



Mallee Regional Catchment Strategy 2013-19



Acknowledgements

The Mallee Catchment Management Authority (Mallee CMA) acknowledges Aboriginal Traditional Owners past and present within the region, their rich culture and spiritual connection to Country. We also recognise and acknowledge the contribution and interest of Aboriginal people and organisations in land and natural resource management.

A Steering Committee involving key regional partners was established to oversee the development of this Regional Catchment Strategy. The committee was chaired by Sharyon Peart, Chair of the Mallee CMA Board, and had representation from: the Department of Environment and Primary Industries; Parks Victoria; Lower Murray Water; GWMWater; and the Mallee CMA Community Advisory Committees and Aboriginal Reference Group. The project was also supported by the management and staff of the Mallee CMA, with technical input from many partner agencies. Final endorsement of the Regional Catchment Strategy was the responsibility of the Mallee CMA Board.

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Mallee Regional Catchment Strategy 2013-19

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Preface



Our region is recognised nationally and internationally for the uniqueness and diversity of its natural assets, the importance of its dryland and irrigated agricultural industries, and the richness of its Indigenous and non-Indigenous cultural heritage.

This 2013-2019 Mallee Regional Catchment Strategy reflects our communities' aspirations for the future management of these natural, productive and cultural landscapes; while providing a framework for action to support and focus the ongoing efforts of all regional stakeholders, building on our past successes and lessons learnt.

An extensive consultative process was undertaken in developing the Mallee Regional Catchment Strategy, with stakeholder input integral to the identification of long-term (20 year) objectives for the condition of our regional assets, the short-term (6 year) strategic actions required to achieve these objectives, and the priority landscapes on which to direct our efforts. I wish to thank everyone who provided comment, attended workshops and meetings, and made individual submissions throughout this process.

All sectors of our community including individual farmers, industry groups, community based groups, and government agencies and authorities are fundamental to the success of this Regional Catchment Strategy. It will only be through sustained and collaborative efforts that our vision for the region can be realised.

The Mallee has a proud history of identifying and addressing key natural resource management issues through innovative solutions and effective partnerships. This capacity continues to be a vital resource for the region, and one which I believe can be further enhanced through the implementation of this Regional Catchment Strategy.



Sharyon Peart

Mallee CMA Board Chair

May 2013



Our Vision

This Mallee Regional Catchment Strategy is based upon the vision of:

“Informed and active communities balancing the use of resources to generate wealth, with the protection and enhancement of our natural and cultural landscapes”.

The vision provides a long-term (50 year) statement of our communities’ aspirations for the region and is based upon the following key principles:

- Recognising that our communities/people are crucial to the effective management of our regional assets, through the behaviours they adopt and support; and
- Recognising that to achieve widespread and sustained environmental improvements in our natural landscapes, our actions should also deliver social and economic benefits to the community.

Long-term (20 year) objectives have been set for each of our nine regional asset types. These remind us as a community of where we are going and what we want to achieve. They help us to look beyond our immediate work programs and practical tasks to gain a sense of why we are engaged in the vision.

Rivers - To protect and enhance the environmental values of the Mallee’s watercourses, their associated riparian ecosystems and, in turn, the social, economic and environmental services that they provide to the community.

Wetlands - To protect and enhance the environmental values of the Mallee’s wetlands and, in turn, the social, economic and environmental services that they provide to the community.

Terrestrial Habitat - To protect and enhance the extent, condition and ecological connectivity of high value terrestrial habitat across all Mallee land tenures.

Threatened Species Populations and Communities - To protect and enhance the present diversity of Mallee threatened species and communities.

Soils - To protect and enhance the environmental values and ecosystem services provided by all Mallee soils.

Agricultural Land - To optimise the productive capacity of Mallee agricultural landscapes, while minimising any adverse impacts of associated management practices (both current and historical) on our natural and cultural landscapes.

Groundwater - To protect the quality and availability of the Mallee’s groundwater resource for current and future users.

Culture and Heritage - To protect the extent and condition of cultural heritage (Indigenous and non-Indigenous) sites across all Mallee land tenures.

Community Capacity for Natural Resource Management - To increase community capacity for, awareness of, and participation in efforts to protect the Mallee’s natural, cultural and productive landscapes.



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Acronyms

AAV - Aboriginal Affairs Victoria

ABA - Asset Based Approach

ARG - Aboriginal Reference Group

BCG - Birchip Cropping Group

CAC - Community Advisory Committee

CaLP Act - *Catchment and Land Protection Act 1994* (Victoria)

CFA - Country Fire Authority (Victoria)

CMA - Catchment Management Authority

DEPI - Department of Environment and Primary Industries (Victoria)

DTPLI - Department of Transport, Planning and Local Infrastructure (Victoria)

EC - Electro Conductivity (measure of salinity)

EPBC Act - *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)

FFG Act - *Flora and Fauna Guarantee Act 1988* (VIC)

GL - Gigalitre

GMW - Goulburn-Murray Water

ha - Hectare

LMW - Lower Murray Water

MERI - Monitoring, evaluation, reporting and improvement

ML - Megalitre

MSF - Mallee Sustainable Farming

NRM - Natural Resource Management

PV - Parks Victoria

RCS - Regional Catchment Strategy

TAC - Technical Advisory Committee

TfN - Trust for Nature

VROTS - Victorian Rare Or Threatened Species

WSPA - Water Supply Protection Area



Section 1

Introducing the Strategy

About the Strategy

The Regional Catchment Strategy (RCS) is the primary integrated planning framework for land, water and biodiversity management in each of the 10 catchment management regions of Victoria. It is also the overarching regional framework for action under which are found a range of sub-strategies and action plans for each region.

Developed in partnership with stakeholders, this RCS provides a six-year framework for strategic action to support and focus the ongoing coordinated effort of the region's land managers, government agencies and community groups.

Purpose of the RCS

The RCS is prepared under the provisions of the *Catchment and Land Protection Act 1994* (CaLP Act) which sets the overall purpose of the strategy as being:

- To establish a framework for the integrated and coordinated management of the catchment which will:
 - a. maintain and enhance long term land productivity, while also conserving the environment;
 - b. aim to ensure that the quality of the state's land and water resources and associated plant and animal life are maintained and enhanced;
- To establish processes that can be used to assess the condition of the state's land and water resources and the effectiveness of land protection measures; and
- To establish processes to encourage and support participation of landholders, resource managers and other members of the community in catchment management and land protection.

Scope of the RCS

To fulfil its purpose, this RCS sets an aspirational vision for the management of our natural, cultural and productive

landscapes; long-term (20 year) objectives for the condition of assets within these landscapes; the short-term (6 year) strategic actions required to achieve these objectives; and the regional delivery partners responsible.

Landscapes of high significance or value (termed Catchment Assets) are also identified using an Asset Based Approach (ABA) to further focus resources and effort.

A monitoring, evaluation, reporting and improvement (MERI) framework has been developed to guide assessments of the strategy's implementation, progress towards asset condition objectives, and the effectiveness of associated strategic actions.

This RCS **does not** set specific management activities or on ground targets as these are found within supporting strategies and action plans that sit under, and align to, the RCS. This framework is illustrated in Figure 1.

History of the RCS

This 2013-2019 RCS represents the third such strategy for the region. The first RCS was ministerially endorsed in June 1997 and reviewed in 2002 after five years of implementation. The major success stories identified by this review included:

- Completion of the Northern Mallee Pipeline providing major benefits for land management, small towns and stressed rivers;
- Major reductions in rabbit populations with the advent of the rabbit haemorrhagic disease (calicivirus), providing benefits to biodiversity and primary production;
- Increased focus on biodiversity through greater resourcing of actions, particularly on private land and roadsides;
- Sustainable expansion in irrigated horticulture through application of an environmental protection

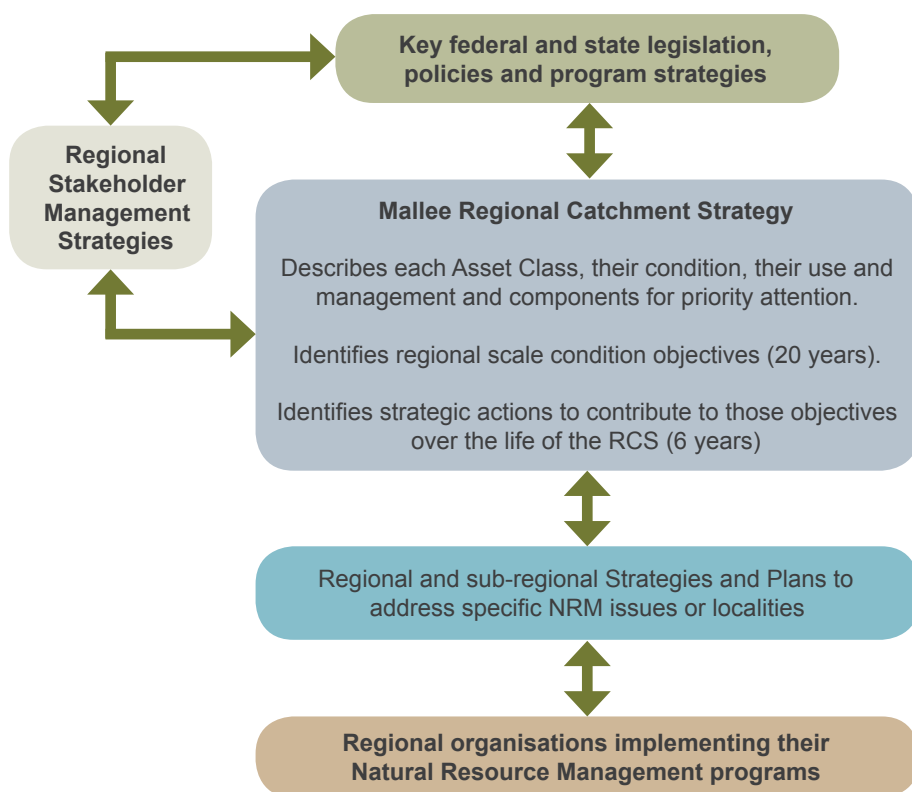


Figure 1: Hierarchical framework of the RCS.

