economy of the shire is dominated by agricultural production, particularly grain growing and sheep. There is a significant groundwater irrigation industry that grows a range of products including clover, grains and vegetables.

There are significant areas of native vegetation on private land. These landholders play a significant role in the management of these areas, for example fire management and invasive plant and animal control.

West Wimmera is geographically bisected by the Little Desert. South of the desert there is a strong north–south running dune–swale system. The rainfall is relatively high in the south, with a very high density of wetlands. The swales have historically provided the best cropping and grazing country with their heavier clay soils. The lighter sandy country on the dunes is less developed, and patches of stringybark scrub remains. South of the Little Desert, broadacre cropping

and sheep farming dominate, with a zone of groundwater sourced for irrigated agriculture and horticulture in the Neuarpuir district and surrounds. In the higher rainfall areas of the far south–west, blue gum and pine plantations have been established over the last decade. To the north of the Little Desert, the dune–swale system is less pronounced, rainfall is lower and seasonal wetlands are less dense. North of the desert is one of Victoria’s most productive broadacre cropping districts.

The West Wimmera is unique due to the myriad of seasonal wetlands in its landscape. While many wetlands are protected in parks and reserves, thousands of smaller, more seasonal wetlands exist on private land. There is a large amount of native vegetation remaining in and south of the Little Desert. This provides good connectivity of habitat on a north–south axis, and many of the larger patches of native vegetation are connected by strips on the dunes.

Mosquito Creek feeds into the Ramsar–listed Bool Lagoon in South Australia, making it a high priority stream for the district. This stream has been known to support growling grass frogs (*Litoria raniformis*) and native fish, including the Yarra pygmy perch (*Nannoperca obscura*), river blackfish (*Gadopsis marmoratus*) and dwarf galaxias (*Galaxiella pusilla*).

The Kowree Farm Tree Group has been dedicated to protecting flora and fauna while maintaining agriculture. There have been many significant conservation projects in the region supported by Trust for Nature, Greening Australia, the Red–tailed Black Cockatoo Recovery Team, DELWP and Bank Australia.



Lake Charlegrark



ASSESSMENT OF CURRENT CONDITION AND TRENDS

Wetlands



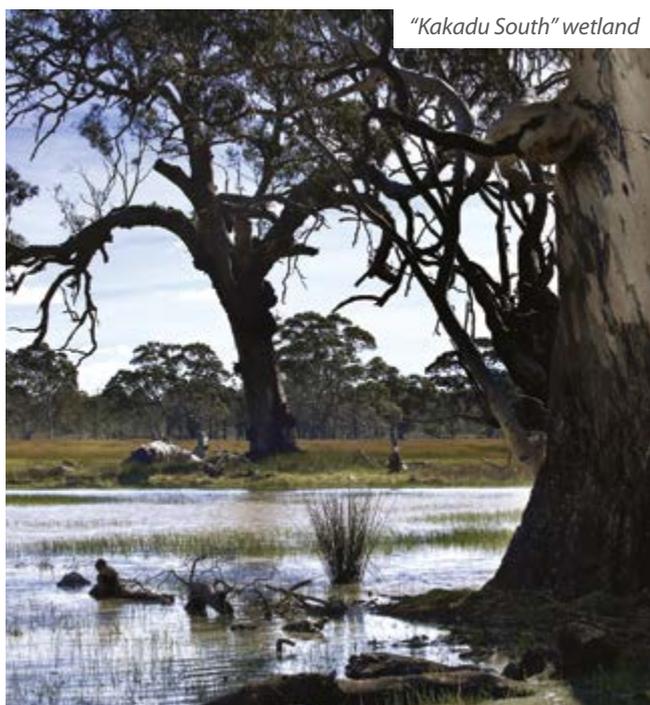
There are 2,174 wetlands in the West Wimmera, 610 of these have no modification. In 2017, 514 wetlands were cropped compared to 235 in 2004. Dams in wetlands increased from 786 to 963 between 2004 and 2017. The Victoria Land Cover Time Series indicates

that between 1985 and 2019 seasonal wetlands reduced in area from 22,000 to 18,000. ⁽²⁵⁾ This indicates there was a continued impact on wetlands natural processes during this period.

The recreation opportunities provided by wetlands in the West Wimmera is strongly influenced by climate and land use. Many local wetlands, particularly those with small catchments, do not contain water for as long as they once did. For example, Lake Wallace at Edenhope has been shown to be at risk of a changed hydrologic regime due to climate change and improved agricultural practices to retain soil moisture. ⁽¹⁵⁾

Lakes Wallace, Ratzcastle, Charlegrark and Bringalbert are the most popular lakes for recreation. Lake Wallace and Lake Ratzcastle can be impacted by low water levels. All these lakes have been impacted by blue-green algae which impacts on their ability to provide economic and social benefits. The economic benefits from the lakes can vary depending on water levels, water quality and more recently the impacts of COVID-19. For example the overall economic contribution from the lakes dropped to \$2.4 million in 2019-20 from \$3.8 million in 2018-19.

Many local landholders have entered into funding agreements to maintain or improve the management of their wetlands.



"Kakadu South" wetland

River and streams



Most of the rivers and streams in the West Wimmera Local Area flow west into South Australia, are relatively short and provide links between wetlands. Many have been converted to drains and have lost their natural values.

Mosquito Creek's catchment has had significant development of plantations and as a result water flows has been impacted. There is uncertainty about the persistence of populations of threatened species including Yarra pygmy perch (*Nannoperca obscura*), growling grass frogs (*Litoria raniformis*) and dwarf galaxias (*Galaxiella pusilla*).

Land



Australian Bureau of Statistics data shows that the gross value of agricultural commodities in the West Wimmera Local Area in 2015-16 was \$238 million of which \$102 million was from livestock, \$49.2 million from livestock products (mostly wool), \$37.7 million from cropping and

\$26.3 million from vegetables. ⁽²⁾ This compares with \$277.5 million in 2010-11. The difference is explained by a cropping income of around \$130 million in 2010-11. Variations are likely to be due to seasonal conditions effecting yield and commodity prices.

The Victorian Land Cover Time Series data indicates that between 1985 and 2019 the cropping area of the West Wimmera increased from 181,700 to 266,600 hectares. In the last 10 years the increase has only been 16,000 hectares indicating that rate of conversion is decreasing. The increase in cropping land has come at the expense of pasture, native grassland and wetlands. As this region has dried because of climate change cropping has been easier to establish, particularly north of the Little Desert. Non-native pasture extent has remain steady since 2000.

Ground cover transect analysis in autumn indicated that between 2014 and 2019 ground cover north of the Little Desert was generally good with about 8% of the area without cover from year to year. Lack of cover was mainly because of stubble burning. There was a spike in bare ground in 2016 (21%) when a significant area of conventional fallow was established.

South of the Little Desert ground cover has generally been good because of the large areas of pasture. In recent times there has been an increase in land without ground cover. For example ground cover in autumn of 2015 was 3%. In 2017 it was 4.3%, 20% in 2018, and 10% in 2019. This could be because of a move from pasture to cropping in some areas.

Biodiversity



Victoria Land Cover Time Series data indicates that native grass herb has reduced from 152,000 hectares to 97,000 hectares between 1985 and 2019. ⁽²⁵⁾ It is likely that most of this area has been converted to cropping as the data indicates a significant increase in

cropping area over the period. Native tree coverage has remained steady throughout the period. Native scattered trees have also remained steady with a slight increase.

While the data indicates that scattered paddock trees have remained steady there have been observations made that many old paddock trees have been lost over the last decade or more.

