



Glenelg Hopkins
**REGIONAL
CATCHMENT
STRATEGY**
2013 - 2019

CONTENTS

Vision.....	1	Wetlands.....	29
Chair’s Foreword.....	2	Estuaries.....	34
About the Strategy.....	3	Coasts.....	38
Purpose of the Regional Catchment Strategy	3	Marine.....	43
How was the RCS developed?	3	Terrestrial Habitat.....	47
How will the RCS lead to action?	4	Species Populations and Communities.....	54
Key Principles.....	5	Soil and Land.....	57
The Glenelg Hopkins Region.....	6	Priority Areas for Intervention.....	62
Physical Environment	7	Significant Risks to Assets.....	64
Social Profile	9	Implementing the Strategy.....	66
Economic Profile	10	Monitoring Evaluation and Reporting.....	73
Cultural History	10	Appendix 1: RCS Development Process.....	75
Cultural Knowledge	11	Appendix 2: Roles and Responsibilities for Natural Resource Management	77
Challenges and Opportunities	12	Appendix 3: Policies, Strategies and Legislation.....	78
Climate Change	12	Appendix 4: Bioregional Conservation Status for Remnant Vegetation in the Glenelg Hopkins Region.....	79
Pressures on Water Resources	13	References.....	79
Carbon Sequestration Activities	13		
Summary	13		
RCS Strategic Relationships.....	14		
Key Achievements to Date.....	15		
Thematic Asset Classes.....	19		
Community Participation.....	20		
Rivers and Floodplains.....	22		

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Front Cover: Grampians (Gariwerd) National Park is a major tourist attraction and contains around 1,000 native plant species.

Photo: Southern Grampians Shire



Photo: James Pevitt



Photo: Alison Pouliot

VISION

THE 50-YEAR VISION STATEMENT FOR THE GLENELG HOPKINS CATCHMENT IS:

.....
 “Achieving a healthy and sustainable relationship between the natural environment and the community’s use of land and water resources.”

In moving towards the vision, people of this region aim to create healthy catchments where the integrity of soils, water and biodiversity is maintained or enhanced in the face of a changing climate.

The vision over the next 50-years aims to foster an environment where:

- biodiversity thrives and clean water is available for environmental, economic and social uses
- environmental assets are valued and protected from threats, and the impacts of pest plants and animals are greatly reduced
- the community is proactive and aware, and understands that ecologically sustainable management of its natural resources is essential to a high quality of life.

Below: The vision for the RCS aims to incorporate the social, environmental, economic and cultural values for the region.



Photo: Ararat Rural City Council



CHAIR'S FOREWORD

.....

As a long-term resident of the Glenelg Hopkins region, I am proud to present the Regional Catchment Strategy (RCS). Our region is home to a magnificent coastline, outstanding national parks, rich biodiversity, and a thriving agricultural sector. Many of the region's natural assets are of national and international significance, and help to support a unique way of life.

The development of the region's third RCS marks the beginning of a new era of planning for the management of natural resources within the Glenelg Hopkins region. It establishes a 50-year vision for the region, and a series of objectives and actions required to achieve this vision. Together these provide clear direction for the many programs, including those of the CMA and of other stakeholders, that continue to improve the state of our natural resources, while contributing to increased prosperity.

The RCS renewal process has enabled us to continue working with the broader community and regional stakeholders in setting the direction for how our land, water and biodiversity resources should be managed. This RCS is based on extensive community consultation, and builds on previous work, in recognition of the long-term investment that is required to achieve a more sustainable use of our environment and its natural resources. It applies to both private and public land, and encourages and supports community participation in catchment management.

Developments in the federal sphere are contributing to some important program changes for our region. This RCS has been developed with consideration of opportunities for biodiverse carbon plantings to optimise any carbon or biodiversity related investment from market and non-market incentives. The Federal Government will support the CMA to prepare a natural resource management plan to guide many of these carbon sequestration activities. This RCS, combined with the landscape-scale connectivity foreshadowed in the Draft Australian Wildlife Corridors Plan, is likely to generate an exciting era of landscape revival within the region and contribute to improved landscape health and resilience.

The major floods of 2010-11 damaged townships, rural areas and large areas of our region. While flood recovery continues to be an important activity for this region, the major improvements that will be made as part of this strategy to improve our preparedness for, and resilience to, future floods will be of greater significance. Flood studies identifying flood levels and mitigation options are proceeding for five towns in the region, planning scheme amendments are being prepared to better include flood information in planning, municipal flood plans will be updated, and improved flood warning infrastructure is to be developed. All of these actions will be possible through increased Victorian Government support. It is appropriate for the residents of our region to enjoy the protection of a modern and effective flood management program.

This 2013-2019 RCS will span a very significant period for the region and I trust it will enable us to continue to serve the people of the Glenelg Hopkins region effectively.



Mike Wagg
Chairperson



Photo: Southern Grampians Shire

ABOUT THE STRATEGY

PURPOSE OF THE REGIONAL CATCHMENT STRATEGY

The Glenelg Hopkins Regional Catchment Strategy (RCS) 2013-2019 is the primary planning framework for land, water and biodiversity management within the Glenelg Hopkins region. It sets the direction for how the region's land, water and biodiversity resources should be managed, and is an important building block in improving the condition of those resources over time.¹

The RCS aims to provide a framework for the coordinated management of catchments, which will maintain and enhance long-term land productivity while also conserving the environment. This will ensure that the quality of land and water resources within the region and their associated plant and animal life are maintained and enhanced.

HOW WAS THE RCS DEVELOPED?

The RCS is a strategy that belongs to the region – to the people of the Glenelg Hopkins catchment. The strategy has been developed by people living and working in the area, in close consultation with the regional community, local, Victorian and Australian government representatives and other stakeholders. The RCS was developed by Glenelg Hopkins Catchment Management Authority (CMA) in partnership with many regional organisations, agencies, community groups and individuals. This is the region's third RCS, with the first published in May 1997.

The RCS was developed in accordance with guidelines from the Victorian Catchment Management Council. The Department of Environment and Primary Industries (DEPI) provided policy and advice to the CMA on expectations for sustainable use and management of land, water and biodiversity, to ensure the RCS meets appropriate standards and is consistent with those of other CMAs.

The RCS was developed using an asset-based approach. This approach provides a structured process to identify areas for priority attention and to achieve targeted outcomes. In this context, 'assets' are defined as tangible bio-physical elements of the environment that are important for their environmental, social and economic values.

Assets were defined using eight asset classes: rivers, wetlands, estuaries, coasts, marine, terrestrial habitat, species populations and communities, and soil and land. Significant assets within each asset class were identified and mapped at a scale that is appropriate for strategic planning. The Investment Framework for Environmental Resources (INFFER) process was one of the tools used for identifying and prioritising asset areas within the region. Other sources of information, including published research and relevant studies, were also considered in identifying and prioritising assets, and establishing regional management priorities.

Objectives and management measures have been set for the entire region for each asset class detailed in this strategy. The objectives that will contribute to the achievement of this vision are long-term (20-years) and provide broad direction for future action. Short-term (six-years) management measures have also been established for achievement within the life of the RCS. Delivery of these management measures is dependent on funding availability and other opportunities beyond government investment. An overview of the RCS development process is provided in Appendix 1.

ABOUT THE STRATEGY

HOW WILL THE RCS LEAD TO ACTION?

Partnerships with community, individuals and organisations within the region are the foundation for effective delivery of the RCS. The RCS encourages and supports the participation of the community, landholders and resource managers in land protection and catchment management.

The RCS provides an integrated framework for investing in and prioritising on-ground works and projects within the region. It will continue to build on the success of earlier work within the catchment and implement initiatives that will be important drivers in achieving the RCS vision.

Some ecosystems are particularly vulnerable to the impacts of climate change due to the highly modified and fragmented nature of the landscape. The objectives of the strategy are designed to improve ecosystem resilience in a changing climate by:

- maintaining and re-establishing ecosystem functions in large landscape-scale biolinks connecting high quality remnant vegetation and freshwater and estuarine ecosystems, and maintaining and improving the quality of existing habitats
- reducing threats to natural resources from pest plants and animals
- improving habitat condition for threatened species
- making the best use of environmental water
- reducing the threat of soil acidification and salinity to high-value environmental and economic assets, and improving the capability of regional soils.

The strategy seeks to maximise the biodiversity benefits of sequestering carbon in the landscape and the environmental co-benefits of these opportunities, which include improved landscape function and connectivity, establishment of wildlife corridors, biodiverse plantings and protection of remnant vegetation.

The strategy will also contribute to improved preparedness for and resilience to future floods through:

- an upgrade of the regional flood warning system
- investment in floodplain and waterway management systems
- implementation of a range of initiatives aimed at improving floodplain knowledge
- completion of a regional floodplain management strategy.

This strategy recognises that natural assets found in the region are interconnected with natural assets found in neighbouring regions and management jurisdictions such as Wimmera CMA, Corangamite CMA and South Australian natural resource management (NRM) agencies. Effective implementation of the strategy is reliant on strong and effective partnerships both within the Glenelg Hopkins region and with neighbouring CMAs and NRM bodies. Examples of cross-boundary partnership opportunities include the Grampians National Park (known to Indigenous people of the area as 'Gariwerd'), the Victorian Volcanic Plain and the Millicent Coast Basin. Key strategies for engaging with cross-boundary partners will be outlined in the RCS Community and Stakeholder Engagement Plan, which will detail engagement and communication processes for implementation of the RCS.

The RCS seeks to create close links with local government and influence the planning schemes under their control, and will be used to inform the development of Regional Growth Plans. It includes a range of measures that are designed to protect, maintain or improve the condition of the region's assets and complements the actions of targeted regional NRM strategies such as the Western Region Sustainable Water Strategy.



KEY PRINCIPLES

The RCS is underpinned by a set of principles designed to guide the implementation of the strategy (Table 1).

Principles	
Sustainable Development	A whole-of-catchment approach to natural resource management that seeks to deliver social, economic and environmental outcomes for the community and reduce our ecological footprint.
Ecological Resilience	Natural resource management should build ecological resilience and contribute to the ongoing provision of ecosystem services.
Biodiversity	Biodiversity within the Glenelg Hopkins catchment will be preserved and enhanced.
Prevention	Prevention of ecosystem damage and species decline is more cost-effective than attempting rehabilitation or recovery.
Community Empowerment	Catchment management is a partnership between community and government. Planning and implementation of natural resource management programs should maximise opportunities for community engagement. The involvement of landholders is crucial to the effective implementation of natural resource management.
Indigenous Knowledge	The skills, knowledge and perspectives of Indigenous people should be incorporated into natural resource management.
Integrated Management	Integrated catchment management is an important means of achieving sustainability of land and water resources and contributing to biodiversity management. Management of natural resources should recognise the linkages between land, water and biodiversity and that the management of one component can impact on the other.
Targeted Investment	Government and community need to ensure that resources are targeted to address priorities and deliver maximum on-ground benefits.
Accountability	Those making decisions on natural resource management should be clearly accountable to government and the community, both in a financial sense and for biophysical outcomes.
Administrative Efficiency	To maximise on-ground results, catchment management structures should facilitate more efficient procedures and practices.
Adaptation to Climate Change	Wherever possible undertake action to manage or reduce the impact of climate change.

Table 1: Principles designed to guide implementation of the strategy.

Below: The region is one of Australia's biodiversity 'hot spots'.



THE GLENELG HOPKINS REGION

THE GLENELG HOPKINS REGION LIES SOUTH OF THE GREAT DIVIDING RANGE IN VICTORIA'S SOUTH WEST.

.....
The region is renowned for its scenic beauty, dramatic coastline and rich biodiversity.



Photo: James Pevitt

PHYSICAL ENVIRONMENT

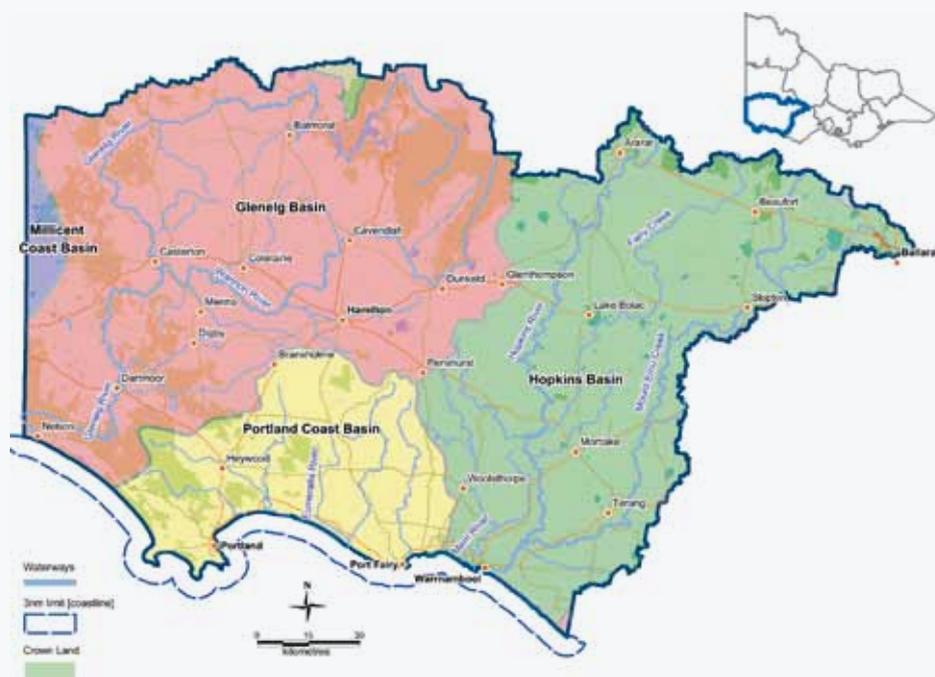


Figure 1: Basins of the Glenelg Hopkins region.

It covers approximately 26,910 square kilometres (sq km), extending from Ballarat in the east to the South Australian border in the west, and from the southern coast of Victoria to the townships of Harrow and Ararat in the north (Table 2). There are four main basins occurring within the region: Glenelg, Hopkins, Portland Coast and Millicent Coast (Figure 1).

The boundaries of the region include marine and coastal waters out to the state limit of three nautical miles. The region is characterised by flat volcanic plains in the south, while the Grampians, Dundas Tablelands, and Central Highlands are dominant in the north (Figure 2).

Area of the Region	26,910 sq km
Area of the Glenelg Basin	12,370 sq km
Area of the Hopkins Basin	9,897 sq km
Area of the Millicent Coast Basin	431 sq km
Area of the Portland Coast Basin	3965 sq km
Length of Coastline	220km

Table 2: Catchment facts.

THE GLENELG HOPKINS REGION

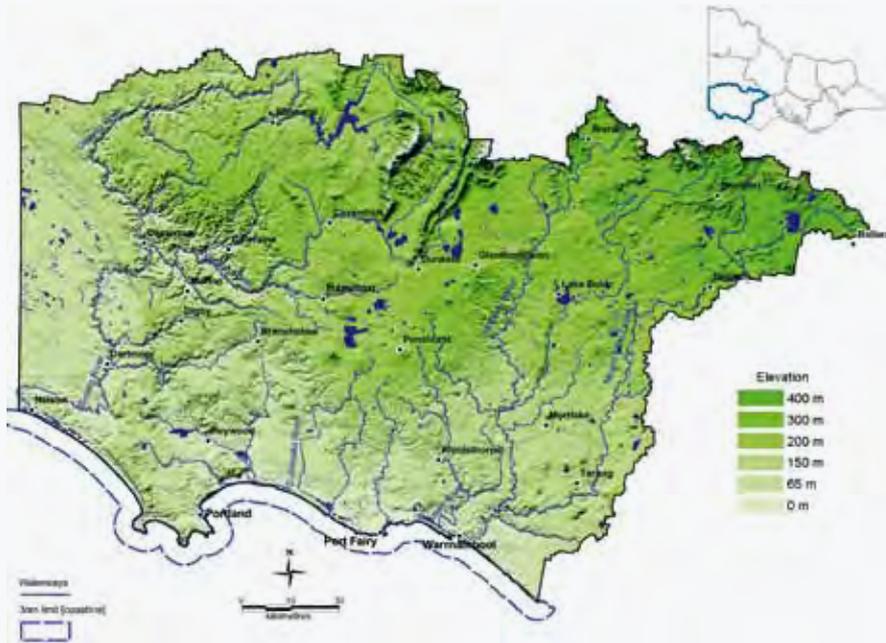


Figure 2: Glenelg Hopkins region: Elevation.

The Glenelg Hopkins region contains a number of natural features that are of national and international significance, including:

- Budj Bim National Heritage Landscape (Mt Eccles/Lake Condah/Tyrendarra Area)
- Grampians (Gariwerd) National Park (listed on National Heritage Register)
- Kanawinka Geopark (UNESCO listed), encompassing sites of geologic significance such as Wannon Falls, Tower Hill, Mt Noorat and Princess Margaret Rose Caves
- Glenelg River – the lower section of the Glenelg River is one of 18 heritage river areas in Victoria
- Western District Ramsar lakes – one lake (Lake Bookar) in the region is recognised as internationally important under the Ramsar Convention on Wetlands
- three Important Bird Areas (IBA) (sites of global bird conservation importance) – Yambuk Lakes Complex IBA, Port Fairy to Warrnambool IBA and Discovery Bay – Piccaninnie Ponds IBA
- significant areas of two of 15 recognised Australian Government 'biodiversity hotspots' (Victorian Volcanic Plain, South Australia's South-east/Victoria's South-west)
- 13 endangered Ecological Vegetation Communities
- 94 federally listed species
- the iconic Red-tailed Black Cockatoo, Orange-bellied Parrot and endemic Glenelg Spiny Cray, and 173 of Victoria's threatened species.

The region is renowned for its visual amenity and aesthetic values. The catchment is home to Australia's most extensive volcanic province (containing six geosites of international significance)² and a large section of the internationally renowned Grampians National Park, which comprises a series of rugged sandstone mountain ranges³ and around 1,000 native plant species, 23 of which are found nowhere else in the world.⁴ Old river red gums within the region also hold considerable appeal, many of which are more than 300 years old.

Water is abundant and reliable in many parts of the region. The region has 17 of Victoria's 134 declared water supply catchments. These catchments have significant value as a source of water supply for both stock and domestic use and are protected under the *Catchment and Land Protection Act 1994* (Victoria).

Extensive wetlands are a key feature and provide important habitat for a diverse range of species, many of which are threatened. The region contains approximately 44 per cent of Victoria's wetlands. Twenty-six of the region's wetlands are listed on the Australian Directory of Important Wetlands.

The catchment contains substantial reserves of groundwater with varying salinities. Regional groundwater systems underlie the region including the Otway, Murray, Highland and Dilwyn – with other shallow local aquifers present. Groundwater is an important source of stock and domestic water for landholders and supplies much of the region's irrigated horticulture and fodder industries. It also supports a range of ecological and physical environmental assets such as rivers, wetlands and groundwater dependent ecosystems. Groundwater management is a component of the Western Region Sustainable Water Strategy.

While there are large sections of high conservation value native vegetation secured through numerous parks and reserves within the south-west and north of the catchment, other vegetation is often fragmented, especially across private land. Major parks and reserves in the region include the Grampians National Park, Lower Glenelg National Park, and Cobboboonee National Park and Forest Park. Around 1,000 sq km of intact native vegetation is estimated to remain on private land. Intact areas of native vegetation are of particular importance, as they contain much of the region's rare ecological vegetation communities.

The region has a diverse range of soil types, reflecting the ancient and diverse geology of parent material and climatic conditions under which the soils were formed.

The climate of the Glenelg Hopkins region is generally characterised by warm dry summers and cool, wet winters. Average annual rainfall in the area ranges from 500 mm per year near Lake Bolac to more than 910 mm per year in the Cobboboonee Forest west of Heywood. The average annual daily maximum temperature in the region is 19°C.⁶

SOCIAL PROFILE

POPULATION, AGE STRUCTURE AND FUTURE SETTLEMENT GROWTH

The catchment supports a permanent population of 130,000 with year-round tourism adding significantly to this number. Major cities and towns include Ballarat, Warrnambool, Hamilton, Port Fairy, Portland, Ararat, Casterton and Beaufort. More than 33,000 of the catchment's residents reside in Warrnambool, and strong population growth is forecast for this area.⁷ Ballarat, Warrnambool and Portland have been identified during recent strategic planning activities as areas of either very high or high forecast future settlement growth.⁸

A significant proportion of the population is over the age of 45 (more than 50 per cent within the Great South Coast region), and this proportion is expected to increase.⁹ Many of the region's smaller towns have declined in population. Population decline in rural areas has been exacerbated by the trend towards larger farms and reduced farm numbers.

*"The old Wannon Shire, centered around Hamilton, had 566 predominantly sheep farms in 1961. By 2001 this had halved to 287. The average farm had almost doubled in size from 340 to 650 hectares."*¹⁰

Many areas of the region are undergoing change as communities age and employment centres shift. Some settlements will continue to decline. Conversely, there will be major challenges involved in planning for significant population growth in Warrnambool and Ballarat. The disproportionate ageing of the rural population, exacerbated by the loss of rural youth and young adults to larger urban centres, presents a key challenge for natural resource management within the region.

Recent work by RMIT University has identified a number of prospective challenges for natural resource management within the area, including:¹¹

- population pressures on natural resources as demand for more housing rises
- increased cultural pressures between urban and rural populations
- pressure on aquatic systems from an increase in aquatic sports activity
- reduced overland water flow and groundwater recharge due to land use change, particularly from increases in woody and non-woody vegetation
- increased groundwater extraction with intensive farming such as dairy and horticulture.

Below: The Glenelg Hopkins region is important for biodiversity values as well as social values.

Photos (L-R): Bob McPherson, James Pevitt and Glenelg Hopkins CMA.



THE GLENELG HOPKINS REGION

ECONOMIC PROFILE

The Great South Coast Regional Strategic Plan¹² highlights the importance of the region's terrestrial and aquatic systems in underpinning the region's economic strength and livability. Key features include significant areas of national parks and public land, productive agricultural land, and large areas of undeveloped coastline.

The south west coast's water resources support important agricultural production including dairying, grazing, cropping and forestry. This area is Australia's most productive milk region, providing nearly a quarter of the nation's milk. The manufacturing sector generates \$4 billion a year, a quarter of which is derived from dairy products.¹³

Value-adding to primary products occurs via milk processing in Warrnambool, Allansford and Koroit, meat processing in Warrnambool, and timber processing in Portland. Other significant manufacturing includes aluminium production near Portland and wind turbine systems fabrication and assembly in Portland. Forestry is a major industry – the harvesting of 180,000 ha of blue gum plantations over the next few years will make the Port of Portland Australia's largest hardwood chip handling port. Almost 20 per cent of the nation's forestry plantations are in, or near, the south west coast. Many of the forestry plantations are in high rainfall areas.

The Glenelg Hopkins catchment has a rich resource base that supports a diverse and growing economic industry. The main economic drivers are agriculture, fisheries, retail, manufacturing, health and community services, education and construction, while agriculture, forestry and fishing are the major employers, providing nearly 25 per cent of total employment. The region has one of the premier deep water ports in Australia at Portland, a rail network and several commercial airports. In addition, there is significant investment occurring in sustainable energy, particularly in wind energy innovation and gas-fired power plants.

The region attracts thousands of tourists each year due to its spectacular coastline and excellent tourism infrastructure. Destinations favoured by tourists include the Grampians National Park, Port Fairy, Great Ocean Road and Great South West Walk. Nature-based tourism makes a significant economic contribution to the region. The Grampians National Park generates visitor expenditure of more than \$211 million per year in the region,¹⁴ with a substantial net economic product for Victoria estimated at \$65 million per year.¹⁵

Approximately 81 per cent of the catchment has been developed for agricultural use, primarily widespread grazing enterprises and cereal and oilseed cropping. The region is also home to a large and expanding dairy industry.

The viability of these agricultural enterprises is reliant on the healthy and productive soils of the region.

Land-use change in agricultural areas of the region in the past two decades has been due largely to the expansion of broadacre cropping, dairy and blue gum plantations, with cropping as the only land use expected to continue to expand.

In spite of rapid changes, livestock still accounts for 65 per cent of the region's landuse with cropping 6.7 per cent, plantations 4.7 per cent and native vegetation 16.6 per cent.¹⁶

Manufacturing in the region is also significant. It generates almost \$4 billion, ahead of agriculture at nearly \$2 billion annually.¹⁷ Four of the most important industries in south west Victoria – agriculture, fisheries, forestry and tourism – depend on maintaining a healthy natural resource base.

CULTURAL HISTORY

At least ten different Aboriginal language groups occurred in south west Victoria, often identified on the basis of their environmental associations.¹⁸ Clans closely associated with the ocean were very mobile in the summer months and large numbers would congregate in the nearby hinterlands to exploit concentrations of yam daisy, kangaroo and emu. Their base camps were in coastal swamps, such as the Tower Hill and Moyne swamps, which provided easy access to nearby forest.

Temporary camps were located in the dunes where seabirds, crayfish, shellfish, fish and seals were harvested. In autumn, coastal clans moved to camp beside rivers and streams where, as semi-sedentary groups, they exploited an abundance of eels and other fish. Eels were harvested using complex stone or wooden weirs erected across rivers or streams. Stone weirs can still be found in many regional streams. During winter, coastal clans gravitated to places with ample water, fuel and food supply.¹⁹

Aboriginal people living away from the coast have been described as 'plains people'. Their most common form of campsite was an artificially constructed earthen mound occupied on a seasonal basis and usually located close to rivers, streams or wetlands. In summer, plains people used fire as a hunting aid. Bird hunting and communal kangaroo hunting were important summer activities. Eels and fish were caught in traps – which were major engineering achievements – in wetlands such as Lake Condah.

At the time of European settlement, some Aboriginal groups in the region lived in substantial settlements comprising clusters of up to 30 circular shaped huts. Large gatherings of people occurred at localities that experienced a seasonal abundance of food, particularly the fresh and saltwater wetlands that were a prominent and important landscape feature of the region. These occasions were times of great ceremonial importance, where trading and social arrangements were made.

Current evidence suggests that Aboriginal people occupied parts of the Glenelg Hopkins region for at least 11,000 years and probably more than 40,000 years. Thousands of ancient and more recent Aboriginal sites and places can be found throughout the region. Evidence of Aboriginal land use in the region includes scarred trees, stone arrangements, mounds, rock shelters, stone engraving sites, middens, rock paintings, surface scatters, fish traps, burial places, stone house sites, quarries and axe-grinding places.²⁰

The Dutton family, which engaged in whaling, and the Henty family, which was involved in whaling and pastoral activities around Portland Bay, are recognised as the first European settlers in the region.

Further European settlement was rapid. Pastoralists moved in with stock to take up runs, and by the end of the 1840s many of the areas suitable for grazing were occupied.²¹

The passing of the *Land Act* in 1898 began breaking up the large squatter estates of the region. Smaller farmers were encouraged to clear the land, but soil limitations and the influx of rabbits dramatically affected farming success. Soldier settlement schemes were introduced after both World Wars, further increasing land clearance pressures. The Closer Settlement Board encouraged mixed farming enterprises after available timber had been cleared and milled. In recent years, significant work has been undertaken in the region to conserve remnant bushland and revegetate the landscape.

CULTURAL KNOWLEDGE

Indigenous peoples' relationship to country is based on a long tradition of ownership, custodianship, utilisation and cultural significance. Within traditional Aboriginal society, men and women have particular roles and responsibilities in the process of 'caring for country'. These are largely determined by their relationship to others and to particular places on the landscape. They have a deep and historic understanding of their environment and strategies for environmental protection and enhancement.

Traditional environmental knowledge refers to a particular form of place-based understanding of the diversity and interactions among plant and animal species, landforms, watercourses and other qualities of the biophysical environment in a given place.

Indigenous perspectives on resource management tend to reflect the holistic nature of traditional knowledge, which cannot be separated from lands and resources. There is often no distinction made between the environmental and cultural values of natural resources – land, water, plants and animals are conceived as the source and focus of all life, and the key to cultural, spiritual, social and economic survival.²² The RCS recognises cultural knowledge as a valuable asset for long-term management of natural resources.

The practical importance of the interweaving of environment and culture is that there is a distinct overlap between places of cultural importance and natural heritage.

As traditional owners, Indigenous communities have a central role in land management in the region. Indigenous communities manage significant parcels of land of high environmental, historical and cultural value, including areas at Mt Eccles, Lake Condah and Tyrendarra, which are listed on the National Heritage Register as part of the Budj Bim National Heritage Landscape.

Below: The region has a rich cultural history that has shaped the region and led to its present day management.



THE GLENELG HOPKINS REGION

CHALLENGES AND OPPORTUNITIES

The 2003-2007 Glenelg Hopkins RCS identified a number of key regional challenges, including:

- **Regional sustainability**
Regional sustainability was identified as the overarching goal for the Regional Catchment Strategy 2003-2007. This acknowledged that the social and economic future of south west Victoria was directly linked to the health and maintenance of the region's natural resources, while supporting the encouragement and development of human enterprise and innovation.
- **Biodiversity**
The Glenelg Hopkins region has significant, but often threatened, biodiversity found in unique and complex systems on land, in soil, fresh water, estuaries and the sea. Numerous Ecological Vegetation Classes (EVCs) and flora and fauna species have become extinct and many more are threatened. The major threat to biodiversity across the region is the destruction of habitat. Extensive clearing of native vegetation in the years since European settlement has drastically reduced the extent and quality of available habitat for native species. While salinity has been recognised as a natural feature of the region, extensive clearing has greatly increased the areas affected and has the potential, if left unchecked, to further reduce suitable habitat in aquatic and terrestrial environments.
- **Waterway health and water quality**
High quality fresh water is one of the region's most important natural assets and a resource at enormous risk. Major threats to water health include pollution from farming activities, stock access to waterways, salinity, erosion, pest plants and animals and over use of water resources.
- **Soil decline and salinity**
Healthy soil is an essential asset for agricultural industries operating in the Glenelg Hopkins catchment, including horticulture, cropping, dairy and livestock. Soils within the region have been recognised for their very high productivity potential, with appropriate management. Soil erosion has been a feature of the Dundas Tablelands since European settlement. Extensive sheet, tunnel, gully and stream bank erosion has lead to large volumes of sand being trapped in the Glenelg River and its tributaries. Soil acidification and sodicity are emerging issues in parts of the catchment. Salinity, erosion and soil degradation were considered by the catchment community to be the greatest threats to agricultural land.²³ Compaction of soils by stock, farm machinery and intensive cultivation also threatens soil health.