framework established under the Nyah to South Australian Border Salinity Management Plan; and

- Reduction in irrigation drainage flows and salt loads to the Murray River, dropping by 4% each year and meeting a 20 year target in five years.

The second RCS was endorsed by the minister in June 2003 and reviewed in 2009, with major successes identified as being:

- Significant improvement in base datasets describing environmental conditions, particularly with regard to vegetation, hydrology, groundwater, salinity and landforms;
- The protection and enhancement of some 21,973ha of native vegetation;
- The delivery of more than 100GL of environmental water, including approximately 7,000ML of donated water;
- Substantial increase in irrigation efficiency throughout the older irrigation districts leading to reductions in groundwater levels and modelled reductions in salinity impacts to the river;
- Significant and sustainable expansion in irrigation undertaken within the Mallee Irrigation Development Guidelines;
- Environmental management action plans covering 529,000ha of agricultural land; and
- The recording of more than 450 new sites of cultural significance.

This third RCS builds on the lessons learnt from the design, implementation and review of the preceding two documents. Specifically in regards to:

- Engagement - facilitating a high level of regional understanding and ownership of the strategy's purpose, objectives and priorities provides the foundation for future implementation;
- Flexibility - the strategy should be sufficiently flexible throughout its lifetime to take into account the adaptive management principles that are key to good NRM;
- Knowledgeable – the strategy should continue to be based on the best available scientific data and analysis in order to provide confidence in investment and interventions;

- Balanced ambition – both long-term goals and short-term management actions should balance the ambitions for a better Mallee region with what is physically, financially and perhaps even socially possible; and
- Engaging through partnerships – partnership arrangements between the various government and community NRM and farming organisations in the Mallee have been a positive and rewarding feature of the RCS implementation to date. The strategy should continue to provide specific strategic support and encouragement for such arrangements.

Framework of the RCS

A key learning from previous RCS's was that over the implementation phase, is the strategy must allow for adaptation and refinement of regional priorities and direction, as knowledge levels and contexts change.

With this in mind, the RCS will be supported by a series of information resources to inform the overarching strategic document, and to act as a flexible and updateable repository of knowledge. This will ensure that the RCS itself remains current, flexible and responsive to externalities.

Detail on the specific information resources to be developed is provided in Figure 2.

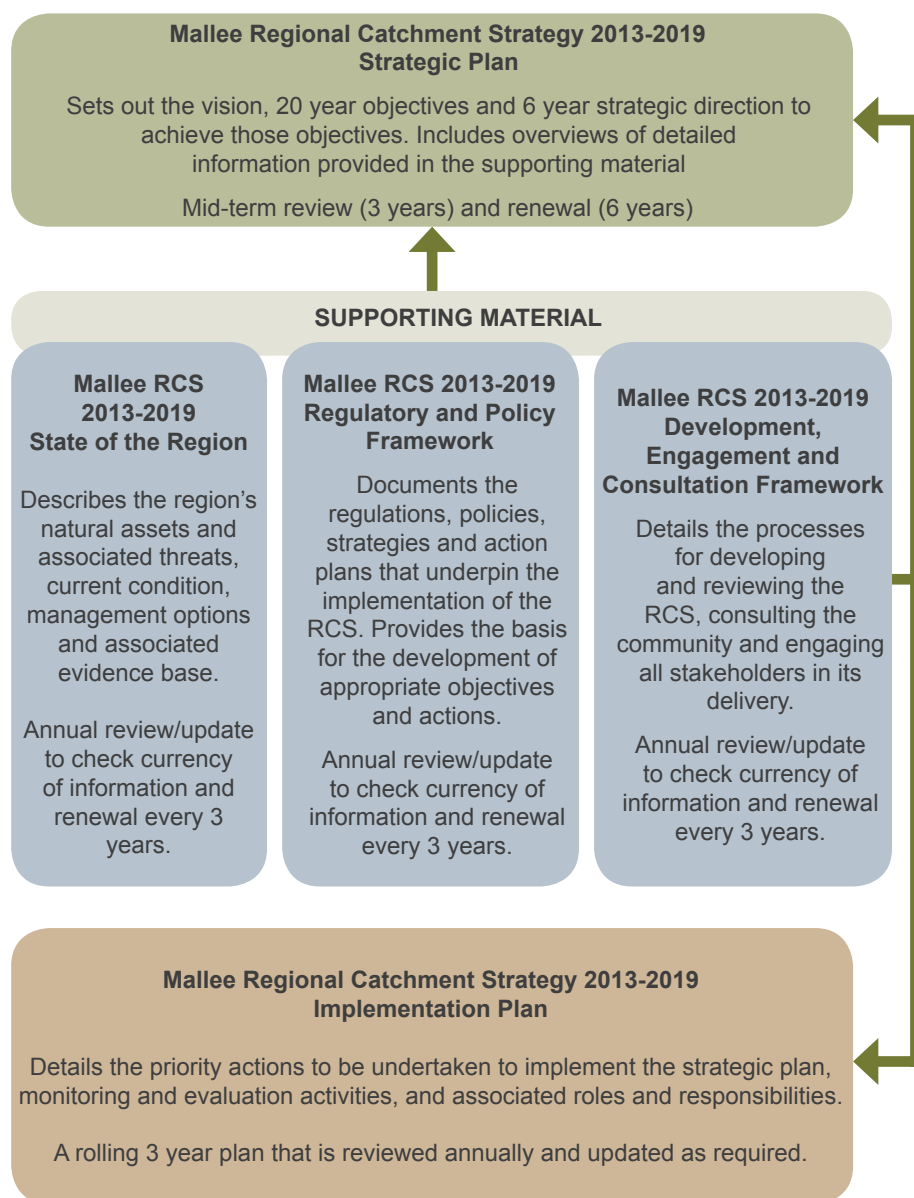


Figure 2: Information resources supporting the RCS.

Development of the Strategy

Development of this RCS has primarily been informed by three key means - federal and state legislation, policies and strategies; regional strategies and action plans; and the Mallee community.

Strategic Framework

The Mallee RCS sits within a complex regulatory and policy framework that informs its development and which in turn gives it purpose and effect. By considering the relevant components of this framework in the identification of regional priorities, objectives and strategic actions, the RCS provides a

key mechanism for translating state and federal objectives into regional outcomes.

Key regional planning documents have also been integrated into the RCS development process to capture existing commitments which are based on comprehensive stakeholder input.

Figure 3 provides examples of the relevant federal, state and regional legislation, policies, strategies and plans which have informed the development of this RCS. A full listing of these instruments is available on the Mallee RCS website: rcs.malleecma.vic.gov.au

Community Engagement

The success of this RCS is dependent on meaningful and ongoing engagement with all stakeholders. Capturing the aspirations, knowledge and expectations of the region's individuals, groups and organisations throughout the RCS development phase was a fundamental component of this process.