There has been a concerted effort over the last 20 years to protect and improve the management of biodiversity in the West Wimmera. Landholders have taken advantage of grants and tenders to invest in the management of wetlands and native vegetation for the benefit of native flora, fauna and ecosystems. Some of the significant species that have been the focus of these efforts include:

- Southern pipewort (*Eriocaulon australasicum*)
- Large-headed fireweed (*Senecio macrocarpus*)
- Elegant spider orchid (*Caladenia Formosa*)
- Whipstick westringia (*Westringia crassifolia*)
- Jumping jack wattle (*Acacia eneterocarpa*)
- Growling grass frog (*Litoria raniformis*)
- Red-tailed black cockatoo (*Calyptorhynchus banksii graptogyne*)
- Bush stone-curlew (*Burhinus grallarius*)
- Malleefowl (*Leipoa ocellata*)
- Brolga (*Grus rubicunda*)
- Migratory wetland birds

MAJOR THREATS AND DRIVERS OF CHANGE

Climate change is one of the biggest impacts on the West Wimmera. It is having an influence on land use for example conversion from grazing to cropping. This land use change along with climate change is impacting on water flows in the region's wetlands. This impacts on the environmental values of these wetlands but also the community's ability to use them for social and economic benefit. There is also an ongoing impact on water supply for stock and domestic use in parts of the West Wimmera. There will need to be continued consideration of additional water supply to sustain agriculture and the community.

The cropping or modification of wetlands reduces their ability to provide environmental and recreational opportunities. This is most evident in the West Wimmera's shallow seasonal wetlands which dry more often.

Parts of the groundwater system are being stressed because of use being greater than recharge. This is magnified by climate change as rainfall recharge decreases and use increases in dry times. The community will need to determine the outcomes they want for the resource in the medium and long-term and the action required to meet these outcomes.

The community has a strong desire to access public areas in the municipality for recreation, in particular waterways. This access contributes active living and opportunities to improve the economy through tourism and recreation. This access needs to be managed so it is safe and does not impact on the biodiversity, water quality and amenity of these sites. The West Wimmera Shire Council (WWSC) is developing a management plan for Lake Wallace to ensure it is developed and used in a way that sustains its values.

Weeds and pests remain a challenge. Rabbits and foxes have been an issue for many decades. In recent times cats and deer have become more of an issue. Private and public land managers will need to work together to ensure their impact is minimised.



DESIRED OUTCOMES FOR THE FUTURE

Outcomes to be achieved in 20+ years

1. The condition and connectivity of habitat is improved.
2. Lake's Wallace, Charlegrark, Ratzcastle and Bringalbert are maintained in a state that continues to support social, environmental, cultural and economic values.
3. Red-tailed black cockatoo and Malleefowl numbers are increasing.
4. Soils support productive agriculture and healthy, functioning natural environments.
5. Licensed groundwater users have access to water supply.
6. Stock and domestic user access to water supply is not impacted by licensed extraction.

Outcomes to be achieved in 6 years

1. Waterway user participation numbers are maintained or improved at Lake Wallace, Charlegrark, Ratzcastle and Bringalbert when water levels are adequate.
2. More areas are permanently protected for biodiversity with a priority given to endangered habitat like Shallow Seasonal Wetlands, grasslands and Woodlands.
3. No new pest plant and animals are established beyond small, localised populations.
4. Ground cover is maintained on at least 80% of the area assessed.
5. The impact of weeds, herbivores and pest predators on habitat and wildlife is reduced.
6. Revegetation contributes to connectivity, carbon storage and land productivity.
7. Farmers that are converting land from grazing to cropping are implementing management practices that maintain healthy productive soils in a changing climate.
8. The West Wimmera Groundwater Management Area Local Management Plan is maintained until there is evidence of groundwater levels stabilising.

PRIORITY DIRECTIONS

Integrated catchment Management in this area will focus on:

- Barengi Gadjin Land Council (BGLC), the wider community, West Wimmera Shire Council (WWSC), Wimmera CMA and Wimmera Mallee Tourism working together to integrate tourism opportunities such as the silo art trail with nature-based tourism like walking trails and wetland trails.
- WWSC and Wimmera CMA working together to investigate and implement actions to improve opportunities for integrated water management that improves social, economic, cultural and environmental outcomes.
- BGLC, the wider community, WWSC, Wimmera CMA, GWMWater and DELWP working together to create a well understood pathway for the long-term management of the West Wimmera groundwater resource.
- Landcare groups, Wimmera CMA, Agriculture Victoria, BGLC and farmers working together to improve knowledge and techniques that balance ground cover, farm profitability and improved environmental outcomes.
- BGLC, farmers, Landcare groups, government agencies, Wimmera CMA and stakeholder organisations working together to build and improve corridors of well managed vegetation between private and public land, particularly associated with the Little Desert National Park and wetlands.
- Community groups, WWSC, BGLC, Wimmera CMA and government agencies working together to improve the opportunities high community valued lakes such as Ratzcastle, Wallace, Bringalbert, Charlegrark and Kaniva Wetlands provide to the community. This will include a combination of environmental improvements and improved management of recreation and access.



Lake Jacka



Yarriambiack & Buloke



Land area

374,671 ⁽²⁵⁾



Population

5,100 (approximate) ⁽⁶⁸⁾



Population trend

Declining. Aging population



Main towns

Warracknabeal, Murtoa, Minyip, Rupanyup, Brim



Climate

Semi-arid. Summer temperatures can reach over 40 degrees and regular frosts are experienced in winter. Average annual rainfall is around 425 mm



Land use

89% of the area is dryland broadacre cropping ⁽²⁵⁾



Main industries

Agriculture (27.5% of workers): cropping, lambs and wool, major producer and exporter of hay, intensive animal industries

Healthcare and social services (19.8% of workers) ⁽²⁾

Tourism is an emerging industry: silo art trail, murals, lakes and weir pools, historic attractions like Murtoa's stick shed



Main natural features

10.5% of the area is covered by native vegetation and waterways ⁽²⁵⁾

- Yarriambiack Creek
- Dunmunkle Creek
- Scattered bushland reserves, some including wetlands

The Yarriambiack Local Area extends north from the Barringgi Gadyin (Wimmera River) to just north of Brim. It covers the southern part of Yarriambiack Shire and western portion of Buloke Shire. Yarriambiack Creek is the major natural feature bisecting the Local Area, flowing north into the Mallee CMA region to terminate at Lake Coorong northeast of Hopetoun. Dunmunkle Creek also flows in a northerly direction in the eastern part of the Local Area. Agriculture, specifically grain production, is the primary source of income. The Wimmera Mallee Pipeline has facilitated the development of intensive animal industries, mostly pigs and ducks.

The Yarriambiack Local Area has a rich cultural history with First Nations people living traditionally up until the 1930s. The Yarriambiack and Dunmunkle Creeks were originally inhabited by the Wotjobaluk people. The many scarred trees and middens present provide evidence of the importance of this area to Aboriginal people. Barrabool Flora and Fauna Reserve is a distinctive place that contains over 120 scarred trees and some of the most significant artefact scatters in the region.

The Yarriambiack and Dunmunkle Creeks provide two waterways of largely connected riparian vegetation running south to north. They provide ecological links through a highly agricultural landscape. The creeks are hydrologically rare systems within south-east Australia. They are episodic distributaries of the Barringgi Gadyin (Wimmera River), meaning they flow away from the river, only receiving flows when the river has high flows and floods. ⁽⁸⁷⁾

GWMWater supplies recreational water from the Wimmera Mallee Pipeline to weir pools on the Yarriambiack Creek at Warracknabeal and Brim, Lake Marma at Murtoa and Watchem Lake. This water provides environmental benefits, recreational opportunities for local communities and attracts visitors. The limited places in the Yarriambiack where surface water is regularly present have become a focus for the local community. There is passionate interest in their condition and management. Water-skiing, camping and fishing are popular at the Warracknabeal and Brim weir pools. Fishing is also popular at Jack Emmett Billabong on the Dunmunkle Creek at Rupanyup and Lake Marma.