- **Pest plants and animals**

Pest plants and animals pose some of the most significant threats to regional environmental assets. Appropriate pest management actions will dramatically increase the chance of successful outcomes across a variety of natural resource programs. Research commissioned in support of the region's second RCS found that weeds and pest animals were perceived to be the greatest threat to the region behind salinity.²⁴

- **Coastal areas**

The coastal area of the Glenelg Hopkins catchment contributes significantly to the economic, cultural, environmental and recreational life of regional communities. Coastal areas, particularly around Warrnambool, are experiencing unprecedented increases in population and tourism activity. However, pollution, erosion and overdevelopment are perceived by the community to be major threats to the coastal environment.²⁵

While these challenges still remain, there are a number of emerging challenges for natural resource management within the Glenelg Hopkins catchment – some of which may lead to opportunities. These new or emerging challenges are summarised below.

CLIMATE CHANGE

The Victorian Government's recent report on Climate Change and Greenhouse Gas Emissions in Victoria identified the following observed trends that indicate that Victoria's climate is changing:

- Victorian minimum temperatures averaged over the decade 2000-2010 were at least 0.2°C warmer than any other decade from 1910
- the frequency and severity of very hot temperatures has increased, and the frequency and severity of very cold temperatures has decreased since the beginning of the twentieth century
- annual rainfall in Victoria experienced large decadal variations over the past century, with no clear trend. Over the past 20-years there has been a large decline in autumn rainfall, a small decline in winter and spring rainfall, and a small increase in summer rainfall
- since the mid-twentieth century there have been reductions in the frequency of weather systems over Victoria that are associated with wetter conditions. The number of severe storms affecting the south west Victorian coast has decreased by around 40 per cent from 1856 to 2006

- the average sea level along the Victorian coastline has risen, consistent with global increases
- sea surface temperatures in Australia have warmed since at least 1960, with the ocean surrounding Victoria showing some of the highest warming.²⁶

The CMA and its regional partners will undertake action to manage or reduce the impact of climate change where possible. Australian and Victorian government funding opportunities will be pursued to help identify where in the landscape adaptation and mitigation activities should be undertaken, and produce regional-level climate change information to support medium term regional NRM and land use planning.

PRESSURES ON WATER RESOURCES

Water security will be a key driver for capital investment and land-use change in the region. Sustainable management of the region's groundwater and surface water's natural capital will underpin the forecast residential, agricultural and industrial development of the region.

As noted in the Western Region Sustainable Water Strategy,²⁷ 'The recent prolonged dry period and subsequent heavy flooding in many parts of the region demonstrated that water management needs to address climate variability'. There will be significant pressures on future water use in the region due to the combined impacts of population growth and climate change. Annual stream flows fell by 40, 56 and 65 per cent respectively in the Hopkins, Portland Coast and Glenelg basins during the 1997-2009 drought. Drought remains a significant risk for the region and is likely to be more frequent than in the past. Other key pressures include:

- increased demands for water due to changing farming practices (e.g. increased use of irrigation for dairying)
- reduced surface flow of water due to land-use change (e.g. increased number of farm dams, an expanding plantation industry).

CARBON SEQUESTRATION ACTIVITIES

There are a number of possible future carbon sequestration activities in the region that may enhance or adversely impact on values and services provided by natural assets. Carbon sequestration is a general term used for the capture and long-term storage of carbon dioxide.

In planning for the development of carbon markets within the region, Glenelg Hopkins CMA will pursue opportunities to identify priority areas for sequestration planting. A regional NRM plan will be developed as part of this strategy to assist with planning for future carbon sequestration activities. Biodiverse carbon plantings have the potential for multiple natural resource management outcomes: improving catchment health, expanding and reconnecting habitats and sequestering carbon. These plantings will need to consider potential adverse impacts on water availability, pest plant and animals (i.e. dispersal potential), agricultural productivity and fire risks to the community. Potential negative economic and ecological consequences of tree programs aimed exclusively at mitigating climate change effects and reducing atmospheric carbon dioxide include:

- tree plantings that impact negatively on ecosystem processes such as hydrological and fire regimes
- establishment of trees that become invasive.²⁸

SUMMARY

The environmental challenges are significant; however, the community has a growing awareness of the need to strike a balance between development, sustainable growth and protection of the environment. A key challenge is to continue to make natural resource management scientifically rigorous and socially relevant in the face of funding variations, lifestyle and population changes, climate variability and increasing demand for water resources. Achieving biodiversity improvements and farm productivity gains, and balancing public use and development with environmental protection of coasts and estuaries will also be major challenges. Securing environmental water for the Glenelg River from the savings resulting from the Wimmera-Mallee pipeline will be another challenge.

RCS STRATEGIC RELATIONSHIPS

Figure 3 summarises the relationship between the RCS and Australian and Victorian legislation, policies and strategies. Links to relevant regional policies, strategies and action plans are also shown.

Key regional strategic planning documents such as the Great South Coast Regional Strategic Plan, Central Highlands Regional Strategic Plan, and South West Sustainability Partnership Priorities Direction Statement 2010-2012 were used to inform the development of the RCS. These documents are based on extensive stakeholder consultation and provide an important regional frame of reference for the development of the RCS.

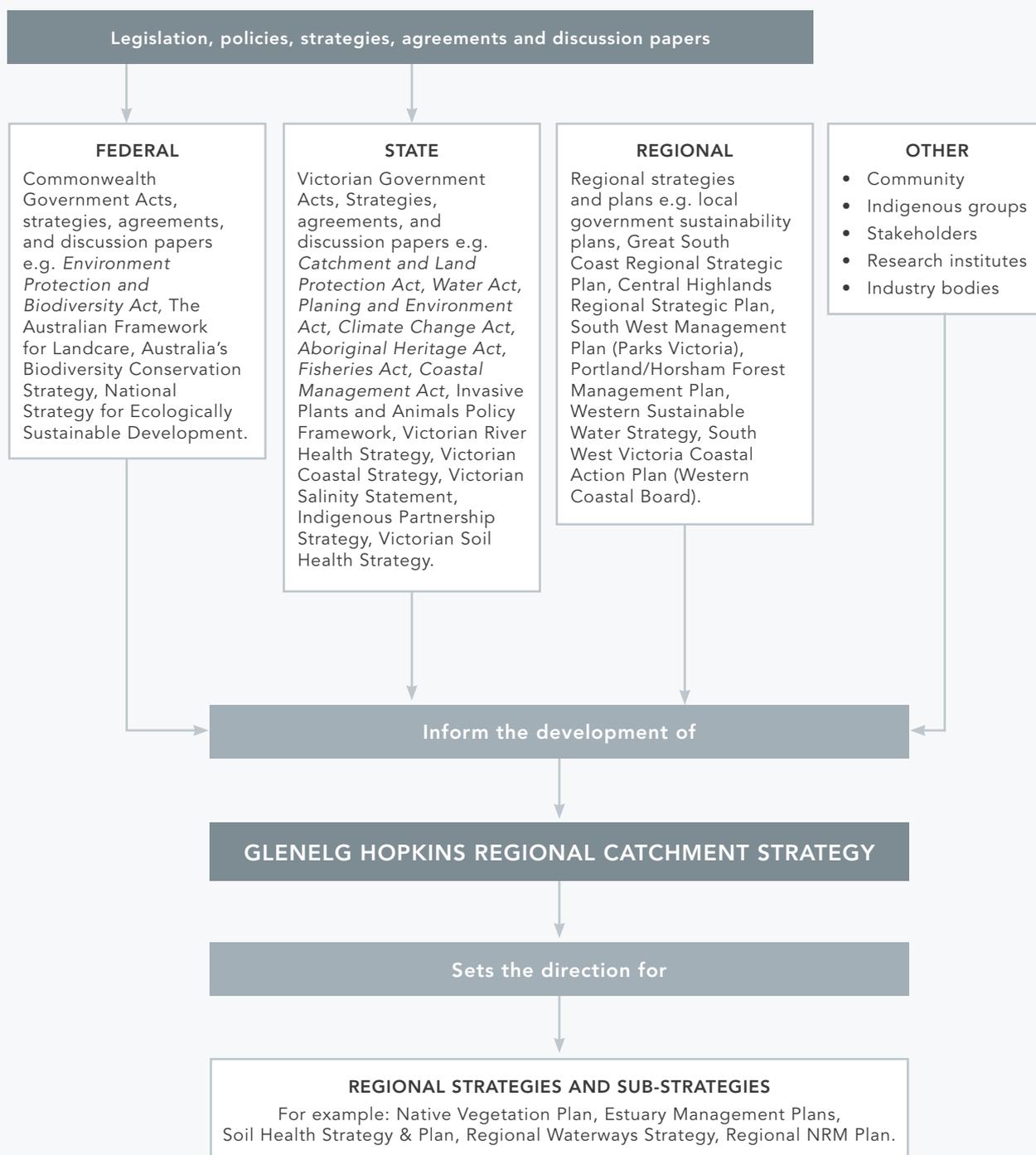


Figure 3: RCS Strategic Context.

KEY ACHIEVEMENTS TO DATE

Significant achievements have been made in natural resource management in the Glenelg Hopkins region since 1997 by a range of land managers, community groups, government and non-government organisations. A key focus has been on developing strong partnerships within the region to achieve healthy and sustainable relationships between the natural environment and the community's use of land and water resources.

Figure 4 shows a timeline of key natural resource management events and challenges in the Glenelg Hopkins region since 1997, while regional project highlights are illustrated in Figure 5.

<ul style="list-style-type: none"> The Glenelg Hopkins CMA pioneered its first Regional Catchment Strategy Red Tailed Black Cockatoo Recovery team established 	1997	<ul style="list-style-type: none"> Distribution of Waterway Initiative Funding for on-ground works to Merri River Landcare Network for revegetation and to the Sandford Landcare Group for erosion control works along Lower Wannon River
<ul style="list-style-type: none"> The first partnership project was delivered along the Wannon The first Index of Stream Condition data collected 	1999	<ul style="list-style-type: none"> Implementation of Hopkins River Water Quality Plan and South West Rivers Restoration Project Preparation of waterways Works Program as part of the CMA's Business Plan
<ul style="list-style-type: none"> Glenelg Hopkins CMA starts working closely with landholders and community groups to help protect riparian land to improve water quality, reduce severe erosion and reduce sedimentation in waterways The state government funds the first Regional Landcare Coordinator position Analysis of groundwater flow systems completed for the region Landcare achievement awards initiated 	2002	<ul style="list-style-type: none"> The Victorian Salinity Management Framework was released Rabbit Buster Program run across the region West Victoria Regional Forest Agreement
<ul style="list-style-type: none"> The first soil and land health project commenced with the appointment of a salinity coordinator Carp discovered in the Glenelg River downstream of Rocklands Reservoir Intensive carp monitoring program was undertaken to monitor carp within Rocklands Reservoir and in the river downstream Community fishing day caught 500 kg of carp Resnagging of the Glenelg River Mt Eccles Koala control program commenced 	2004	<ul style="list-style-type: none"> Carp discovered at Rocklands Reservoir
<ul style="list-style-type: none"> Glenelg River restoration works for in-stream habitat included the reinstatement of 3 km of large woody debris (approx 170 logs per km) Protection of more than 200 ha of native vegetation at Casterton through covenant, with more than 85 per cent of the area providing habitat for threatened species Improved management across 10,000 ha of covenanted land Approximately 70 ha of Orange-bellied Parrot habitat protected and enhanced Biodiversity overlays included in local government planning schemes 300 kg of local provenance seed supplied to projects Collaboration between public and private land managers through the Weed Spotters and Good Neighbour programs Draft Soil Health Plan, Weed Action Plan, Landcare Strategy and Community Engagement Plan delivered 	2005	<ul style="list-style-type: none"> The dry winter of 2002 resulted in severely low storage levels in Rocklands Reservoir leading to only a small environmental flow allocation Carp fishing competition – 700 anglers caught 600 kg of carp which were turned into fertiliser The CMA strengthens its involvement in Landcare with the appointment of 10 federally funded Landcare facilitators Victorian River Health Strategy released Glenelg Hopkins RCS 2003-2007 the first to be approved in Australia by joint State/Federal Governments
<ul style="list-style-type: none"> 465 ha of floodplain wetlands fenced on the Wannon River Estuary habitats mapped Two major barriers to fish movement removed, opening 11 km of the Glenelg River to fish movement Port Fairy Regional Flood Study completed Second Index of Stream Condition completed 	2009	<ul style="list-style-type: none"> The Glenelg Hopkins River Health Strategy is launched – the first such strategy in Victoria Hamilton's Grange Burn Wetland project was a 'showcase' Community Partnership Project which involved rehabilitation of 14 ha of wetlands, treating 70 per cent of Hamilton's storm water Sustainability indicators report Establishment of Marine National Parks Glenelg Ark Pest Animal Project established
<ul style="list-style-type: none"> Floods cause significant damage to the Grampians National Park 13,300 ha of agricultural land with property management plans implemented 250 ha of perennial pasture sown to mitigate salinity and reduce the risk of soil acidification Pig trapping over 3,000 ha in the Discovery Bay Coastal Park 5,467 ha of private and crown land managed to address pest plant, cat, pig and fox threats 238 ha of Weeds of National Significance treated by CMA Milestone of 1,000 km of riparian fencing achieved River Tender delivers 18 km of river frontage fencing and 206 ha of revegetation and pest plant animal control Environmental water allocations from the Wimmera Mallee Pipeline delivered to the Glenelg River Spiny Cray EPBC listed First Index of Wetland Condition completed 	2011	<ul style="list-style-type: none"> Major fire in the Grampians Completion of the Warrnambool/Port Fairy Flood Study and Regional Wetlands Guide Glenelg Hopkins Salinity Plan 2005-2008 launched Carp screens installed at Rocklands Reservoir and major infrastructure upgraded to manage future environmental releases into the Glenelg River Grampians Ark, Back in Balance program established
		<ul style="list-style-type: none"> Cobboboonee National Park and Forest Park established Large scale river restoration project on the Glenelg River delivers 230 km of waterway protection, removal of 180,000 m³ of sand and prevention of carp movement downstream Removal of five fish barriers opens 198km of waterway to fish passage Bush Tender protects 2,836 ha of native vegetation Six estuary management plans developed
		<ul style="list-style-type: none"> Wimmera Mallee Pipeline completed, giving much greater security than previously possible for environmental flows Five Brush-tailed Rock Wallabies released into the Grampians National Park Soil Health Plan launched Regional Weed Plan launched Weir constructed at Lake Condah Significant environment flows released to the Glenelg River Glenelg Hopkins Invasive Animal Strategy 2010-2015 launched
		<ul style="list-style-type: none"> Flood recovery assistance provided to the community State funded Landcare facilitators appointed to the region Regional Catchment Strategy 2013-2019 Port Fairy – Warrnambool Rail Trail opened

Figure 4: Timeline of key events and challenges.

KEY ACHIEVEMENTS TO DATE



Figure 5: Key Regional Achievements.

Disclaimer: The map shown in this figure is representational of the Glenelg Hopkins region and is not intended to accurately reflect land use on a finer scale. Locations are indicative only.

GRAMPIANS ARK

 17,000 ha fox baiting was completed by Grampians Ark program.

LANDCARE

 A 25-year history of leading the way in protecting the environment.

WETLANDS OF THE WANNON

 CMA and landowner partnerships have led to changed grazing regimes for the protection of seasonal wetlands.

SAVING THE BUSH

 1,400 ha of remnant bush protected through voluntary legal agreements with private landowners.

WESTERN UPLAND

 CMA and landowner partnerships to control soil erosion and salinity in the Western Tablelands.



EEL FESTIVAL & HEALING WALK

 Raise awareness of the environment.

LANDMATE SUCCESS

 Prison work crews support community and agencies in environmental on-ground work.

FARM PLANNING

 Extension programs increase knowledge of land productivity and environmental management.

PARTNERSHIP PROJECTS IMPROVE STREAM HEALTH

 Fencing along the Mt Emu Creek and Fiery Creek to exclude stock improves stream health.

REDUCING SOIL ACIDIFICATION

 Reducing soil acidification and improving nutrient management on dairy farms through improving knowledge and skills in nutrient management practices.

CREATING COASTAL CONNECTIONS

 Developing projects with community groups to protect waterways, wetlands and terrestrial habitat along the coast.

WORKING WITH THE COMMUNITY

 Across the Glenelg Hopkins region, community volunteers have fenced 2,200 km of waterway and revegetated 3,784 ha of waterway areas.

FLOOD RECOVERY ASSISTANCE

 Glenelg Hopkins CMA work crews installed 64 km of new fences, repaired or cleaned 127 km of riparian fences, revegetated 61 ha, and eradicated 211 ha of weeds.

PROTECTING THREATENED SPECIES

 The regional biodiversity program has seen the once-common Mellblom's Spider-orchid brought back from the brink of extinction. With as few as six plants remaining in 1996, there are now more than 1,000 plants growing in the wild today after an intensive recovery program. The Eastern Barred Bandicoot is another species brought back from the brink of extinction through recovery programs.

CASE STUDY: ENVIRONMENTAL WATER RESERVE

The Wimmera–Mallee Pipeline Project provided a major investment in water security and environmental water recovery for western Victoria.

The problems associated with the inefficient earthen water channel and storage systems of the Wimmera and Mallee regions were realised through the prolonged drought which dominated the first decade of this century.

Leakage, seepage and evaporation meant that as little as 15 per cent of the water released to supply the system from headwork dams such as Rocklands Reservoir on the Glenelg River, would reach the end user. In a dry landscape, the adverse environmental, social and economic implications of such inefficiency were stark.

The negative impacts of changed flows in the Glenelg River were evident within a few years of the completion of Rocklands Reservoir. Long-term declines in water quality and the formation of sand slugs that smothered sections of the river bed both impacted dramatically on the ecology of the river and the communities that rely on the Glenelg River.

The business case for the project promised to deliver improved security of supply for all entitlement holders (including the environment) and to increase environmental flows to the Wimmera and Glenelg rivers by an average of 83 gegalitres per year.

In October 2010, the Wimmera and Glenelg Rivers Environmental Entitlement was created, formalising the environment's right to pipeline water savings and consolidating previous entitlements to environmental water. The new entitlement provides water to the environment through passing flow rules, allocations of water in storages for later release and unregulated flows or spills from storages.

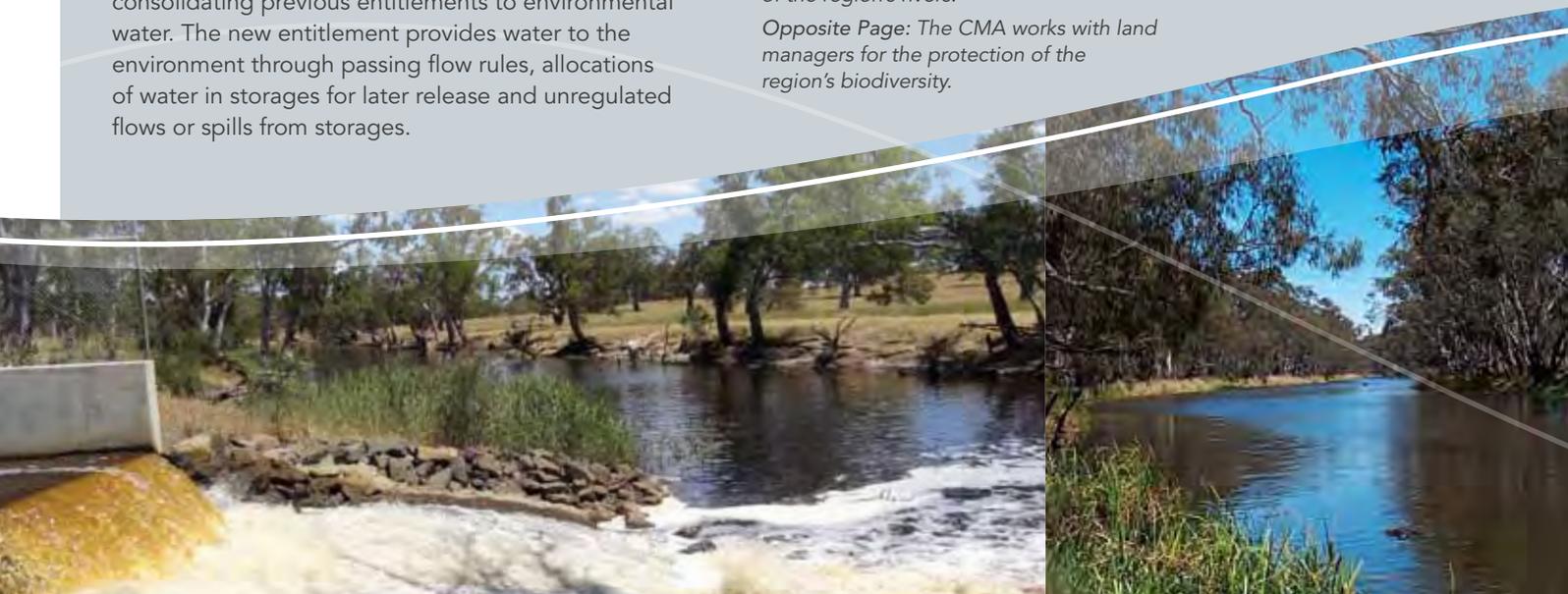
The environmental benefits of the new entitlement were quickly realised when drought-breaking rains fell during spring 2010. In addition to short-term floods that provided a much-needed reset for instream conditions, the rain contributed to high allocations credited to the Environmental Entitlement. The Environmental Entitlement is overseen by the Victorian Environmental Water Holder who is responsible for sharing the entitlement between the Wimmera and Glenelg systems based on watering proposals submitted by Glenelg Hopkins and Wimmera CMAs.

Continued rainfall events combined with strategic delivery of environmental flows have produced visible improvements in the health of the iconic Glenelg River. Water plant recovery and increased breeding activity of waterbirds have been the most visible responses to improved flows and water quality. Under the surface, dramatically improved water quality and increased habitat have supported native fish breeding events.

In planning for environmental water use, Glenelg Hopkins CMA has an obligation to maximise the ecological benefits of environmental releases; however, where possible, efforts are made to support other community values with environmental releases. An example of this is the concurrent releasing of the Glenelg River Compensation Flow, which provides landholders with stock and domestic water, and the environmental summer base-flow releases through the summer of 2011-12.

Below: Environmental water releases for the health of the region's rivers.

Opposite Page: The CMA works with land managers for the protection of the region's biodiversity.



THEMATIC ASSET CLASSES

THIS SECTION OF THE RCS DESCRIBES THE REGION'S ASSETS AND THEIR CURRENT CONDITION.

.....
 Management objectives are long-term (20-years) and set broad direction for future action.

Catchment-level objectives and management measures have been identified for each thematic asset class described in *Table 3*. Through extensive community and stakeholder consultation they have been summarised under nine themes: community participation, rivers and floodplains, wetlands, estuaries, coasts, marine, terrestrial habitat, species populations and communities, and soil and land (*Table 3*).

A program of measures (or commitments) that identifies the action necessary to achieve these objectives is provided in *Table 26*. These measures are planned for implementation during the six year life of this RCS and are supported by actions in associated sub-strategies and plans. Objectives and associated measures that relate to all or more than one asset class are listed in *Table 26*.

Thematic Asset Class	Definition
Community	Individuals and groups involved in natural resource management.
Rivers and floodplains	Individual river reaches and their associated riparian ecosystems. Reaches can be grouped into larger components of a river system.
Wetlands	Individual wetlands, wetland complexes, and their associated floodplain ecosystems.
Estuaries	Individual estuaries and their associated riparian ecosystems.
Coasts	Stretches of coastline. Coastal assets can extend inland as far as appropriate.
Marine	Marine ecosystems or sub-systems, up to the high water mark, including mangroves.
Terrestrial habitat	Individual ecological classes or spatial occurrences of Ecological Vegetation Classes based on their intrinsic value or their contribution to landscape processes (e.g. connectivity, refuge areas buffering).
Species populations and communities	Populations of threatened or significant species. Occurrences of threatened communities.
Soil/land	Selected geographic areas of land and/or specific soil types.

Table 3: Definition of Thematic Asset Classes.

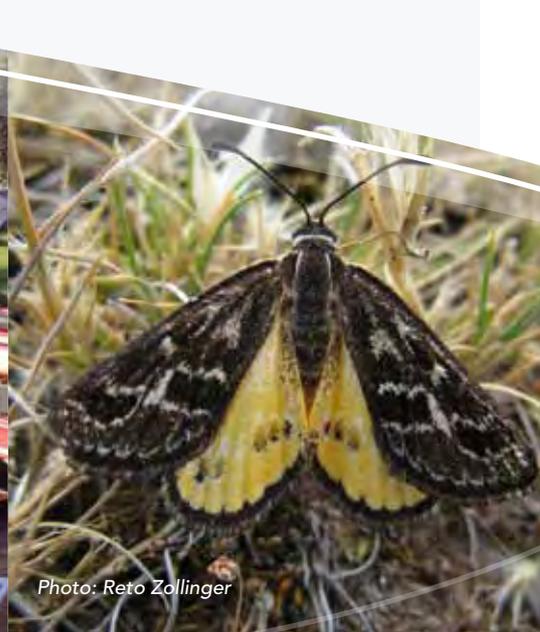


Photo: Reto Zollinger

COMMUNITY PARTICIPATION

THE GLENELG
HOPKINS COMMUNITY
PLAYS AN INTEGRAL
ROLE IN THE DELIVERY
OF NATURAL
RESOURCE
MANAGEMENT
ACTIONS AND THE
MAINTENANCE AND
IMPROVEMENT OF
NATURAL ASSETS.

.....
Fostering a strong
regional identity and
connection with the
environment will be key
to achieving the objectives
outlined in the RCS.

There is already strong community commitment to improve natural resource outcomes across the region. This is clearly evident with the uptake in CMA partnership projects, Landcare and participation at community forums and field days over the last decade. The Statewide Social Benchmarking results for waterways²⁹ showed that the Hopkins Basin had the highest score across all the state basins for people that are involved with rehabilitating native habitat.

Land managers within the region are characterised by their strong land stewardship, with the majority aspiring to pass on their property to future generations in better condition. This aspiration is illustrated by the strong Landcare network and volunteerism within the Glenelg Hopkins catchment. Landcare across the region takes a variety of forms and performs a range of functions, while maintaining the core objective of conserving natural resources, enhancing profitability and supporting communities.³⁰ Programs conducted by a range of natural resource management organisations attract volunteers that play a significant role in data collection, on-ground works and feedback or issue identification. *Figure 6* illustrates the approximate distribution of Landcare groups within the Glenelg Hopkins region.

Connecting historical actions to present-day environmental issues, and recognising the diverse way that people view the environment are important considerations for natural resource management.³¹

A wide range of programs centred on cultural heritage, culturally sustainable development and Indigenous ecological knowledge are working towards maintaining and improving partnerships and outcomes for communities within the region. Of note is the Gunditj Mirring Partnership Project, funded by the Australian Government's Caring for our Country program and delivered by the Glenelg Hopkins CMA and Gunditj Mirring Traditional Owners Aboriginal Corporation partnership. The project builds on relationships with Traditional Owners to collate traditional Indigenous ecological knowledge and to trial practices within a contemporary setting. The importance of integrating traditional knowledge and practices into land management is recognised in the region.³² The extension component of the project aims to collaborate with land managers to increase knowledge and implement traditional practices on farms. The collaborative nature of the project has resulted in a large network of organisations contributing to the outcomes, including agencies, universities, Indigenous corporations and the community.

Involvement from the Glenelg Hopkins regional community and its neighbours is essential for the successful implementation of the RCS. Detailed engagement and communication processes for implementation of the RCS will be developed as part of an RCS Stakeholder and Engagement Plan.

OBJECTIVES AND MANAGEMENT MEASURES

Objectives and management measures for community participation are shown in *Table 4*.

Objectives (20-years)	Management Measures (6-years)
2.1 Maintain and enhance community capacity, awareness and involvement in natural resource management within the region	2.1.1 Prepare a Stakeholder and Community Engagement Plan for the implementation of the RCS by 2013.
	2.1.2 Update and implement the Glenelg Hopkins Regional Landcare Support Strategy by the end of 2013.
	2.1.3 Develop a targeted community education program to increase awareness of natural assets within the region and encourage actions that improve land, water and biodiversity outcomes.
	2.1.4 Develop and implement programs to build community capacity in natural resource management.
	2.1.5 Undertake community awareness and extension activities to promote natural resource management and best management practices in agriculture.
	2.1.6 Involve the community in decisions relating to natural resource management within their region.
2.2 Facilitate a collaborative approach to NRM	2.2.1 Collaborate with Indigenous communities, community organisations, local government, agencies, tertiary institutions and industry groups to develop partnership projects and joint initiatives.
	2.2.2 Improve inter-agency and cross border communication through active support of groups.
	2.2.3 Seek opportunities for cross border and interagency partnerships to address mutual natural resource management priorities.
2.3 Support land managers in meeting their responsibilities as active stewards of the catchment's land, water and biodiversity	2.3.1 Provide information to land managers on their responsibilities to conserve soil and protect water resources under the <i>Catchment and Land Protection Act</i> .
2.4 Support farmers to incorporate environmental outcomes into their farm systems	2.4.1 Where possible, make existing property management planning tools available to land owners on-line.
	2.4.2 Raise land owner awareness of incentive programs.

Table 4: Objectives and management measures for community participation.