Figure 4 provides a summary of the communication and engagement framework employed in the development of this RCS. Key engagement activities conducted under this framework included media articles, workshops, email updates,

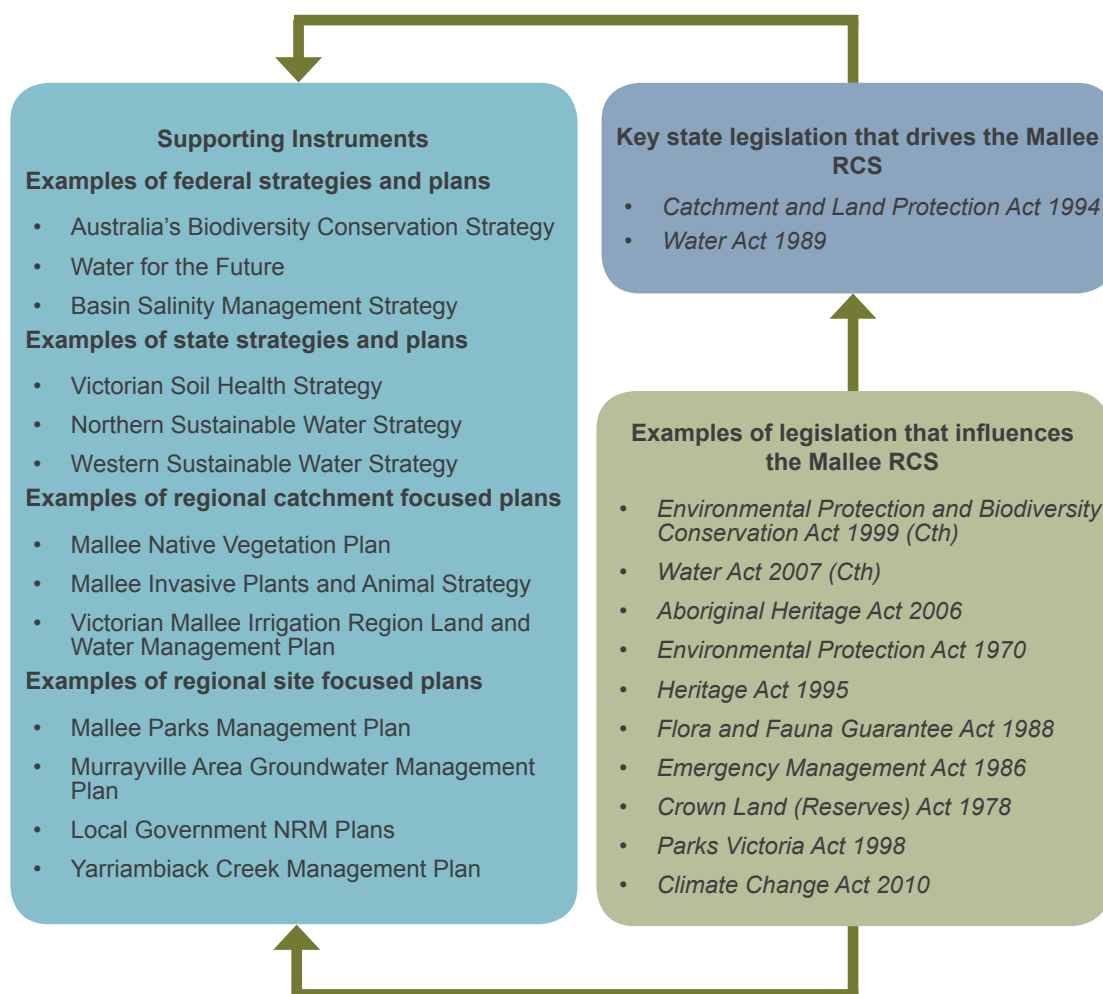


Figure 3: Examples of federal, state and regional legislation, policies, strategies and plans which have informed the development of the RCS.

a dedicated website and associated information resources, and general promotions at regional events such as field days. Further detail on activities delivered and the stakeholders engaged throughout the RCS development phase is provided in Appendix 1.

Through these forums a broad cross-section of the Mallee community has provided valuable input into:

- The identification of regional and local scale strategies and plans to assist in identifying existing commitments and priorities;
- The identification of key values, threats and priority management actions for each of our regional assets;

- The development of long-term (20 year) objectives and short-term (6 year) strategic actions to be delivered by the RCS;
- The identification of new and emerging challenges and opportunities for the region;
- The identification of catchment asset boundaries which capture the region's most significant/valuable landscapes; and the key values, threats and priority management actions associated with each of these landscapes; and
- The identification of locally significant assets.

This has delivered multiple benefits; both to the RCS development and

to increasing our (and our partners') awareness of regional issues, priorities and challenges.

A draft of the RCS was released for public comment in August 2012, and opportunities to provide feedback were widely promoted. Comments were received on the draft at targeted workshops and through written submissions and personal communications (e.g. telephone calls).

This final RCS has taken account of the comments and feedback received throughout the consultation period.

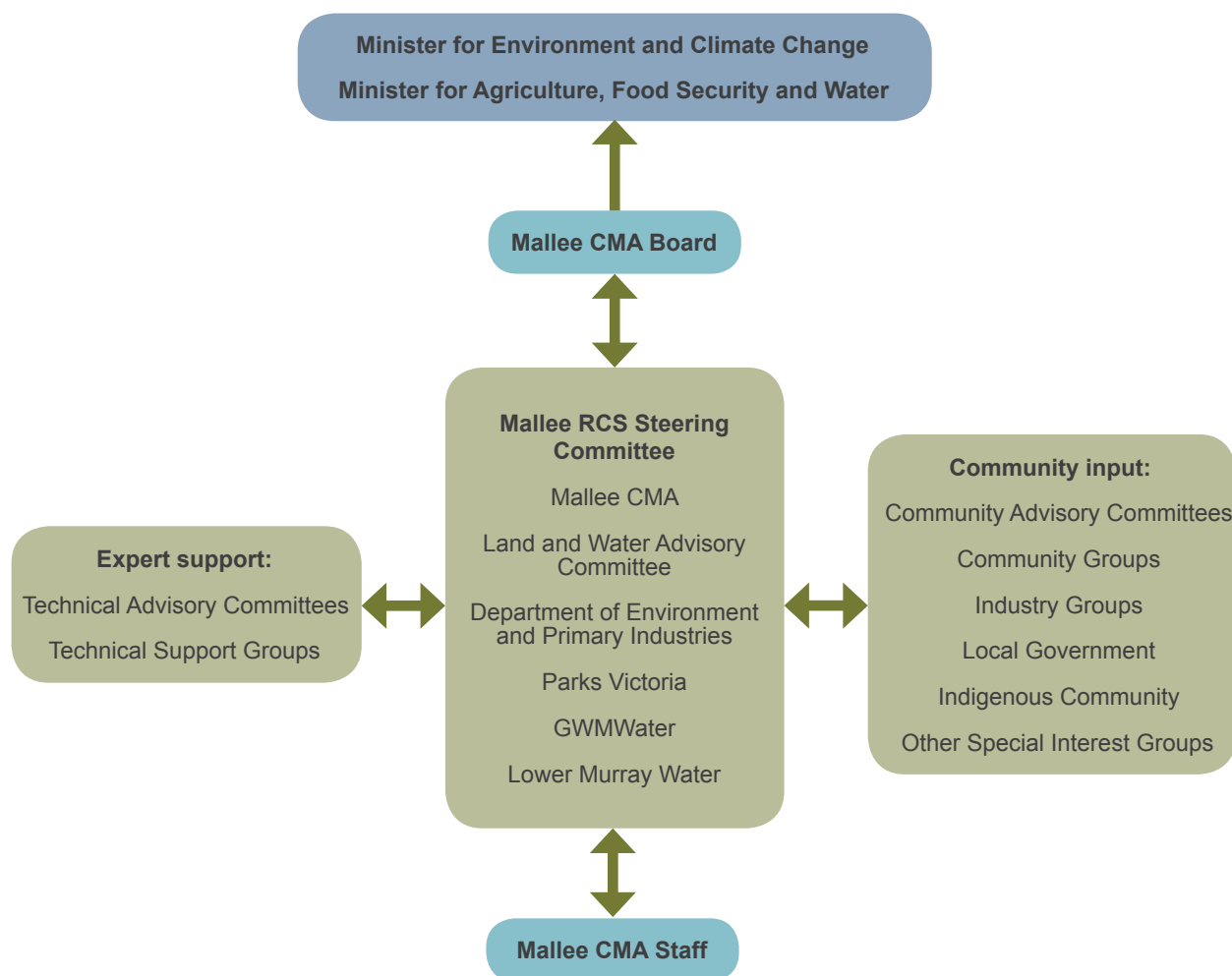


Figure 4: RCS communication and engagement framework.



Applying the Asset Based Approach

The concept of assets is fundamental to natural resource management in the Mallee. Our assets are the biophysical elements of the environment that give our region significance, substance and meaning to both our community and the wider community within the state, across the country and around the world.

Each asset has its own significance, which is derived from a complex combination of environmental, social and economic values that are attached to it by society.

The Asset Based Approach (ABA) requires the region to examine an asset's significance against the level and trend of risks to ongoing asset condition and the capacity and likelihood of effectively mitigating against those risks.

Such an examination identifies and attaches priorities for interventions that are intended to protect or improve the condition of an asset in accordance with community and regional stakeholder expectations.

This RCS identifies three different classifications of assets within our region. They are Regional Assets, Catchment Assets and Local Assets.

Regional Assets

Regional Assets are key elements of our natural, cultural and productive landscapes that apply at a whole-of-region scale.

This RCS considers nine such Regional Assets: Rivers; Wetlands; Terrestrial Habitat; Threatened Species, Populations and Communities; Soils; Agricultural Land; Groundwater; Culture and Heritage; and Community Capacity for Natural Resource Management (NRM). Definitions of these Regional Assets are provided in Table 1.