Threatened species have also been recorded along or in the catchment of both creeks including species listed under the *Environment Protection and Biodiversity Conservation Act 1999* such as the turnip copperburr (*Sclerolaena napiformis*), winged pepper-cress (*Lepidium monoplocoides*), slender darling-pea (*Swainsona murrayana*), Australasian bittern (*Botaurus poiciloptilus*), Mallee emu-wren (*Stipiturus mallee*), Wimmera rice-flower (*Pimelea spienscens subsp. publiflora*) and growling grass frog (*Litoria raniformis*).

Nationally threatened ecological communities include Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions and Natural Grasslands of the Murray Valley Plains.

Scattered wetlands exist in Crown Reserves and occasionally on private land. Some of these receive environmental water from the Wimmera Mallee Pipeline to help retain biodiversity values in the largely agricultural landscape.

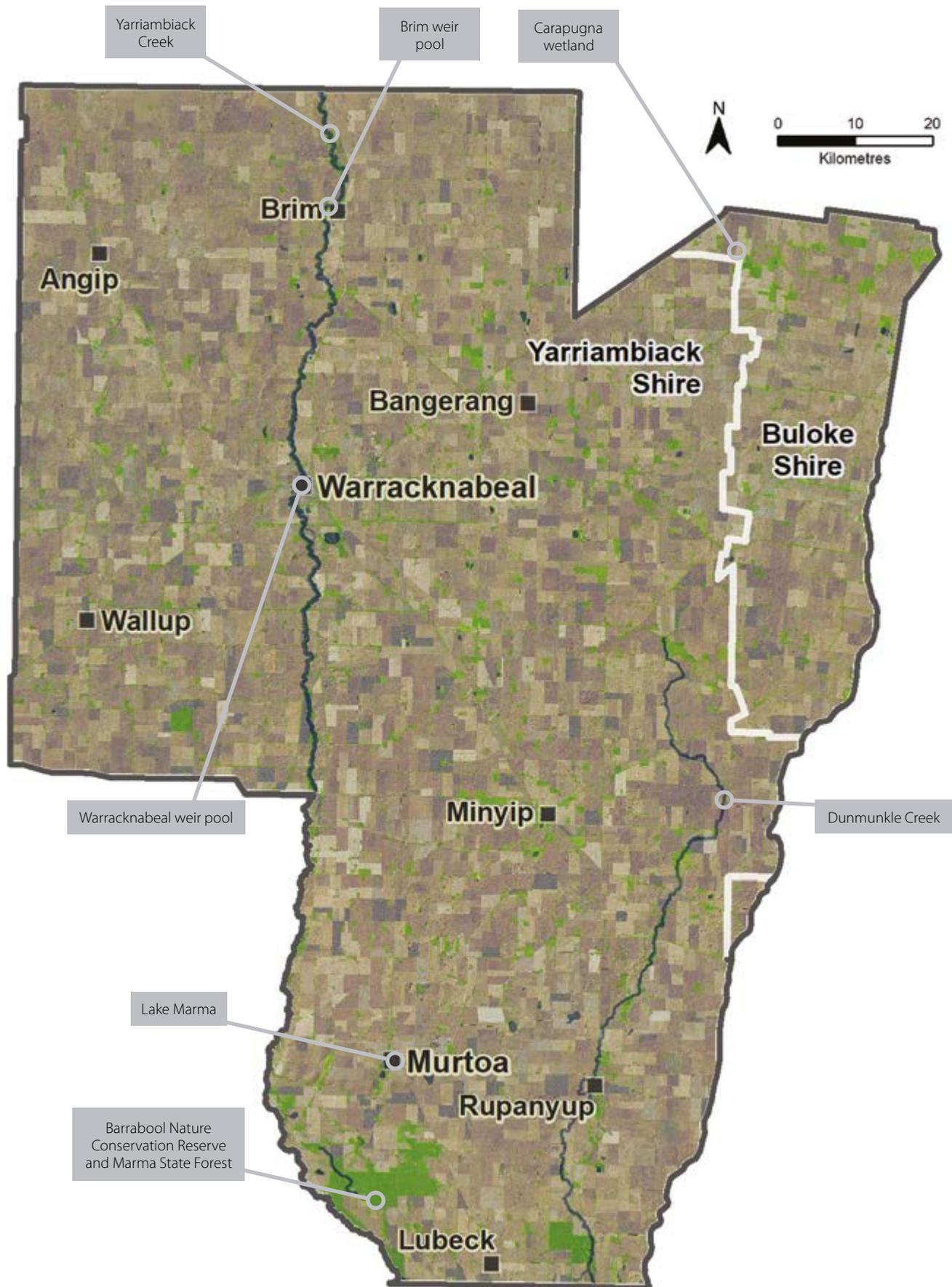
Many small, fragmented pockets of native vegetation remain on private land and roadsides. These are predominantly Buloke Woodlands, a threatened ecological community, and some represent the best examples of these communities in the Wimmera. There is also high-quality endangered vegetation on private land, particularly around the Barrabool and Marma state forests.

Yarrilinks is a well-established, community run, Landcare network covering the southern Yarriambiack region. It aims to improve the connectivity of native vegetation in and around the Yarriambiack and Dunmunkle Creeks and along roadsides. In some cases, Landcare groups volunteer their time in management activities around weed control. The Yarriambiack Creek Advisory Group focuses on the integrated management of the Yarriambiack Creek across the Wimmera and Mallee CMA areas. The group has a keen interest in providing permanent water at towns along the creek.

The Birchip Cropping Group and Victorian No-Till Farmer's Association are two of the most active agricultural groups in the area. They both undertake a range of progressive and innovative trials to support farmers to improve productivity. Improving the environmental and economic sustainability of farms is a key focus.



Yarriambiack Creek, Warracknabeal



ASSESSMENT OF CURRENT CONDITION AND TRENDS

Rivers and streams



Reduced rainfall and surface runoff in the upper Wimmera catchment have reduced flows to downstream waterways including the Yarriambiack Creek and Dunmunkle Creek. Given that natural flows are infrequent, water provided by stormwater and the Wimmera Mallee

Pipeline is vital for providing environmental benefits and wellbeing benefits to local communities.

Remnant vegetation is present along most of Yarriambiack Creek and Dunmunkle Creek's lengths. The overall health of the riparian vegetation along the Yarriambiack Creek is very good, with the dominant Black Box (*Eucalyptus largiflorens*) and River Red Gum (*Eucalyptus camaldulensis*) overstorey being very healthy despite ongoing dry conditions. There is good connectivity from the headwaters to the lower catchment. Landholders, Landcare and Greening Australia have completed extensive revegetation projects, enhancing connectivity, often under the Yarrilinks Landcare Network banner.

All the Ecological Vegetation Classes along the Dunmunkle Creek are endangered in the Wimmera Bioregion and many along the Yarriambiack Creek are endangered or vulnerable. Weeds are also present, dominated by annual grasses with some noxious weeds present including African boxthorn (*Lycium ferocissimum*), Bathurst burr (*Xanthium spinosum*), horehound (*Marrubium vulgare*) and prickly pear cactus (*Opuntia*). Grazing by stock is impacting the quality of understorey in places along both creeks. Rubbish dumping and rabbits have also been observed in places. ^{(87) (88)}

The Dunmunkle Creek suffered modifications in the 1880s and 1900s to provide an efficient channel delivery system distributing water to farms as part of the Wimmera-Mallee Stock and Domestic Supply System. Channelisation, realignment, removal of large woody debris and progressive enlargement of the channel have significantly damaged the integrity of the creek.