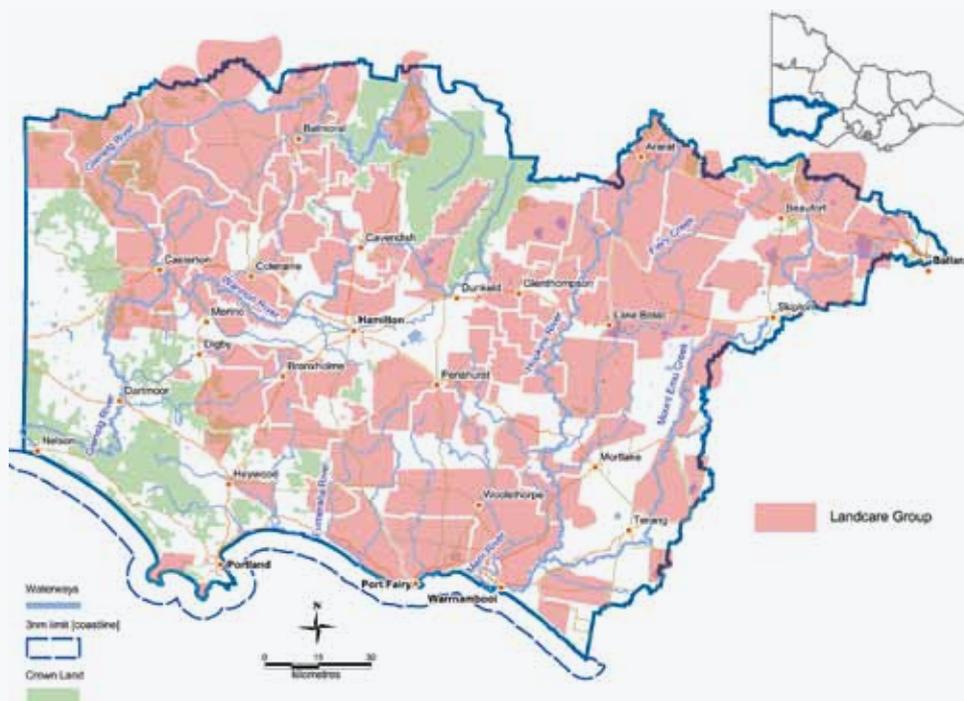


Figure 6: Approximate distribution of Landcare groups within the Glenelg Hopkins catchment.

RIVERS AND FLOODPLAINS

RIVERS AND FLOODPLAINS ARE AN INTEGRAL PART OF THE CATCHMENT AND PROVIDE MANY SOCIAL, ECONOMIC AND ENVIRONMENTAL SERVICES.

.....
They are valued by the community and are highly important in the movement and cycling of sediment and nutrients through the landscape.

There are four main basins within the Glenelg Hopkins region: Glenelg, Hopkins, Portland Coast and Millicent (*Figure 7*).

The Millicent Basin within the Glenelg Hopkins region does not contain any rivers, but there is a small section of the catchment which flows north into the Mosquito Creek catchment area.

The Glenelg River is the largest river in south west Victoria and boasts some of the state's best river reaches. Between Dartmoor and the coast, the Glenelg River is classified as a Heritage River under the *Heritage Rivers Act 1992 (Vic)*. The Glenelg Basin contains more than 150 threatened to near-threatened species and ecological communities. Ten per cent of all Victorian threatened species are resident. The region is one of 15 listed 'biodiversity hotspots' in Australia, and one of only two in Victoria. Significant tributaries of the Glenelg River include the Wannon, Chetwynd, Stokes, Crawford and Wando rivers.

The four main catchments within the Portland Coast Basin are the Moyne, Eumeralla/Shaw system, Darlots Creek/Fitzroy River system and the Surry. These are relatively short rivers and all drain the immediate inland areas, meeting the Southern Ocean at a variety of points.

The Hopkins River is a major waterway draining the eastern part of the region and entering the Southern Ocean at Warrnambool. The Hopkins Basin is largely cleared and devoted to significant agricultural activity. The Hopkins estuary is one of only three 'Premier Rivers' for fishing across Victoria. The Merri River, the Fiery Creek and Mt Emu Creek are other significant waterways within the Hopkins Basin.

The region's rivers have a range of social values including fishing, boating, camping, swimming, picnicking and bushwalking. In an economic sense rivers in the region are valued for the supply of water for agriculture (and their proximity to agricultural land), drinking water, tourism and fishing.

Below: Flooding often poses problems for the community but are a natural process for the maintenance of biological diversity and river health.



- 1 Glenelg River
- 2 Wannon River
- 3 Crawford River
- 4 Wannon Falls Scenic Reserve
- 5 Fulhams Reserve
- 6 Brucknell Creek and Deep Creek
- 7 Mathers Creek
- 8 Nigretta Falls Scenic Reserve
- 9 Fitzroy Darlots System
- 10 Moleside Creek
- 11 Fiery Creek
- 12 Mt Emu Creek
- 13 Stokes River

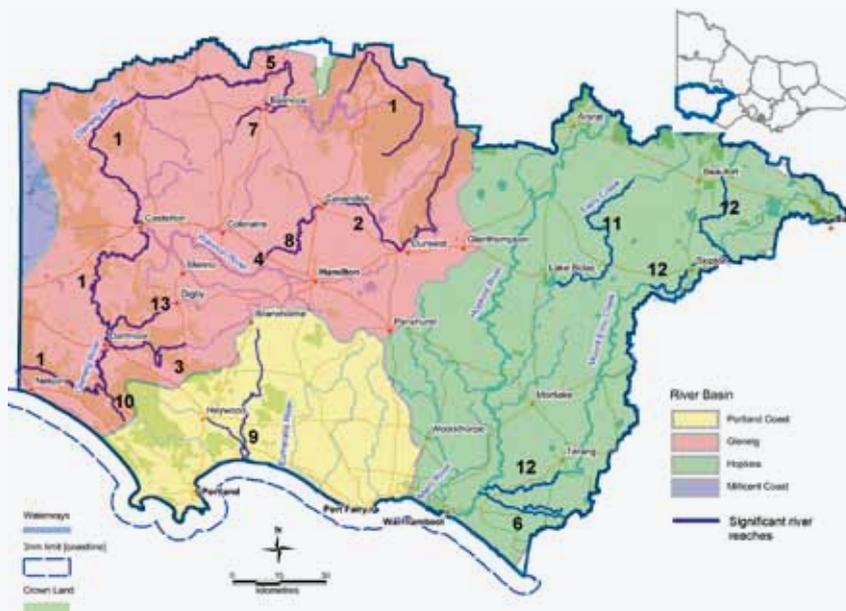


Figure 7: Map of the key river basins in the Glenelg Hopkins region.

Rivers and floodplains in the region are protected by two key pieces of legislation: the *Water Act 1989* (Vic) and the *Catchment and Land Protection Act*. Currently the Glenelg Hopkins River Health Strategy and the Victorian River Health Strategy are in place to assist in management of waterways in this region.

Both of these strategies will be superseded by the Victorian Waterway Management Strategy (in development), and the Glenelg Hopkins Regional Waterway Strategy.

During periods of prolonged heavy rainfall, storm surges or high tides, water levels along rivers rise, often causing inundation of the surrounding landscape. While flooding can become a serious problem for the community if not adequately managed, it is a natural process and is important for the maintenance of biological diversity.³³ A key future challenge will be to ensure the protection of life and property, while allowing rivers to maintain their natural flooding processes.

Local flood management plans and studies help manage floodplains and outlying areas in the Glenelg Hopkins region that are at high risk of inundation. Towns with areas subject to flooding are shown in *Table 5*. The RCS outlines measures (*Table 26*) that will be undertaken in the future to manage this risk.

Glenelg Basin	Hopkins Basin	Portland Basin
Casterton	Beaufort	Port Fairy
Coleraine	Urban area of Ballarat (within CMA region)	Urban areas of Portland
Sandford	Warrnambool	Heywood
Hamilton	Skipton	Macarthur
Harrow	Wickliffe	
Dunkeld	Ararat	

Table 5: Towns in the region with areas subject to flooding.



RIVERS AND FLOODPLAINS

Flood investigations are being undertaken to better understand and predict the outcomes of future flood events, which will inform floodplain planning processes. The RCS seeks to maintain and improve the health of rivers and floodplains in relation to riparian extent, connectivity and hydrological regime.

CONDITION OF RIVERS IN THE GLENELG HOPKINS REGION

River condition in Victoria is assessed using the Index of Stream Condition (ISC). The ISC is an integrated tool for catchment management that measures the environmental condition of river reaches.³⁴

The 2004 ISC assessment indicated that most river reaches in the Glenelg Hopkins region are in moderate to very poor condition. This is generally due to modified flow regimes, degraded riparian vegetation, poor bank condition and low water quality from elevated nutrients and salinity. Some river reaches in the Glenelg and Portland basins were assessed as being in good condition. Updated ISC data is due to be released in 2012.

The Glenelg Basin is recognised as one of the most severely eroded catchments in Victoria. Extensive erosion has delivered large volumes of sand from the Dundas Tablelands, with between four and eight million cubic metres of sand trapped in the Glenelg River and its tributaries. Biodiversity within the river has been severely affected by sand build-up, with the original sequence of deep pools now filled, reducing habitat and drought refuge.³⁵ Despite this, the Glenelg Basin still contains the greatest biodiversity values in the region, with a number of river reaches in moderate to good condition. The basin also contains all five of the reaches classified as 'ecologically healthy' under the Regional River Health Strategy.

Streams within the Hopkins and Portland Coastal basins are physically stable with minor erosion associated with stock access. Blue-green algal blooms have occurred with increasing frequency in some areas. Clearing native riparian vegetation and the introduction of unsuitable exotics have also contributed to the decline in river health.³⁶ Most streams are in poor to moderate environmental condition and have reduced water quality. Poor water quality across the catchment is generally due to rising salinity levels, increased sedimentation and nutrient enrichment. However, recent high flows have seen improvements across a number of water quality measures.

The 2004 River Health Strategy recognised these challenges and mapped out a program of river management. Significant gains in the region's river health have been made over the past eight years. For example, in the upper Glenelg River region, 441 kilometres (km) of waterway has been protected through fencing, with associated revegetation and weed control. Instream habitat and aquatic biodiversity have been enhanced through environmental watering, removal of fish barriers, restoring deep pools and natural riverbed form through sand removal and installation of logs, as well as the control of carp.

The RCS will build on this work through a range of instream and streamside initiatives, and investing in on-ground actions such as revegetation and fencing of riparian areas to help improve water quality.

The highest stream inflows in the catchment in more than a decade occurred during 2010-2011. This had both positive and negative impacts on inland aquatic ecosystems and water quality measures. Three high-value reaches along the Glenelg River between Rocklands Reservoir and the estuary met agreed ecological flow objectives, with flow levels monitored daily. The above average run-off also benefited lakes and wetland systems in the region, many of which are full for the first time in more than a decade.

THREATS

The Glenelg Hopkins River Health Strategy 2004-2009 identified a number of potential threats to river health within the region, including: stock access to riparian zones, barriers to native fish movement, channel modification, bank and bed instability, poor water quality, flow deviation, loss of in-stream habitat, sand deposits and pest plants and animals (eg. carp). Other threats to river health include changes in land use and clearance of streamside vegetation.

Current climate change modelling predicts changing seasonal patterns with an increase in intense periods of rainfall over a shorter timeframe. This is likely to exacerbate the risk of flood. Sea-level rise will also impact on floodplain management, increasing the extent and depth of inundation of floodplains and estuarine areas. In addition to an increase in flood events, climate change is expected to present further challenges for the management of rivers and floodplains with an increase in the severity of drought conditions. Annual run-off in the Hopkins and Glenelg rivers is predicted to be reduced by 5 and 30 per cent by 2030.³⁷ This will most likely result in a reduction in river flows, a reduction in water quality, increasing demands on water resources as well as increased development of the region's floodplains.

SIGNIFICANT AREAS

Identification of regionally significant river areas has been a collaborative process. The prioritisation process has been informed by analysis of existing strategies and consultation with regional experts in river health, and community and agencies through use of the INFFER process.

River assets that have been identified as being exceptional or very highly significant in value are detailed in *Table 6*.

River Asset	Regional Significance
1. Glenelg River (as shown in <i>Figure 7</i>)	The lower section of the Glenelg River is listed as a heritage river under the <i>Heritage Rivers Act 1992</i> (Vic), from south of Dartmoor to its mouth at Nelson, reflecting its high natural, social and landscape values. The river is used for a variety of recreation and tourism activities, and is a popular camping destination. The river reaches support a range of threatened species, including the Glenelg Spiny Cray.
2. Wannon River	This waterway contains high environmental value reaches, a representative reach and an ecologically healthy reach with an excellent ISC. It has also been identified as a key mechanism for connectivity in the landscape. The Wannon floodplain plays a key role in improving water quality for the lower Glenelg River. The Wannon rapids area contains around 237 different native plant species and is of high conservation value.
3. Crawford River	This is a major waterway of a priority sub-catchment within the Glenelg Hopkins region. This waterway contains a high environmental and social value reach and an ecologically healthy reach with an excellent ISC rating. The area contains a number of threatened fauna species, including Broilga, Brown Quail, River Blackfish and Variegated Pygmy Perch. Recreational values include fishing and camping. The area is highly significant to Indigenous people.
4. Wannon Falls Scenic Reserve	A popular recreational reserve with high scenic and conservation value. It contains one of the few remnants of Dundas Tableland native riparian vegetation. The area is part of the wildlife corridor of the Wannon River Valley and has considerable geomorphic and geological significance. The major vegetation community is manna gum woodland and the flora reserve contains about 250 indigenous plant species. A healthy native grassland is also present. ³⁸
5. Fulhams Reserve	Fulhams Reserve is an 860 ha streamside reserve located along the Glenelg River. It has high recreational value and is home to a diverse range of flora and fauna species. The area is an important corridor for the movement of birds, due to the presence of water in the reserve. 111 bird species have been identified within this area.
6. Brucknell Creek and Deep Creek	The area contains a number of rare or endangered riparian EVCs including Swamp Scrub which is one of the rarest EVCs in Victoria. Remaining riparian vegetation has good structural intactness. It is one of the best streams in the Hopkins basin and provides excellent habitat for fish. Significant fish species include the Australian Grayling and River Blackfish.
7. Mathers Creek, Downstream of Cameron's Rd	Upper tributary of the Glenelg River that is largely inaccessible to stock, with intact permanent deep pools providing drought refuge for a range of fauna. The chain of deep pools is a rare feature for the region. ³⁹
8. Nigretta Falls Scenic Reserve	This area is of high conservation and scenic value and is a popular tourist destination. The area is located on the Wannon River and is botanically rich – over 165 plant species have been recorded within the area, including important remnant grasslands. ⁴⁰
9. Fitzroy Darlots system	Darlot creek flows south from Condah to the Fitzroy River at Tyrendarra. The area contains a number of threatened species.
10. Moleside Creek	This waterway contains an ecologically healthy reach with a good ISC rating. The area is of high conservation value, and supports a diverse range of species. The area has high social values, and is a popular location for fishing and camping.
11. Fiery Creek (reaches 26, 27 and 28)	A number of reaches within this system are of ecological significance and support social and economic activity in the region. Good examples of remnant Creepline Grassy Woodland and Riparian Woodland occur within the area. The lower sections of the creek - especially Lake Bolac - have high recreation value, and are popular for camping, walking, boating and fishing. Fiery Creek is highly significant to Indigenous people.
12. Mt Emu Creek (reaches 15, 18 and 22)	This creek contains reaches with relatively intact remnant riparian vegetation and deep permanent pools providing drought refuge for threatened species.
13. Stokes River	The Stokes River contains a high environmental value reach and an ecologically healthy reach. Riparian vegetation which has good structural intactness. Significant EVCs include Damps Sands Herb-rich Woodland, Floodplain Riparian Woodland, Riparian Woodland and rare Swamp Scrub. Significant fauna include Red-tailed Black Cockatoo, Glenelg Spiny Freshwater Crayfish, River Blackfish and Variegated Pygmy Perch. ⁴¹

Table 6: Significant river areas within the Glenelg Hopkins region.

RIVERS AND FLOODPLAINS

OBJECTIVES AND MANAGEMENT MEASURES

Objectives and associated management measures for the region's rivers and floodplains are shown in *Table 7*.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
3.1 Waterways classified as good or excellent in the Index of Stream Condition (ISC3) will remain as such in 2033	3.1.1 Develop and implement Regional Waterway Strategy.*
3.2 The condition of specified waterways currently classed as poor to moderate in the Index of Stream Condition (ISC3) is improved by 2033	3.2.1 Develop and implement Regional Waterway Strategy.
3.3 Improve river health in relation to riparian extent, connectivity, hydrological regime and water quality	3.3.1 Develop and implement action plans for priority waterways and their catchments except where existing park and forest management plans address priority waterways that occur within parks, reserves and forests.
	3.3.2 Develop and implement seasonal watering proposals.
3.4 Increase provision of reliable flood information for settlements	3.4.1 By 2014 complete a Regional Floodplain Management Plan.
	3.4.2 Support the development of a framework for upgrading flood warning systems.
	3.4.3 Complete a priority list for new and upgraded flood warning systems for the region.
	3.4.4 Undertake flood studies to improve knowledge of potential flood impacts on settlements.
	3.4.5 Work with local government to amend planning schemes to reflect best available flood information.
	3.4.6 Develop guidelines for appropriate use and management of floodplains.
3.5 Improve river and floodplain management	3.5.1 Increase community preparedness for flood events through development of early warning systems and flood awareness programs.
	3.5.2 Seek community input during the planning and delivery of strategic management plans.

* This strategy will implement actions relevant to the 2013-2019 timeframe of the *Regional Strategy for Waterways*.

Table 7: Objectives and management measures for rivers and floodplains.

The RCS will support the implementation of actions from the Western Region Sustainable Water Strategy that apply to the Glenelg Hopkins catchment region. These actions are summarised in *Table 8* and are designed to protect and improve the health of waterways, aquifers, wetlands and estuaries; and promote sustainable urban, industrial and rural water use.



Action No.	Action
Promoting sustainable water management	
3.1	Providing more security to section 51 take and use licence-holders.
3.9	Streamlining the approval of section 67 storage construction licences.
3.10	Investigating the potential to harvest high flows.
3.12	Improving opportunities for water trading in groundwater and unregulated river systems.
3.20	Using consumptive water en route for environmental and social benefits.
3.21	Managing riparian land – programs to assist landholders to protect, improve and better maintain high priority riparian land.
3.22	Changing environmental management objectives in response to long-term changes in water availability will be considered by the regional strategies for healthy rivers and wetlands.
3.24	Developing capacity for Indigenous involvement in water management.
Making the best use of the region's groundwater resources	
4.7	Systems with groundwater/surface water interactions will be identified and considered as part of strategic groundwater resource assessment and local management plans or statutory management plans.
4.11	Developing Ministerial guidelines for groundwater dependant ecosystems.
The Wimmera-Mallee Pipeline and the Wimmera-Glenelg system	
6.1	Reviewing operation of the bulk entitlements.
6.2	Collaborating to improve efficiency of managing and operating the supply systems.
6.8	Managing the Wimmera-Glenelg environmental entitlement to achieve optimum environmental outcomes for flows.
The South-west Coast	
8.1	Revised caps on the amount of unallocated surface water available for winter-fill diversions in the South-west Coast .
8.4	Improved environmental flows for the Merri River.
8.5	Investing in integrated catchment management to improve South-west waterways.
The Western District	
9.3	Investing in integrated catchment management to improve western district waterways.

Table 8: Actions from the Western Region Sustainable Water Strategy relevant to Glenelg Hopkins CMA.

Below: Nigretta Falls Scenic Reserve is a significant river asset and popular tourist destination.



CASE STUDY: LAKE CONDAH WEIR

'Listen to the land, respect it, walk softly on it and it'll relate. If you listen to the land you'll hear things.'

- Uncle Johnny Lovett

.....

An ambitious infrastructure project to restore water to Lake Condah was well timed, with the conclusion of the project greeted by the best rains experienced in the region for more than 10 years.

Four years of research, planning and community consultation paved the way to construct a weir at the southern end of Lake Condah, a site of national cultural significance in order to provide water to the lake all year. The Lake Condah Sustainable Development Project also constructed a 450 metre pipeline to ensure environmental flow is retained in Darlot's Creek. A 90 metre weir and fish ladder were added to restore fish and eel access to the lake, previously blocked by the drain's construction in 1946.

The higher than average rainfall in the summer of 2010-11 meant the water level in the lake was higher than expected at that early stage. Since completion of the weir and filling of the lake, native birds have arrived in remarkable numbers: black swans, black ducks, hardheads, cormorants, grebes, and shovelers in their hundreds, with many breeding, as well as notable arrivals of a pair of Brolgas, and a White-bellied Sea Eagle.

The Lake Condah project was widely supported and provided an example for reconciliation through a practical means. It was a partnership between the Winda-Mara Aboriginal Corporation, Department of Sustainability and Environment, Glenelg Hopkins CMA, Parks Victoria, Glenelg Shire and Southern Rural Water.

The project provided work for 25 Indigenous employees, who gained a range of practical work skills and accreditation.

The weir was completed in August 2010 and named to commemorate the Kerrup-jmara people who conceived and constructed the sophisticated system of channels and fish traps at least 6,000 years ago.

The lake is interwoven with the history of the Gunditjmarra people. For thousands of years the Gunditjmarra modified more than 100 sq km of the landscape to breed and farm eels.

Some modifications of the landscape by the Gunditjmarra included digging through rock to allow water to flow from swamp to swamp. Some chains of channels and ponds stretched more than 30 km, carrying water to low-lying areas where a system of weirs was used to pond the water. The ponds and wetlands enabled a form of aquaculture where they grew fish and eels and then harvested them with woven baskets. Eels were then preserved through smoking, and traded with neighbours.

Stone houses and stone fish traps can still be observed in the bed and shores of Lake Condah and along the Budj Bim landscape.

Below: Lake Condah is a site of national cultural significance.

Photo: Leonard Cooper.



WETLANDS

THE WETLANDS OF THE GLENELG HOPKINS REGION CONTRIBUTE TO ENVIRONMENTAL, SOCIAL AND AGRICULTURAL HEALTH, AND HAVE SIGNIFICANCE BEYOND THE REGION.

.....
Wetlands are a significant environmental feature of the Glenelg Hopkins region.

The catchment has more than 5,400 wetlands, covering 73,000 ha or three per cent of the region’s area. This represents 14 per cent of Victoria’s total area of wetlands and 44 per cent of the state’s total number of wetlands.⁴² The border region between South Australia and Victoria has the highest density of wetlands in southern Australia. The distribution of wetlands in the region, as well as significant wetland areas, are indicated in *Figure 8*.

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains have been nominated for listing under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. Seasonal Herbaceous Wetlands are isolated freshwater wetlands that are ephemeral (non-permanent).

Most ephemeral wetlands provide critical habitat for a range of invertebrate communities. Reptiles such as snakes, lizards and turtles live in or near these wetlands. Brolgas build their nests from grassy material on small islands or directly on shallow waters and are listed as threatened in Victoria, SA and NSW. The absence of fish due to seasonal dry periods provides good breeding and foraging habitat where frog species can complete their life cycles.⁴³ These wetlands also provide feeding sites for a range of native waterbird species. Some terrestrial mammals make use of these wetlands for feeding or habitat, and bats fly over the wetlands to feed on insects emerging from the water and habitats on the wetland margin.

Wetlands are an integral part of the region’s landscape and underpin some of the most significant recreational attractions in the region including boating, fishing, camping, swimming and sightseeing. They also help support the regional economy through tourism, agriculture and fisheries activities.

Below: Wetlands provide critical habitat for a range of species.

Photo: James Pevitt.



WETLANDS

Wetlands of the Glenelg Hopkins have long been acknowledged as key areas for conservation under a number of international agreements. Lake Bookaar, near Camperdown, is recognised under the Ramsar Convention as a wetland of international importance,⁴⁴ while several other wetlands fall within the flyways of bird species recognised under international treaties (JAMBA, CAMBA and ROKAMBA). There is also three Important Bird Areas (IBA)⁴⁵ including Yambuk Lakes Complex IBA, Port Fairy to Warrnambool IBA and Discovery Bay to Piccaninnie Ponds IBA. Sixteen of the region's wetlands are listed in the Directory of Important Wetlands of Australia (DIWA).

Since European settlement, many wetlands have been drained, reducing their extent and connectivity.⁴⁶ Other wetlands have been affected by grazing, cropping or establishment of tree plantations.

Wetlands are integral to healthy ecosystems in the region's landscape, particularly with respect to water quality and biodiversity. They receive run-off, absorb and filter floodwaters, replenish groundwater reserves, act as direct surface water supplies⁴⁷ and are important drought refuges for wildlife.

The region's wetlands vary greatly, ranging from large and permanent freshwater lakes to small and ephemeral (non-permanent) freshwater meadows.

CONDITION OF WETLANDS IN THE GLENELG HOPKINS REGION

The condition of wetlands varies considerably over the region. While many are in good condition, large numbers have been degraded.

The extent of wetlands has declined by approximately 50 per cent since European settlement. Primary causes for the decline are drainage and conversion to agriculture.

Permanent lakes have a fairly stable water level while ephemeral wetlands are exposed to fluctuating levels, including a drying phase. These processes influence plant communities, which will react differently under different threats and stressors.

The Index of Wetland Condition (IWC) was developed by the Department of Environment and Primary Industries (DEPI) in November 2005 to measure the condition of wetlands across Victoria. The IWC measures aspects of the wetland's soils, water, plants and the wetland catchment. The method is designed for naturally occurring wetlands without a marine hydrological influence. DEPI coordinated an assessment of the condition (health) of approximately 600 wetlands across the state in spring and summer 2009 using the IWC method, and a further 300 in early 2011. *Table 9* provides a breakdown of wetland condition for six wetland types in the region.

This breakdown of the IWC results reveals that a majority of the wetlands were in good to excellent condition with the exception of meadows. This is consistent with the fact that meadows are the least obvious on the landscape and tend to exist on land that is favourable for agriculture. On the other hand, deep and shallow marshes tend to have longer periods of inundation and are therefore less conducive to agricultural conversion.

- 1 Boiler Swamp
- 2 Dergholm Wetlands
- 3 Long Swamp
- 4 Bridgewater Lakes
- 5 Lake Condah
- 6 Tower Hill
- 7 Lake Bookar
- 8 Nerrin Nerrin Wetlands
- 9 Woornadoo Wetlands
- 10 Lake Linlithgow
- 11 Bryans Swamp
- 12 Lake Muirhead
- 13 Mt William Swamp
- 14 Lake Muirhead
- 15 Gooseneck Swamp

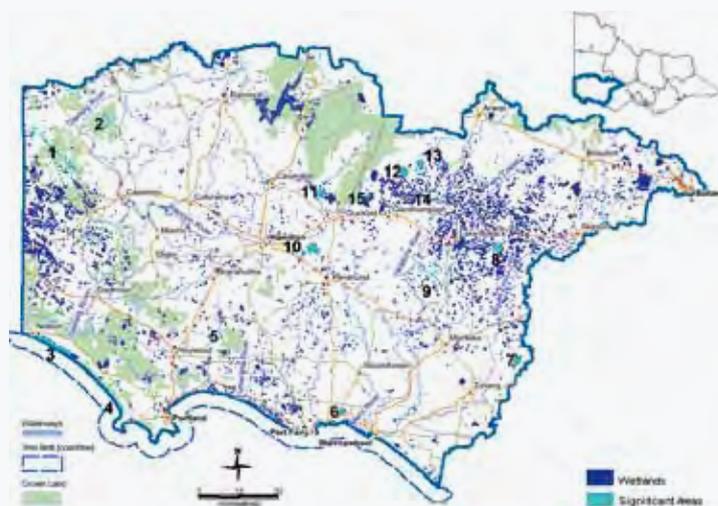


Figure 8: Wetlands in the Glenelg Hopkins catchment.



Photo: James Pevitt

CONDITION OF WETLANDS IN THE GLENELG HOPKINS REGION

Type	% of all wetlands	% Surveyed	% of all types surveyed	Wetland condition rating for six wetland types found in the region				
				Excellent	Good	Insufficient Data	Moderate	Poor
Deep marsh	12.3%	6.9%	27.0%	30	15		4	1
Shallow marsh	20.3%	4.1%	27.0%	33	6	2	5	4
Meadow	47.4%	2.5%	37.8%	17	8	1	13	31
Open water	13.9%	0.8%	3.8%		3		1	3
Perm saline	1.5%	8.0%	3.8%	3	3		1	
Semi saline	4.5%	0.4%	0.5%				1	

Table 9: Wetland condition assessment by wetland type for the Glenelg Hopkins region.

THREATS

Of the wetlands that remain in the region, most are on private land and exist as relics across a landscape largely converted for agriculture. Many are directly accessed by stock or lack fringing vegetation, resulting in changed hydrology and impacting on their natural processes. Consequently, the bulk of the remaining wetlands are artificially dry and/or are exposed to pollution, nutrient enrichment, pesticides and herbicides (through run-off and drift), and pest plant and animal infestations.

Climate variability influences how land adjacent to and within wetlands is managed. Over the past five years and prior to the wet summer of 2010-11, many wetlands were dry for an extended period and some had been converted to cropping or plantation forestry. Based on current estimates of Victoria's future climate, the extent and frequency of droughts in Victoria may more than double by 2050.⁴⁸ This will undoubtedly present increased pressures on the wetlands of the Glenelg Hopkins region.

Recent rain has not necessarily alleviated the pressure on wetlands. Following the spring and summer rainfall events of 2010 and 2011, there are renewed calls for drainage of wetlands and floodplains in order to return this land to agricultural production.

WETLANDS

SIGNIFICANT AREAS

Significant wetland areas within the Glenelg Hopkins region are shown in *Table 10 and Figure 8*. These areas have been determined from a number of processes including INFFER and consultation with key partners.