Catchment Assets

Catchment Assets are spatial boundaries that recognise significant ecological landscapes or groupings of a number of Regional Assets within a specific landscape. The concept of Catchment Assets is an important component of the Mallee RCS development process. They provide greater capacity and transparency to objectively identify and prioritise specific areas for attention.

Catchment Asset boundaries for the Mallee were derived from a combination of spatial analyses, expert workshops,

and stakeholder feedback (see Figure 5 for detail).

Further detail on these Catchment Assets and how they will be applied in delivering this RCS is provided in Section 4 - Integrating and Targeting Delivery.

Local Assets

Local Assets are discrete locations determined by local stakeholders, which represent local values and/or priorities within a particular geographic area. They are a subset of Catchment Assets and may or may not occur within the boundary of a single Catchment Asset.

Due to the fine local scale at which they operate, Local Assets are not considered within this RCS, but within its underlying Implementation Plan. A diverse range of Local Assets have been nominated through stakeholder workshops conducted as part of the development of the RCS.

It is anticipated that Local Assets will continue to be identified and recorded throughout the life of this RCS.

Table 1: Regional asset classes considered in the development of the RCS.

Regional Assets	Definition
Rivers	Rivers, streams, their tributaries, and surrounding riparian land (including the floodplain).
Wetlands	Individual wetlands, wetland complexes, and their associated floodplain ecosystems (including groundwater dependent ecosystems and the groundwater flow systems and aquifers they are reliant on).
Threatened Species, Populations and Communities	Populations of threatened or significant species. Occurrences of threatened communities.
Terrestrial Habitat	Individual ecological classes or spatial occurrences of ecological vegetation classes based on their intrinsic value to their contribution to landscape processes (e.g. connectivity, refugia, buffering etc.).
Soils	All soils regardless of the tenure and type of land systems to which they are subject.
Agricultural Land	All parts of the landscape that have been developed for the purpose of agricultural production.
Groundwater	Groundwater resources within the region that are utilised for human use such as irrigation or stock & domestic water supplies (please note that groundwater within flow systems and aquifers upon which groundwater dependent ecosystems are reliant is captured within the Wetlands Asset Class).
Culture and Heritage	Locations within the Mallee region that have recognised cultural, historical or spiritual significance to all or part of the Mallee community and/or Australian community.
Community Capacity for NRM	The inherent knowledge, understanding and willingness the community has for effective and sustainable natural resource management (NRM).

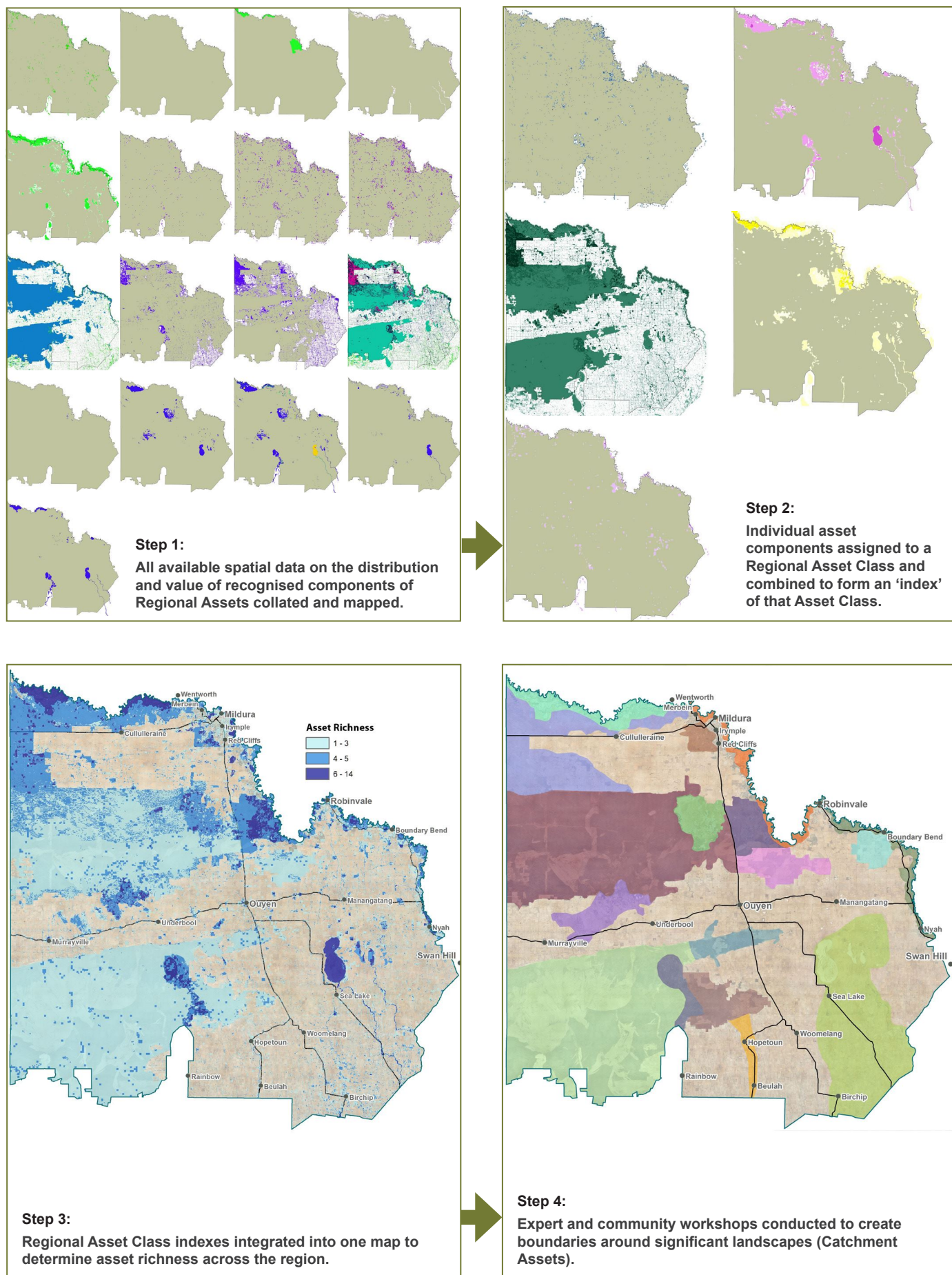
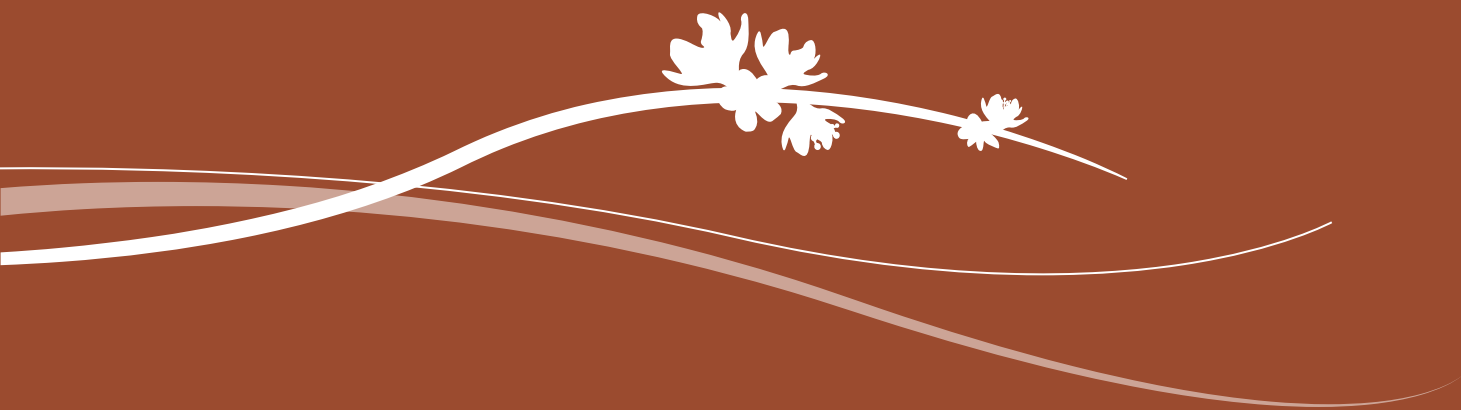


Figure 5: Development of Catchment Asset boundaries.





Section 2

Our Region

Our Landscapes

The Mallee region covers 39,939km², around one-fifth of Victoria. The largest catchment area in the state, it runs along the Murray River from Nyah to the South Australian border and south through vast dryland cropping areas and public reserves. The region is recognised nationally and internationally for the diversity and uniqueness of its natural, cultural and productive landscapes.

Natural Landscapes

The natural character of the region has been shaped by a climate of temperature extremes, low rainfall, and its underlying geology and hydrology; resulting in a series of unique ecosystems and natural features.

The Mallee lies primarily within two broad landform regions: the Riverine Plain, which encompasses the entrenched

floodplain of the Murray; and the Mallee Dunefields, a gently undulating plain formed by aeolian (wind) processes. A small area around Birchip lies within the Wimmera Plain.