Since the replacement of the channel supply system with the Wimmera Mallee Pipeline around 2010, community members have raised concerns about the ongoing role and management of Dunmunkle Creek. Some have expressed a need to minimise damage during floods. Some are keen to see the creek rehabilitated to a more natural waterway. These concerns have been exacerbated by flood events in the last decade that saw farm crops and parts of Rupanyup impacted. Since 2018, Wimmera CMA commissioned and completed a flood investigation, rehabilitation and restoration plan and waterway action plan in consultation with the local community. These plans provide the information needed to inform decisions by the community and waterway managers about the future management of the creek.

Wetlands



There are very few wetlands in this dry agricultural landscape, with 76 wetlands recorded on public and private land, some contained in small Crown bushland reserves. Most of these wetlands are modified. An analysis of 2017 aerial photography found that half were wholly or partially covered by a crop, 29 contained a dam and 31 contained a drain or levee. Only 16 wetlands were unmodified. Most typically only fill due to local runoff during exceptionally wet conditions. Climate change, dry years, modifications to the wetland basin and drainage and improvements to paddock management has seen their frequency of filling decline.

About 10 wetlands are supplied with water from the Wimmera Mallee Pipeline when allocations are sufficient. Ecological surveys have found that these wetlands contain a surprising diversity of native flora and fauna, including threatened species, despite their isolation and size. ⁽⁷³⁾

Individual landholders have also used GMMWater allocations to fill small frog ponds to support wildlife.

Land



The gross value of agricultural commodities in 2015-16 was \$103 million of which \$68 million was from broadacre crops, \$20 million from livestock, \$8 million from hay and \$7 million from livestock products. This compares with \$216 million in 2010-11. The difference is

explained by a cropping income of around \$191 million in 2010-11. Variations are likely to be due to seasonal conditions affecting yield and commodity prices, with 2015 representing a particularly dry year.

Soils in this Local Area are highly susceptible to wind erosion, surface and subsurface alkalinity, compaction, surface and subsurface sodicity. ⁽⁸⁹⁾ Annual cropland management transect analysis indicates that between 1996 and 2009, there was a clear trend towards increased stubble retention peaking at 83% of paddocks in 2009. Since the Millennium Drought, stubble retention and removal rates have become more variable. More stubble is being removed by burning and cultivation in the autumn following a wet season due to issues associated with heavy stubble loads. For example, less than 2% of the surveyed area had stubbles removed by burning and cultivation in 2015 and 2016 following low rainfall growing seasons, while in 2014 and 2017 it increased to 18% and 13% respectively.

Biodiversity



The Victorian Land Use Time Series shows that over the period 1985-90 to 1990-95, there was a 13,540 hectare decline in native grass herb and 1,136 hectare decline in scattered native trees. Dryland cropping increased by 15,000 hectares over the same period. Land use has remained relatively stable since then. Only 10% of the local area contains native vegetation and remaining vegetation is significant for providing habitat to allow species to persist in the landscape. Roadsides contain some of the last significant remnants of native vegetation, often on 3 and 5 chain roads.

The remnant patches of vegetation along creeks and roadsides provide important habitat, refuge and connectivity for native species, including threatened species in this largely cleared agricultural area. Maintaining and improving the integrity of these remnants will become increasingly important under climate change scenarios due to increased rainfall, fires, droughts or other climate variability.

The buloke woodlands community is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, existing in small (<200 hectares) and isolated patches. There are few good quality remnants remaining with the associated understorey often missing. Ongoing degradation through weed and rabbit invasion and grazing continues.

Many landholders have used Wimmera CMA's assistance to improve the management of buloke woodlands as well as riparian areas along the Yarriambiack and Dunmunkle Creeks. Further efforts are required to connect remnant vegetation in reserves and private land using roadsides.

Silo art at Sheep Hills



MAJOR THREATS AND DRIVERS OF CHANGE

Climate change is a significant threat to natural assets and soil health in the Yarriambiack Local Area. Climate change is impacting on flows to Yarriambiack Creek, Dunmunkle Creek and scattered wetlands. This impacts on the frequency, volume and quality of water in these waterways and in turn affects environmental condition, recreational values and community wellbeing.

Hotter and drier conditions also place increased stress on the health of waterways, fragmented native habitat remnants and wildlife in the Yarriambiack Local Area. The behaviour of problem weeds may also change, with incursions of new problem weeds and the spread of existing weeds likely under changed climate scenarios.

Climate change also has a strong influence on farming practices, with many farmers adapting management techniques and technology to retain soil moisture with drier growing seasons.

Wind erosion of valuable topsoil is an ongoing threat, with the potential to be exacerbated by climate change if ground cover is low and conditions are dry. The threat of soil erosion has significantly decreased over the past two decades, with most farmers adapting practices to retain ground cover throughout the year. This threat increases following high rainfall growing seasons when more paddocks are burnt or cultivated to remove heavy stubbles in autumn prior to sowing. This leaves soils vulnerable to erosion until cover of the new crop is established.

Threats to scattered patches of remnant vegetation and linear sections along creeks and roadsides include weed incursions, stock access and fragmentation. Rabbits and kangaroos also place pressure on vegetation regeneration and growth. Incremental loss of native vegetation has been observed, including loss of paddock trees and grasslands by fire or machinery, roadside firewood collection and cropping of roadsides.

Increased access to creeks and wetland and bushland reserves has the potential to impact on the biodiversity, water quality and amenity of these sites. The community has a strong desire to access public natural areas, particularly creeks and lakes, for recreation and to attract tourists. This access needs to be managed so it is safe and does not impact on environmental condition or amenity.

DESIRED OUTCOMES FOR THE FUTURE

Outcomes to be achieved in 20+ years

1. Habitat condition and connectivity is enhanced along the Yarriambiack Creek, Dunmunkle Creek and between patches of remnant habitat.
2. Soils support productive agriculture and healthy, functioning natural environments.
3. Significant vegetation and species persist in the Yarriambiack landscape.

Outcomes to be achieved in 6 years

1. The condition of remnant buloke woodlands is protected and improved.
2. Most paddocks have at least 70% ground cover maintained throughout the year.
3. More farmers use management practices that improve environmental health.
4. The geomorphology and habitat of Dunmunkle Creek is restored to a more natural waterway.
5. No new pest plant and animals are established beyond small, localised populations.
6. Water delivered to wetlands, drought refuges and pools in Yarriambiack Creek and Dunmunkle Creek maintain environmental, cultural, social and economic values.
7. Alternatives to stubble burning and cultivation following wet seasons are explored.
8. Improve habitat quality and manage the impacts of recreation and access to waterways and public reserves, including Yarriambiack Creek, Dunmunkle Creek and Barrabool Flora and Fauna Reserve.

PRIORITY DIRECTIONS

Integrated catchment Management in this area will focus on:

- Barengi Gadjin Land Council (BGLC), farmers, Landcare groups, government agencies, Wimmera CMA and stakeholder organisations working together to build corridors of well managed vegetation between private and public land, particularly the Yarriambiack Creek, Dunmunkle Creek and wetlands and remnant native buloke and box woodlands.
- Landcare groups, Wimmera CMA, Agriculture Victoria, BGLC and farmers working together to improve knowledge and techniques that balance ground cover, farm profitability and improved environmental outcomes.
- Community groups, BGLC, Yarriambiack Shire Council, Wimmera CMA and government agencies working together to add value to recreational water bodies through a combination of environmental improvements and improved management of recreation, access and impacts.



Remnant vegetation and wildflowers on a Yarriambiack roadside



Monitoring and reporting

Wimmera CMA will coordinate regional monitoring and reporting that focuses on assessing progress towards the RCS's 20-year and 6-year outcomes.

Victorian CMAs and DELWP have developed an Outcomes Framework, 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. Improved consistency in reporting across the state will also help demonstrate how local and regional-scale contributions achieve state wide outcomes. The state wide RCS Outcomes Framework can be viewed at Appendix 4.