Asset Name	Regional Significance
1. Boiler Swamp Wetland System	This system consists of a band of wetlands and is of high conservation value for its flora and fauna. This wetland system is frequented by two species listed under JAMBA and CAMBA. ⁴⁹ These wetlands are nationally significant and are listed on the Directory of Important Wetlands in Australia (DIWA).
2. Dergholm (Youpayang) Wetlands	These wetlands are a network of shallow and deep freshwater marshes. They support a diverse range of flora and fauna, and are of high conservation value. This wetland complex is listed on the DIWA. ⁵⁰
3. Long Swamp	A coastal freshwater wetland separated from the sea by an extensive dune field. This wetland is utilised by the community for recreation and is of high scenic value. This lake is rated as a wetland of national importance (DIWA listed) and is noted for its flora and fauna.
4. Bridgewater Lakes	A freshwater line of lakes in a dune corridor. The area has high social values with water sports, fishing, swimming and bushwalking (Great South West Walk). The area is an important drought refuge for water birds and provides freshwater habitat.
5. Lake Condah and Allambie Wetlands	A seasonal stream-fed wetland which provides rich seasonal habitat for a variety of wildlife. Geomorphological features are of national significance, the area contains Indigenous sites of international significance. The area is renowned for short-finned eel, blackfish and many waterbirds. ⁵¹ Lake Condah is listed on the DIWA.
6. Tower Hill	Is a unique wetland type formed in a volcanic crater. These wetlands are of high-value for their flora and fauna as well as their geomorphology, geology and invertebrates. Socially, Tower Hill is an important tourist attraction due to its scenery, walking tracks, wildlife and facilities. ⁵² Tower Hill is listed on the DIWA.
7. Lake Bookaar	Lake Bookaar is RAMSAR listed. It is a permanent, brackish lake formed between basalt flows. It is a high-value wetland for its ecological and educational features and particularly for its birdlife. ⁵³ It is rated as being of national and international importance.
8. Nerrin Nerrin Wetlands	This system consists of a network of stream-fed freshwater to brackish wetlands. It consists of five wetlands that provide a variety of habitats which support a diversity of vegetation types and waterbirds. Current recreational uses include nature conservation, grazing, water extraction, commercial eel fishing and duck hunting. Grazing and cropping occur in the surrounding area. ⁵⁴ These wetlands are listed on the DIWA.
9. Woorndoo Wetlands	A narrow string of lunette wetlands between Woorndoo and the Hopkins River. Current land uses include nature conservation, grazing, and duck hunting. ⁵⁵ These wetlands are rated as a nationally significant wetland and are listed on the DIWA. The wetlands provide important habitat for a number of threatened bird species.
10. Lake Linlithgow System	These wetlands are of high conservation value for their flora and fauna. They cover a large area and have the capacity to hold very large numbers of waterbirds in a part of the Victorian Volcanic Plains which has few large permanent wetlands. This system acts as a drought refuge and includes several wetland types that vary in salinity and depth. Socially, the wetland system is important for recreation activities such as boating and fishing. ⁵⁶ This wetland is listed on the DIWA.
11. Bryans Swamp	An 805 ha swamp which is accessible to the public and is good for bird watching.
12. Lake Muirhead	A large, permanent, shallow freshwater swamp that is an example of an uncommon mechanism for wetland formation in Victoria. It is a major flocking site for Brolgas as well as other bird species. This wetland is rated as a nationally significant wetland and is listed on the DIWA.
13. Mount William Swamp	A large, shallow freshwater swamp surrounded by grazing land. The wetland is a good example of a reed-dominated shallow freshwater marsh which is not common in Victorian midlands. The wetland supports many waterbird species including Brolga. Duck hunting is popular. ⁵⁸ This wetland is listed on the DIWA.
14. Cockajemmy Lakes	A system of salt lakes that is a flocking area for birds, including Brolga. This attraction makes it a popular site for birdwatching. The lakes are surrounded by agricultural land.
15. Gooseneck Swamp	A 60 ha ephemeral wetland that is public land and classified as National Park. The swamp provides habitat and refuge for a number of threatened fauna and flora species. In recent years it has supported breeding events for Ibis and feeding grounds for the threatened Brolga.
Seasonal Herbaceous Wetlands	This asset incorporates the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains. Seasonal Herbaceous Wetlands are isolated freshwater wetlands that provide critical habitat for a number of listed threatened species.

Table 10: Significant wetland areas within the Glenelg Hopkins region.

The priorities listed in Table 10 may be refined with the completion of the Aquatic Value Identification and Risk Assessment (AVIRA) database and development of the Regional Waterway Strategy.

OBJECTIVES AND MANAGEMENT MEASURES

Objectives and related management measures for wetlands are detailed in *Table 11*.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
4.1 By 2033, improve the condition of wetlands, and maintain the diversity of wetland types (using IWC1 assessment for comparison)	4.1.1 Develop and implement a wetland strategic framework as part of the Regional Waterway Strategy.
	4.1.2 Develop strategic management plans for significant (priority) wetlands.
	4.1.3 Develop best management practices for wetlands.
	4.1.4 Support Indigenous wetland restoration projects.
	4.1.5 Establish a management framework for reinstating drained wetlands.
	4.1.6 Review the effectiveness of current measures to mitigate the impact of land-use change on wetlands.
	4.1.7 Through education and incentive programs, increase the number of private land managers implementing best wetland management practices.
	4.1.8 Prevent negative impacts to wetlands from new developments by working with councils to implement wetland-specific planning scheme overlays.
	4.1.9 Identify opportunities for land purchase of priority wetlands.

Table 11: Objective and management measures for wetlands.

Below: Wetlands are important for agriculture, biodiversity and social values.

Photos (L-R): James Pevitt, Rob Drummond, James Pevitt.



ESTUARIES

ESTUARIES ARE
BODIES OF WATER
WHERE RIVERS MEET
THE SEA.

.....
The ever-changing
characteristics of
estuaries are influenced
by catchment rainfall and
subsequent run-off, ocean
swells, winds and tides.⁵⁹

The eight major estuaries in the Glenelg Hopkins region are the Glenelg River Estuary, Fawthrop Lagoon, Surry River Estuary, Fitzroy River Estuary, Yambuk Lake, Moyne River Estuary, Merri River Estuary and the Hopkins River Estuary (*Figure 9*). Moyne Estuary and the smaller outlet associated with the Fawthrop Lagoon are kept permanently open while the remainder naturally intermittently close following the formation of a sand bar at the estuary mouth. Closure often coincides with seasonal periods of low catchment rainfall and run-off. Estuaries that intermittently close within the region typically reopen following high rainfall events when there is enough water flowing down the river to flush the built-up sand from the estuary mouth.

Estuaries are highly dynamic and productive systems which support a rich and diverse array of wildlife and unique wetland vegetation communities. They provide key spawning and nursery grounds for many species of fish, critical breeding and foraging areas for birds, are a drought refuge and play a pivotal role in maintaining water quality through nutrient and sediment filtering. Regional estuaries also support a significant number of threatened species that are listed under the *Flora and Fauna Guarantee Act 1988* (Vic) and the *Environment Protection and Biodiversity Conservation Act*.

Estuaries underpin key social, economic and cultural heritage values within south west Victoria. They are a significant drawcard for tourism and are highly valued by the local and broader community for scenic beauty, recreational fishing, swimming, camping, bird watching and boating. Investment has been made in public infrastructure to support recreational use of estuaries, particularly those near population centres at Warrnambool, Port Fairy, Yambuk, Narrawong, Portland and Nelson. Estuaries are culturally significant, and the Fitzroy Estuary occurs within the Budj Bim National Heritage Landscape.

When estuaries intermittently close, the resultant increase in water level has significant environmental benefits when adjoining wetlands and fringing vegetation are flooded. However, there are also economic costs associated with flooding of highly productive agricultural land and infrastructure such as jetties and roads. Therefore, the decision to artificially open the estuary to relieve flooding requires consideration of a range of environmental, social and economic values.

There are a number of potential consequences of artificially opening estuaries at inappropriate times, including fish kills and the flushing of fish eggs and larvae out to sea.⁶⁰ Glenelg Hopkins CMA uses the Estuary Entrance Management Support System (EEMSS) to consider the risks of artificially opening estuary mouths at different water levels and times of the year, and possible impacts on infrastructure and natural assets.⁶¹ The RCS will implement this system across the region's six intermittently closed estuaries to ensure that they are appropriately managed.

The environmental significance of several of the catchment's estuaries is recognised at a national and international level. The Glenelg River estuary is listed as a Heritage River under the *Heritage Rivers Act* and as a wetland of national significance in the Directory of Important Wetlands in Australia (DIWA). The Yambuk Lake complex, along with the Lower Merri River Wetlands (Kelly's and Saltwater swamps) are also listed as nationally important (DIWA) wetlands. Estuaries also provide important habitat for migratory species and are protected under international agreements.

CONDITION OF ESTUARIES IN THE GLENELG HOPKINS REGION

A Victorian Index of Estuary Condition (IEC) is currently in development. The IEC will identify potential measures for use in a consistent, systematic assessment of estuarine ecological condition. This data, together with information about the social, economic and cultural values of each estuary, will contribute to a comprehensive risk assessment that identifies the values and threats to each of the estuaries in this region. The Regional Waterway Strategy will identify priority reaches and management actions required to protect or enhance those values.

Regular water quality monitoring contributes to the regulation and administration of artificial river mouth openings, implementation of management actions and identification of emerging issues to estuary health. Data from regular water quality profiles and surface measurements from telemetry stations contribute to the understanding of physical and biological processes and are an important component of the CMA's estuary management. The long-term dataset has been provided to several research projects, including the trial Index of Estuary Condition. Ultimately, estuary monitoring aims to improve knowledge to enable better protection and management of estuarine assets.

To improve the condition for estuarine environments the following points need to be addressed:

- improvement of water quality in waterways feeding estuaries
- restoration and protection of natural riparian vegetation along major waterways in the Glenelg Hopkins region
- increased length of river available to native fish in the Glenelg Hopkins region while maintaining carp-free status and excluding exotic predator fish
- no further decline or loss of rare or threatened estuarine dependent flora or fauna species.



Figure 9: Location of estuaries in the Glenelg Hopkins region.

ESTUARIES

THREATS

Estuaries are dynamic and resilient systems, but face a broad range of threats from human and natural causes. The proximity of estuaries to coastal settlements exposes them to intensive levels of recreation and social use. Predicted rapid population growth in coastal areas will increase development pressure, particularly along waterways. The high-value of coastal agricultural land will contribute to the pressure on coastal land generally, including land adjacent to estuaries.⁶²

The main threats to the region's estuaries include: inappropriate development, inappropriate land use, loss of instream habitat, riparian degradation, reduced water quality, exotic flora and fauna, bank and bed instability, stock access to riparian zones and flow deviation.

Unlicensed artificial estuary mouth openings can also have a negative impact on the form and function of estuaries. Implementation of the Estuary Entrance Management Support System and associated increased community understanding of estuary function will reduce the potential threat from these activities.

Estuaries and their associated wetland complexes are particularly susceptible to climate change impacts. Hydrological changes associated with climate change provide a challenge for management of land use and habitat values in areas adjacent to estuaries. Altered inundation and salinity regimes from increased sea levels, storm surges, lower rainfall, increased temperatures and increased storm events will affect infrastructure and biota both in and adjacent to estuaries.

SIGNIFICANT AREAS

Identification of regionally significant estuaries has been a collaborative process. Consultation with regional experts in estuarine health, analysis of existing strategies and extensive community and agency consultation using the INFFER process has been undertaken to identify and prioritise the regional assets shown in *Table 12*.

Asset	Regional Significance
Glenelg River Estuary	The Glenelg River Estuary is a heritage reach. It is part of the Discovery Bay Coastal Park and the Glenelg River is listed on the National Estate Register. The Glenelg River Estuary is linked to Piccaninnie Ponds Conservation Park in South Australia. It is a high-value wetland for its ecological features, and is the only estuarine lagoon system in Victoria developed within a framework of dune calcarenite ridges. It is the only remaining relatively undisturbed salt marsh community in western Victoria. Social values include fishing, boating and walking.
Moyne River Estuary and Belfast Lough	This system supports key social and economic values, including an operational port and subsequent commercial, recreational activities and supports a range of critical habitats and species. ⁶³ The system is a drought refuge for waterbirds and is a nursery area for fish.
Merri River Estuary	This estuary is a wetland of national significance and is listed on the DIWA. The system supports significant habitat for rare and threatened species and has been an important meeting place for the Gunditjmarra people for thousands of years. ⁶⁴ The area contains significant habitat for rare species such as the Orange-bellied Parrot and are breeding grounds for the Hooded Plover and other nesting birds. The area contains a number of plant species that are considered rare or threatened in Victoria. ⁶⁵
Yambuk Lake	The system is a wetland of national significance and is listed on the DIWA. It supports a diverse range of habitat for a large number of nationally and internationally protected species. ⁶⁶ During drought the lake and wetlands provide feeding and breeding grounds of state-wide importance. 28 native flora species of regional significance have been recorded which are rare or threatened in the local bioregion. It is an important regional recreation and tourist destination.

Below: Hopkins River Estuary is an important nursery area for juvenile fish, and supports a range of recreational activities.

Photo: James Pevitt.



SIGNIFICANT AREAS (Cont.)

Asset	Regional Significance
Hopkins River Estuary	A total of 39 fish species have been found in the estuary which is an important nursery area for juvenile fish. Terrestrial habitat surrounding the estuary is equally important for birds, mammals and reptiles. The river marks the tribal border of the Kirrae Whurrong, Gunditjmara and Tjap Whurrong peoples and is highly important to the Indigenous community (listed on the National Trust of Australia). ⁶⁷ The estuary is used for a variety of recreational activities including walking, cycling, boating, waterskiing, swimming, rowing and recreational fishing, and is a popular tourist destination.
Fitzroy River Estuary	The Budj Bim National Heritage Landscape is a key cultural site within the Darlots Creek catchment. Rare and threatened plants are found in the area including the Salt Paperbark. 120 bird species have been identified, 17 of which are listed under the <i>Flora and Fauna Guarantee Act 1988 (FFG Act)</i> and two under the Commonwealth Environment Protection and <i>Biodiversity Conservation Act 1999 (EPBC Act)</i> (including the Orange-bellied Parrot). Threatened fauna that occur within the area include the Spot-tailed Quoll (listed under <i>FFG Act</i> and <i>EPBC Act</i>).

Table 12: Significant estuaries in the Glenelg Hopkins region.

OBJECTIVES AND MANAGEMENT MEASURES

Objectives and management measures for the region’s estuaries are summarised in Table 13.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
5.1 By 2033, improve the condition of estuaries across the region as compared with the 2018 IEC assessment	5.1.1 Develop and implement an estuaries strategic framework through the Regional Waterway Strategy.
	5.1.2 Review Estuary Management Plans as they expire, in conjunction with the Regional Waterway Strategy.
	5.1.3 Revise the South West Victoria Coastal Action Plan by 2014.
	5.1.4 Develop Environment Significance Overlays to protect estuaries from inappropriate development and use.
	5.1.5 Where appropriate identify strategic land purchase sites for the protection and improvement of estuary function and biodiversity values.
	5.1.6 Implement Estuary Entrance Management Support System across the eight estuaries that occur within the Glenelg Hopkins region.
	5.1.7 Conduct research into estuarine environments to better understand function, structure and connectivity with coastal and marine environments and to reduce negative impacts.
	5.1.8 Continue estuary monitoring to inform Estuary Entrance Management Support System (EEMSS) and enable implementation of IEC.

Table 13: Objectives and management measures for estuaries.

Below: Estuaries underpin many social, economic, cultural and environmental values within the region.

Photos (L-R): James Pevitt.



COASTS

THE REGION'S
DRAMATIC
COASTLINE, WITH
ITS TOWERING CLIFFS
AND EXTENSIVE DUNE
SYSTEMS, HAS BEEN
CARVED OUT BY
CHANGING SEA
LEVELS, VOLCANIC
ACTIVITY AND WIND
AND WATER
EROSION.⁶⁸

.....
The coastal area contains
some of Australia's most
beautiful, spectacular and
pristine environments that
represent a unique blend
of values important to
residents and visitors.

Seventy three per cent of Victorians rate coastal and marine environments as the most important natural feature of Victoria.⁶⁹ The coast contributes significantly to the economic, cultural, environmental and recreational life of local, regional and state communities. Environmentally, the coast is rich in biodiversity and is home to a variety of threatened species. The coastal zone also contains regionally significant ports, industry and many sites of Aboriginal and European historical significance.⁷⁰

The boundaries of the coastline are currently not formally defined. When determining the extent of the Glenelg Hopkins coastline, reference is made to the Victorian Coastal Strategy. The strategy refers to '...all private and coastal Crown land directly influenced by the sea or directly influencing the coastline. Those influences range from visual to drainage impacts'.⁷¹

The Glenelg Hopkins CMA developed a Coastal Asset Tool to guide the definition of the inland extent of the coastal zone. *Figure 10* shows the Glenelg Hopkins region coastal zone and the significant areas that it contains.

The majority of the coast is in public ownership, with specific areas under delegated community management, and a limited amount in private ownership.⁷² A proportion of the coastline is protected as parks and reserves managed by Parks Victoria. Parks Victoria is therefore a key stakeholder in urban and industrial development in coastal areas and in the management of coastal and estuarine environments.⁷³

Coastal areas within the Glenelg Hopkins region occur within three bioregions: Glenelg Plain, Warrnambool Plain and Bridgewater Plain.

Coastal flora and fauna communities of the Glenelg Plain bioregion are composed of beach and dune vegetation. It also includes a largely unvegetated extensive dune system with lakes that support wetland vegetation. Geomorphically significant basaltic sea caves occur along adjoining coastline, with extensive coastal cliffs, salt marshes and wet heathlands.⁷⁴ The bioregion supports a wide variety of reptiles, birds of prey, waterbirds, woodland and ground-dwelling birds, and an array of mammal species.⁷⁵

Photo: James Pevitt



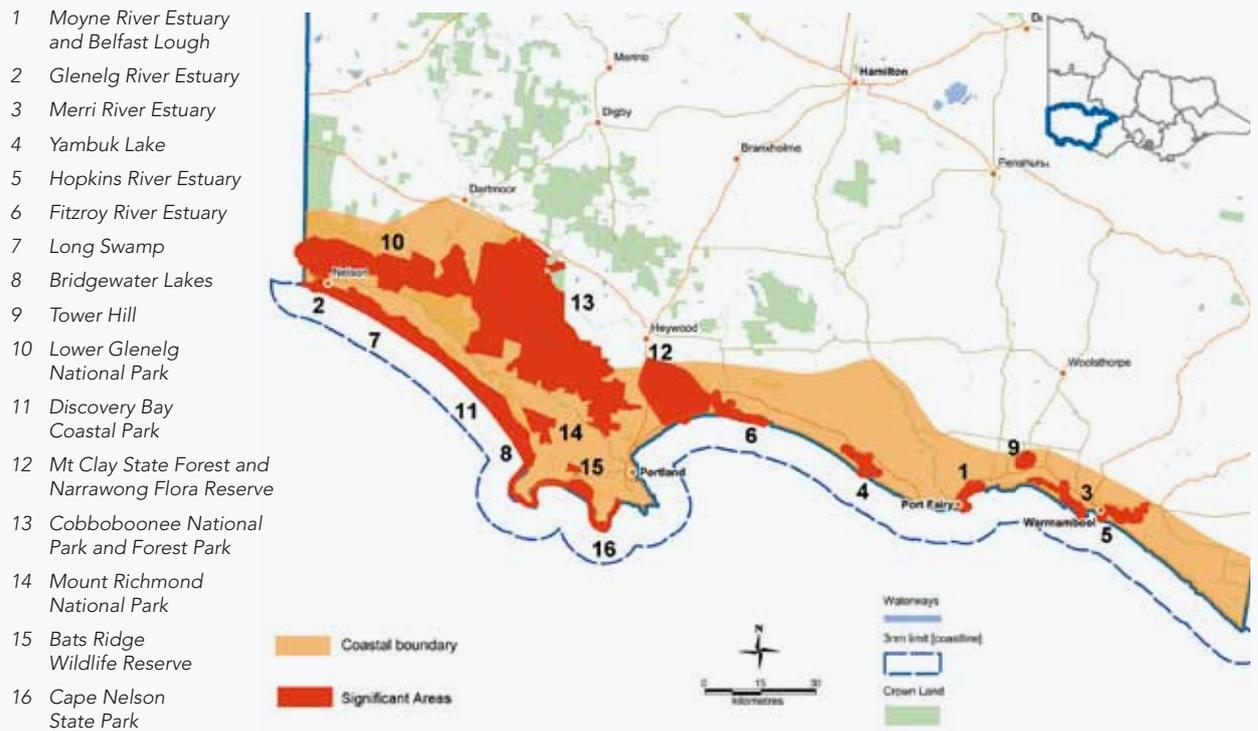


Figure 10: Distribution of the Glenelg Hopkins coastal zone and significant areas.

Most of the Warrnambool Plain bioregion is in private ownership. At the time of European settlement the coastal plains were dominated by forests, heathy and grassy woodlands and coastal shrubs and grasslands. There has been substantial clearing of all vegetation types, particularly those on deeper, more fertile soils. The remaining native ecosystems are highly significant and vital for biodiversity conservation. Severely depleted ecosystems of particular importance include open coastal shrubs and shallow freshwater wetlands. Vegetation remnants are at risk from weed invasion and rabbits, while native fauna is increasingly affected by introduced predators (foxes and feral cats), fragmentation and modification of habitats.

The Bridgewater bioregion is a thin coastal plain with a sand ridge stretching along the coastline and a lagoonal system situated behind. The lagoonal system supports a network of deep-water pools, collapsed caverns and sink holes.

CONDITION OF THE COAST ALONG THE GLENELG HOPKINS REGION

The coastal zone encompasses a number of values that need to be incorporated into a condition assessment. These include estuarine health, wetland health, extent of native vegetation and the presence of threatened species.

Based on these considerations, it could be determined that, overall, the coastal environment is under extreme pressure and may be considered to be in marginal condition.

Some specific asset areas may be considered to be in marginal to good condition but generally this would be related to the protection that is afforded to them (for example, areas of national park).

A key challenge for improving or maintaining the condition of the coastal zone is coastal development. Where areas of the coastline are under high demand and are subject to development pressures, coastal habitats tend to gradually fragment or are lost.⁷⁶

The likely impacts of climate change will add further challenges and pose serious impacts on biodiversity and ecosystem health.⁷⁷

ESTUARIES

The condition of estuaries is addressed in the previous section.

COASTAL WETLANDS

Wetlands within the Glenelg Hopkins CMA coastal zone cover 6,073 ha, of which half is on Crown land primarily associated with parks and reserves.

The number of coastal wetlands on Crown land is one-quarter of the total number of coastal wetlands.

Most of the systems on Crown land are larger and more connected. The remaining 50 per cent of the coastal wetland area makes up approximately 75 per cent of the total number of coastal wetlands. They are generally smaller in size, are more fragmented and occur across a matrix of land that is largely used for stock grazing. Many are open to stock access and a large number, primarily those behind the dunes, are sinks for agricultural drainage and run-off.

COASTS

This is likely to result in increased periods of inundation and compromised water quality.

Coastal residential development has impacted several areas of coastal wetlands, both directly through drainage and conversion. They are also exposed to higher intensity recreational use.

Coastal wetlands are particularly vulnerable to climate change impacts such as inundation from rising sea levels and storm surges.

COASTAL HABITAT

The coastal region of the Glenelg Hopkins catchment contains a wide range of habitats that support diverse and unique floristic species and communities. This includes relatively large pockets with good levels of connectivity in the west, to smaller isolated patches in the east. The major vegetation communities include Coastal Dune Scrub, Damp Sands Herb-rich Woodland and associated Wet and Damp Heathland complexes.

European settlement brought vast changes to the coastal landscape, resulting in highly modified plant communities. Large expanses of coastal vegetation have been cleared for agricultural purposes and this fragmentation continues to be a major concern through future development of high-value coastal land.

Introduced animals such as rabbits, have been responsible for the ongoing decline of indigenous species while the introduction of exotic and environmental weeds – in particular, species such as Marram Grass, Coastal Tea-tree and New Zealand Mirror Bush – has had an irreversible effect on vegetation communities. A key challenge is to maintain a healthy and diverse coastal ecosystem that exhibits connectivity on a landscape scale, particularly where the coast is in high demand or under threat from the implications of climate change.

COASTAL THREATENED SPECIES

A number of EPBC Act listed threatened species occur within the coastal zone, including the Orange-bellied Parrot (endangered), Southern Bent-wing Bat (vulnerable), Lime Fern (endangered), Pretty Leek-orchid (endangered) and Metallic Sun-orchid (endangered).

THREATS

Coastal areas are experiencing unprecedented increases in population and tourism activity, and the coastal environment is highly valued. However, pollution, erosion and over-development are major threats.⁷⁸

Impacts of management activities in the catchment directly and indirectly affect the coastal zone. Nutrient and sediment enrichment of waterways, chemical pollution and reduced water flows potentially impact on the health of the coastal environment.

Similar to other areas of the catchment, the coast is threatened by loss of biodiversity, pest plant and animal invasion and erosion. However, in stark contrast to other catchment areas, the increase in population growth and associated urban development along the coastal strip is contributing to the significant impact on the health of the coastal environment.⁷⁹

The key threats to the Glenelg Hopkins coastline can be summarised as:

- inappropriate planning and development
- pest plants
- pest animals
- sea-level rise
- storm surges
- inundation
- coastal acid sulphate soils
- unsustainable tourism
- water quality
- water quantity
- unauthorised artificial river mouth openings
- erosion.

Climate change predictions have indicated that sea levels are projected to rise. This is a significant issue for the Glenelg Hopkins catchment region, as it contains more than 220 km of coastline. The frequency of storm events and storm surges in coastal areas is also forecast to increase, and erosion and inundation may worsen, impacting coastal and marine ecosystems.⁸⁰

SIGNIFICANT AREAS

Significant coastal areas are listed in *Table 14*. It should be noted that these areas are also identified under other asset themes including terrestrial habitat, estuaries, and wetlands. A number of consultative processes contributed to this list of significant areas including the INFFER process, agency consultation and consultation with coastal experts.

DEPI is currently developing a methodology to identify coastal assets. Significant coastal assets (*Table 14*) will be reviewed following the completion of this work.

Asset Name	Regional Significance
1. Moyne River Estuary and Belfast Lough	This system supports key social and economic values within the Port Fairy area, including an operational port and recreational activities. The area provides critical habitat for threatened species, ⁸¹ is a drought refuge for waterbirds and is a nursery area for fish.
2. Glenelg River Estuary	The Glenelg River estuary has significant natural, recreation, scenic and Indigenous cultural values. It is the only estuarine lagoon system in Victoria developed within a framework of dune calcarenite ridges, and the only remaining relatively undisturbed salt marsh community in western Victoria. Social values include fishing, boating and walking.
3. Merri River Estuary	The system has been an important meeting place for the Gunditjmara people for thousands of years. ⁸² The area contains significant habitat for rare species such as the Orange-bellied Parrot, and is a breeding ground for the Hooded Plover and other nesting birds. A number of plants that occur within this area are considered rare or threatened in Victoria. ⁸³
4. Yambuk Lake	The system provides important habitat for a large number of nationally and internationally protected species, including the Orange-bellied Parrot. ⁸⁴ During drought, the lake and wetlands provide feeding and breeding grounds of state-wide importance. It is an important recreation and tourism destination.
5. Hopkins River Estuary	A total of 39 fish species have been found in the estuary which is an important nursery area for juvenile fish. The river marks the tribal border of the Kirrae Whurrong, Gunditjmara and Tjap Whurrong peoples and is highly important to the Indigenous community (listed on the National Trust of Australia). ⁸⁵ The estuary has high social value, and is used for a variety of recreational activities including walking, cycling, boating, waterskiing, swimming, rowing and recreational fishing.
6. Fitzroy River Estuary	The Budj Bim National Heritage Landscape is a key cultural site within the Darlots Creek catchment. 120 bird species have been identified within the area, including the critically endangered Orange-bellied Parrot. A number of threatened flora and fauna species are also present, including the Salt Paperbark, and Spot-tailed Quoll.
7. Long Swamp	Long Swamp is a coastal freshwater wetland separated from the sea by an extensive dunefield. This wetland has high scenic and social value, and is used by the community for a variety of recreation purposes. ⁸⁶ This lake is DIWA listed and is noted for its flora and fauna.
8. Bridgewater Lakes	A freshwater line of lakes in a dune corridor. The area has high social values, and is used for a variety of water sports including fishing, swimming and bushwalking (e.g. Great South West Walk). The area is a drought refuge for water birds and provides important freshwater habitat.
9. Tower Hill	This area contains a unique wetland type formed in a volcanic crater. The area has high social and natural values, and is noted for its geomorphology, geology and invertebrates. Socially, Tower Hill is an important tourist attraction due to its scenery, walking tracks, wildlife and facilities. ⁸⁷ Tower Hill provides critical habitat for a range of bird species and is DIWA listed.
10. Lower Glenelg National Park	Lower Glenelg National Park has significant social, economic, natural and cultural values, and is a biodiversity hotspot. The park receives over 200,000 visitors per year, and supports a wide range of recreation activities including: recreational sightseeing, fishing, pleasure boating, canoeing, water-skiing, picnicking, camping and bushwalking. The park contains a variety of biological and landscape features associated with the limestone terrain, including Kentbruck Heath, Moleside Creek catchment and the Glenelg River gorge. The park is home to a number of unusual plant communities, and flora and fauna species that are not well represented in other conservation reserves. The area is an 'interchange zone' where elements of Australian flora from wetter parts of Victoria reach their westernmost limit. Over 600 vascular plant species have been recorded within the park boundary. ⁸⁸
11. Discovery Bay Coastal Park	The park contains freshwater lakes, massive sand dunes, coastal cliffs, volcanic features and ocean beaches and is popular for sight-seeing, picnics, swimming, boating, surfing and camping. A colony of Australian Fur Seals is located at Cape Bridgewater. The section of Discovery Bay Coastal Park containing the Glenelg River and Oxbow Lake is part of the Glenelg River Heritage Area, and is managed under the <i>Heritage Rivers Act 1992 (Vic)</i> . Bridgewater Bay dunes contain important and highly sensitive coastal natural and scenic environments. Wetlands and beaches are important habitat for threatened fauna such as the Orange-bellied Parrot, Hooded Plover and Little Tern. The area is an internationally important non-breeding area for Sanderling, which use the whole of the coastal strip but concentrate around the Glenelg River mouth. The park contains important natural and Indigenous cultural values and significant archaeological sites. ⁸⁹
12. Mt Clay State Forest and Narrawong Flora Reserve	The area contains endangered and vulnerable EVCs, and provides high-value habitat for a range of threatened species, including the Southern Brown Bandicoot and Long-nosed Potoroo. The area has high social values. It contains a scenic lookout, and popular walking trails.
13. Cobboboonee National Park and Forest Park	The park protects a large area of lowland forest and has significant natural values. It incorporates most of the Surry River corridor, the headwaters of the Fitzroy River, and a number of tributaries of the Glenelg River. The park provides critical habitat for a range of threatened species, including large forest owls, small marsupials and lizards. The park has high social values, and offers a range of recreational opportunities, including a section of the Great South West Walk and camping. ⁹⁰
14. Mt Richmond National Park	The park contains a high diversity of flora and fauna. Over 498 vascular plant species have been recorded within the park. ⁹¹
15. Cape Nelson State Park	The park has significant natural, cultural and social values. The park contains the only known stand of Soap Mallee in Victoria, and its geomorphological features are of State significance. ⁹² The historic Cape Nelson Lightstation and spectacular coastal cliff scenery attracts many visitors.
16. Bats Ridge Wildlife Reserve	The reserve provides critical habitat for a number of threatened species, including the Limestone Caladenia spider orchid and Coast Dandelion.