Extensive water courses and wetlands are a key feature of the region, the Murray River and its environs being one of our most significant areas. North flowing intermittent streams, including Yarriambiack Creek and Tyrrell Creek, and the ephemeral wetland complexes in which they terminate (e.g. Wirrengen Plain, Lake Corrong and Lake Tyrrell) are defining features of the southern part of our region.

There are more than 900 wetlands in the Mallee region, 14 of which are listed as 'nationally significant'. The Hattah Lakes system is internationally recognised (under the Ramsar Convention) for its value to waterfowl and its importance

in maintaining regional biodiversity. In addition to this, the wetland and floodplain ecosystems of the Hattah Lakes and Lindsay-Mulcra-Wallpolla Islands have been recognised as Icon Sites under The Living Murray program.

Native vegetation across the Mallee once covered some 3,919,887ha, of which 52% is estimated to have been cleared. Much of the region's remaining vegetation has been reserved in large parks such as Murray-Sunset, Big Desert, Wyperfeld and Hattah-Kulkyne National Parks; extensive tracts of riverine and dryland state forests; and over 500 small reserves scattered throughout the agricultural area. These areas of public land are particularly significant given the largely cleared and fragmented agricultural landscape in which they occur.

The Mallee is recognised nationally and internationally for the diversity and uniqueness of its natural, cultural and productive landscapes. Significant features include:

- The Hattah Lakes - recognised as internationally important under the Ramsar Convention on wetlands;
- The wetland and floodplain ecosystems of the Hattah Lakes and Lindsay-Mulcra-Wallpolla Islands - recognised as Icon Sites under The Living Murray Program;
- Two internationally recognised Important Bird Areas (IBAs) encompassing the Murray-Sunset, Hattah, Annuello, Wyperfeld and Big Desert reserves - supporting populations of three globally threatened species: Malleefowl; Black-eared Miner; and Mallee Emu-wren;
- An extensive network of national parks, state forests and crown reserves including Wyperfeld National Park, Big Desert Wilderness Park, and Big Desert State Forest; which collectively form the largest remnant of uncleared native vegetation in the agricultural areas of south-eastern Australia;
- A key part of Victoria's foodbowl - producing almost 50% of Victoria's cereals, and over 40% of all fruit and nut production; and
- A large number of Indigenous heritage sites - unique in Victoria both for their concentration and diversity.

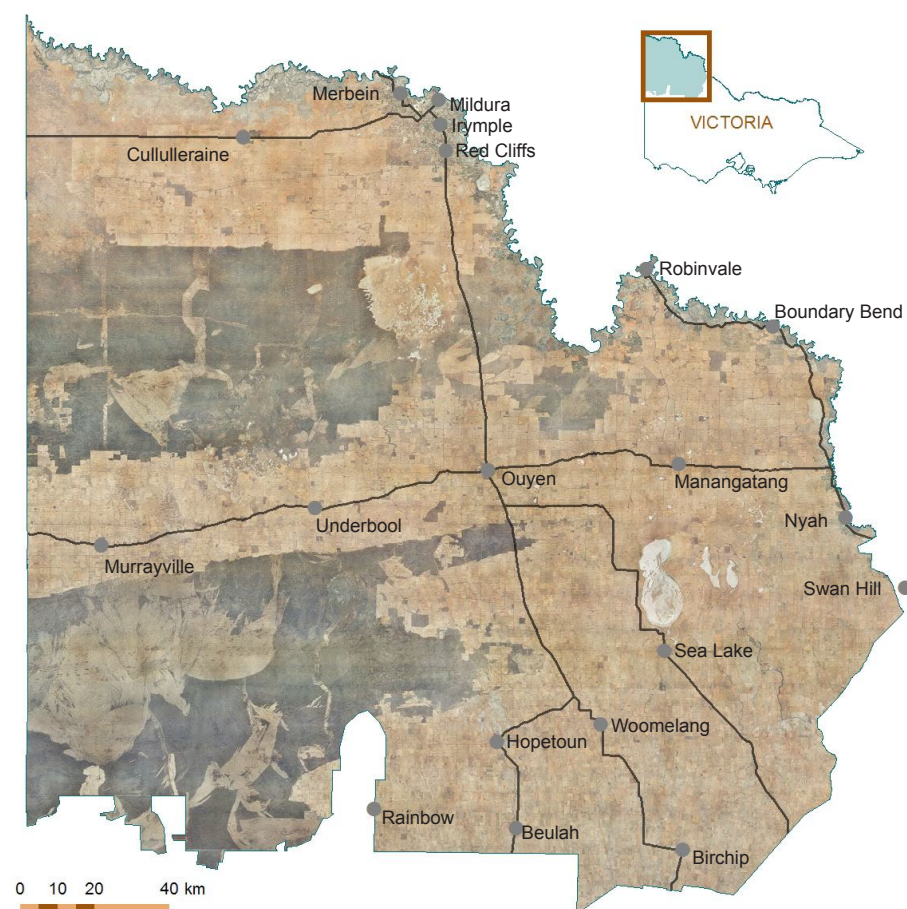


Figure 6: The Mallee region.

Remnants on private land, and the roadsides and rail reserves dissecting this land, represent significant areas of our native vegetation. They are of particular importance for the threatened flora they contain and for the connectivity opportunities they provide to our region's fauna.

This complex mosaic of vegetation communities and habitats across the Mallee represents significant diversity and includes: Riverine forests and woodlands along the Murray River; the Mallee shrublands and woodlands of the dunefields; the Cypress-Pine, Buloke and Belah woodlands of the lunettes and plains; the heathy woodlands and heathlands of the Big Desert; and the herblands of our ephemeral lakes.

The aquatic and terrestrial habitat provided by these landscapes supports a diverse and unique range of fauna, with many species associated with the more arid interior having their southernmost distribution in the Mallee. Species such as the Red Kangaroo, Giles Planigale, Mallee Ningauai and Mitchell's Hopping Mouse are not found anywhere else in Victoria; and the Silky Mouse and Western Pygmy Possum are restricted to the Big and Little Deserts.

The Mallee has a particularly rich avifauna, with over 300 bird species having been recorded. The dominant groups, in both numbers and diversity, are the raptors, parrots and cockatoos; and in the Big Desert, the honeyeaters. Large old River Red Gums along the Murray River support many hollow-dependent birds like the Regent Parrot. The Pine, Buloke and Belah woodlands support a different suite of hollow-dependent birds such as Major Mitchell's Cockatoo. Mallee woodlands and shrublands with porcupine grass understories support one of the iconic Mallee birds, the Malleefowl.

The number of reptile species in our region exceeds that of anywhere else in Victoria. At least 77 species of reptiles occur including; fresh-water tortoises, geckos, legless lizards, dragon lizards, goannas, skinks, blind snakes, venomous snakes, and one python. Inland or more northern species such as the Beaked Gecko and the Coral Snake reach the southern edge of their distribution in the Victorian Mallee. Eleven frog species occur including the Growling Grass Frog and Bibron's Toadlet.

Nineteen species of native fish have been recorded in the watercourses and wetlands of the region including the Murray Cod and the Murray Hardyhead.

Productive Landscapes

Despite the semi-arid nature of the region, the predominance of winter rainfall and access to reliable water from the Murray River has allowed the Mallee to develop into an agriculturally diverse region; with important irrigation areas in the north along the Murray, and extensive dryland cropping and grazing areas in the south, east and west. In total, some 62% of the region's area is given over to agricultural production.

The productive capacity of our agricultural lands rose steadily over the last half of the 20th century in response to increased mechanisation, improved management techniques, and genetic improvement of crops. Today, agriculture remains our major land use and most economically important industry.

Dryland farming in the region covers some 2.4 million hectares and includes the cropping of a wide variety of cereals, pulse and oilseed crops such as wheat, barley, vetch, lupins and canola.

Livestock that form a part of many farm operations include sheep for their wool products and lambs for their quality meat. There has been overall decline in average sheep numbers over the past two decades however, from around 1,100 head to just over 400 head per farm. This has been due to a number of factors such as significant reductions in stock numbers in response to the "millennium drought" and a substantial proportion of farmers now operating more intensive no-till or reduced till cropping systems, with a share of these no longer running livestock at all.

This changed cropping intensity saw an almost three-fold increase in the average area of crop grown in the dryland Mallee between 1990 and 2010; from around 400ha to 1,100ha per farm business. This has largely been comprised of an increase in the area under cereal production and has coincided with the release of improved wheat varieties with better disease resistance.

Irrigation in the Mallee extends adjacent to the Murray River corridor from Nyah to the South Australian Border; encompassing Private Diverters and the Pumped Irrigation Districts of Mildura, Merbein, Red Cliffs, Robinvale and Nyah. A groundwater irrigation district centred on the town of Murrayville also exists.