The region's progress towards achievement of the RCS's outcomes will be monitored using outcome indicators specified in the Outcomes Monitoring Plan for the Wimmera RCS. Progress towards RCS implementation will be reported regularly in accordance with the Outcomes Monitoring Plan.

Mid-term and final reviews of the RCS also provide robust processes to monitor and report on implementation.

The Outcomes Monitoring Plan for the Wimmera RCS will be available for downloading from Wimmera CMA's website (www.wcma.vic.gov.au) once it is finalised in 2021.



Review of the Wimmera RCS

Reviewing the RCS is an important step in ensuring effective implementation and identifying improvements.

Wimmera CMA will coordinate reviews of the RCS mid-way through its life and at the end of its life.

A review after three years will evaluate the RCS's effectiveness and identify minor changes for immediate action or decisions regarding dealing with more substantial issues.

This mid term review will report on progress towards achieving the RCS's desired 6-year and 20 year outcomes.

There will be a major review including extensive community consultation after six years.

Both the mid-term and final reviews will look back to the overall effectiveness of the RCS, and forwards, with recommendations for the future.



Partners

Achievement of the Wimmera Regional Catchment Strategy's outcomes is dependent on the collaborative effort of all parties involved in integrated catchment management.

The following table identifies implementation partners and their core functions of relevance to the RCS. The responsibilities of individual organisations in implementing the Wimmera RCS will be further articulated through collaborative development of detailed action plans. This approach is based on the principle of delivering efficient and effective services and reducing duplication.

Implementation partners	RCS roles and responsibilities
Aboriginal Victoria	Administers the <i>Victorian Aboriginal Heritage Act 2006</i> and works with Traditional Owners to protect and manage Victoria's Aboriginal cultural heritage. Provide advice and expertise on areas of interest to the local Aboriginal community and natural resource management programs, including in areas outside existing Registered Aboriginal Party boundaries.
Agricultural extension and industry groups: Perennial Pasture Systems, Birchip Cropping Group, Victorian No-Till Farmers Association	Farmer-led organisations supporting peer learning and practical information on best management techniques for soil conservation and productivity benefits in local conditions.
Australian Government Department of Agriculture, Water and the Environment	Purpose is to partner and regulate to enhance Australia's agriculture, unique environment and heritage, and water resources. Develops and administers national agriculture, environment and water related policies and investment programs. Has a role in the purchase of environmental water and listing threatened species and ecological communities.
Barengi Gadjin Land Council Aboriginal Corporation	Trustee for the Native Title rights and interests of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagulk peoples, collectively known as the Wotjobaluk peoples as recognised in the Consent Determination in 2005. Registered Aboriginal Party under the <i>Victorian Aboriginal Heritage Act 2006</i> .
Centre for Participation	Regional organisation providing programs, services and facilities to empower people of all ages to actively participate in their communities through local opportunities in community support, volunteering, learning and partnerships.
Committees of management of Crown land reserves (delegated responsibility by the government to manage crown land)	Role under the <i>Victorian Crown Land Reserves Act 1978</i> is to "manage, improve, maintain and control" Crown land reserves that have been set aside for the benefit of the people of Victoria. Reserves support amenities and uses such as public halls, showgrounds, gardens, bushland, caravan parks, foreshores, sporting facilities, playgrounds, swimming pools, walking tracks and rail trails.
Commonwealth Environmental Water Holder	Responsible for managing water entitlements acquired by the Australian Government. These water entitlements are used in the Murray-Darling Basin to protect and restore environmental assets.
Conservation Volunteers Australia	Recruits and volunteers around Australia and across the world to support participation in diverse projects to protect and enhance the natural environment.
Education sector, including Victorian Government Department of Education and Training, teachers and schools, Federation University Australia, Charles Sturt University and Longerenong College	Deliver education and development support and services to children, young people and adults. Implement Victorian Government policy in government schools, early childhood services, non-government schools, training programs and higher education services. Also provides climate change and agricultural education services.
Victorian Government Department of Environment, Land, Water and Planning (DELWP)	Brings together climate change, energy, environment, water, forests, planning and emergency management functions to maximise connections between the environment, community, industry and economy.
Victorian Government Department of Jobs, Precincts and Regions, including Agriculture Victoria	Purpose is focused on growing Victoria's economy and ensuring it benefits all Victorians - by creating more jobs for people, building thriving places and regions, and supporting inclusive communities. Agriculture Victoria works with the agriculture industry on research, development and extension to improve production, connect the sector with international markets, support development and maintain effective biosecurity controls.

Implementation partners	RCS roles and responsibilities
Eastern Maar Aboriginal Corporation	Manages native title rights for the Eastern Maar people. Registered Aboriginal Party for Eastern Maar Country and currently negotiating a Recognition and Settlement Agreement under the <i>Traditional Owner Settlement Act 2010</i> .
Emergency Services, such as Victorian State Emergency Services, Country Fire Authority, DELWP, Victoria Police, Department of Jobs, Precincts and Regions, Department of Health and Human Services	Responsible for leading relevant emergency responses in accordance with the <i>Victorian Emergency Management Act 1986</i> . Collaboration occurs in times of emergency, including flood, fire and pest plague.
Environment Protection Authority Victoria	Responsible for the prevention and control of air, land and water pollution and industrial noise.
Goolum Goolum Aboriginal Cooperative	Recognised as the principal Aboriginal Community Controlled Health Organisation within the local government areas of Horsham, Northern Grampians, Hindmarsh, West Wimmera, Ararat and Yarriambiack. Aims to provide effective health, welfare and family services to the local Aboriginal community.
Greening Australia	Engages the community in vegetation management to protect and restore the health, diversity, and productivity of Australian landscapes.
Grampians Wimmera Mallee Water (GWMWater)	Responsible for managing groundwater and surface water resources, including water and wastewater services and associated infrastructure. GWMWater also coordinates blue-green algae management in the catchment.
Landcare Networks	Hindmarsh Landcare Network, Project Platypus and Yarrilinks Landcare Network are community-based organisations that provide support to Landcare Groups and landholders in their local areas through leadership, planning and resources.
Landcare Victoria Incorporated	Independent representative body for Landcare in Victoria. Exists to secure increased recognition, resourcing and support for Landcare. Serves the broader Landcare community within Victoria and represents paid members.
Landholders	Manage and influence natural assets on private land. Many conserve natural assets, manage land and implement sustainable farming practices to prevent off-site impacts.
Local farming, conservation and waterway protection groups: Landcare groups, "Friends of" groups, river improvement committees, Waterwatch groups	Local environmental volunteering groups whose focus includes capacity building and undertaking on-ground natural resource management works such as invasive plant and animal control, revegetation, waterway monitoring and improving farming practices at a local scale.
Local Government: Ararat Rural City Buloke Shire Hindmarsh Shire Horsham Rural City Northern Grampians Shire Pyrenees Shire West Wimmera Shire Yarriambiack Shire	Responsible for local services including emergency management such as response and recovery, transport and infrastructure, planning and building such as land use planning, economic development, public open space and recreation planning and environmental conservation relevant to local government.