Table 14: Significant coastal areas of the Glenelg Hopkins region.

COASTS

OBJECTIVES AND MANAGEMENT MEASURES

The Victorian Coastal Strategy 2008 identifies principles to guide planning and decision-making about land use and development on coastal private and Crown land, as well as estuarine and marine waters. The RCS supports the principles of the Victorian Coastal Strategy through the objective and measures listed in *Table 15*.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
6.1 By 2033 maintain the condition of the coast and manage specific threats to improve condition where appropriate	6.1.1 Revise the South West Victoria Regional Coastal Action Plan by 2014.
	6.1.2 Develop environmental significance overlays for the protection of coasts.
	6.1.3 Develop coastal adaptation plans to manage the impact of sea-level rise, storm surge and flooding in priority areas.
	6.1.4 Include need for coastal pest plant and animal management into regional plans.
	6.1.5 Monitor and work to control pest plant and animal species on the coast.
	6.1.6 Promote and encourage a sustainable tourism and recreation to minimise negative environmental impacts.
	6.1.7 Continue to convene a marine, coastal and estuarine cross agency management coordination forum for the region.
	6.1.8 Consult the community in coastal planning and management processes.
	6.1.9 Conduct research into coastal environments to better understand function, structure and connectivity with estuarine and marine environments and to reduce negative impacts.

Table 15: Objectives and management measures for coasts.

Below: The region's coastline faces a number of pressures including coastal erosion and new development.

Photos (L-R): Glenelg Shire, Glenelg Hopkins CMA.



MARINE

THE MARINE ENVIRONMENT OF THE GLENELG HOPKINS REGION FALLS ENTIRELY WITHIN THE OTWAY MARINE BIOREGION, WHICH RUNS FROM CAPE JAFFA, SOUTH AUSTRALIA TO CAPE OTWAY, INCORPORATING KING ISLAND.

.....
It is one of five bioregions in Victoria which are distinguished by their physical characteristics and ecological communities.

The Otway marine bioregion is characterised by cold, nutrient-rich water, powerful waves, kelp-dominated rocky reefs, and a seafloor that drops away steeply offshore. The cold, nutrient-rich waters 'well up' from deep water to the surface at the edge of the continental shelf in an oceanographic event known as the Bonney Upwelling. This supports a variety of planktonic organisms and, in turn, rich assemblages of sessile filter feeders such as sponges and bryozoans. The region is a feeding ground for seabirds, fishes, whales and other higher order predators such as fur seals and penguins.

Marine national parks and sanctuaries recognise and protect important marine habitats and species, natural features, cultural heritage and aesthetic values. Areas formally recognised within the region include the Discovery Bay Marine National Park near Portland and the Merri Marine Sanctuary near the mouth of the Merri estuary. These areas have been established under the *National Parks Act 1975 (Vic)*. In addition, special management areas were identified at Cape Bridgewater, Lawrence Rocks, Portland Bay, Deen Maar Island and Logans Beach.

The marine environment contributes significantly to the environmental, economic and social values of the region. The Otway Bioregion is a productive fishing ground sustaining valuable commercial fisheries, in particular rock lobster and abalone, and both land-based and off-shore recreational fishing.

There is a strong Indigenous cultural association with the region's marine environment. This is in evidence by the many middens along the coast which indicate a long history of Indigenous people utilising the marine environment for food.

Deen Maar Island is located between Port Fairy and Portland. It is of national geological and geomorphological significance and of cultural and spiritual importance to the local Gunditjmara peoples, who associate the island with the spirits of the dead.⁹⁴ The island is home to the second-largest Australian Fur Seal colony in Victoria and is a breeding ground for numerous birds. Middle Island and Griffiths Island are also sites for key sea bird colonies.

Significant marine areas for the region are indicated in *Figure 11*. These areas are significant environmentally at the state or bioregional scale.

MARINE

- 1 Southern Right Whale nursery area
- 2 Childers Cove Reefs
- 3 Middle Island and surrounds
- 4 Migratory shorebird feeding area
- 5 Port Fairy boulder shores
- 6 The Craggs
- 7 Deen Maar Island and Georgia's Peak
- 8 Julia Reef
- 9 Portland Bay
- 10 Cape Bridgewater
- 11 Portland Reefs
- 12 Lawrence Rocks and Grant Bay
- 13 Discovery Bay
- 14 Blue Whale feeding zone/Bonney upwelling
- 15 Bonney upwelling epicenter
- 16 Blue Whale distribution



Figure 11: Glenelg Hopkins marine extent and significant areas.

CONDITION OF THE MARINE ENVIRONMENT

The Glenelg Hopkins marine environment provides a range of ecosystem services and is critical habitat for a number of rare and threatened species. Key marine asset areas and associated threats were recently identified for western Victoria as part of the Western Marine Assets Identification Project. This work provides a foundation for future investigations of marine condition. However, there are challenges in describing and monitoring marine condition given the highly dynamic nature of the environment and our limited understanding of marine biota and its likely response to various threats that often act over large spatial scales. For these reasons it is also challenging to measure the effectiveness of regulations in place to mitigate the impact of threatening activities on the marine environment.

The Bonney Upwelling occurs regularly between November and April as a result of the prevailing southeasterly winds causing surface waters to be moved offshore and an upwelling of the deeper, colder, nutrient-rich water at the edge of the continental shelf. The upwelling produces surface swarms of krill that are thought to drive much of the area's productivity. Pygmy Blue Whales are attracted to the region by these swarms. The intensity and frequency of these events may be affected by changes in sea-surface temperatures and currents anticipated in a future climate.

Portland Bay features extensive seagrass meadows which perform important ecological functions, including acting as fish nurseries for commercially important species such as King George whiting, bream and garfish, and rare and threatened species of pipe fishes and seahorses. The Port of Portland harbours many commercial and recreational vessels, increasing the risks from physical damage to the seafloor and introduction of foreign species.

Southern Right Whales frequent the Logans Beach area. Port Fairy and Lawrence Rocks support the largest colony of Australasian Gannets, and one of the largest breeding colonies of Australian fur seals in Australia is found on Deen Maar Island. All sites are subject to ecotourism activities and therefore potential disturbance from human visitation and physical damage from recreational and commercial crafts.

The morphologically complex reef systems surrounding Deen Maar Island, and other reefs in the region, support dense macroalgal communities and habitat for numerous fish and invertebrate species, including commercially important rock lobster and abalone. However, the population of rock lobster has dramatically reduced in recent years, despite the introduction of measures to reduce fishing pressure on this species. The abalone population was decimated by a viral disease, abalone viral ganglioneuritis.

The 2008 Victorian Coastal Strategy outlines policies and actions to address the issue of marine ecological integrity, including actions to protect the marine environment, improve knowledge of marine biodiversity and processes, and improve monitoring and reporting on marine condition.

THREATS

The scope of this strategy is limited to addressing catchment-based threats to marine natural assets. The Western Marine Asset Identification Project identified a number of potential catchment-based threats to marine assets, including: urbanisation (urban stormwater, recreational fishing and sewage), agricultural based erosion and runoff, and industrial developments.

Climate change is likely to pose additional threats to the marine environment through increased storm surges and inundation in the near shore, increased seawater acidity and temperature. Both the timing and extent of catchment inputs are also predicted to change in a more variable future climate.

Threats to the marine environment are not well-understood and interactions among threats can be complex and difficult to predict.⁹⁵

In addition, the level of threats is likely to vary across bays and open coasts and habitat types such as seagrass, rocky reefs and sand.

SIGNIFICANT AREAS

Regionally significant marine areas have been identified through the Western Marine Assets Identification Project and are detailed in *Table 16*. This project took an asset-based approach to identify marine environmental assets. Assets were identified using expert ecological judgment which was supported by the recent extensive spatial mapping of Victoria's marine habitats and data available in the Oil Spill Response Atlas.⁹⁶ In addition to the assets identified through this project, Discovery Bay Marine National Park and Merri Marine Sanctuary have been included as priority marine areas for the Glenelg Hopkins region due to their environmental, social and economic significance to the region.

Asset	Regional Significance
1. Southern Right Whales nursery area	This area supports the regular occupation of calving female Southern Right Whales (SRW) from May to October and occasional non-calving whales.
2. Childers Cove Reef	This area extends from Childers Cove to Dog Trap Bay reef. It has a high diversity of endemic seaweeds that are relatively intact (high naturalness), with high wave exposure and low human exposure.
3. Middle Island and surrounds	Middle Island is a breeding colony for little penguins, cormorants and shearwaters and has high algal diversity.
4. Migratory shorebird feeding area	This area supports a diverse assemblage of shorebird species.
5. Port Fairy boulder shores	This area has a high diversity of microhabitats.
6. The Crags	This area is comprised of calcarenite (cemented dune limestone) intertidal and subtidal reefs. Pitted rock structures create complex habitats for a high abundance of various invertebrates and very diverse seaweed assemblages. There is a high level of naturalness as access to the reefs is limited.
7. Deen Maar Island and Georgia's Peak	Deen Maar Island is the largest breeding colony in the world of Australian fur seals. New Zealand fur seals and Penguins are also present. The island is highly significant to Indigenous people.
8. Julia Reef	This reef is a continuation of the Mt Eccles lava flow. It contains an unusual seaweed assemblage and provides habitat for threatened species including weedy seadragons and Port Jackson sharks.
9. Portland Bay (Minerva Reef)	This is a unique habitat area in Victoria. It is sheltered, contains extensive seagrass beds not found elsewhere in the west. The area provides habitat for greenlip abalone, kingfish, mulloway and snapper. It is also likely to be a productive feeding area for many fished species.
10. Cape Bridgewater	This area is characterized by huge underwater cliffs with 25-30 metre drop-offs. Algae is present to depths of 45 metres.
11. Portland Reef Complex	The area from Point Danger to Whites beach is considered one of the most productive reef systems in Victoria. There is a high abundance of rock lobster and black lip abalone.
12. Lawrence Rocks and Grant Bay	Important habitat for penguins, seals and gannets and is a productive fisheries area. Steep walls form a unique reef habitat with collapsed volcanic caldera.
13. Discovery Bay	This area is formally recognised as an International Flyway Site and provides habitat for a range of migratory birds. The intertidal area supports the highest density of pippies in the bioregion.
14. Blue Whale Feeding Zone/Bonney upwelling	This is an important feeding area for the EPBC-listed Blue Whale.
15. Bonney Upwelling Core	The upwelling extends to Cape Otway but is most intense west of Portland where the continental shelf is narrowest.

MARINE

SIGNIFICANT AREAS (Cont.)

Asset	Regional Significance
16. Blue Whale Distribution Zone	Includes movement area or migratory path for the EPBC listed Blue Whale.
Discovery Bay Marine National Park	Covering 2770 ha, this park protects part of the largest coastal basalt formation in western Victoria. There is a rich diversity of marine life due to the cold, nutrient rich waters of the area. ⁹⁷
Merri Marine Sanctuary	This 25 ha sanctuary has a diverse range of marine life because of the varying sand and rocky habitats and cool, nutrient rich, oxygen charged waters. ⁹⁸

Table 16: Significant marine areas of the Glenelg Hopkins region.

The identification of these significant marine environmental assets provides a resource to inform prioritisation of risk mitigation activities. This foundation will continue to be built on as scientific understanding develops.⁹⁹

OBJECTIVES AND MANAGEMENT MEASURES

Objectives and management measures to manage catchment based threats to marine assets are shown in Table 17.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
7.1 By 2033, maintain the condition of the marine environment and manage specific catchment-based threats to improve condition where appropriate	7.1.1 Support and assist in fisheries education program with a particular focus on species that utilise both the marine and estuarine freshwater environments.
	7.1.2 Consolidate and integrate programs to address land-based sources of marine pollution.
	7.1.3 Reduce the impact of catchment discharges on the health of marine ecosystems by promoting operational changes in farm practices.
	7.1.4 Support, where appropriate, delivery of regional actions listed in the 2008 Victorian Coastal Strategy designed to protect marine biodiversity and ecosystems.
	7.1.5 Conduct research into marine environments to better understand function, structure and connectivity with estuarine and coastal environments and to reduce negative impacts.
	7.1.6 Promote and encourage a sustainable tourism industry to minimise negative environmental impacts.
	7.1.7 Monitor developments in alternative energy and resource use and work with agencies for their ecologically sustainable development.
	7.1.8 Undertake research to better understand catchment-based threats to marine assets.

Table 17: Objectives and management measures for marine.

Below: The marine environment supports a rich diversity of life that contributes significantly to the environmental, social, economic and cultural values of the region.

Photo: Daniel Ierodiaconou, Deakin University.



TERRESTRIAL HABITAT

TERRESTRIAL HABITAT REFERS TO NON-MARINE AREAS WHERE SPECIES LIVE, AND MAY INCLUDE SOILS, ROCKY OUTCROPS, GRASSLANDS, RIVERS, WETLANDS, SHRUBLANDS, WOODLANDS AND FORESTS.

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 Terrestrial habitat provides a range of economic, social and environmental benefits, including supporting biodiversity, protecting soil and water resources, cycling nutrients and maintaining regional rainfall patterns.

Economic values include ecological services that contribute to agricultural production, such as habitat for beneficial invertebrates and birds, windbreaks for crops, soil erosion and salinity prevention, shelter and feed for stock, and production of timber, honey and flowers. Terrestrial habitat also plays an important role in maintaining microclimates – a key factor affecting the distribution of many species – and lowering watertables.

While there are large sections of high conservation value habitat secured through parks and reserves in the west of the region, vegetation is often fragmented, especially across private land. Less than 18 per cent of the pre-European coverage of native vegetation within the region now remains. Of this amount, around 12 per cent occurs on Crown land, and 5 per cent on private land.¹⁰⁰ The Lower Glenelg, Cobboboonee and Grampians National parks and the Black Range State Park contain most of the intact native vegetation and habitat within the catchment, but there are also important vegetation remnants on private land, especially along waterways. A recent regional highlight was the creation of the 18,150 ha Cobboboonee National Park and 8,685 ha Cobboboonee Forest Park in late 2008.

Important examples of remnant native vegetation can be found along roadsides. 25 per cent of all plant species listed under the *Victorian Flora and Fauna Guarantee Act*, and 45 per cent of the remaining Western (Basalt) Plains Grassland communities occur on roadside reserves.¹⁰¹

Much of the eucalypt woodlands within the region have now been cleared for farming. In Victoria, native grasslands and grassy woodlands have been reduced to less than one per cent of their previous extent. The support of private land managers is crucial to help conserve the small fragments of native grasslands and grassy woodlands that remain, as about 75 per cent of these communities now occur on private land within Victoria.

Areas in the west of the Glenelg Hopkins region and around the Grampians have not experienced the same widespread clearing as elsewhere within the region, leaving a large reserve of remnant vegetation, and the opportunity to connect vegetation across the landscape. Species become less resilient to external pressures when they are isolated from each other, or when their ecological communities shrink.¹⁰² Re-establishment of connectivity is important for building ecosystem resilience to the effects of climate change and improving 'the potential of plants and animals to disperse, recolonise, evolve and adapt.'¹⁰³ Improved connectivity offers opportunities for species to move and locate resources as the climate changes, and is important for maintenance of geographic diversity.¹⁰⁴

TERRESTRIAL HABITAT

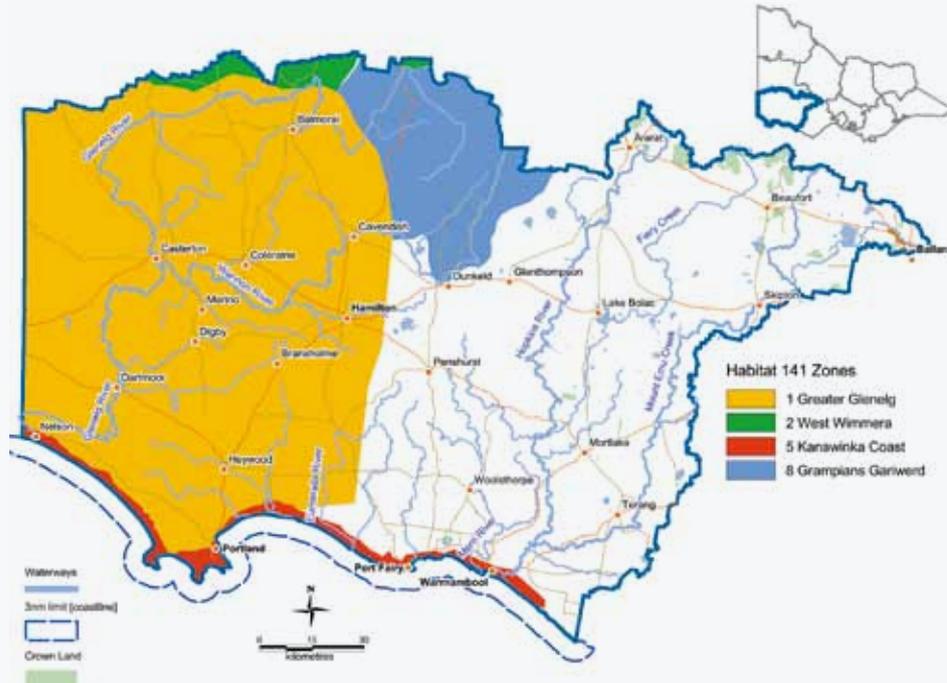


Figure 12: Habitat 141 zones within the Glenelg Hopkins region.

Terrestrial habitat connectivity is more than simply corridors, and includes large areas such as those protected through the conservation reserves and parks system, smaller patches of remnant vegetation that may occur within farmland and linear corridors such as those along roadsides and railways. Vegetation remnants and linear corridors provide important 'stepping stones' to assist the movement of species¹⁰⁵ and are an important focus of the RCS.

The Habitat 141 (H141) project is identified in the 2012 Draft National Wildlife Corridors Plan as one of six major existing corridor initiatives in Australia. These initiatives have been highlighted in the draft plan on the basis of their 'biodiversity values, as well as conservation and community needs'. The vision for H141 is 'to work with communities to conserve, restore and connect habitats for plants and wildlife on a landscape scale from the outback to the ocean'.

The Glenelg Hopkins catchment is a major H141 focus, as the region contains four of the nine H141 zones (Figure 12). The Glenelg River is considered the 'spine' of Zone 1 under the H141 program, and the region anchors the southern end of this visionary project. Partners in this project include catchment management authorities, the Wilderness Society, Trust for Nature, Greening Australia, and Victorian and South Australian government agencies.¹⁰⁶

The RCS complements the H141 initiative by supporting programs that improve connectivity within these zones, and other priority areas, such as the Grampians to Pyrenees Biolink, where there is significant community support.

Figure 13 shows significant areas of terrestrial habitat and incorporates the best information available on species distribution for plants and animals in the Glenelg Hopkins region, including mammals, birds, amphibians, reptiles and fish, and explicitly considers rare and threatened species location information. The map shows areas within the Glenelg Hopkins region that contribute most to biodiversity conservation¹⁰⁷ and was developed using DEPI's NaturePrint Version 2.0 biodiversity planning tool. This tool can be used to inform biodiversity decision-making by identifying biodiversity assets that are the most useful focus for planning and management.¹⁰⁸ The red, pink and dark green colours show high-value areas where it is essential to protect current values. Light green, purple and mauve areas can indicate where there is significant value in re-establishing and improving habitat values through revegetation and improving connectivity.

Significant areas of terrestrial habitat are described in Table 20. These areas are important for the environmental, social and economic services they provide. The Victorian Volcanic Plain is considered to be a significant area of terrestrial habitat but due to its extensive but highly fragmented nature has not been included in Figure 13.

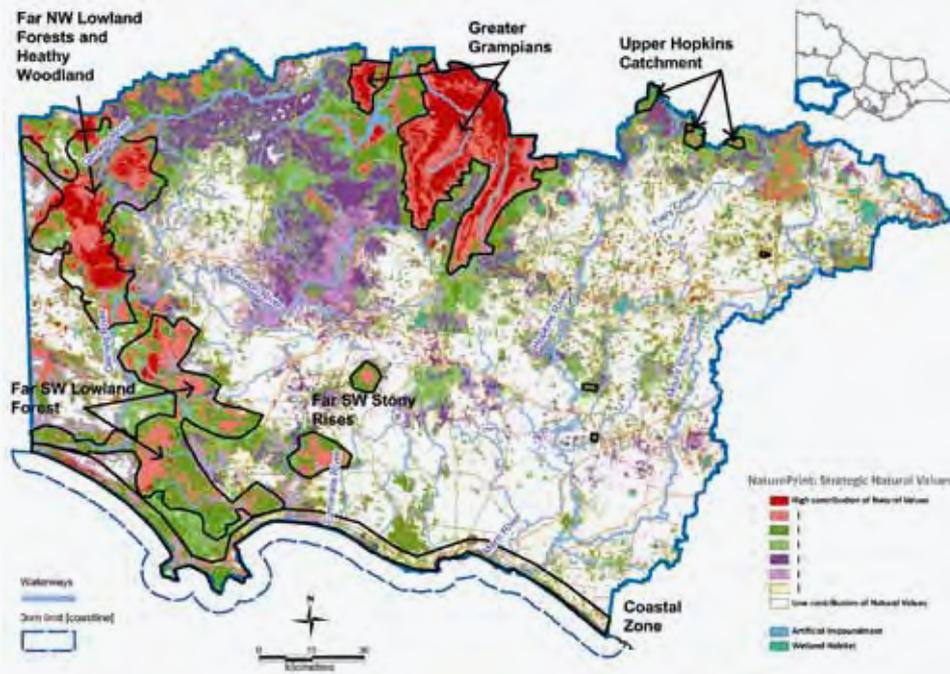


Figure 13: NaturePrint strategic natural values map including significant areas of terrestrial habitat.

CONDITION OF TERRESTRIAL HABITAT IN THE GLENELG HOPKINS REGION

Parks Victoria are currently preparing a report on the condition of land that they manage. When available, this information will be used to inform future condition assessments.

Bioregions are frameworks for terrestrial and marine environment classification on the basis of ecological characteristics. Assessment of the condition and extent of vegetation within these bioregions provides an indication of the condition of terrestrial habitat at a regional level. Nine bioregions occur within the Glenelg Hopkins region (Figure 14). The extent of remnant vegetation compared with estimated pre-1750 coverage is shown in Table 18.

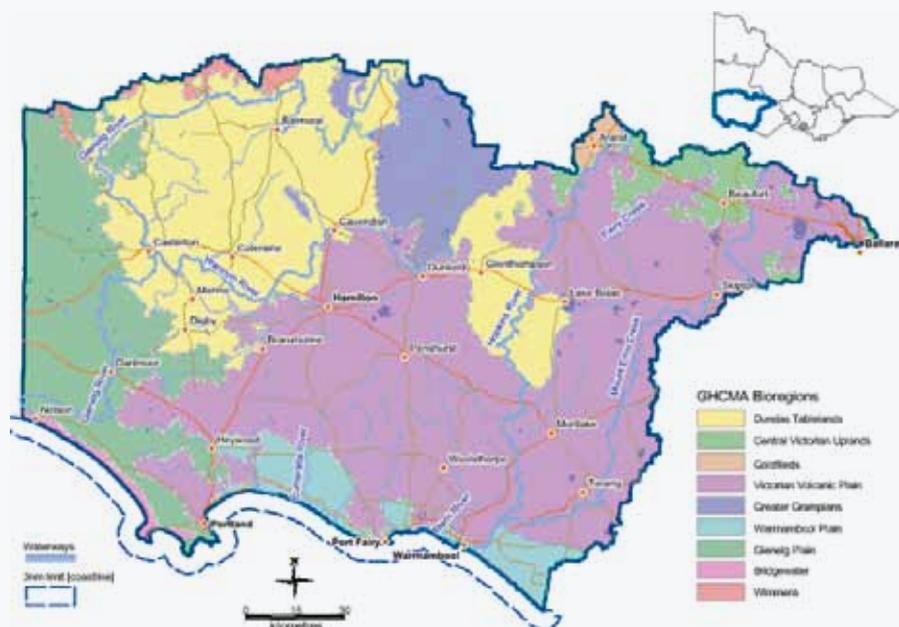


Figure 14: Bioregions of the Glenelg Hopkins catchment management area.

TERRESTRIAL HABITAT

Bioregion	Pre-1750 area (ha)	Remnant vegetation remaining (ha)	Percentage of original	No. of endangered regional EVCs
Greater Grampians	151,140	129,634	86%	22
Bridgewater	18,192	11,471	63%	4
Glenelg Plain	383,116	148,554	39%	34
Wimmera	24,861	4,953	20%	16
Goldfields	15,363	4,000	26%	9
Central Victorian Uplands	81,351	22,123	27%	12
Dundas Tablelands	660,782	64,319	10%	49
Warrnambool Plain	113,598	7,742	7%	18
Victorian Volcanic Plain	1,223,766	72,286	6%	58
Total	2,672,169	465,082	17.4%	222

Table 18: Remnant vegetation compared to pre-1750 figures.

The general condition of native vegetation in each bioregion within the Glenelg Hopkins catchment is described in Table 19. Of the major flora communities, only lowland forests and heathlands are still reasonably represented. Most of the woodlands have been cleared or altered for agriculture and the areas that remain are generally on public land, occurring as small remnants. Native vegetation now covers less than 18 per cent of the Glenelg Hopkins region. Two of the region's Broad Vegetation communities, Box Ironbark Forest and Riparian Forest now appear to be extinct.¹¹⁰

Bioregion	Condition of Native Vegetation
Greater Grampians	The Greater Grampians bioregion supports a diverse range of native vegetation which is generally in good condition. About 86% of the estimated pre-1750 native vegetation cover remains. Vegetation within this bioregion is mostly protected in the Grampians National Park, which is of outstanding conservation significance. The Park contains over a thousand different plant species, including 23 species that are found nowhere else in the world.
Bridgewater	Native vegetation cover within this bioregion has been reduced to approximately 63% of its pre-1750 extent. About 70% of the remaining native vegetation occurs within public land. Discovery Bay Coastal Park is the most significant reserve within this bioregion.
Glenelg Plain	Approximately 60% of the Glenelg Plain has been cleared for agriculture. About 40% of the bioregion's original vegetation cover remains and consists of a mix of large sized blocks on public land, scattered remnants on private land, and linear strips of vegetation along roadsides and creeks with highly varying levels of connectivity.
Wimmera	A relatively small proportion of the Wimmera bioregion occurs within the Glenelg Hopkins catchment management area. Native vegetation has been reduced to approximately 20% of its pre-1750 extent within this area and is highly fragmented.
Goldfields	A small section of the Goldfields bioregion occurs within the Glenelg Hopkins catchment management area. Native vegetation that occurs within this area is highly fragmented, and is mostly cleared for agriculture.
Central Victorian Uplands	Larger areas of native vegetation occur within mostly intact landscapes at Mount Buangor State Park, Langi Ghiran State Park and Ararat Hills Regional Park. ¹¹¹ These areas contain relatively undisturbed plant communities and are of high conservation value. Much of the remaining area has been cleared for agriculture.
Dundas Tablelands	Large areas of native vegetation within the Dundas Tablelands have been cleared for sheep and cattle grazing. Only around 10% of the Dundas Tablelands pre-1750 native vegetation coverage extent now remains within the Glenelg Hopkins region. Much of the remaining vegetation is in a degraded state due to its highly fragmented nature, and continues to decline in condition. Native grasslands that once occurred to the east of the Grampians within the Willaura Plains area (Dundas Tablelands bioregion) have now been substantially cleared or modified. ¹¹²
Warrnambool Plain	Native vegetation within the Warrnambool Plain has been substantially cleared or modified. Approximately 10% of the pre-1750 extent is estimated to remain within the Glenelg Hopkins area and there has been substantial clearing of all vegetation types. The Warrnambool Plain was once dominated by lowland and foothill forests, heathy and grassy woodlands, coastal shrubs and grasslands. Remaining vegetation remnants are mostly confined to crown land.
Victorian Volcanic Plains	Native vegetation within the Victorian Volcanic Plain bioregion is amongst the most depleted in the State. Only around 1% of the original extent of grassy woodland and native grassland communities now remain. ¹¹³ Almost all native vegetation within the basalt plains of the central and eastern part of the Glenelg Hopkins region (Victorian Volcanic Plains bioregion) has now been cleared or substantially modified. ¹¹⁴ Very few areas of native vegetation occur within the formal reserve system, ¹¹⁵ and most occur on private land.

Table 19: Condition summary by bioregion.

Information on the bioregional conservation status of remnant vegetation in the Glenelg Hopkins region is provided in Appendix 4: Bioregional conservation status of remnant vegetation in the Glenelg Hopkins region.

THREATS

Land-use changes continue to pose a significant threat to terrestrial habitat within the region. The 2010 Great South Coast Regional Strategic Plan¹¹⁶ provides the following summary:

“Once extensive ecosystems are now highly fragmented. A range of land use changes including raised bed and broad acre cropping, rock crushing and subsequent pasture improvements, increased use of pivot irrigation systems, blue-gum farming and rural residential development have seen an acceleration of the loss of native vegetation on private land resulting in shrinking habitats for a range of threatened species. There are significant areas of dry land salinity and soil acidification and the native vegetation quality of the majority of the region is classified as low.”

The Portland and Horsham Forests: Forest Management Plan 2010¹¹⁷ identifies a number of potentially threatening processes that can adversely affect the distribution and structure of ecosystems, including the loss of hollow-bearing trees, inappropriate fire regimes and removal of coarse woody debris.

Other key threats to terrestrial habitat within the region include:

- bushfire
- extreme weather events
- pest animal grazing
- weed invasion
- pathogens and diseases
- habitat fragmentation and loss of connectivity
- inappropriate water regimes
- biomass accumulation in native grasslands.

Remnant grassland and grassy woodland habitats remain at risk of habitat loss and degradation due to threatening factors such as inappropriate mowing and herbicide regimes, pest animals and plants, increased use of fertiliser, and changed fire regimes.

Climate change may pose an additional threat by influencing the distribution and composition of ecosystems by altering water flows in rivers and wetlands and through bushfires and floods. Existing threats will most likely be amplified, such as habitat loss and invasive species, making the impacts considerably worse.