The major irrigated sectors are almonds, wine grapes, table grapes, citrus, olives,

dried fruit and vegetables. In the period 2003 to 2009, the irrigable area increased by 13,000ha. The industry has seen increased diversity in crop types and is becoming far more dynamic in response to climatic conditions and market forces. Almonds have become the single largest crop by area and water demand. Olive and vegetable plantings have also grown substantially.

Cultural Landscapes

The Mallee has been occupied for thousands of generations by Indigenous people with human activity dated as far back as 23,400 years ago. The region's rich and diverse Indigenous heritage has been formed through the historical and spiritual significance of sites associated with this habitation, together with the strong connection Traditional Owners continue to have with the Mallee's natural landscapes.

The first inhabitants of our region were numerous Aboriginal tribes of different language groups, including Ngintait, Ngarkat, Latji Latji, Wergaia, Wadi Wadi, Wamba Wamba, Jari Jari, and Dadi Dadi. Given the semi-arid climate of the region, ready access to more permanent water has been a major determinant of human habitation, and as such the highest density of identified Indigenous cultural heritage sites are located around or close to areas of freshwater sources.

The high number of Indigenous cultural heritage sites throughout the Murray floodplain is unique in Victoria, both for their concentration and diversity and include large numbers of burial, middens and hunting sites. In the south of the region, freshwater lakes, streams and wetlands were focal points for the region's Traditional Owners. Many lakes were the sites of large gatherings of several hearth groups that afforded trade and cultural exchanges.

More recent non-Indigenous heritage is largely related to historical infrastructure (e.g. buildings, irrigation and river navigation structures), cemeteries, national parks, reserves, and gardens. Concentrations of non-Indigenous heritage items generally occur in and around townships often relating to the region's early industries and settlements, providing links to our past and through this, a regional identity.

Our Communities

The people of the Mallee are at the heart of the current and future management of our natural, productive and cultural landscapes.

Population

The Mallee is home to over 61,000 people. The largest centre is Mildura and its surrounds (Irymple, Merbein and Red Cliffs), which with almost 40,000 people represents the key service and economic hub of the region. Other population centres of the region; including Robinvale, Ouyen, Sea Lake, Hopetoun, Murrayville and Birchip; make up about 15% of the population.

The region's population grew by 861 people or 1.6% between 2001 and 2006 and a further 0.7% between 2006 and 2011. This growth was uneven however across the region, with strong growth in urban Mildura, matched by parallel losses from smaller communities. Overall, our population is projected to increase by 2.8% between 2006 and 2026.

The Mallee has a strong Indigenous heritage with some 3% of the total regional population, or 1,880 people, identifying themselves as Indigenous in the 2006 census; a significantly greater proportion than that of Victoria as a whole at 0.6%, or regional Victoria at 1.2%.

A diverse multi-cultural population has also helped to shape the region over the years and continues to provide many social and cultural benefits. While English is the first language of more than 86% of the population, the remaining 14% of the population speak another language

at home including Italian (2.5%), Turkish (1.2%), Greek (0.7%) and Vietnamese (0.3%).

Education

Rates of school completion in the Mallee region are lower than those for regional Victoria as a whole. For example, Year 12 completion is approximately 27%, compared with 33% for all of regional Victoria. Tertiary education in the Mallee region is also lower than that for regional Victoria as a whole. Access to post-secondary education within the Mallee region is limited and partly explains why fewer young people go on to tertiary education.

Wellbeing

Many communities in the Mallee are experiencing significant socio-economic disadvantage. All of the Local Government Areas (LGAs) within the region rank under Victoria's average socio-economic status on the Australian Bureau of Statistics' Socio-Economic Indexes for Areas Index (ABS SEIFA) of Relative Disadvantage.

This index ranks LGAs by their income, occupation, education, wealth and living conditions. Communities within Mildura, Merbein, Red Cliffs, Robinvale, Swan Hill and Nyah West comprise the most disadvantaged 10% of the population in Australia.

Community connectedness in the region is strong however. The proportion of people reporting feeling part of the community, having reliable social support,

and volunteering in community activities is significantly greater than the average for regional Victoria; with Buloke Shire ranking among the most connected municipalities in the state.

Land Managers

Some 62% of the Mallee is private land, with individual landholders being primarily responsible for its management. There are currently 2,415 rural land holdings representing both the dryland and irrigation industries. The average age of rural landholders is 55 years, while the average length of time landholders have been managing their land is 26 years.

To keep pace with declining terms of trade (ratio between prices received for produce and prices paid for inputs) farmers are striving to increase productivity and scale in the dryland region. This has led to fewer numbers of farmers and an increase in larger holdings in the Mallee (Table 2).

Similarly, the number of irrigated properties declined by 182 (7%) between 1997 and 2009, with the average property size (irrigated area) increasing from 16.4 ha to 30.9 ha.

The remaining 38% of the region is public land, the majority of which is managed by Parks Victoria and the

Our community is broadly made up of individuals, community and industry groups, and government. It is characterised by:

- Significant variations in population density; ranging from over 2,000 people per km² in the urban Mildura area, to less than 0.2 people per km² across much of the dryland farming area;
- Fewer dryland farmers and irrigators with larger properties, collectively having primary responsibility for the management of over 60% of the region;
- Representation from seven Local Government Areas; and
- A diverse range of community and industry based groups connected to our natural, productive and cultural landscapes.

Table 2: Number of dryland farming businesses in Mallee 1997-2004 (Neil Clark & Associates 2006).

Farm business size	Annual gross turnover \$	1997	2004	% change in property numbers
Small	< 200k	769	385	50% reduction
Medium	200 < 500k	674	622	Steady
Large	500k – 1M	178	329	85% increase
Very large	> 1M	26	101	380% increase
Total		1647	1438	13% reduction

Department of Environment and Primary Industries. Local Government, VicTrack, VicRoads and a number of Crown Land Committees of Management also have land management responsibilities.

Delivery Partners

The Mallee has a long history of building effective partnerships between all sectors of our community including individual farmers, industry groups, community based groups, and government agencies and authorities.

The Mallee region has 22 active Landcare groups with over 600 rural properties having at least one person who is a member of Landcare. This equates to approximately 25% of all rural land holdings.

The presence of industry groups such as Dried Fruits Australia, Citrus Australia Limited, Murray Valley Citrus Board, Murray Valley Winegrowers, Mallee Sustainable Farming and Birchip Cropping Group in the region provides landholders with access to the knowledge and resources of locally-

relevant community-driven organisations committed to the ongoing development of a competitive and sustainable agricultural sector.

Community groups also make a significant contribution to the management of the Mallee region's many parks and reserves. 'Friends of' groups, Community Reference groups, and the Victorian Malleefowl Recovery Group work in close association with Parks Victoria and Department of Environment and Primary Industries to protect and enhance the value of these important natural resources.

Input from local Indigenous stakeholders into the management of our natural and cultural landscapes is provided through a range of community based groups such as the Mallee Aboriginal Reference Group (ARG).

Local government is a key regional stakeholder and delivery partner. The Mallee encompasses all of the Rural City of Mildura, most of the Rural City of Swan Hill (but not the city of Swan Hill), the northern half of the Buloke Shire and

Yarriambiack Shire, the northern third of Hindmarsh Shire and small sections of West Wimmera Shire and Gannawarra Shire. The Mildura and Swan Hill Rural City Councils together account for 90% of the region's population and 70% of the land area.

State government agencies and authorities also form a core component of our community and regional partnerships. These include the Department of Environment and Primary Industries (DEPI), Parks Victoria (PV), the Mallee Catchment Management Authority (Mallee CMA), GWMWater, Lower Murray Water (LMW), Goulburn-Murray Water (G-MW), Aboriginal Affairs Victoria (AAV), Trust for Nature (TfN), VicRoads, VicTrack, and Department of Transport, Planning and Local Infrastructure (DTPLI).

Further detail on 'Our Communities', including references can be found in the report *Mallee Region Social, Cultural and Economic Overview* which is available for download from the Mallee RCS website: rcs.malleecma.vic.gov.au



Figure 7: Our people are central to the effective management of the region's assets. Photos: Mallee CMA.

Our Economy

Agriculture and related industry is a dominant component of the Mallee regional economy.

In any given year, the region supports some 1.3 million hectares of crops and irrigated horticulture, representing a gross value of \$1,191 million and contributing 11.5% of total agricultural production value for the state of Victoria (see Table 3).

Related industries such as wineries, processing plants and packing facilities also provide significant economic value to the region.

The economic importance of tourism within the regions of Victoria is estimated by Tourism Research Australia. For 2007-08, tourism in the Mallee was estimated to account for 3.84% of the regional economy. This is slightly higher than the whole of regional Victoria figure of 3.4%.

Mining, estimated to account for 0.4% of the regional economy, is a growing industry. Mineral sands, bentonite and salt being the main commodities extracted.

The 2006 Census identified that 26,759 people were employed across the region. Agriculture is the main industry sector covering approximately 19% of those employed. Other important industries include the retail trade (12%),



Figure 8: Mallee wheat crop. Photo: Mallee CMA.

manufacturing (10%), health care and social assistance (10%).