Implementation partners	RCS roles and responsibilities
Murray-Darling Basin Authority	Independent statutory authority responsible for planning the Murray-Darling Basin's water resources in the interest of the Basin as a whole.
Parks Victoria	<p>Parks Victoria is a statutory authority established to protect, conserve and enhance Parks Victoria managed land, including its natural and cultural values, for the benefit of the environment and current and future generations consistent with the Parks Victoria Act 2018. The Wimmera catchment includes almost 290,000 hectares managed by Parks Victoria.</p> <p>Parks Victoria's state-wide Land Management Strategy (in preparation in 2021) sets the direction for Parks Victoria's land management including nature conservation, cultural heritage management and visitor management and services. Parks Victoria works closely with Traditional Owners, other agencies and the community to continuously improve its capacity to deliver large-scale programs and on-ground actions to protect and manage the best of Victoria's natural assets, throughout the Parks estate.</p>
Regional Development Victoria	Lead Victorian Government agency for rural and regional economic development. 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.
Research institutions such as the Commonwealth Scientific and Industrial Research Organisation, and Universities	Provide scientific evidence on the condition of natural assets and information and advice on appropriate management tools and directions.
Soils Cooperative Research Centre	Engage with farmers to ensure they can optimise their productivity, yield and profitability on complex soils to ensure long-term sustainability of farming businesses.
Trust for Nature	Responsible for helping people protect biodiversity on private land. This includes conservation covenants, land management stewardship, Revolving Fund program, land ownership and management and assistance in arranging native vegetation offsets.
Victorian Environmental Water Holder	Responsible for holding and managing Victoria's environmental water entitlements. Work with CMAs to ensure environmental water entitlements are used to achieve the best environmental outcomes with available water.
Wimmera Catchment Management Authority	Responsible for strategic planning and coordinating actions, monitoring and reporting to improve the management of land, water and biodiversity. Responsible for coordinating regional investment in integrated catchment management. Provides a link between the Wimmera community, Victorian and Australian Governments. Carries out several statutory functions including floodplain management and delivery of water for the environment.
Wimmera Development Association	Works with community and governments in Western Victoria to attract new investment, further develop existing business and promote the Wimmera's sustainable development opportunities.



Development of the Wimmera RCS

Wimmera CMA led the development of the Wimmera RCS with valuable contributions from a range of partner organisations, groups and individuals with interests and expertise in integrated catchment management.

A review of the Wimmera Regional Catchment Strategy 2013-19 was completed in 2019 following a series of meetings with partner and stakeholder organisations and groups. Meetings discussed feedback on the existing strategy and focused on looking forward, identifying regional and Local Area priorities, challenges and issues.

Following the review, the steps taken to develop the Wimmera RCS included:

1. During 2020, Wimmera CMA staff developed working drafts, collating a range of information and evidence and discussing content with stakeholders.
2. In February and March 2021, a Stakeholder Consultation Draft was provided to a range of partner and stakeholder organisations and groups. The Wimmera CMA Board's Business and Planning Committee also reviewed this draft.

3. Wimmera CMA refined the draft RCS, incorporating feedback on the Stakeholder Consultation Draft, and continuing to work with stakeholders where necessary.
4. A full draft was released for public consultation from 31 March until 3 May 2021. The draft was also provided to partner and stakeholder organisations and groups for further comment.
5. Following the public consultation period, Wimmera CMA revised the draft taking into consideration the feedback provided by the community and partner and stakeholder organisations.
6. Wimmera CMA's Board approved the final RCS in June 2021.

The final Wimmera Regional Catchment Strategy was submitted to the Ministers responsible for administering the *Victorian Catchment and Land Protection Act 1994* in June 2021 for their consideration. This includes the Minister for Energy, Environment and Climate Change and Minister for Water.

References

1. Barengi Gadjin Land Council. Growing What is Good Country Plan. Voices of the Wotjobaluk Nations. Horsham: Barengi Gadjin Land Council, 2017.
2. Australian Bureau of Statistics. Agricultural Data - 2005-06, 2010-11 and 2015-16. Canberra: Australian Bureau of Statistics, 2020.
3. Wimmera Primary Care Partnership. Population Health and Wellbeing Profile. Horsham: s.n., 2016.
4. Curtis, Allan and Mendham, Emily. The Social Drivers of Natural Resource Management: Wimmera. Wagga Wagga: Charles State University, 2017.
5. Bureau of Meteorology and CSIRO. Regional Weather and Climate Guide: A climate guide for agriculture: Wimmera, Victoria. Melbourne: Bureau of Meteorology and CSIRO, 2019.
6. Street Ryan Pty Ltd . Wimmera Southern Mallee Socio-Economic Value of Recreational and Environmental Water. Horsham: Wimmera Development Association, 2017.
7. Department of Environment, Land, Water and Planning, Bureau of Meteorology, Commonwealth Scientific and Industrial Research Organisation and the University of Melbourne. Victoria's Water in a Changing Climate. Melbourne: s.n., 2020.
8. Morris, K, Kitchingman, A and Cornell, G. Investigating Priorities for Wetland Connectivity in the Wimmera CMA Region. Melbourne: Department of Environment, Land, Water and Planning, 2020.
9. Department of Agriculture, Water and the Environment. Directory of Important Wetlands in Australia b. Australian Government Department of Agriculture, Water and the Environment. [Online] 10 March 2021. [Cited: 10 March 2021.] <https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands>.
10. Wimmera CMA. Analysis of wetland modifications in the Wimmera CMA region. Horsham: Wimmera CMA, 2021.
11. Sinclair Knight Merz. Wetland Extent and Drainage Line Mapping Project. Horsham: Wimmera CMA, 2006.
12. Water's Edge Consulting. Wimmera Wetland Condition Assessment Project. Horsham: Wimmera CMA, 2005.
13. Department of Environment and Primary Industries. Index of Stream Condition: The Third Benchmark of Victorian River Condition. Water Reporting. [Online] 2013. <https://www.water.vic.gov.au/water-reporting/third-index-of-stream-condition-report>.
14. Cook, David. Report on Tree health and Regent Parrot Survey at Lake Albacutya. Chewton: Rakali Ecological Consulting, 2019.
15. Water Technology. Wimmera Wetland Hydrology Investigation. Horsham: Water Technology, 2019.
16. Sinclair Knight Merz. Indicative Assessment of Climate Change Vulnerability for Wetlands in Victoria. Melbourne: Department of Sustainability and Environment, 2012.
17. URS. West Wimmera Socio-Economic Study. 2009.
18. GWMWater. West Wimmera Groundwater Management Strategy. Horsham: GWMWater, 2011.
19. GWMWater. West Wimmera Local Management Plan. Horsham: GWMWater, 2019.
20. GWMWater. Wimmera Catchment Surface Water and Groundwater Local Management Plan. Horsham: GWMWater, 2018.
21. Wimmera CMA. Carbon Ready Plan. Horsham: Wimmera CMA, 2016.
22. Agriculture Victoria. Wimmera Southern Mallee: Invest in Agriculture and Food. Melbourne: Department of Economic Development, Jobs, Transport and Resources, 2018.
23. Towards 10,1000 Economic Development Strategy. Pyrenees Shire Council. Beaufort: Pyrenees Shire Council, 2020.
24. Jeffery, Michael. First Report to the Minister for Agriculture. Canberra: National Advocate for Soil Health, 2012.
25. Department of Environment, Land, Water and Planning. Victoria's Land Cover Time Series: Summary by location statistics. Melbourne: Department of Environment, Land, Water and Planning, 2020.
26. Pitchard, Felicity and Robson, Susan. Northern Wimmera Cropland Management Survey: Autumn 2019. Horsham: Department of Economic Development, Jobs, Transport and Resources, 2019.
27. Clarke, JM, et al. Wimmera Southern Mallee Climate Projections 2019. Melbourne: CSIRO, 2019.
28. Commissioner for Environmental Sustainability. Land: Scientific Assessments Part III. Melbourne: Australia State of Environment 2016, 2018.
29. Centre for Water and Landscape Dynamics. Australia's Environment in 2019. Australia's Environment Report Card Wimmera. [Online] Fenner School of Environment & Society, Australian National University, 02 October 2019. http://wenfo.org/aer_pdf/NRM_Regions_2017/Wimmera.pdf.
30. Leys, JF, et al. Setting Targets for National Landcare Program Monitoring and Reporting Vegetation Cover for Australia. Sydney: Department of Planning, Industry and Environment, 2020.
31. GEOGLAM RAPP Map. Total Vegetation Cover: Soil Protection Region NRM Wimmera . Victoria: Data 61, 2020.