SIGNIFICANT AREAS

Significant areas of terrestrial habitat are listed in *Table 20* and have been identified through the INFFER process and consultation with DEPI and Parks Victoria. These areas of the Glenelg Hopkins region provide economic, environmental and/or social values. A number of criteria were used when assessing their significance including: value of the asset area, the level of threat to the asset area and the feasibility of managing those threats.¹²⁰

Asset Name	Description
Coastal Zone	Incorporates a diverse range of coastal ecosystems, and extends from the Corangamite – Glenelg Hopkins catchment boundary to the South Australian border. The area provides critical habitat for threatened species such as the Orange-bellied Parrot and Hooded Plover, as well as important shorebird nesting sites. Key areas of public land include Discovery Bay Coastal Park, Belfast Coastal Reserve, and Bay of Islands Coastal Park. This zone contains three Important Bird Areas: (sites of global bird conservation importance) – Yambuk Lakes Complex IBA, Port Fairy to Warrnambool IBA and Discovery Bay – Piccaninnie Ponds IBA.
Victorian Volcanic Plains Grasslands	Only one per cent of the original extent of grassland and grassy woodland communities remain within Victoria. The Victorian Volcanic Plains provides critical habitat to a range of flora and fauna. Key areas include Blacks Creek Nature Conservation Reserve (234 ha) which is one of the largest grassland reserves in Victoria, Cobra Killuc Wildlife Reserve, and Mortlake Common.
Upper Hopkins Catchment Public Land	This area is located within the vicinity of Ararat and Beaufort. It contains areas of exceptional riparian and remnant vegetation habitat that supports a number of threatened species. The following areas of public land have been identified as having significant terrestrial habitat values: Langi Ghiran State Park, Mount Buangor State Park and Ararat Hills Regional Park.
Far South West Stony Rises	This area includes Mount Eccles National Park/Lake Condah and Mount Napier State Park. It contains the largest community of Manna Gum in Victoria, and provides critical habitat for a number of threatened species.
Far South West Lowland Forests	Contains one of the largest areas of relatively continuous lowland forest within the region and supports a diverse range of fauna, many of which are threatened. Priority areas of public land that occur within this area include Lower Glenelg National Park, Cobboboonee National Park and Forest Park, Mt Richmond National Park, Narrawong Flora Reserve, Mumbannar Nature Conservation Reserve, Crawford River Regional Park and Weecurra, Hotspur, Annya and Mt Clay State Forests. Hotspur State Forest has been identified as a key (but narrow) corridor that links large areas of terrestrial habitat to the north and south of this forest. Cape Nelson State Park, Mount Richmond National Park and Bats Ridge Wildlife Reserve have also been identified through the INFFER process as having exceptional habitat values. It includes covenanted land that abuts or is in close proximity to public land.

TERRESTRIAL HABITAT

SIGNIFICANT AREAS (Cont.)

Asset Name	Description
Greater Grampians	This area is located in the north of the Glenelg Hopkins catchment and includes areas with exceptional terrestrial habitat values, such as the Grampians National Park, Black Range State Park, and Dundas Range Scenic Reserve. The Grampians National Park (167,200 ha) is one of the largest national parks in Victoria. ¹²¹ Black Range State Park (11,700 ha) occurs to the west of the Grampians Ranges and provides important habitat for a range of threatened fauna. ¹²²
Far North West Lowland Forests and Heathy Woodlands	This area occurs to the north west of the catchment and contains several large areas of protected habitat. Areas with exceptional habitat values include: Dergholm State Park, Tooloy-Lake Mundi Wildlife Reserve, Wilkin Flora and Fauna Reserve, and Kaladbro Wildlife Reserve. It includes covenanted land that abuts or is in close proximity to public land.

Table 20: Significant areas of terrestrial habitat.

OBJECTIVES AND MANAGEMENT MEASURES

A core objective of this strategy is to work with regional partners to improve the condition of remnants and increase connectivity across the landscape, helping to build ecosystem resilience in response to climate change. Objectives and management measures for the region's terrestrial habitat are listed in *Table 21*.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
8.1 Maintain extent and improve condition of terrestrial habitat	8.1.1 By 2019, maintain and/or increase the extent of native vegetation on public and private land (compared with 2012 levels) and improve its quality.
	8.1.2 Implement actions within the Glenelg Hopkins Regional Weed Plan to improve the condition of native vegetation.
	8.1.3 Protect and improve the condition of terrestrial habitat through revegetation, fencing where appropriate and implementation of best management practices.
	8.1.4 Improve native vegetation resource condition by building partnerships with private land holders to preserve rare Ecological Vegetation Classes.
	8.1.5 Protect important biodiversity values found in the parks and reserves network through the implementation of park and forest management plans.
	8.1.6 Support the development and implementation of Roadside Vegetation Plans for priority roadsides with significant remnant vegetation.
	8.1.7 Increase the extent of private land managed for biodiversity conservation.
	8.1.8 Develop conservation covenants to protect areas of high-value remnant vegetation.
	8.1.9 Develop condition statements for terrestrial habitat as information becomes available.
	8.1.10 By 2015, develop and commence implementation of regional biodiversity strategy.
8.2 Improve connectivity of habitat for species populations and communities	8.2.1 Identify priority regional biolinks by the end of 2013.
	8.2.2 Identify and map areas within biolinks where ecosystems have natural regenerative capacity.
	8.2.3 Implement cross-tenure landscape connectivity programs on private and public land.
	8.2.4 Where appropriate, pursue opportunities for land purchase within priority biolink areas.
8.3 Public land is managed as the core of resilient ecosystems	8.3.1 Implement Portland Horsham Forest Management Plan (State Forests).
	8.3.2 Develop and implement Ngootyoong Gunditj, Ngootyoong Mara South West Management Plan.
	8.3.3 Support resilient ecosystem management on public land with buffer zones and linkages by protecting adjacent private land.

Table 21: Objectives and management measures for coasts.

CASE STUDY: THE GLENELG ALLIANCE

The Glenelg Alliance is a four-year program which began in 2009 to address priority pest plant and animal threats on 34,603 ha of public and private land threatening habitat values within the lower Glenelg River High Environmental Value Aquatic Ecosystem (HEVAE) region.

The title for the program – The Glenelg Alliance – reflects the focus to improve the co-ordination and integration of land managers in the target area, including local government (Glenelg Shire Council), agencies (Parks Victoria, Department of Environment and Primary Industries, Glenelg Hopkins CMA) and the local community.

The Glenelg Alliance program targets the Glenelg River downstream of the Stokes River confluence, the lower Stokes and Crawford rivers, the Lower Glenelg National Park (LGNP) and the Discovery Bay Coastal Park.

By the end of the second year priority pest plant and animal threats were addressed across 28,107 ha of public and private land within the Lower Glenelg HEVAE region. Activities included treating 9,343 ha of priority infestations, and mapping, extension and monitoring of 25,260 ha, with each agency undertaking separate but complementary tasks.

For example, Parks Victoria tackled pest plant control in the Lower Glenelg National Park and Discovery Bay Coastal Park and was responsible for pig monitoring and control. DEPI treated Blackberry along the Glenelg River Streamside Reserve at Dartmoor and ran a fox-baiting and cat-trapping program. DEPI has inspected properties for Weeds of National Significance (WoNS), and 15 landholders have established partnership agreements with the Glenelg Hopkins CMA for the control of pest plants.

The success of the co-operative partnerships has resulted in the project exceeding targets.

The project has continued to show improvements in the co-ordination, integration and knowledge of pest plant and animal management across all land managers and tenures in the Lower Glenelg region, resulting in priority species being targeted in a strategic and effective manner.

The second-year achievements significantly contributed to the program's aim of sustaining the high conservation values of this critical aquatic ecosystem.

Further works will focus on improving riverine and catchment health through targeted assessments, engagement and financial incentives for on-ground works. Invasive species have been identified as the primary threat.

Engagement activities and surveys conducted with landholders involved in the project also highlighted the importance of the co-operative approach.

Photo: The Glenelg Alliance project aims to address pest plants and animals that are threatening habitat values.

SPECIES POPULATIONS AND COMMUNITIES

THE GLENELG HOPKINS REGION IS HOME TO OVER 94 NATIONALLY LISTED THREATENED SPECIES INCLUDING NUMEROUS ENDEMIC SPECIES, THREE NATIONALLY LISTED VEGETATION COMMUNITIES, AND ICONIC SPECIES SUCH AS THE RED-TAILED BLACK COCKATOO

.....
- the official mascot of the 2006 Melbourne Commonwealth Games.

The Glenelg Hopkins region has a high concentration of threatened species when compared with other areas of Victoria and Australia. The Glenelg Basin contains 10 per cent of Victoria's threatened species. The Glenelg Basin contains well over 150 threatened or near-threatened flora and fauna species. Two species of pygmy-possum occur together in the landscape, and it is 'one of two highly localised areas in Australia supporting the nationally endangered heath mouse.'¹²³

The region is renowned for its flora values and supports more than 20 threatened species of orchid, with at least 10 listed nationally.¹²⁴ A recent discovery of the Limestone Spider-orchid was the first recorded in Victoria, and a newly discovered bottlebrush endemic to western Victoria, *Callistemon wimmerensis*, is a state and nationally listed, critically endangered plant species.

The wetlands of the region are rich in bird life, and provide important habitat for a range of threatened species, including the Brolga and critically endangered Orange-bellied Parrot.

The primary tool used to plan and prioritise species-specific on-ground actions in Victoria is the DEPI developed Actions for Biodiversity Conservation (ABC) database. The Strategic Natural Values map (*Figure 13*), in conjunction with DEPI's ABC system, has identified seven key priority asset areas for the Glenelg Hopkins region. These areas are shown in *Figure 15* and encompass priority populations and habitats for the region's threatened species and communities. This will help direct projects and investment to maximise biodiversity outcomes. It must be noted that these seven areas do not include all threatened species populations and communities in the Glenelg Hopkins region. Sites outside the asset areas will not be excluded from the objectives of the RCS and future investment.

Below: The region contains a number of iconic species including the Growling Grass Frog, Red-tailed Black Cockatoo and the Glenelg Spiny Crayfish.

Photos (L-R): Leonard Cooper, Bob McPherson, Glenelg Hopkins CMA.



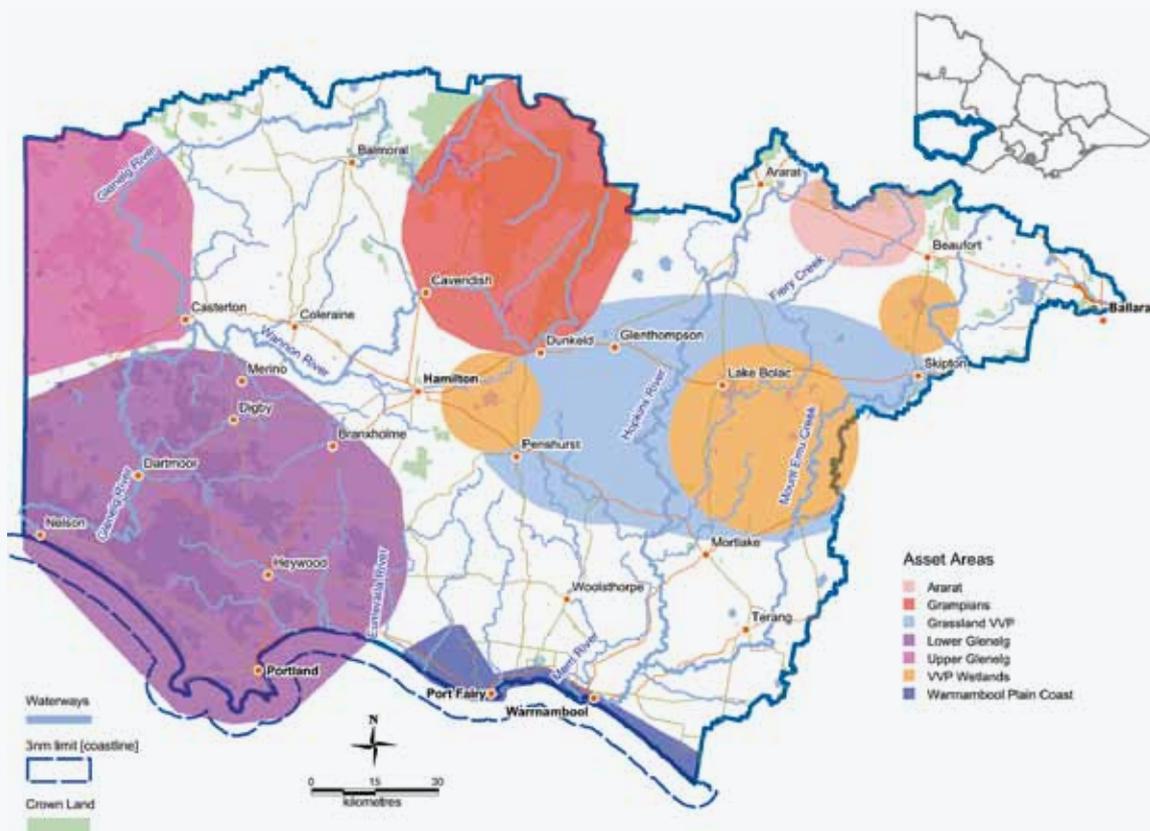


Figure 15: Significant asset areas for species populations and communities.

CONDITION OF SPECIES POPULATIONS AND COMMUNITIES IN THE GLENELG HOPKINS REGION

The ecosystems that provide habitat to threatened flora and fauna species and communities range from highly fragmented (Volcanic Plain) to largely intact (Grampians) and occur across private and public land. Since 2003, DEPI and Glenelg Hopkins CMA have implemented a recovery program for 57 nationally and/or state-listed threatened species (47 flora and 10 fauna) across the Glenelg Hopkins catchment. These species range from the well-known Brush-tailed Rock Wallaby, Eastern-barred Bandicoot, Orange-bellied Parrot and Red-tailed Black Cockatoo, to the little known Corangamite Water Skink, Southern Bent-wing Bat, Basalt Greenhood, Portland Long-tongue Shell Orchid, Square Raspwort and the recently discovered Wind-blown Tussock-grass.

Central to the delivery of the recovery program has been the Actions for Biodiversity Conservation (ABC) database – a web-based information system administered by DEPI as a repository for knowledge about threatened species and communities in Victoria. It tracks the progress of management actions documented in action statements prepared under the *Flora and Fauna Guarantee Act* and in recovery plans prepared under the *Environment Protection and Biodiversity Conservation Act*.

The ABC system is a vital reporting tool that enables DEPI to deliver detailed, qualitative reports to the CMA and investors, while providing a tool to monitor and manage delivery of the recovery program.

Priority actions such as threat abatement, habitat management and enhancement, and in some cases species reintroduction, have been implemented as part of the Glenelg Hopkins threatened species recovery program. Over the past seven years these actions have stabilised the decline and led to a gradual recovery of most of the threatened species covered by this program. Partnerships and community involvement have played a significant role in the success, with over 5,500 community members, land managers and volunteers participating in on-ground actions such as surveys, threat assessment, seed collection, weeding and habitat revegetation.

The program has bridged numerous key knowledge gaps, such as species distributions, habitat requirements, life histories and behaviours. This knowledge is not only being used to boost species recovery and habitat management, but is contributing to other biodiversity programs, including fire and native vegetation management, waterways and wetland programs, and major project developments.

SPECIES POPULATIONS AND COMMUNITIES

THREATS

Major threats to species populations and communities within the Glenelg Hopkins region include:

- loss of instream habitat due to stock access and excessive sedimentation
- pest plant and animal infestation
- clearing and fragmentation
- salinity
- intensification of agricultural practices
- extreme events such as fire, flood and drought
- nutrient enrichment, sedimentation, chemical contamination and other agricultural impacts
- long-term impacts from reduced inflows due to climate change
- lack of environmental flows
- marine pests
- bushfire.

The effects of climate change on species populations and communities will occur at different levels – from individual species to ecosystems. Species may alter their distribution, abundance, behavior and the timing of events such as migration or breeding. The most susceptible species will be those with restricted or specialised habitat requirements, poor dispersal abilities or small populations. Indirect impacts may include increased pressure from competitors, predators, parasites, diseases and disturbances (such as bushfire or drought).¹²⁵

OBJECTIVES AND MANAGEMENT MEASURES

The objective and its associated management measures for threatened flora and fauna within the Glenelg Hopkins region are listed in *Table 22*.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
9.1 Improve the health of key populations of threatened species and communities	9.1.1 By 2015, develop and implement regional biodiversity strategy.
	9.1.2 Implement actions from the Glenelg Hopkins Invasive Animal Strategy 2010-2015.
	9.1.3 Continue to support regional Threatened Flora and Fauna Program and the implementation of high priority actions in high priority locations consistent with the Actions for Biodiversity Conservation (ABC) database.
	9.1.4 Achieve an improvement in the conservation status of listed threatened species and ecological communities.
	9.1.5 Review and implement Action Statement and Recovery Plans for listed threatened species and communities within the Glenelg Hopkins region.
	9.1.6 Invest in improving the resilience of threatened species through programs targeted at habitat improvement.
	9.1.7 Implement ecologically appropriate burning for protection of flora and fauna communities where appropriate.
	9.1.8 Support long-term, two-way knowledge transfer and capacity building to enhance the role of traditional ecological knowledge in biodiversity conservation.
	9.1.9 Build capacity and enhance knowledge of industry and local government to plan and protect biodiversity, particularly threatened species and critical habitats.
	9.1.10 Build regional capacity through training and education programs (e.g. whole farm planning) to increase awareness of regional biodiversity assets, values and threats.
	9.1.11 Collaborate with other stakeholders (e.g. universities and research institutions) to increase capacity to survey and monitor threatened species within the region.

Table 22: Objective and management measures for species populations and communities.

SOIL AND LAND

HEALTHY SOIL IS A LIVING ECOSYSTEM OF BIOLOGICAL, CHEMICAL AND PHYSICAL ATTRIBUTES WHICH MAINTAIN VITAL ECOLOGICAL PROCESSES THAT SUSTAIN BIODIVERSITY, FRESH WATER, CLEAN AIR AND SOIL FERTILITY.

.....
 'A nation that destroys its soil destroys itself'
 - Franklin. D Roosevelt,
 32nd President of
 the United States
 (1933-1945).

Soil provides the foundation for agricultural production and has the ability to cycle and store carbon. The catchment supports major industries such as cattle, wool, prime lambs, forestry and cropping, generating over a billion dollars¹²⁶ for the regional economy. Major land-use within the region is shown in *Figure 16*. Wool production has traditionally been the main agricultural commodity produced in the region; however, it is no longer the dominant industry and there has been a significant increases in the number of beef, dairy, cropping and prime lamb enterprises.¹²⁷

With more than 80 per cent of the Glenelg Hopkins catchment used for agricultural production, the protection and enhancement of soil is closely linked to regional and national prosperity.

The Glenelg Hopkins catchment contains 49 different soil types with characteristics that vary with the parent material geology, landscape location and the weathering processes active over the period of their formation. The resulting soils vary in suitability and capability for agricultural production, and in susceptibility to processes that degrade soil health.

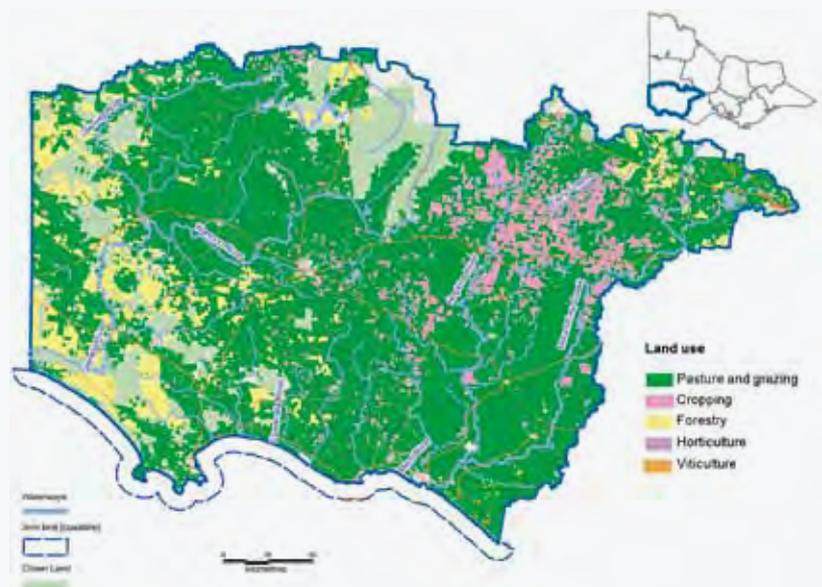


Figure 16: Major land-use in the Glenelg Hopkins region (DPI, 2003).

SOIL AND LAND

CONDITION OF SOIL AND LAND IN THE GLENELG HOPKINS REGION

Soil health can be defined as the capacity of a soil to sustain biological productivity, perform essential ecosystem services (cycle nutrients, maintain air and water quality, and provide habitat) and to promote plant, animal and human health.

In an agricultural landscape, soil is valued for its production potential. South west Victoria is recognised as having some of the most fertile and productive soils in Australia. Historical widespread removal of indigenous vegetation, rabbit infestations and agricultural production have each contributed to a decline in soil health. Deterioration in soil health continues today under inappropriate management regimes.

Decline in soil health usually occurs over long periods and can prove challenging to ameliorate once established. Soil conservation programs in the region began in the 1950s; however, despite these efforts, soil health in the catchment has continued to decline, with detrimental impacts on waterways and biodiversity.

'To be a successful farmer one must first know the nature of the soil.'

– Xenophon of Athens, 'Oeconomicus', 362BC

Managing soil to land capability is a core principle in sustaining soil health. Soil health can be improved where land use accords with land capability: the capacity of land and soils to sustain production without degradation. Land capability is a product of the landscape's inherent properties (e.g. geomorphology, soil type and topography), land management practices and climate.

Farmers of the Glenelg Hopkins region have a strong stewardship ethic. A 2004 survey of landowners' attitudes to natural resource management identified 'Being able to pass the property on in better condition' as the primary aspiration of 81 per cent of farmer respondents.¹²⁸

It is recognised that individual land managers, urban and rural, are best placed to make land management decisions and implement soil improvement actions. Managing for healthy soils can reduce negative environmental impacts, improve farm production and form a necessary step in a transition towards sustainable land management. Limitations in managing for healthy soils can include information availability and financial constraints.

THREATS

Threats to soil health involve physical, chemical or biological processes that exceed the capability of the soil to absorb disturbance and return to a previous, long-term stable state.

Inappropriate land management practices that exceed the resilience limits of a specific soil system can lead to degeneration of soil health and reduced productive capacity.

The Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014 identifies six priority threats to soil health: acidification, soil structure decline, nutrient decline, salinity, water erosion and wind erosion.¹²⁹ Decline in soil organic matter was identified as an emerging threat. *Figure 17* shows sub-catchment areas at risk of soil health decline from priority threats.

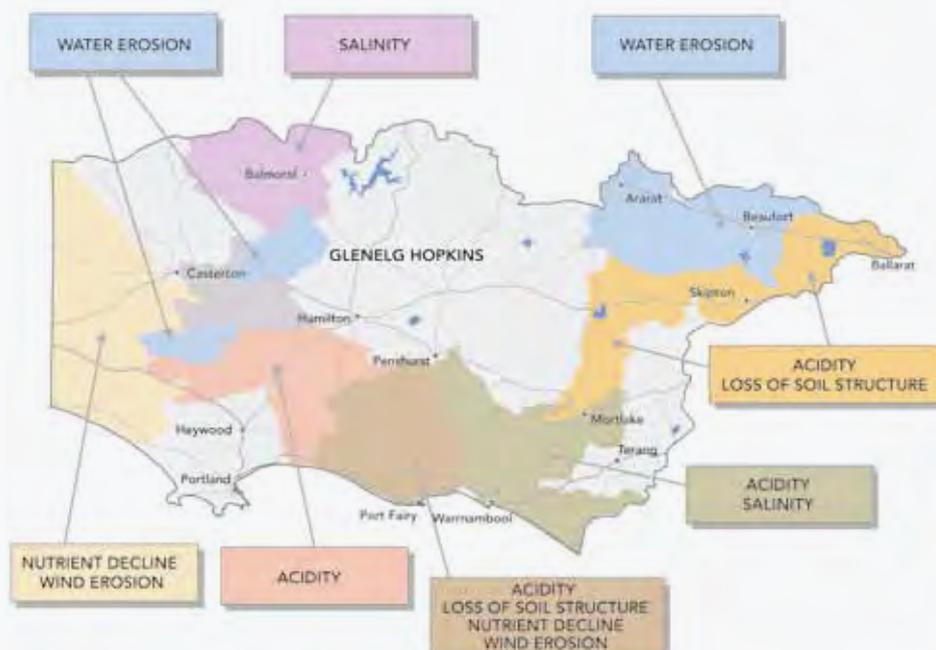


Figure 17: Sub-catchment areas at risk of soil health decline from priority threats.

Soil erosion and dryland salinity arising from past practices have long been recognised as the foremost threats to soil health within the region. Primary salinity is a natural feature of the catchment illustrated by the labelling of streams as salty and brackish by early settlers.¹³⁰ Dryland salinity arising from the altered hydrological characteristics of cleared landscapes inhibits plant growth, reduces farm productivity, degrades soil structure and can result in areas of exposed, dispersive soil prone to erosion by wind or water.

Salinity management programs have been active since the 1970s. The Glenelg Hopkins Salinity Strategy was released in 1994, and in 2005 the CMA produced the Glenelg Hopkins Salinity Plan 2005-2008. A 2008 review of Salinity Plan implementation¹³¹ identified significant gains made in salinity mitigation and increased landholder awareness of salinity processes and management skills.

A decade of lower-than-average rainfall¹³² at Hamilton and climate change projections of reduced mean annual rainfalls have reduced concern for salinity as a long-term threat. However, the recent wetting-phase of the climate is likely to reactivate salinity.¹³³ Salinity remains a threat to natural resources that requires ongoing monitoring, planning and management. Any recurrence of salinity in this region places high-value assets at considerable threat of degradation.

In the past, combating soil erosion has been a major focus of on-ground work. Soil susceptibility to erosion is increased by adoption of farming practices that expose soil, exceed land capability or are unsuitable for soil type.

Recent high rainfall and flooding events during seasonal periods of low groundcover resulted in increased erosion and demonstrated the risks of the changing rainfall patterns from climate variation. Reduced soil health increases susceptibility of soils to erosion with significant off-farm impacts on waterways, biodiversity and infrastructure. Soils of the Dundas and Merino tablelands are particularly susceptible to erosion.

Productive agriculture necessarily involves movement of stock and machinery, cultivation and removal of nutrients as food and fibre. These actions can lead to reduced productivity through decline of plant-available nutrients, loss of soil carbon, loss of soil structure and increased soil acidity. The long history of agriculture in the region and increasing economic pressure on producers has meant that nutrient decline, soil acidification and loss of soil structure remain priority threats to soil health. The extent of soil degradation depends on the nature of the land use, the inherent susceptibilities of the soils and the capacity of the land manager to identify and amend these threats.

Occurrences of coastal acid-sulphate soils have been identified within the catchment.¹³⁴ These areas have been mapped and this information is used to inform local government planning processes.

Climate change will have positive and negative impacts on the types of crops that are grown and the productivity of primary production systems. Any reduction in rainfall is likely to place most farms under stress, particularly when linked to higher temperatures. In addition, heavy rainfall events and winds from storm events will contribute to crop damage and soil erosion.¹³⁵

Below: View of the landscape from Mount Napier.



CASE STUDY: REDUCING RISKS OF SOIL ACIDIFICATION (RSA)

Soil acidification poses a major threat to the long-term sustainability of agriculture.

The Australian Government's Caring for our Country program funded a four-year project (commencing 2009-10) to increase knowledge and skills of 1,200 farmers to reduce the risk of soils becoming acidic. The result was that 200 farmers adopted improved land management practices on 6,400 hectares. Evidence for output achievement was a funding condition and a Monitoring, Evaluation, Reporting and Improvement (MERI) plan was compiled to direct output achievement verification. Royal Melbourne Institute of Technology University (Hamilton) was engaged to implement the MERI plan and provide independent evaluation of project delivery.

To engage key agricultural enterprises and connect with existing networks, partnerships were established with Southern Farming Systems (cropping), WestVic Dairy and Department of Environment and Primary Industries (meat and wool). To accommodate a diversity of farm practices, funding support was made available to community groups to hold events informing farmers on soil health, managing soil acidification risks and production.

Traditionally, annual events such as workshops and field days involve DEPI, industry organisations and community groups. Survey and anecdotal data from these events verify the increased knowledge and skills gained by participants. Many farmers have adopted improved practices, and it is expected that actual achievements will exceed targets.

Below (L-R): The farming community plays an important role in the management of the region's natural resources.

A visual soils assessment workshop.



OBJECTIVES AND MANAGEMENT MEASURES

Several objectives for soil and land have been developed through consultation with partners and stakeholders. These objectives and their associated management measures are detailed in *Table 23*. The aim of these actions is to increase community capacity in the management of soil, resulting in healthy, productive and resilient landscapes.

Objectives (to be achieved by 2033)	Management Measures (to be achieved by 2019)
10.1 An improvement in soil condition (as measured by key indicators) by 2033*	10.1.1 Update and implement the Glenelg Hopkins region Soil Health Strategy and Soil Health Plan 2009-2014.
	10.1.2 Update and commence implementation of the Glenelg Hopkins Salinity Plan.
10.2 An increase in the area of soils managed within their capability	10.2.1 Investigate benchmarks for key indicators of healthy soils (stable-state targets).
	10.2.2 Investigate opportunities for soil capability mapping under different land management practices.
	10.2.3 Identify soils at risk under certain management regimes.
	10.2.4 Promote increased levels of awareness and adoption of land management methods to maintain or improve the health and productivity of soil.
	10.2.5 Undertake education programs that promote soil as a finite, valuable resource and ecosystem services provided by soils
	10.2.6 Continue development and communication of land capability information (e.g. trials and on-farm demonstration sites) to guide land-use change decisions.
	10.2.7 Maintain a minimum of 70 per cent ground cover during the summer season.
	10.2.8 Examine opportunities for compliance programs.
	10.2.9 Identify opportunities for land capability, overlays and planning controls.
	10.2.10 Raise awareness of fundamentals of soil carbon composition, function and sequestration opportunities.
10.3 By 2033 reduce the impact of soil-based threats, including salinity and erosion, on waterways and wetlands as measured by improved ISC and IWC scores (turbidity and EC)	10.3.1 Implement the Glenelg Hopkins Salinity Plan.
	10.3.2 Implement the revised Glenelg Hopkins Soil Health Strategy and Soil Health Plan.
10.4 By 2033 soils are managed for protection and enhancement of the beneficial ecosystem services they provide	10.4.1 Implement the revised Glenelg Hopkins Soil Health Strategy and Soil Health Plan.