Employment in the agricultural sector has declined from 25% in 2001 to 19% in 2006. Employment in wholesale trade has halved over the five years between 2001 and 2006 and retail trade has also seen a small decline.

Overall, employment rates remain stable, with growth in other areas such as construction; manufacturing; transport and warehousing; accommodation and

food services; health care; and social assistance.

Projections of change in employment to 2026 suggest that improvements in technology and efficiency, combined with growth in other sectors, will further reduce the proportion of people employed in agriculture in the future.

The growth currently evident in construction, manufacturing, transport and warehousing, accommodation and food services, health care and social assistance is projected to continue.

Table 3: Proportion and value of agricultural commodities produced in the Mallee region (ABS 2009/2010).

Type of production 2009/10	Gross Value of Production (\$m)	% of State Total
Fruit and nuts (including grapes)	491.1	40.49% ¹
Cereal crops for grain	310.9	29.47%
All other broadacre crops	211.4	61.76%
Vegetables for human consumption	59.7	8.20%
Livestock slaughtered	45.7	1.52%
Nurseries, cut flowers and cultivated turf	18.3	4.06%
Pasture and other crops cut for hay	17.6	2.18%
Livestock products	14.8	0.59%
Legumes for grain	14.5	15.23%
Oilseeds	7.6	5.08%
Agriculture Total Value	1,191.5	11.5%

¹ This is expected to increase as large areas of immature almonds come into production.

The region's economy continues to reflect our major land use, agriculture, with:

- The Mallee producing 11.5% of total agricultural production value for the state of Victoria;
- Some 5,000 people directly employed in agricultural industries; and
- A further 3,750 people employed in manufacturing, transport and storage, a significant proportion of which would be agriculture related (i.e. food processing and transport).

However, recent years has seen a decline in agriculture related employment; a trend which is expected to continue with ongoing technological and efficiency improvements.

Our Neighbours

The management of our natural, cultural and productive landscapes requires effective cross-border partnerships and coordinated effort.

Within Victoria we border two other Catchment Management Authority (CMA) regions: Wimmera and North Central. In both cases we share different portions of the same river basins; with Wimmera, the Wimmera River Basin; and with North Central, the Avoca River Basin. The Mallee contains ephemeral northward flowing effluent streams from both systems including Yarriambiack, Outlet, Tyrrell and Lalbert Creeks.

Other key assets that we share the management of include significant remnants of the nationally threatened Buloke Woodlands vegetation community, Wyperfeld National Park, Big Desert State Forest, and large tracts of agricultural land.

Uniquely for a Victorian Natural Resource Management (NRM) region, we also share our borders with two Australian states: South Australia and New South Wales. As with Victoria, both of these states have a range of entities with NRM responsibilities. These include Catchment Management Authorities (CMAs), Natural Resource Management Boards, Water Authorities and a range of state government departments.

Given that assets do not recognise administrative boundaries such as state borders, we share many Asset Class components (notably rivers; wetlands; soils; agricultural land; groundwater; and biodiversity) with our cross-border communities.

The breadth, scale and complexity of this cross-border relationship requires effective partnerships in diverse fields such as environmental watering,

agricultural land management, soil health research, groundwater resource management, salinity interception and threatened species interventions.

As neighbours, regardless of our status and individual responsibilities, it is important that we recognise and where possible, integrate each others efforts to protect and enhance the natural, productive and cultural assets that are contained within these shared systems.

Coordinated, and where possible integrated efforts to protect and enhance our cross-border assets is essential for effective and efficient outcomes:

- The Wimmera CMA and North Central CMA border our southern region in Victoria;
- Our eastern and northern border is defined by the Murray River which we share with the New South Wales' Murray CMA region; and
- To the east is the South Australian Murray Darling Basin region, and a small area of the South East region.

A range of partnership groups and forums have been established at both the Tri-state and state scale to enhance cross-border cooperation.

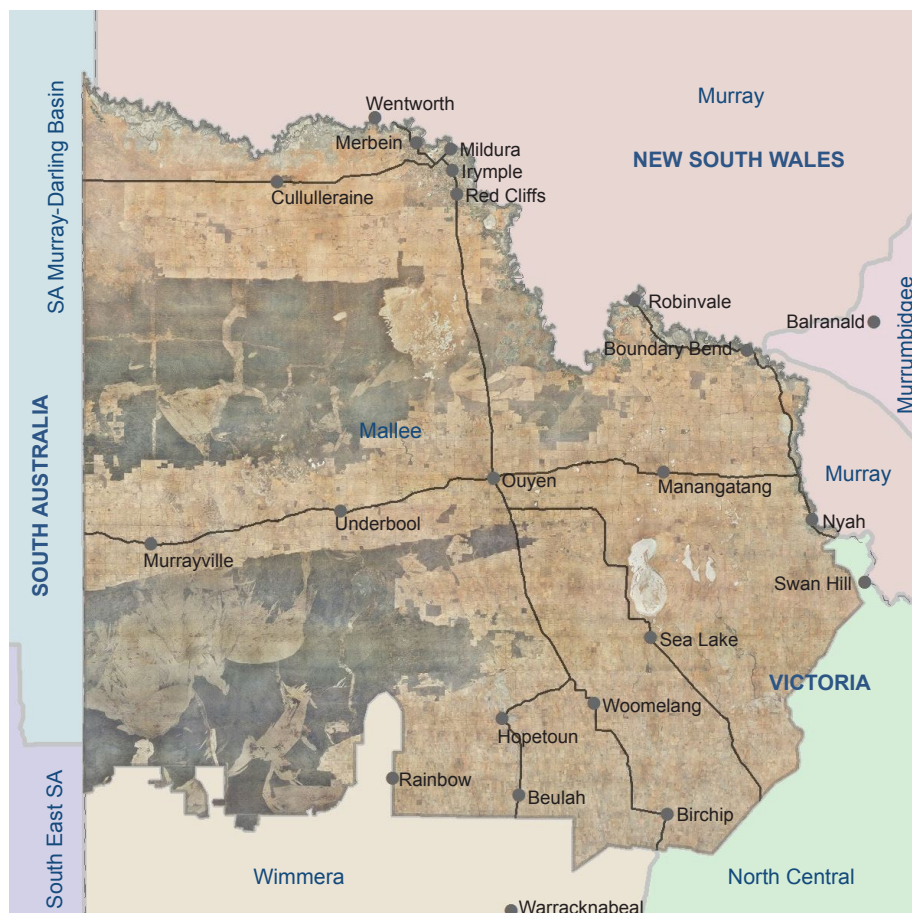


Figure 9: Neighbouring NRM Regions and examples of shared assets (Top right: Mallee Emu-wren. Photo: Rohan Clarke. Bottom right: Murray River at Mulcra Island. Photo: Mallee CMA.

Our Challenges and Opportunities

The Mallee faces a number of long-term challenges that may threaten both the effectiveness of our management actions and the resilience of our natural, cultural and productive landscapes. Conversely, there are also a range of opportunities that currently present themselves to the region. Collectively, these represent key drivers which have the potential to significantly influence the outcomes achieved through this RCS.

Climate Variability

The variability of our climate presents significant external risks to NRM in the Mallee. Weather extremes are not uncommon and recent examples include the so-called “Millennium Drought,” which had severe impacts on the region between 2002 and 2010; and the La Nina rains of the 2010/11 summer that

followed the drought, causing significant flooding events and widespread damage. Other weather extremes common to our region include heavy frosts, hail, heat waves and high winds.

These extremes have the potential to either directly impact on the region’s management actions, or impact indirectly by generating damaging events such as fire, flood or dust storms.

They can also influence the short-term capacity of individuals and organisations to be involved in management interventions on land that they manage by damaging infrastructure; or otherwise diverting financial or physical resources in order to respond to such events, or their results.

In many cases, these weather events pose short-term interruptions over a generally localised area. While they are

significant and often traumatic to those directly affected, their impact does not usually extend right across the region. Under these circumstances it is important that our NRM stakeholders have the flexibility to revise and adjust their programs without significant difficulty.

However, drought is an exception in terms of extreme weather as it typically impacts across large swathes of the landscape. Despite this, our recent experience with the “Millennium Drought” has demonstrated that there is a range of management responses available to our NRM stakeholders that can benefit both the landscape and our communities.

Climate Change

A changing climate has been identified as a critical issue facing the Mallee, with our future climate projected to be hotter and drier than it is today. By 2030 (in comparison with 1990 figures) average annual temperatures will be around 0.9°C warmer, with the greatest increases expected in summer (1°C). The number of hot days (days over 30°C) are also expected to increase.

Reductions in the total average annual rainfall of around 4% are expected, with the greatest reductions occurring in spring (7%). Increases in potential evaporation and reductions in relative humidity are expected to contribute to drier conditions.

Key challenges which have the potential to significantly influence the outcomes achieved through this RCS include:

- Extreme weather events such as drought and flood;
- Identifying and implementing adaptation options in response to a changing climate;
- Participating in emerging carbon market opportunities;
- Supporting ecologically appropriate fire regimes; and
- Supporting NRM stakeholders in small rural communities which are experiencing population decline and increasingly older age profiles.