32. Barson, M. Land Management Practice Trend in Victoria's Grazing (beef cattle/sheep) Industries, Caring for our Country Sustainable Practices Fact Sheet 12. Canberra: Department of Agriculture, Fisheries and Forestry, 2013.
33. Wimmera CMA. Wimmera Regional Salinity Action Plan 2005-2010. Horsham: Wimmera CMA, 2005.
34. Parks Victoria. Conservation Action Plan for parks and reserves managed by Parks Victoria - Wimmera. Melbourne: Parks Victoria, 2018.
35. Department of Environment, Land, Water and Planning. Victorian Biodiversity Atlas. Biodiversity. [Online] Department of Environment, Land, Water and Planning, 2020. [Cited: 11 December 2020.] <https://vba.dse.vic.gov.au/vba/#/>.
36. Department of Environment, Land, Water & Planning. NatureKit. Biodiversity. [Online] 2020. <https://maps2.biodiversity.vic.gov.au/Html5viewer/index.html?viewer=NatureKit>.
37. Department of Environment, Land, Water & Planning. Conservation Status Assessment Project. Department of Environment, Land, Water & Planning. [Online] 25 11 2020. [Cited: 03 04 2021.] <https://www.environment.vic.gov.au/conserving-threatened-species/conservation-status-assessment-project>.
38. Grampians Tourist Board Inc. Grampians Tourism 2016-2020 Strategic Plan. Halls Gap: Grampians Tourism Board Inc., 2016.
39. Merriam-Webster. Habitat. [Online] 2020. <https://www.merriam-webster.com/dictionary/habitat>.
40. Merriam-Webster. Dictionary. Merriam-Webster . [Online] [Cited: 02 03 2021.] <https://www.merriam-webster.com/dictionary/habitat>.
41. Department of Environment Land Water and Planning. Bioregions and EVC benchmarks. Department of Environment Land Water and Planning. [Online] [Cited: 02 03 2021.]
42. Department of Environment, Land, Water & Planning. Native Vegetation - Modelled 2005 Ecological Vegetation Classes (with Bioregional Conservation Status). [Spatial Data Set] Melbourne: s.n., 2018. ANZVI0803003495 .
43. Blake, Adam. Personal Communication. Horsham: s.n., 2020.
44. Geyle, H., et al. Evaluation of camera placement for detection of free-ranging carnivores; implications for assessing population changes. [Online] 2020. <https://doi.org/10.1002/2688-8319.12018>.
45. Predator and herbivore occupancy and habitat use in response to fox baiting in the Little Desert, Victoria. Thorpe, Mary. s.l. : B.Environmental Science (Hons) thesis, School of Life and Environmental Sciences, Deakin University., 2020, Honours Thesis, Deakin University.
46. Department of Environment, Land, Water and Planning. Victorian Deer Control Strategy. Melbourne: Department of Environment, Land, Water and Planning, 2020.
47. Threatened Species Recovery Hub. Managing impacts of feral and over-abundant herbivores on threatened species and ecological communities. National Environmental Science Programme. [Online] 20 01 2021. <https://www.nespthreatenedspecies.edu.au/projects/managing-impacts-of-feral-and-over-abundant-herbivores-on-threatened-species-and-ecological-communities>.
48. Moloney, P D, Ramsey, D S.L and Scroggie, M P. State-wide abundance of kangaroos in Victoria: results from the 2018 aerial survey. Heidelberg: Arthur Rylah Institute for Environmental Research Technical Report Series No. 296. Department of Environment, Land, Water and Planning, 2018.
49. Scroggie, M P and Ramsey, D S.L. Kangaroo harvest quotas for Victoria, 2020. Heidelberg: Arthur Rylah Institute for Environmental Research Technical Report Series No. 308. Department of Environment, Land, Water and Planning, 2019.
50. Bennett, Kelsey. Population monitoring of the South-eastern Red-tailed Black Cockatoo - Flock count Report 2020. Melbourne: BirdLife Australia, 2020.
51. National Malleefowl Recovery Group. Malleefowl Monitoring in the Wimmera CMA region, Victoria: 2019/20 Season. s.l. : National Malleefowl Recovery Group, 2020.
52. Griffiths, Josh, Song, Sue and Weeks, Andrew. Platypus distribution, relative abundance and genetic health in the MacKenzie River 2018. Melbourne: cesar, 2018.
53. Hale, Susan, et al. Fire and climatic extremes shape mammal distributions in a fire-prone landscape. Diversity and Distributions. 2016, <https://doi.org/10.1111/ddi.12471>.
54. Protecting micro-refugia through small-scale winter burns: The Wannon heathland experimental burn system. White, J., et al. Melbourne : Deakin University , 2020.
55. Holmes, Ben, et al. Little Desert Nature Lodge small mammals and reptile surveys. Unpublished data. Horsham: s.n., 2021.
56. Climate change-induced vegetation shifts lead to more ecological droughts despite projected rainfall increases in many global temperate drylands. Tietjen, Britta, et al. doi: 10.1111/gcb.13598, s.l.: Global Change Biology, 2017, Global Change Biology.
57. Attribution of the Australian bushfire risk to anthropogenic climate change. van Oldenborgh, G. J., Kriksen, F., et al. s.l. : Natural Hazards and Earth System Sciences, 2020, Natural Hazards and Earth System Science.