* Key indicators are identified in the Glenelg Hopkins region Soil Health Strategy and Soil Health Plan.

Table 23: Objectives and management measures for coasts.

PRIORITY AREAS FOR INTERVENTION



Figure 18: Priority areas for intervention within the Glenelg Hopkins region.

All sites of regional significance identified within the RCS have been aggregated in one map to demonstrate areas for priority attention. *Figure 18* provides a summary of priority areas that have resulted from the asset identification and filtering processes described in Appendix 1: RCS development process. These priority areas represent catchment level assets and have resulted from a number of considerations including significance, threat and feasibility of intervention.

Significant features of each catchment level asset are described in *Table 24*.

These priority areas will provide important direction during implementation of the strategy in terms of guiding investment and project development opportunities, and will be used to inform the development of regional sub-strategies and plans such as the Regional Waterway Strategy.

Sites outside these priority asset areas will not be excluded from future investment. For example, the Volcanic Plains Bioregion as a whole is noted for its agricultural potential and has some of the best soils in the region. It is important that investment continues to be targeted to these areas to mitigate soil health risks.



Priority Area	Description
1. Glenelg Plain	<ul style="list-style-type: none"> The Glenelg Plain contains several large conservation parks and reserves that are of significant environmental, social and economic value. The area is located within Zone 1 of the Habitat 141 corridor, which straddles the South Australian and Victorian borders. The Glenelg Plain has a number of interconnected areas of small native vegetation fragments that provide important linkages between larger areas of public land. Improving and restoring linkages within this area is a key focus of the RCS. There are five listed ecologically healthy river reaches in the region. Three of these - the Stokes River, Crawford River and Moleside Creek are contained within the Glenelg Plain. The area is home to a diverse range of flora and fauna, including many endemic and/or threatened species, and is located within one of 15 Australian Government biodiversity hotspots. The Glenelg River is listed as a heritage river under the <i>Victorian Heritage Rivers Act 1992</i> from south of Dartmoor to its mouth at Nelson, reflecting its high natural, social and landscape values. The Glenelg Estuary is the longest estuary in Victoria and has very high habitat values. It is listed as a wetland of national significance on the DIWA due to the habitat it provides for animal taxa at vulnerable life cycle stages, and its function as a refuge during drought. The Glenelg Plain has one of the highest densities of wetlands in Victoria. Several of these wetlands are DIWA listed: Boiler Swamp System, Dergholm (Youpyang) Wetlands and Long Swamp. The area is also home to the Bridgewater Lakes, one of the longest freshwater lakes systems in Victoria. The Discovery Bay – Piccaninnie Ponds Important Bird Area is of global bird conservation importance. The area incorporates part of the Budj Bim National Heritage Landscape (Tyrrendarra Area) which is renowned for its cultural values. Cape Bridgewater and Discovery Bay Coastal Park have been identified as key nature based tourism assets at a State level. The area has been identified as one of the areas that contribute most to biodiversity conservation at a regional scale (see NaturePrint <i>Figure 13</i>).
2. Grampians	<ul style="list-style-type: none"> The Grampians area is dominated by the Grampians National Park, which is listed on the national heritage register for its outstanding national heritage significance, Indigenous rock art sites, and outstanding species diversity. The Grampians National Park is a largely intact landscape. It supports over 1,000 native plant species, including 23 that are found nowhere else in the world. The Grampians region provides significant nature-based tourism and recreational services, and has recorded over 1.5 million visitor days annually. The area has been identified as one that contributes most to biodiversity conservation at a regional scale (see NaturePrint <i>Figure 13</i>), and one of five listed ecologically healthy river reaches in the region (Headwaters of the Wannon).
3. Upper Hopkins	<ul style="list-style-type: none"> Upper Hopkins contains several areas of public land that have been identified as having high quality terrestrial habitat and significant environmental values, including Langi Ghiran State Park, Mount Buangor State Park and Ararat Regional Hills Park. These areas contain relatively undisturbed plant communities and are of high conservation value.
4. Volcanic Plains	<ul style="list-style-type: none"> The Victorian Volcanic Plain is recognised as one of 15 Australian Government biodiversity hotspots. Only around one per cent of the original extent of native grasslands and grassy woodland communities now remain within this bioregion. Remaining areas of habitat provide important refuge sites for a range of threatened species. The area contains a significant number of the region's wetlands, particularly within the Lake Bolac area. Lake Bookar is recognised as internationally important under the Ramsar Convention on Wetlands. Several other wetlands are listed on the DIWA, including: Woorndoo-Hopkins Wetlands, Lake Linlithgow, Lake Muirhead and Mt William Swamp. The Lake Linlithgow wetland system is of national significance, and is one of the few large permanent wetlands that occur within the region. It provides an important drought refuge for many waterbirds. The area contains some of the most productive land within the region and is noted for its contribution to the gross value of Australian agricultural production.
5. Coast	<ul style="list-style-type: none"> Two locations with this area that have been identified as being of global bird conservation importance: the Yambuk Lake complex, and the Port Fairy to Warrnambool Important Bird Areas. Both the Yambuk Lake complex, and Lower Merri River Wetlands (Kelly's and Saltwater swamps) are listed on the DIWA. The estuarine section of the Hopkins River is one of three 'Premier Rivers' that have been identified for fishing across Victoria. Coastal inlets that occur within the area provide important areas of habitat for migratory waders and shorebirds. Many of these species are listed on the Japan-Australia Migratory Birds Agreement (JAMBA), China-Australia Migratory Birds Agreement (CAMBA), and Republic of Korea-Australia Migratory Birds Agreement (ROKAMBA).
6. Far South West Stony Rises	<ul style="list-style-type: none"> The Far South West Stony Rises area encompasses the Budj Bim National Heritage Landscape – Mt Eccles Lake Condah Area. Lake Condah is listed on the DIWA and is of outstanding historical and cultural significance, with evidence of the oldest aquaculture systems in the world. The Mt Eccles/Lake Condah area have been identified as key nature based tourism assets at a State level. The area contains the largest community of Manna Gum in Victoria, and provides critical habitat for a diverse range of threatened species.

Table 24: Description of catchment level assets within the Glenelg Hopkins region.

SIGNIFICANT RISKS TO ASSETS

Significant risks to assets have been identified and evaluated through the application of a risk assessment framework based on the Australian/New Zealand Standard.¹³⁶

Significant risks have been interpreted at the regional scale and are described in *Table 25*. The risk assessment incorporated threat information that was identified for each of the asset themes. A likelihood and consequence assessment was applied and those risks that were calculated as being significant or high have been described in *Table 25*.

Significant Risks	Description	Rivers/ Floodplains	Wetlands	Estuaries	Coasts	Marine	TH	SPC	Soil/Land
Land-use change	Land-use changes causing the accelerated loss of native vegetation and natural landscapes include raised-bed and broadacre cropping, rock crushing and subsequent pasture improvements, increased use of pivot irrigation systems, blue gum plantations and rural residential development. In many cases land-use change leads to a degradation of wetlands, native grasslands, soil and water resources and impacts on threatened species and habitats. ¹³⁷ Large-scale land clearing has raised watertables and leached salt into groundwater, rivers, wetlands and upper layers of the soil. It continues to contribute to widespread loss of native species, loss of ecosystem function, and land and water damage. ¹³⁸	✓	✓	✓	✓	✓	✓	✓	✓
Clearance of native vegetation	Clearance of native vegetation reduces the diversity of habitats and ecological processes that occur within them. ¹³⁹ Approximately 81 per cent of the Glenelg Hopkins region has been cleared for agriculture. ¹⁴⁰	✓	✓	✓	✓	✓	✓	✓	✓
Stock access	Stock access and grazing of some asset areas can lead to removal of, or damage to, native vegetation, a reduction in water quality, and river bank erosion and wetland degradation.	✓	✓	✓	✓	✓	✓	✓	✓
Pest plants	Pest plants (weeds) are a risk to regional biodiversity and agriculture and can significantly lower land values. ¹⁴¹ Pest plants invade native vegetation, provide habitat for pest animals and create fuel loads for fire. ¹⁴²	✓	✓	✓	✓	✓	✓	✓	✓
Pest animals	Pest animals impacting negatively on the Glenelg Hopkins region include rabbits, foxes, feral goats, carp, pigs, feral cats and feral deer. ¹⁴³ These species have caused widespread economic and environmental impact and have significant potential for further impact. ¹¹¹ Invasive animals declared under the <i>Catchment and Land Protection Act</i> , such as rabbits and foxes, are well established in the Glenelg Hopkins region. Some studies indicate that foxes may account for up to 30 per cent of the deaths of newborn lambs. ¹⁴⁴	✓	✓	✓	✓	✓	✓	✓	✓
Drainage of wetlands	The major threats to wetlands are drainage, salinity, agriculture, dredging, landfilling, pollution, water supply and recreation. ¹⁴⁵ Since European settlement there has been a 21 per cent decrease in the number of wetlands and a 49 per cent loss of wetland area (includes partial drainage).	✓	✓	✓	✓	✓	✓	✓	✓
Reduction in river flows	Reduced flows threaten a number of environmental, social and economic values, such as aquatic life, riparian vegetation, recreational fishing opportunities and floodplain processes. Climate change is forecast to have an impact on rivers.	✓	✓	✓	✓	✓	✓	✓	✓
Declining water quality	Water quality can be affected by a number of influences including urban and agricultural pollution, salinity, erosion and overuse of resources. Poor water quality has impacts on aquatic ecosystems, aquaculture and agriculture, water-based recreation, suitability for sustaining a productive agricultural industry, domestic use, recreational pursuits and environmental needs.	✓	✓	✓	✓	✓	✓	✓	✓

Below (L-R): As a pest animal, foxes pose a significant risk to the region both environmentally and economically.

Photos: Bob McPherson.

Opposite Page: Major bushfires pose a threat to many species.

Photo: DEPI.



Significant Risks	Description	Rivers/ Floodplains	Wetlands	Estuaries	Coasts	Marine	TH	SPC	Soil/Land
Flood damage	While flooding and inundation of land is largely considered a natural process, it can be exacerbated by modification of waterways. The Glenelg Hopkins region may have a greater potential for flooding due to climate change. With changing seasonal patterns, it is predicted that there will be an increase in intense periods of rainfall over a shorter timeframe, increasing the likelihood of floods occurring. Sea-level rise will also impact on floodplain management, increasing the extent and depth of inundation of floodplains and estuarine areas.	✓	✓	✓	✓				
Inappropriate artificial river mouth openings	Within the region's estuaries, there is a history of artificial river mouth openings undertaken to alleviate land inundation. If artificial river mouth openings are undertaken when the conditions in the estuary are unfavorable mass fish kills can occur and fish eggs and larvae can be flushed out to sea. ¹⁴⁶			✓	✓	✓		✓	
Barriers to fish movement	Structures placed across waterways can form a barrier to fish movement. ¹⁴⁷ Structures can include dams, weirs and roads. These barriers can affect the movement of indigenous fish species, isolating fish populations and restricting spawning activities.							✓	
Soil erosion (on-site and off-site impacts)	Vegetation removal and intensive agricultural production can lead to a loss of soil organic matter, resulting in soil structure breakdown and increased erosion. Long-term outcomes of continued erosion can be seen in sediment deposits in the river systems. Extensive sheet, tunnel, gully and stream bank erosion has led to large volumes of sand being trapped in the Glenelg River and its tributaries. ¹⁴⁸ Gully and tunnel erosion are most significant in the Glenelg Basin where 52 per cent of agricultural land is estimated to be affected to a moderate or severe extent. ¹⁴⁹	✓				✓	✓		✓
Soil salinity	Salinity has developed in response to changes in land use and vegetation cover with settlement clearing and agricultural development. ¹⁵⁰ Salinity affects more than 27,000 ha ¹⁵¹ and costs the region more than \$44 million annually. It impacts the region's agricultural production, water quality, river health, biodiversity, and environmental, heritage and infrastructure assets. ¹⁵² These impacts are expected to increase substantially over the next 30 years. ¹⁵³	✓	✓				✓	✓	✓
Soil acidity	Soil acidification poses a major threat to the productivity and profitability of agriculture and to the health of terrestrial biodiversity. Some agricultural practices accelerate the rate of acidification. ¹⁵⁴ Most of the Glenelg Hopkins region has a high, inherent susceptibility to soil acidification, with an estimated 74 per cent of agricultural soils in the region strongly acidic (pH < 5.6). There is a risk of further soil acidification in parts of the region under agriculture, particularly in areas receiving more than 500 millimetres of annual rainfall. Under the influence of current agricultural practices around 10 to 15 per cent of the region could become extremely acidic in the future. ¹⁵⁵						✓	✓	✓
Decline in soil organic matter	Soil organic matter is a vital component of healthy soils and has many benefits in terms of soil structure, water holding ability, its support of soil organisms and its release of nutrients. Some farming practices may reduce soil organic matter, such as burning, tillage, overgrazing and cropping. Sixty-six per cent of the region is considered highly susceptible to soil structure decline. ¹⁵⁶						✓		✓
Bushfires	While fire is an integral part of the environment, major bushfires may pose a threat to many species, particularly those located in isolated remnants.						✓	✓	
Climate Change	During this century, it is likely the Victorian coastline will be impacted by sea level rise and increased frequency and severity of storm events leading to inundation and erosion. It is also predicted that higher temperatures will increase bushfire risk along the coast, and increased sea temperatures, changing sea currents and further acidification of the ocean will affect the marine environment. ¹⁵⁷	✓	✓	✓	✓	✓	✓	✓	✓

Table 25: Summary of significant risks to regional assets.



IMPLEMENTING THE STRATEGY

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
OBJECTIVES AND MEASURES THAT RELATE TO ALL OR MULTIPLE ASSET THEMES				
Objective 1.1: Protect and improve the region's waterways, wetlands and estuaries				
1.1.1	Develop and implement Regional Waterway Strategy (which includes rivers, estuaries and wetlands)	Victorian Waterway Management Strategy (in development)	CMA	DEPI, Water Authorities, Parks Victoria, local government, Western Coastal Board, community groups
1.1.2	Implement actions from the Western Region Sustainable Water Strategy that apply to the Glenelg Hopkins Catchment Region	Western Region Sustainable Water Strategy	CMA, DEPI, Water Authorities	Parks Victoria, community groups
Objective 1.2: Reduce the impact of pest plants and animals on the region's natural resources and agricultural industries				
1.2.1	Implement the Glenelg Hopkins Invasive Animal Strategy	Glenelg Hopkins Invasive Animal Strategy (2010-2015)	CMA	DEPI, Parks Victoria, land managers, community groups, local government, Trust for Nature
1.2.2	Implement the Glenelg Hopkins Regional Weed Plan	Glenelg Hopkins Regional Weed Plan (2008-2012)	CMA	DEPI, Parks Victoria, land managers, community groups, local government, Trust for Nature
1.2.3	Update the Glenelg Hopkins Regional Weed Plan	Glenelg Hopkins Regional Weed Plan (2008-2012)	CMA	DEPI, Parks Victoria, land managers, community groups, local government
Objective 1.3: Maximise biodiversity benefits of sequestering carbon in the landscape and minimise adverse effects				
1.3.1	Develop a Regional NRM Plan to guide future carbon sequestration activities	-	CMA	DEPI
1.3.2	Identify priority landscapes for potential carbon sequestration opportunities	-	CMA	DEPI
1.3.3	Identify opportunities and management strategies to maximise environmental co-benefits of carbon bio-sequestration opportunities	-	CMA	DEPI, Trust for Nature
1.3.4	Provide guidance on the potential risks and adverse impacts associated with carbon sequestration in the landscape, including impacts to biodiversity, water resources and production systems	-	CMA	DEPI
Objective 1.4: Protect and manage the visual character of the landscape				
1.4.1	Undertake south west Victoria Landscape Assessment Study	-	Department of Transport, Planning and Local Infrastructure	DEPI, Parks Victoria, CMA, local government, Western Coastal Board
1.4.2	Provide guidance through local planning schemes to protect and manage the visual character of the landscape in the future	-	Department of Transport, Planning and Local Infrastructure	DEPI, Parks Victoria, CMA, local government, Western Coastal Board
COMMUNITY PARTICIPATION				
Objective 2.1: Maintain and enhance community capacity, awareness and involvement in natural resource management within the region				
2.1.1	Prepare a Stakeholder and Community Engagement Plan for the implementation of the RCS by 2013	Glenelg Hopkins Regional Catchment Strategy 2013-2019	CMA	-
2.1.2	Update and implement the Glenelg Hopkins Regional Landcare Support Strategy by the end of 2013	Glenelg Hopkins Regional Landcare Support Strategy	CMA	DEPI, industry groups, Landcare groups, Landcare networks, land managers, Western Coastal Board
2.1.3	Develop a targeted community education program to increase awareness of natural assets within the region and encourage actions that improve land, water and biodiversity outcomes	-	CMA	DEPI, Parks Victoria, local government, Western Coastal Board
2.1.4	Develop and implement programs to build community capacity in natural resource management	-	CMA	DEPI, Parks Victoria, local government

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
2.1.5	Undertake community awareness and extension activities to promote natural resource management and best management practices in agriculture	-	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, EPA, Indigenous partner organisations, community groups, Trust for Nature, Western Coastal Board
2.1.6	Involve the community in decisions relating to natural resource management within their region	-	CMA	DEPI, Parks Victoria, local government,
Objective 2.2: Facilitate a collaborative approach to NRM				
2.2.1	Collaborate with indigenous communities, community organisations, local government, agencies, tertiary institutions, industry groups and neighbouring NRM bodies to develop partnership projects and joint initiatives	-	CMA	DEPI, Parks Victoria, local government, Trust for Nature, Indigenous communities
2.2.2	Improve inter-agency and cross border communication through active support of groups	-	CMA	DEPI, Wimmera CMA, Southern Rural Water, GWM Water South East NRM Board, Department of Environment and Natural Resources, Department for Water, South Eastern Water Conservation and Drainage Board
2.2.3	Seek opportunities for cross border and interagency partnerships to address mutual natural resource management priorities	-	CMA	DEPI, Wimmera CMA, Southern Rural Water, GWM Water South East NRM Board, Department of Environment and Natural Resources, Department for Water, South Eastern Water Conservation and Drainage Board
Objective 2.3: Support land managers in meeting their responsibilities as active stewards of the Catchment's land, water and biodiversity				
2.3.1	Provide information to land managers on their responsibilities to conserve soil and protect water resources under the <i>Catchment and Land Protection Act</i>	-	DEPI	CMA
Objective 2.4: Support farmers to incorporate environmental outcomes into their farm systems				
2.4.1	Where possible, make existing property management planning tools available to land owners on-line.	-	DEPI	Landcare, DemoDairy
2.4.2	Raise land owner awareness of incentive programs	-	CMA	Local government, Landcare, DEPI, Demo Dairy
RIVERS AND FLOODPLAINS				
Objective 3.1: Waterways classified as good or excellent in the Index of Stream Condition (ISC3) will remain as such in 2033				
3.1.1	Develop and implement Regional Waterway Strategy	Regional Waterway Strategy (to be developed)	CMA	DEPI, Water Authorities, Parks Victoria, local government, community groups, land managers
Objective 3.2: The condition of specified waterways currently classed as poor to moderate in the Index of Stream Condition (ISC3) is improved by 2033				
3.2.1	Develop and implement Regional Waterway Strategy	Regional Waterway Strategy (to be developed)	CMA	DEPI, Water Authorities, Parks Victoria, local government, community groups, land managers
Objective 3.3: Improve river health in relation to riparian extent, connectivity, hydrological regime and water quality				
3.3.1	Develop and implement action plans for priority waterways and their catchments except where existing park and forest management plans address priority waterways that occur within parks, reserves and forests	Regional Waterway Strategy (to be developed)	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, EPA, Indigenous partner organisations, land managers
3.3.2	Develop and implement seasonal watering proposals	Regional Waterway Strategy (to be developed)	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, EPA, Indigenous partner organisations, community groups, land managers

IMPLEMENTING THE STRATEGY

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
Objective 3.4: Increase provision of reliable flood information for settlements				
3.4.1	By 2014, complete a Regional Floodplain Management Plan	-	CMA	DEPI, local government
3.4.2	Support the development of a framework for upgrading flood warning systems	-	CMA	Local government
3.4.3	Complete a priority list for new and upgraded flood warning systems for the region	-	CMA	Local government
3.4.4	Undertake flood studies to improve knowledge of potential flood impacts on settlements	-	CMA	Local government, community groups
3.4.5	Work with local government to amend planning schemes to reflect best available flood information	-	Local government	CMA, DEPI
3.4.6	Develop guidelines for appropriate use and management of floodplains	-	CMA	DEPI, local government
Objective 3.5: Improve river and floodplain management				
3.5.1	Increase community preparedness for flood events through development of early warning systems and flood awareness programs	-	CMA	Local government
3.5.2	Seek community input during the planning and delivery of strategic management plans	-	CMA	Community groups and community members
WETLANDS				
Objective 4.1: By 2033, improve the condition of wetlands, and maintain the diversity of wetland types (using IWC1 assessment for comparison)				
4.1.1	Develop and implement a wetland strategic framework as part of the Regional Waterway Strategy	Victorian Waterway Management Strategy (in development)	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, Western Coastal Board, VicRoads, Indigenous partner organisations, EPA, community groups, Trust for Nature
4.1.2	Develop strategic management plans for significant (priority) wetlands	-	CMA (DEPI on public land)	DEPI, Parks Victoria, local government, community, adjacent land managers, Trust for Nature
4.1.3	Develop best management practices for wetlands	-	CMA	DEPI, Parks Victoria, local government
4.1.4	Support indigenous wetland restoration projects	-	CMA / Winda-Mara Aboriginal Corporation	Parks Victoria, DEPI, SRW, local government, Western Coastal Board (consult)
4.1.5	Establish a management framework for reinstating drained wetlands	-	CMA	DEPI, SRW, Water Authorities, local government, Western Coastal Board, Indigenous partner organizations, Trust for Nature
4.1.6	Review the effectiveness of current measures to mitigate the impact of land-use change on wetlands	-	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, Trust for Nature
4.1.7	Through education and incentive programs, increase the number of private land managers implementing best wetland management practices	-	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, land managers
4.1.8	Prevent negative impacts to wetlands from new developments by working with councils to implement wetland-specific planning scheme overlays	-	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, Indigenous partner organisations
4.1.9	Identify opportunities for land purchase of priority wetlands	-	CMA	DEPI, Parks Victoria

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
ESTUARIES				
Objective 5.1: By 2033 improve the condition of estuaries across the region as compared with the 2018 IEC assessment				
5.1.1	Develop and implement an estuaries strategic framework through the Regional Waterway Strategy	Draft Victorian Water Strategy	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, Western Coastal Board, VicRoads, Indigenous partner organisations, EPA, Community
5.1.2	Review Estuary Management Plans as they expire, in conjunction with the Regional Water Strategy	Regional estuary management plans	CMA	DEPI, Parks Vic, local government, Western Coastal Board
5.1.3	Revise the South West Victoria Coastal Action Plan by 2014	South West Estuaries Coastal Action Plan	Western Coastal Board	Local government, DEPI, Parks Vic, CMA, Committees of Management
5.1.4	Develop Environment Significance Overlays to protect estuaries from inappropriate development and use	Regional estuary management plans, municipal planning schemes	CMA	Local government, Western Coastal Board, DEPI, Department of Transport, Planning and Infrastructure
5.1.5	Where appropriate identify strategic land purchase sites for the protection and improvement of estuary function and biodiversity values	Regional estuary management plans	CMA	DEPI, Parks Vic, local government, Trust for Nature, BHF, private land managers
5.1.6	Implement Estuary Entrance Management Support System across the eight estuaries that occur within the Glenelg Hopkins region	Regional Waterway Strategy (to be developed), regional estuary management plans	CMA	DEPI, SRW, Water Authorities, Parks Victoria, local government, EPA,
5.1.7	Conduct research into estuarine environments to better understand function, structure and connectivity with coastal and marine environments and to reduce negative impacts	-	Universities	DEPI, Parks Victoria, Western Coastal Board
5.1.8	Continue estuary monitoring to inform Estuary Entrance Management Support System (EEMSS) and enable implementation of IEC	Regional Waterway Strategy (to be developed), regional estuary management plans	CMA	DEPI
COASTS				
Objective 6.1: By 2033 maintain the condition of the coast and manage specific threats to improve condition where appropriate				
6.1.1	Revise the South West Victoria Regional Coastal Action Plan by 2014	South West Victoria Regional Coastal Action Plan	Western Coastal Board	CMA, local government, DEPI, Parks Vic, Committees of Management
6.1.2	Develop environmental significance overlays for the protection of coasts	Victorian Coastal Strategy, South West Victoria Coastal Action Plan, Victorian Landscape Setting Types for the Victorian Coast	Local government	CMA, DEPI, Western Coastal Board, Department of Transport, Planning and Infrastructure
6.1.3	Develop coastal adaptation plans to manage the impact of sea-level rise, storm surge and flooding in priority areas	Victorian Coastal Strategy, South West Victoria Coastal Action Plan, Local Management Plans	Department of Transport, Planning and Infrastructure	CMA, DEPI, Western Coastal Board, Trust for Nature, local government, Committees of Management
6.1.4	Include need for coastal pest plant and animal management into regional plans	Glenelg Hopkins Invasive Animal Strategy, Glenelg Hopkins River Health Strategy (to be replaced by Regional Waterway Strategy)	CMA	Local government, Parks Vic, EPA, DEPI
6.1.5	Monitor and work to control pest plant and animal species on the coast	Glenelg Hopkins Invasive Animal Strategy	CMA	DEPI, Parks Victoria, local government
6.1.6	Promote and encourage a sustainable tourism and recreation to minimise negative environmental impacts	Regional estuary management plans, Victorian Coastal Strategy, South West Victoria Estuaries Coastal Action Plan	Local government	Tourism Victoria, VRFish, Western Coastal Board, DEPI
6.1.7	Continue to convene a marine, coastal and estuarine cross agency management coordination forum for the region	Victorian Coastal Strategy, South West Coastal Action Plan	CMA	Western Coastal Board, DEPI, Parks Vic, local government
6.1.8	Consult the community in coastal planning and management processes	Victorian Coastal Strategy, South West Coastal Action Plan	Local government	Western Coastal Board, DEPI, Parks Vic, CMA
6.1.9	Conduct research into coastal environments to better understand function, structure and connectivity with estuarine and marine environments and to reduce negative impacts	-	Universities	CMA, DEPI, Parks Victoria, Western Coastal Board

IMPLEMENTING THE STRATEGY

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
MARINE				
Objective: 7.1: By 2033 maintain the condition of the marine environment and manage specific catchment-based threats to improve condition where appropriate				
7.1.1	Support and assist in fisheries education program with a particular focus on species that utilise both the marine and estuarine freshwater environments	Victorian Coastal Strategy, South West Victoria Coastal Action Plan, Fisheries Management Plans	DEPI	Fisheries, industry, CMA, volunteers, community groups
7.1.2	Consolidate and integrate programs to address land-based sources of marine pollution	Victorian Coastal Strategy, South West Victoria Coastal Action Plan	CMA	Western Coastal Board, DEPI, Parks Vic, local government
7.1.3	Reduce the impact of catchment discharges on the health of marine ecosystems by promoting operational changes in farm practices	Victorian Coastal Strategy, South West Victoria Coastal Action Plan	EPA	Western Coastal Board, DEPI, Parks Vic, local government
7.1.4	Support, where appropriate, delivery of regional actions listed in the 2008 Victorian Coastal Strategy designed to protect marine biodiversity and ecosystems	Victorian Coastal Strategy, South West Victoria Coastal Action Plan	CMA	Western Coastal Board, DEPI, Parks Vic, local government, community groups
7.1.5	Conduct research into marine environments to better understand function, structure and connectivity with estuarine and coastal environments and to reduce negative impacts	-	Universities	Universities, DEPI, Parks Victoria, Western Coastal Board
7.1.6	Promote and encourage a sustainable tourism industry to minimise negative environmental impacts	Victorian Coastal Strategy	Western Coastal Board	Local government, Tourism Victoria, DEPI, VRFish
7.1.7	Monitor developments in alternative energy and resource use and work with agencies for their ecologically sustainable development	Victorian Coastal Strategy	CMA	Western Coastal Board, DEPI, Parks Victoria, local government
7.1.8	Undertake research to better understand catchment-based threats to marine assets	-	CMA	Western Coastal Board, DEPI, EPA, local government
TERRESTRIAL HABITAT				
Objective 8.1: Maintain extent and improve condition of terrestrial habitat				
8.1.1	By 2019, maintain and/or increase the extent of native vegetation on public and private land (compared with 2012 levels) and improve its quality	-	CMA	DEPI, Parks Victoria, Land managers, Trust for Nature, local government
8.1.2	Implement actions within the Glenelg Hopkins Regional Weed Plan to improve the condition of native vegetation	Glenelg Hopkins Regional Weed Plan 2008-2012	CMA	DEPI, Parks Vic, land managers, local government, community group, land managers, Trust for Nature
8.1.3	Protect and improve the condition of terrestrial habitat through revegetation, fencing where appropriate and implementation of best management practices	Glenelg Hopkins Regional Weed Plan 2008-2012 Glenelg Hopkins Native Vegetation Plan 2006	CMA	DEPI, Parks Vic, land managers, local government, community groups and land managers
8.1.4	Improve native vegetation resource condition by building partnerships with private land holders to preserve rare Ecological Vegetation Classes	Glenelg Hopkins Habitat Network Action Plan	CMA	DEPI, land managers, Trust for Nature
8.1.5	Protect important biodiversity values found in the parks and reserves network through the implementation of park and forest management plans	Portland Horsham Forest Management Plan, Glenelg Hopkins Region Park Management Plans, South West Management Plan (to be developed), Wannon Water Biodiversity Strategy	DEPI / Parks Vic	-
8.1.6	Support the development and implementation of Roadside Vegetation Plans for priority roadsides with significant remnant vegetation	Glenelg Hopkins Native Vegetation Plan 2006, Wannon Water Biodiversity Strategy	Vic Roads, local government	DEPI, CMA, community groups, CFA
8.1.7	Increase the extent of private land managed for biodiversity conservation	Trust for Nature's Statewide Conservation Plan, Trust for Nature's Regional Conservation Plan	Trust for Nature	DEPI, CMA, land owners, Indigenous groups