58. Scattered trees are keystone structures – Implications for conservation. Manning, Adrian D, Fisher, Joern and Lindenmayer, David B. 3, s.l.: Biological Conservation, 2006, Biological Conservation, Vol. 132, pp. (132) 311-321.
59. The disproportionate value of scattered trees. Stott, Jenny, Fisher, Joern and Law, Bradley S. 6, s.l.: Biological Conservation, 2010, Biological Conservation, Vol. 143, pp. (143) 1564-1567.
60. National Environmental Science Programme Threatened Species Recovery Hub. Reserch finding factsheet - The impact of cats in Australia. s.l.: National Environmental Science Programme Threatened Species Recovery Hub, 2020.
61. Saunders, G and McLeod, L. Improving Fox Management Strategies in Australia. Canberra: Bureau of Rural Sciences, 2007.
62. Deakin University and Park Victoria. Grampians Ark Predator Monitoring Protocol - Final Report. Melbourne: Deakin University, 2018.
63. Department of Environment, Land, Water and Planning . NaturePrint and Strategic Management Prospects (SMP). Biodiversity. [Online] 3 October 2020. <https://www.environment.vic.gov.au/biodiversity/natureprint>.
64. Parks Victoria. Annual Catchment Condition Report. Horsham: Wimmera CMA , 2020.
65. Trust for Nature. The Statewide Conservation Plan for Private Land in Victoria. Melbourne: Trust for Nature, 2013.
66. The Department of Environment, Land, Water and Planning. Protecting Victoria's Environment - Biodiversity 2037. Melbourne: The State of Victoria Department of Environment, Land, Water and Planning, 2017.
67. Hughes, N, Galeano, D and Hattfield-Dodds, S. The Effects of Drought and Climate Variability on Australian Farms. Canberra: Australian Bureau of Agricultural Resource Econmics and Sciences, 2019.
68. Australian Bureau of Statistics. 2016 Census QuickStats. Australian Bureau of Statistics. [Online] 11 March 2021. https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC20979?opendocument.
69. Department of Agriculture, Water and the Environment. Directory of Important Wetlands in Australia - Information sheet. Department of Agriculture, Water and the Environment. [Online] Australian Government, 2021. [Cited: 26 February 2021.] <http://www.environment.gov.au/cgi-bin/wetlands/report.pl>.
70. Birdlife Australia. Key Biodiversity Areas (KBAs) - Nature's Hotspots. Birdlife Australia. [Online] 2021. [Cited: 2021 February 26.] <https://birdlife.org.au/projects/KBA>.
71. Earthwatch Australia. Bush Blitz Little Desert National Park 2019. Bush Blitz Adventure Portal. [Online] 2020. [Cited: 26 February 2021.] <https://www.earthwatch.org.au/bush-blitz-little-desert-national-park-2019#:~:text=Little%20Desert%20National%20Park%20supports%20quite,a%20rich%20biodiversity%20of%20plants%20and%20animals>.
72. Victorian National Parks Association. Lessons from the Little Desert. [Online] 2021. [Cited: February 26 2021.] <https://vnpa.org.au/lessons-little-desert/>.
73. Wimmera CMA. Wimmera Waterway Strategy 2014-2022. Horsham Wimmera CMA, 2014.
74. SBP. Horsham Rural City Council Open Space Strategy. Horsham: Horsham Rural City Council, 2019.
75. Wimmera CMA. Wimmera River Fishing Competition Results. Horsham: Wimmera CMA, 2020.
76. cesar. Platypus distribution and relative abundance in the MacKenzie River. Parkville: Wimmera CMA, 2019.
77. Sykes, David, Department of Environment, Land, Water and Planning. Personal Communication. Horsham: s.n., 2020.
78. Parks Victoria. Greater Gariwerd Draft Landscape Management Plan. Melbourne: Parks Victoria, 2020.
79. Department of Environment, Land, Water and Planning. Bioregions and EVC Benchmark. Biodiversity. [Online] May 2020. <https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks>.
80. ID&A Pty Ltd. Wimmera River Geomorphic Investigation, Sediment Sources, Transport and Fate. Horsham: ID&A Pty Ltd, 2004.
81. Shea, Rob. Personal Communication. Horsham: s.n., 2020.
82. Agriculture Victoria. Southern Wimmera Cropland Management Transect Survey. Horsham: Agriculture Victoria, 2019.
83. Project Platypus. Grampians to Pyrenees Biolink Conservation Action Plan. s.l. : Project Platypus, 2016.
84. Agriculture Victoria. Annual Catchment Condition Report. Horsham: Wimmera CMA, 2019.
85. McIntyre, L. Personal Communication. Horsham: s.n., 2020.
86. Climate change impacts on Australian Viticulture. L.B. Webb, P.H. Whetton, E.W.R. Barlow. Aspendale: s.n., 2007.
87. Alluvium. Yarriambiack Creek Waterway Action Plan. Horsham: Wimmera CMA , 2018.
88. Water Technology. Dunmunkle Creek Waterway Action Plan. Horsham: Wimmera CMA, 2020.
89. Wimmera CMA. Wimmera Soils Health Asset Strategy. Horsham: Wimmera CMA, 2011.

Acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics
BGLC	Barengi Gadjin Land Council Aboriginal Corporation
<i>CaLP Act</i>	<i>Catchment and Land Protection Act 1994</i>
CMA	Catchment Management Authority
DELWP	Department of Environment, Land, Water and Planning
<i>EPBC Act</i>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Classes
<i>FFG Act</i>	<i>Flora and Fauna Guarantee Act 1988</i>
GMA	Groundwater Management Area
GWMWater	Grampians Wimmera Mallee Water
ICM	Integrated Catchment Management
IUCN	International Union for Conservation of Nature and Natural Resources
PCV	Permissible Consumptive Volume
Ramsar	The “Ramsar Convention” is a treaty for the conservation of internationally significant wetlands
RCS	Regional Catchment Strategy
SMP	Strategic Management Prospects
WWSC	West Wimmera Shire Council

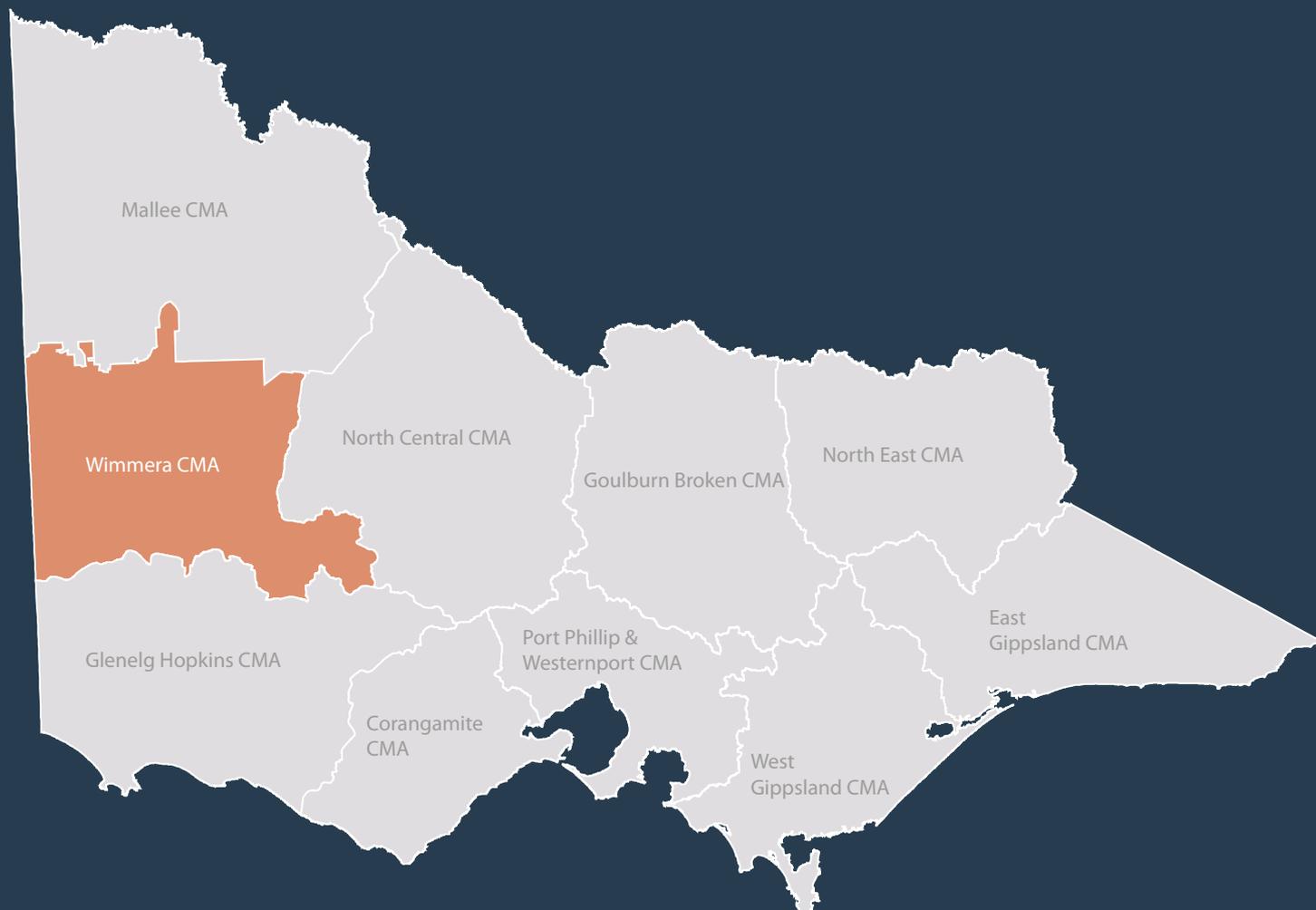
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Wimmera CMA is one of 10 CMAs working in Victoria under an integrated catchment management approach to achieve sustainability across the state.

Each CMA supports the role that communities and government play in protecting and enhancing local natural environments.



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