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
8.1.8	Develop conservation covenants to protect areas of high-value remnant vegetation	-	Trust for Nature	DEPI, CMA, local government, land owners
8.1.9	Develop condition statements for terrestrial habitat as information becomes available	-	CMA	Parks Vic, DEPI
8.1.10	By 2015, develop and begin implementation of regional biodiversity strategy	Glenelg Hopkins Invasive Animal Strategy 2010-2015, Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan	CMA	DEPI, local government, Parks Vic, community groups
Objective 8.2: Improve connectivity of habitat for species populations and communities				
8.2.1	Identify priority regional biolinks by the end of 2013	Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan 2006, Trust for Nature's Statewide Conservation Plan, Trust for Nature's Regional Conservation Plan	CMA	DEPI, Parks Vic, land managers, local government, community groups, Trust for Nature
8.2.2	Identify and map areas within biolinks where ecosystems have natural regenerative capacity	Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan 2006, Trust for Nature's Statewide Conservation Plan, Trust for Nature's Regional Conservation Plan	DEPI	CMA, Parks Vic, land managers, local government, community groups, Trust for Nature
8.2.3	Implement cross-tenure landscape connectivity programs on private and public land	Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan 2006	CMA	DEPI, Parks Vic, land managers local government, community groups, Trust for Nature
8.2.4	Where appropriate, pursue opportunities for land purchase within priority biolink areas	Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan 2006	CMA	DEPI, Parks Vic, land managers, local government, community groups, Australian Government, Trust for Nature
Objective 8.3: Public land is managed as the core of resilient ecosystems				
8.3.1	Implement Portland Horsham Forest Management Plan (State Forests)	Portland Horsham Forest Management Plan 2011	DEPI	
8.3.2	Develop and implement Ngootyoong Gunditj, Ngootyoong Mara South West Management Plan	-	Parks Victoria	Trust for Nature
8.3.3	Support resilient ecosystem management on public land with buffer zones and linkages by protecting adjacent private land	-	CMA	Trust for Nature, land managers
THREATENED SPECIES POPULATIONS AND COMMUNITIES				
Objective 9.1: Improve the health of key populations of threatened species and communities				
9.1.1	By 2015, develop and begin implementation of regional biodiversity strategy	Glenelg Hopkins Invasive Animal Strategy 2010-2015, Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan	CMA	DEPI, local government, Parks Vic, community groups
9.1.2	Implement actions from the Glenelg Hopkins Invasive Animal Strategy 2010-2015	Glenelg Hopkins Invasive Animal Strategy 2010-2015	CMA	DEPI, local government, land managers, Community Groups
9.1.3	Continue to support regional Threatened Flora and Fauna Program and the implementation of high priority actions in high priority locations consistent with the Actions for Biodiversity Conservation (ABC) database	Glenelg Hopkins Invasive Animal Strategy 2010-2015, Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan	DEPI	CMA, local government, Parks Vic, community groups, Birdlife Australia
9.1.4	Achieve an improvement in the conservation status of listed threatened species and ecological communities	Action Statements, Recovery Plans	DEPI	CMA, Regional stakeholders, Trust for Nature
9.1.5	Review and implement Action Statement and Recovery Plans for listed threatened species and communities within the Glenelg Hopkins region	Action Statements, Recovery Plans, Trust for Nature's Statewide Conservation Plan, Trust for Nature's Regional Conservation Plan	DEPI	CMA, Regional stakeholders, Birdlife Australia, Trust for Nature

IMPLEMENTING THE STRATEGY

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
9.1.6	Invest in improving the resilience of threatened species through programs targeted at habitat improvement	Glenelg Hopkins Habitat Network Action Plan	CMA	-
9.1.7	Implement ecologically appropriate burning for protection of flora and fauna communities where appropriate	District Fire Operations Plans	DEPI	Parks Vic, CFA, land managers
9.1.8	Support long-term, two-way knowledge transfer and capacity building to enhance the role of traditional ecological knowledge in biodiversity conservation	-	CMA, DEPI, in partnership with indigenous peoples	Community groups
9.1.9	Build capacity and enhance knowledge of industry and local government to plan and protect biodiversity, particularly threatened species and critical habitats	-	CMA / DEPI	Regional stakeholders, Trust for Nature, community groups
9.1.10	Build regional capacity through training and education programs (e.g. farm planning) to increase awareness of regional biodiversity assets, values and threats	-	CMA / DEPI	DEPI, Parks Vic, Trust for Nature, community groups
9.1.11	Collaborate with other stakeholders (e.g. universities and research institutions) to increase capacity to survey and monitor threatened species within the region	Glenelg Hopkins Habitat Network Action Plan, Glenelg Hopkins Native Vegetation Plan, Regional Waterway Strategy (to be developed)	CMA	DEPI, universities, research institutions

SOIL AND LAND

Objective 10.1: An improvement in soil condition as measured by key indicators by 2033

10.1.1	Update and implement the Glenelg Hopkins region Soil Health Strategy and Soil Health Plan 2009-2014	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014, Victorian Soil Health Strategy	CMA	DEPI, land managers, community groups
10.1.2	Update and commence implementation of the Glenelg Hopkins Salinity Plan	Glenelg Hopkins Salinity Plan 2005-2008	CMA	DEPI, community and industry groups, land managers

Objective 10.2: An increase in the area of soils managed within their capability

10.2.1	Investigate benchmarks for key indicators of healthy soils (stable-state targets)	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	DEPI	CMA
10.2.2	Investigate opportunities for soil capability mapping under different land management practices	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI
10.2.3	Identify soils at risk under certain management regimes	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI, industry groups
10.2.4	Promote increased levels of awareness and adoption of land management methods to maintain or improve the health and productivity of soil	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	DEPI	CMA, community groups, industry groups
10.2.5	Undertake education programs that promote soil as a finite, valuable resource and ecosystem services provided by soils	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI, community groups, industry groups
10.2.6	Continue development and communication of land capability information (e.g. trials and on-farm demonstration sites) to guide land-use change decisions	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI, industry groups, land managers, community groups
10.2.7	Maintain a minimum of 70 per cent ground cover during the summer season	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI, industry groups, land managers, community groups
10.2.8	Examine opportunities for compliance programs	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014	CMA	DEPI
10.2.9	Identify opportunities for land capability, overlays and planning controls	-	DEPI	CMA
10.2.10	Raise awareness of fundamentals of soil carbon composition, function and sequestration opportunities	-	CMA	DEPI

	Objectives and management measures	Lead sub-strategies or action plans to guide implementation	Lead or coordinating responsibility	Delivery partners
Objective 10.3: By 2033 reduce the impact of soil based threats, including salinity and erosion, on waterways and wetlands as measured by improved ISC and IWC scores (turbidity and EC)				
10.3.1	Implement the revised Glenelg Hopkins Salinity Plan	Glenelg Hopkins Salinity Plan 2005-2008	CMA	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014, Victorian Soil Health Strategy
10.3.2	Implement the revised Glenelg Hopkins Soil Health Strategy and Soil Health Plan	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014, Victorian Soil Health Strategy	CMA	DEPI, landholders, community groups, industry groups
Objective 10.4: By 2033 Soils are managed for protection and enhancement of the beneficial ecosystem services provided by soils				
10.4.1	Implement the Glenelg Hopkins Soil Health Strategy and Soil Health Plan	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014, Victorian Soil Health Strategy	CMA	Glenelg Hopkins Soil Health Strategy and Soil Health Plan 2009-2014, Victorian Soil Health Strategy

MONITORING, EVALUATION AND REPORTING

11.1 Conduct a mid-term and full-term review of the RCS

11.1.1	Develop an RCS MER Plan by July 2013	-	CMA	-
11.1.2	Review RCS MER Plan annually	-	CMA	-
11.1.3	Conduct a mid-term review of the RCS by July 2016	Glenelg Hopkins RCS, RCS MER Plan	CMA	-
11.1.4	Conduct a final review of the RCS by July 2019	Glenelg Hopkins RCS, RCS MER Plan	CMA	-

Implementation of the RCS is dependent on funding availability.

Table 26: Implementing the Strategy.

MONITORING EVALUATION AND REPORTING

REVIEW AND MANAGEMENT OF THE RCS

The primary goal of this Monitoring, Evaluation and Reporting (MER) framework is to provide the processes and actions for understanding, improving and communicating the impact of managing the region's natural resource assets.

This framework will provide the overarching direction for the application of MER principles and processes to the implementation of the RCS. It will be supported by a MER plan that will be developed by July 2013.

A MER framework is vital for understanding success (and failures) and how best to learn from them. MER provides the information that is required to adaptively respond and manage programs in an often uncertain field of management.

Glenelg Hopkins CMA commits to co-ordinating a mid-term review of the RCS (due in 2015) using these adaptive management processes as well as undertaking a comprehensive evaluation at the conclusion of the strategy's implementation.

MER PRINCIPLES FOR THE RCS

The RCS MER is based on the following principles:

- During the life of the RCS, new information and knowledge will most likely become available. This information and knowledge will need to be incorporated into the RCS by taking an adaptive management approach.
- Management interventions for natural resource management often have impacts at different temporal scales. Not all impacts of management interventions will be expected to be apparent within the lifetime of this strategy. Ongoing monitoring may be required to recognise these longer term achievements.
- The success of MER for the RCS will require strong partnerships to ensure data and its interpretation is up to date and available. Data collection and sharing procedures may need to be established.
- Various standards (for example vegetation works standards and standard output protocols) are or will be available to support MER and should be considered.
- The MER framework should also consider sub-strategy and action plan implementation.

MONITORING EVALUATION AND REPORTING

OUTCOMES HIERARCHY

The RCS is informed by a hierarchy of outcomes or in other words, things that can be achieved both in the short and long-term. A series of 20-year objectives have been developed that will be required to achieve the region's 50-year vision. Six-year management measures have been identified for each objective.

CRITICAL ASSUMPTIONS FOR THE OUTCOMES HIERARCHY

Assumptions are the expectations, based on current knowledge and experience, about what is important for a strategy's success.

The following broad assumptions can be applied:

- data is available and can be meaningfully applied when evaluating and reporting on implementation
- resources are available for monitoring activities, data collection and management
- resources are available to deliver the necessary action
- new land management practices will be adopted
- predicted conditions (taking into account predictions about climate change and land-use change) for the life of the RCS are correct
- resources are available for the preparation and implementation of supporting sub-strategies and action plans during the life of the RCS
- land managers engage and are encouraged and empowered to act
- land managers are interested in attending training and workshop events and actively seek technical advice
- Funding is available for RCS actions.

ARE THE RIGHT RESULTS BEING ACHIEVED?

Key evaluation questions, form the basis for assessing whether the management measures have occurred as required and whether they have been effective in bringing about the desired change.

Key evaluation questions against the categories of impact, appropriateness, effectiveness, efficiency and legacy are detailed below (*Table 27*). Associated monitoring activities will be detailed in the RCS MER Plan to be developed.

Impact
In what ways and to what extent has the RCS contributed to changing management practices? What increase has there been in the number of land managers applying best management practices?
What is the status and trend in asset condition in the region?
What progress has been made towards achieving the 20-year objectives?
Appropriateness
Do the management measures and actions remain the best management practices available or are there more appropriate methods that should be implemented?
Effectiveness
How effective were the implemented measures at meeting the objectives?
Are the current management measures and actions still the most effective for meeting the 20-year objectives or are there other, more effective ways?
Efficiency
To what extent were the strategy implementation actions completed?
To what extent have the program of measures been implemented?
Legacy
How are the effects of RCS implementation expected to continue over time, particularly after the strategy has reached the end of its cycle?

Table 27: Key evaluation questions.

REPORTING

Glenelg Hopkins CMA must report annually on the condition and management of land and water resources in the region. This report is submitted as a component of the CMA's annual report and is based on a set of guidelines issued by DEPI.

The CMA will conduct a mid-term and a full-term review of the RCS (*Table 19*). These reviews, while similar to the annual reporting process, will place greater emphasis on reporting on condition, achievement of the 20-year objectives and effectiveness of the RCS (in terms of implementation of management measures and actions). These reviews may also indicate necessary changes to implementation of the RCS to ensure objectives will be met.

APPENDIX 1: RCS DEVELOPMENT PROCESS

The Glenelg Hopkins RCS is the result of a collaborative process involving government departments, many regional organisations, agencies, community groups and individuals. The development of the strategy involved four broad stages, as shown in *Figure 19*.

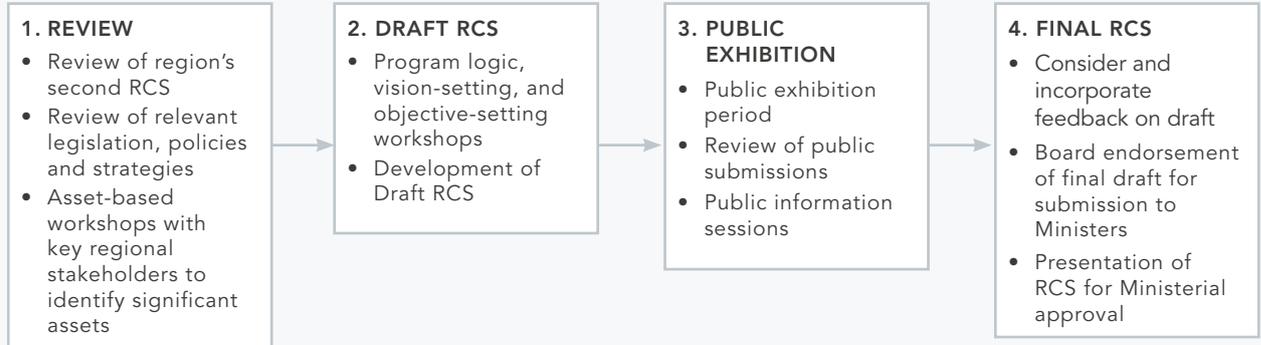


Figure 19: RCS development process.

RCS WORKING GROUP

An RCS Working Group was established to provide advice on the development of the RCS. The composition of the group is shown in *Table 28*.

Organisation	Representative
GHCMA River and Wetland Health Advisory Group	<ul style="list-style-type: none"> Michelle Casanova – community representative
GHCMA Biodiversity and Land Health Advisory Group	<ul style="list-style-type: none"> Martin Westbrooke – community representative Mike Waite – community representative
Department of Environment and Primary Industries	<ul style="list-style-type: none"> Allyson Lardner – Program Coordinator Catchments and Water, South West Region Valerie Little – Whole Farm Planning Officer
Parks Victoria	<ul style="list-style-type: none"> Evan McDowell – Environment Program Manager Grampians
RMIT	<ul style="list-style-type: none"> Mary Johnson – Research Fellow
Glenelg Hopkins CMA	<ul style="list-style-type: none"> Michael Rees – Partnership and Investment Program Manager Adam Bester – Waterway and Catchment Health Program Manager Brad Henderson – Statutory Water Program Manager Phil Perret – Strategy and Investment Manager Kellie Nilsson – Strategic Partnerships Manager Hannah Brook – MER & RCS Coordinator Gabrielle Lanman – RCS Officer

Table 28: RCS Working Group.

REVIEW OF THE 2003-2007 RCS

Glenelg Hopkins CMA undertook a review of the Glenelg Hopkins 2003-2007 RCS in 2009. The intent of the review was to capture learnings from the previous RCS and to record community perceptions about the implementation and effectiveness of the strategy. The aim was to ensure improvement for the 2013-2019 RCS. The review concluded that the Glenelg Hopkins RCS 2003-2007 was viewed as a valued regional document; however, some of its approaches were considered outdated.

The four main opportunities identified were:

- ensuring SMART (Specific, Measurable, Attainable, Relevant, Timely) targets
- more clearly defining project logic and monitoring and evaluation processes
- integrating progress against target reporting to stakeholders and community
- clarifying the approach to assets.

Opportunities for using regional partnerships more effectively for RCS development and implementation were also identified, with a particular emphasis on the role of local government. Respondents also suggested developing a document that was simpler and easier to use.

Several opportunities were highlighted regarding the community engagement component of the strategy development. Ninety-three per cent of survey respondents indicated that they or their organisation would like to participate in the development of the next RCS. Respondents were invited to provide suggestions to assist with planning engagement activities for the 2013-2019 RCS.

Five themes emerged from this process:

1. appropriate tailoring to various audiences
2. establishing and seeking guidance from advisory/working groups
3. providing feedback opportunities
4. engaging with Indigenous community on Country about the RCS
5. ensuring involvement of appropriate representatives from all levels of government.

The review provided valuable guidance for planning stakeholder and community engagement during the development of the 2013-2019 RCS.

STAKEHOLDER WORKSHOPS AND FORUMS

Public forums were held during 2011 in Hamilton, Portland, Balmoral, Mortlake and Skipton, where communities assisted with the identification and prioritisation of environmental assets within each of the asset classes. All contributions nominated by the community were recorded and used to assist in developing the final prioritised list of assets.

In February 2012, an RCS workshop of regional environmental experts helped develop key guiding statements for the RCS. There were more than 30 participants representing DEPI, Grampians Wimmera Mallee Water, Parks Victoria, local government, Wannon Water, Trust for Nature, Glenelg Hopkins CMA and CMA advisory groups, and representatives from local Indigenous communities.

Two major community workshops were held in Hamilton in March 2012 to seek public input into the development of the RCS. The workshops played a key role in the development of the regional vision for the RCS, and associated high-level natural resource management objectives, and were attended by over 50 community members. Additional public information sessions were held in Casterton, Heywood, Portland, Ararat, Lake Bolac and Warrnambool during May and June 2012 to discuss and seek feedback on the RCS.

ASSET-BASED APPROACH

The strategy has been developed using an asset-based approach. An asset-based approach is a structured process to identify areas for priority attention and to achieve targeted outcomes. In this context, assets are defined as tangible bio-physical elements of the environment that are valuable for their environmental, social and economic values.¹⁵⁸

The INFFER process was used during the development of the RCS to identify and prioritise significant assets. In close consultation with the community and regional partners a list of more than 300 significant regional assets was developed.

To reduce the number of significant assets it was then necessary to apply a "filter" using a simplified set of criteria including:

1. How significant is the asset (exceptional, very high or high)
2. What is the degree of threat to the asset? Without a major new project for this asset, how damaged will the asset be in 20-years time? (very high, high, medium, low)
3. Can you clearly identify the asset?
4. Will it be possible to define a goal for the asset that is 'SMART' (specific, measurable, achievable, relevant and timebound)?
5. Is there evidence to indicate that management actions can make a real difference, sufficient to achieve a worthwhile SMART goal for the asset?
6. If the desired management actions are mainly on private land, is it likely that those actions would be reasonably attractive to fully informed land managers when adopted over the required scale?
7. If the project requires change by other institutions (e.g. local government, state government) is there a good chance that this will occur?

The list of significant assets for each of the asset-based chapters appearing in this document are the result of this process. These lists of priority assets were taken a step further with the creation of a catchment assets map (*Figure 18*). The creation and intended use of this map are described in the section titled: "Priority areas for intervention".

APPENDIX 2: ROLES AND RESPONSIBILITIES FOR NATURAL RESOURCE MANAGEMENT

Regional Group	Roles and Responsibilities
Glenelg Hopkins CMA	Responsible for preparing the RCS and coordinating its implementation, setting regional priorities, providing regional leadership and coordination, coordinating works to protect and enhance regional land and water resources, licensing of works on waterways, regional floodplain and drainage management and management of the Environmental Water Reserve. Reports to the Victorian Government on catchment condition and management.
Neighbouring CMAs and NRM bodies	Implementation of the strategy is reliant on strong and effective partnerships with neighbouring CMAs and NRM bodies.
Commonwealth Department of Agriculture Fisheries and Forestry	Develop national initiatives for sustainable resource management and use and administer programs to promote the widespread adoption of sustainable natural resource management practices.
Victorian Catchment Management Council	Report every five years on the environmental condition and management of Victoria's land and water resources through the VCMC Catchment Condition report, advise the Minister for Environment and Climate Change and Minister for Water on land and water management issues, and encourage cooperation and facilitates communication through various projects and forums.
Department of Environment and Primary Industries (DEPI)	DEPI is Victoria's lead government agency for sustainable management of water resources, climate change, bushfires, public land, forests and ecosystems.
Department of Transport, Planning and Local Infrastructure	Conduct land-use planning and environmental assessment in Victoria, manage the legal framework for the Victorian planning system and provide advice on planning policy and strategic planning for land development. The Department also has a role with Aboriginal affairs through Aboriginal Affairs Victoria (AAV). AAV provides advice to the Victorian Government on Aboriginal policy and planning, and delivers key programs.
Local Government	Influences natural resource management through its responsibilities for land-use planning, development approvals and maintenance activities. Some local government authorities have been involved with the development of environmental plans.
Urban water authorities	Provide water and wastewater services to urban communities and management of specific water supply catchments. Meet obligations issued by the Minister for Water under the Water Act, including: preparing plans, community engagement processes, managing assets and safety and environmental management.
Rural water authorities	Provide irrigation, drainage, water supply and management of specific water supply catchments. They issue licenses for surface and groundwater extractions.
Western Coastal Board	Implements the Victorian Coastal Strategy, provides leadership in coastal planning (develop Coastal Action Plans), promotes the sustainable use of natural, social and economic systems within the coastal environment, manage significant coastal, estuarine and marine areas or issues, facilitates appropriate development, recognises the importance of cultural and historic values and encourages community participation.
Parks Victoria	Primary role is the protection of the natural and cultural values in the region's terrestrial and marine parks and reserves network through ecologically sustainable management and visitor access.
Trust for Nature	Is a non-profit organisation working to protect remnant vegetation and wildlife. The Trust focuses on its conservation covenant program and the purchase and re-selling of high conservation value land.
BirdLife Australia	Primary objective is to conserve Australia's birds and their habitats. This is achieved through involvement in conservation science and projects.
Environment Protection Authority	Primary role is to protect air, water and land from pollution, control industrial noise and minimise waste generation through the administration of environmental protection policies.
VicRoads	Is actively involved in developing roadside management plans for major roads. These plans assist with managing roadside environments and consider pest plants and animals, retention of significant roadside areas, maintenance strategies and maintenance of firebreaks.
Committees of Management	Are appointed under the <i>Crown Land (Reserves) Act 1978</i> to manage their reserve on behalf of the Minister for Environment and Climate Change. They have the responsibility to manage crown land reserves.
Landcare and other community groups	Participation in specific area planning and onground works. It is important that community groups are supported to be involved in initiatives to improve the health of the region.
Land managers	Have responsibilities under the <i>Catchment and Land Protection Act</i> to avoid causing or contributing to land degradation. Responsibilities include conserving soil, protecting water resources, eradicating regionally prohibited weeds, preventing the growth of regionally controlled weeds and preventing the spread of (or eradicating where possible) established pest animals.
Indigenous partner organisations	Possess knowledge of the catchment and its processes. They directly control areas of land and should be involved to ensure knowledge is captured and utilised.
Universities and research institutions	Assist with filling information gaps across the region. They also provide a role in supporting natural resource managers through student and staff involvement in regional initiatives.

Table 29: Roles and Responsibilities for Natural Resource Management.

APPENDIX 3: POLICIES, STRATEGIES AND LEGISLATION

Title	Asset Class							
	Rivers	Wetlands	Estuaries	Coasts	Marine	SPC	TH	Soil/Land
International agreements								
Western District Lakes Ramsar site: strategic management plan (2002)		✓						
Convention on Migratory Species ('Bonn' Convention)	✓	✓	✓	✓	✓	✓	✓	
The Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA)		✓	✓	✓		✓	✓	
Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)								
Australian Government legislation and strategies								
<i>Aboriginal and Torres Strait Islander Heritage Protection Act (1984)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Environment Protection and Biodiversity Conservation Act (1999)</i>	✓	✓	✓	✓	✓	✓	✓	
Australia's Biodiversity Conservation Strategy 2010-2030	✓	✓	✓	✓		✓	✓	
Strategy for Australia's National Reserve System 2009-2030				✓		✓	✓	
The Australian Weeds Strategy (revised 2007)	✓	✓	✓	✓		✓	✓	✓
Australian Pest Animal Strategy (2007)	✓	✓	✓	✓		✓	✓	✓
Directory of Important Wetlands in Australia (2001)		✓						
<i>Native Title Act (1993)</i>	✓	✓	✓	✓	✓	✓	✓	✓
State Government legislation and strategies								
<i>Archaeological and Aboriginal Relics Preservation Act (1972)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Catchment and Land Protection Act (1994)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Climate Change Act (2010)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Coastal Management Act (1995)</i>		✓	✓	✓	✓			
<i>Crown Land (Reserves) Act (1978)</i>	✓	✓	✓	✓		✓	✓	✓
<i>Planning and Environment Act (1987)</i>	✓	✓	✓	✓		✓	✓	✓
<i>Environment Effects Act (1978)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Environment Protection Act (1972)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<i>Forests Act (1958)</i>				✓		✓	✓	
<i>Flora and Fauna Guarantee Act (1988)</i>				✓		✓	✓	
Invasive Plants and Animal Policy Framework (2010)	✓	✓	✓	✓		✓	✓	✓
<i>National Parks Act (1975)</i>	✓	✓	✓	✓	✓	✓	✓	✓
Nutrient Management Strategy for Victorian Inland Waters (1995)		✓	✓					
SEPP (Waters of Victoria) (updated 2003)	✓	✓	✓					
Strategic Direction Statement for Victorian Ramsar Sites (2002)		✓						
Victorian Action Second Generation Landcare 2002-2012	✓	✓	✓	✓		✓	✓	✓
Victorian Coastal Strategy 2008			✓	✓	✓			
<i>Victorian Conservation Trust Act (1972)</i>		✓				✓	✓	
<i>Victorian Environment Assessment Council Act (2001)</i>	✓	✓	✓	✓	✓	✓	✓	✓
Victorian's Native Vegetation Management – A framework For Action 2002				✓		✓	✓	
Victoria's Biodiversity Strategy (1997)				✓		✓	✓	
Victorian Pest Management Framework (2000)	✓	✓	✓	✓	✓	✓	✓	✓
Victorian Salinity Management Framework	✓	✓	✓					✓
Victorian Soil Health Strategy 2012	✓	✓	✓	✓				✓
<i>Water Act (1989)</i>	✓	✓	✓					
<i>Wildlife Act (1975)</i>	✓	✓	✓	✓	✓	✓	✓	
Regional sub-strategies and plans								
Glenelg Hopkins CMA Revegetation Standards	✓	✓	✓	✓		✓	✓	✓
Glenelg Hopkins Habitat Network Action Plan 2007				✓		✓	✓	
Glenelg Hopkins Invasive Animal Strategy 2010-2015	✓					✓	✓	✓
Glenelg Hopkins Native Vegetation Plan March 2006				✓		✓	✓	
Glenelg Hopkins Regional Landcare Support Strategy 2007-2012	✓	✓	✓	✓		✓	✓	✓
Glenelg Hopkins Regional Waterways Strategy (to be developed)	✓	✓	✓					
Glenelg Hopkins Regional Weed Plan 2008-2012	✓	✓	✓	✓		✓	✓	
Glenelg Hopkins Salinity Plan 2005-2008	✓							✓
Glenelg Hopkins Soil Health Strategy and Plan 2009-2014	✓							✓

Table 30: Policies, Strategies and Legislation

APPENDIX 4: BIOREGIONAL CONSERVATION STATUS OF REMNANT VEGETATION IN THE GLENELG HOPKINS REGION

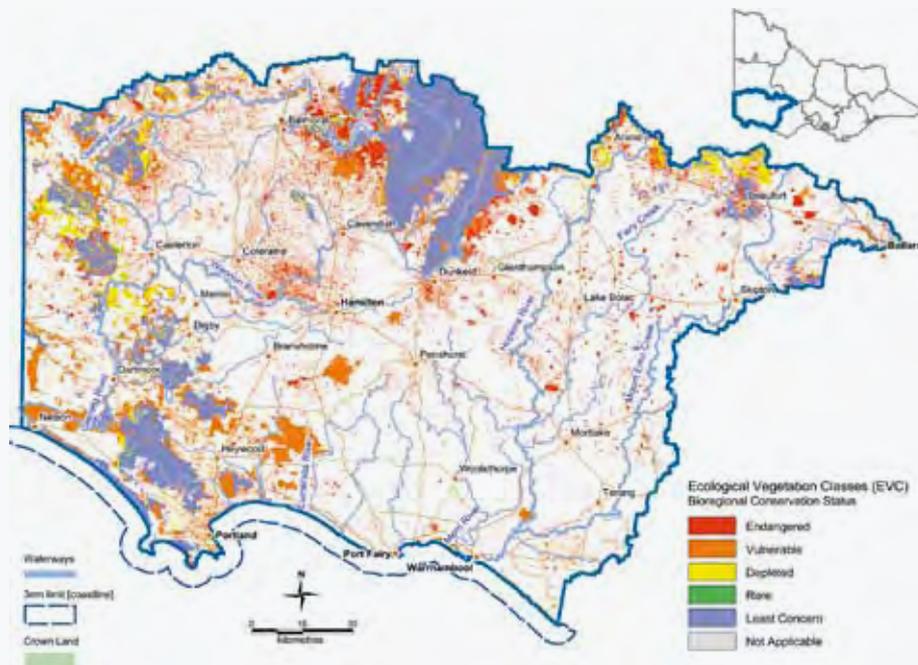


Figure 20: Bioregional conservation status of Glenelg Hopkins remnant vegetation.

Ecological Vegetation Classes (EVCs) are the vegetation mapping datasets used for detailed biodiversity planning and management. The definition of each EVC is based on a wide range of factors including vegetation structure and floristics, life forms of plants, land systems, ecological responses to disturbance, and other environmental parameters (such as aspect, slope, elevation, rainfall and fire frequency). Each EVC represents one or more plant communities that occur in similar types of environments. The communities in each EVC tend to show similar ecological responses to environmental factors such as disturbance.

The Glenelg Hopkins region contains 180 different EVCs and the distribution of the region's original native vegetation is largely determined by soil type and rainfall. As shown in Figure 20, the conservation status of much of the remnant vegetation that occurs within the region is endangered, vulnerable or depleted (with the exception of the Grampians region, and some areas of public land within the south west of the catchment, such as Cobboboonee National Park and Forest Park, and Annya State Forest).

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