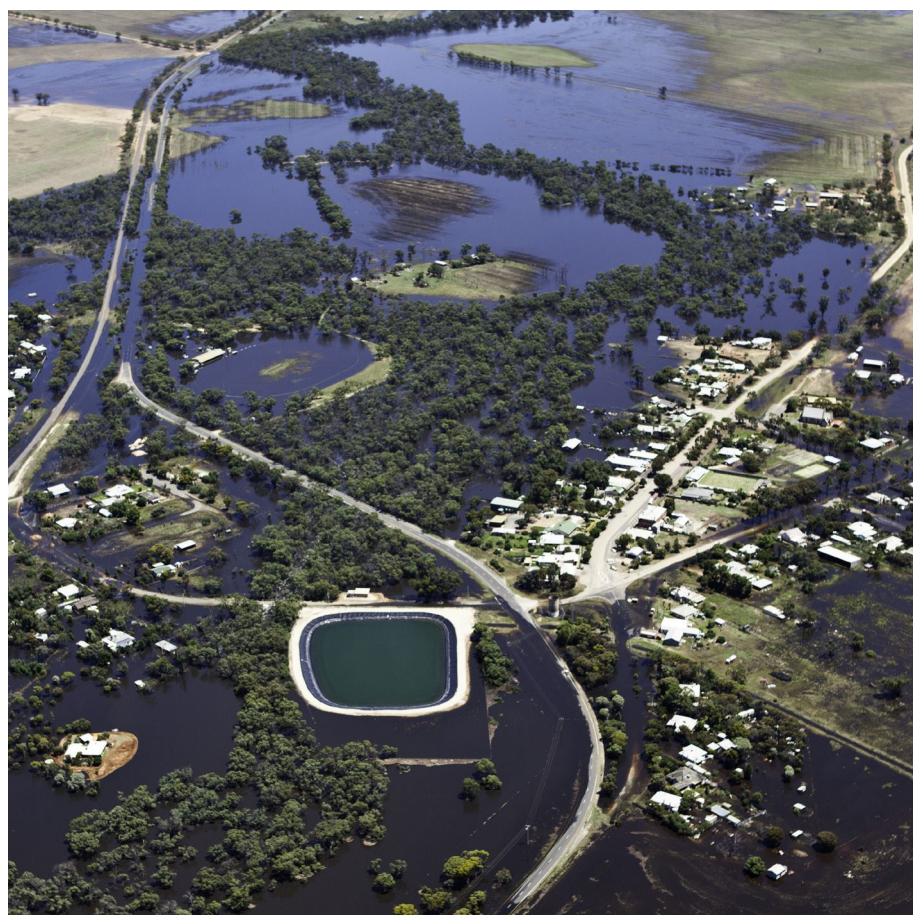


Figure 10: Township of Culgoa during the January 2011 flood. Photo: Mallee CMA.

Climate change may have both positive and negative impacts on the types of crops we grow and the productivity of our agricultural systems. Predicted higher levels of atmospheric carbon dioxide tend to enhance plant growth and water-use efficiency. However, changes in temperature and rainfall are likely to offset these benefits. Any reduction in rainfall will place most farms under stress, particularly when linked to higher temperatures.

Decreases in rainfall and higher evaporation rates will mean less soil moisture and consequently, less water for rivers. Demand for water may also increase as a result of warmer temperatures and population growth. Therefore, our need to use water more efficiently will be even greater.

Based on calculations for elsewhere in the Murray-Darling Basin, decreases in the amount of water available for irrigation from the lower Murray may decrease by up to 20% by 2030. Lower flows and higher temperatures may also reduce water quality within the catchment and create a more favourable environment for potentially harmful algal blooms.

Changed climate conditions are likely to exacerbate the negative impacts of existing threats such as habitat loss and fragmentation, invasive species, and broad scale bushfires; and as such have significant negative impacts on the biodiversity of the Mallee.

Despite the significance of climate change as a risk to the Mallee, in the context of the RCS, our capacity to directly influence the nature and potential consequences of that risk is limited. We do however have the opportunity to plan for these expected changes by identifying and implementing adaptation options that influence land management decisions, provide habitat restoration for biodiversity migration, and improve knowledge to generate greater capacity for individuals and stakeholders to respond over time to pressures arising from climate change.

Carbon Markets

There are likely to be a number of ways in which our land managers can participate in emerging carbon market opportunities. Of particular relevance to this RCS is the sequestering of carbon through activities such as revegetation.

In planning for these markets it is essential that the impacts (both positive and negative) of associated activities on our natural, productive and cultural landscapes are fully recognised. Biodiverse carbon plantings using vegetation communities specific to the location prior to clearing have the potential to significantly enhance our NRM outcomes by re-establishing, connecting and enhancing habitat. Conversely, both biodiverse and non-biodiverse (single species) plantings may impact negatively on water availability and agricultural production.

Through support from the Australian Government, the region will develop a Regional NRM Plan for climate change to guide where carbon farming projects such as sequestration plantings should be located in the landscape for maximum benefit and minimal impact.

The region should ensure that this process is integrated with other landscape scale biodiversity programs such the Habitat 141^o plan¹.

Fire management

Fires are a dominant part of the Mallee landscape and are a major factor in determining the nature and distribution of our flora. Responses to fire by our vegetation communities vary widely; with many species dependent upon it for regeneration, and others with no adaptation to it at all.

Given that different fauna species require differently aged vegetation to meet shelter, food and breeding requirements; and that the ideal fire regime for many of our species is unknown; the management of fire for ecological purposes is complex.

A key challenge for the region is to realise the key fire management objectives of protecting human communities and built assets, and meeting the ecological needs of our natural landscapes.

The Department of Environment and Primary Industries is responsible for developing an Annual Fire Operations plan for the region's public land, which meets area targets set by the Victorian Government. The plan is developed in consultation with the Mallee community and identifies areas proposed for planned burning; drawing on best available knowledge regarding both bushfire and ecological risks.

This community engagement process provides opportunities for stakeholder knowledge transfer, the identification of key information gaps, and enhanced partnerships; all of which are integral to continuous improvements in managing fire for environmental gains.

Changing Demographics

Small rural communities in the Mallee continue to experience population decline and increasingly older age profiles. This reflects the continuing trend for young people to leave rural areas and relocate to larger population centres (e.g. Mildura) to access a greater availability of employment, education, and training opportunities. In some areas, these population changes also coincide with a decline in key industries and the withdrawal of services, both public (e.g. schools and hospitals) and private (e.g. banking and retail), making living in these areas less desirable and further impacting on the wellbeing and sustainability of the remaining community.

The growth of our urban areas at the expense of our rural population presents a great challenge in sourcing the necessary co-investment of time and resources from a diminishing (and ageing) population of rural landholders and community-based NRM groups. There is a risk that there will be insufficient people on the ground in large parts of our region to help implement the interventions that will protect and enhance our assets and the services that they provide.

Opportunities for innovative and more efficient delivery mechanisms should also be encouraged.

Within this context it is essential that the capacity of our communities is recognised and that adequate support mechanisms are established where necessary.

¹ The National Wildlife Corridors Plan identified the Habitat 141^o project as one of six major corridor initiatives in Australia. Three of the nine Habitat 141^o Regions are represented in the Mallee, particularly region 3, the Murray Mallee.





Section 3

Our Assets

Our Rivers

The definition of a river encompasses rivers, streams, their tributaries, and surrounding riparian land (the area of land that adjoins, influences, or is influenced by the river), including the floodplain.

The Mallee contains some 2,170km of waterways, which can be divided into two main groups: the Murray River and its anabranches and distributaries in the north and east; and the ephemeral north flowing systems in the south.

The Murray River forms the northern boundary of the region, as well as the boundary between Victoria and New

South Wales (NSW). While the main river channel lies in NSW, Victoria is responsible for the management of its southern floodplain from the 1881 winter level water mark. The river's floodplain, anabranches and associated wetland systems dominate the northern part of the region between the Tyntynder flats (near Swan Hill) and the South Australian border. The predominant Murray anabranch systems in the region are Wallpolla Creek and Lindsay River, both located downstream of Mildura. The confluences of the Murray River with the Darling, Wakool and Murrumbidgee Rivers also occur within the region.

Healthy rivers are fundamental to our environmental, social and economic future, providing:

- Ecosystem services, such as aquatic habitat and water for wetlands and floodplains;
- Water supplies for irrigation, industrial, stock and domestic use;
- Connectivity opportunities which are essential to the ongoing viability of the regions threatened species and communities; and
- A rich and diverse landscape for tourism and recreational opportunities.

The condition of these assets continues to be threatened by a range of pressures such as:

- Altered flow regimes;
- Salinity;
- Invasive plants and animals;
- Recreational activities; and
- Adjacent landuse practices.

Pressures which require attention in an integrated and targeted manner for the future protection and enhancement of our river assets.

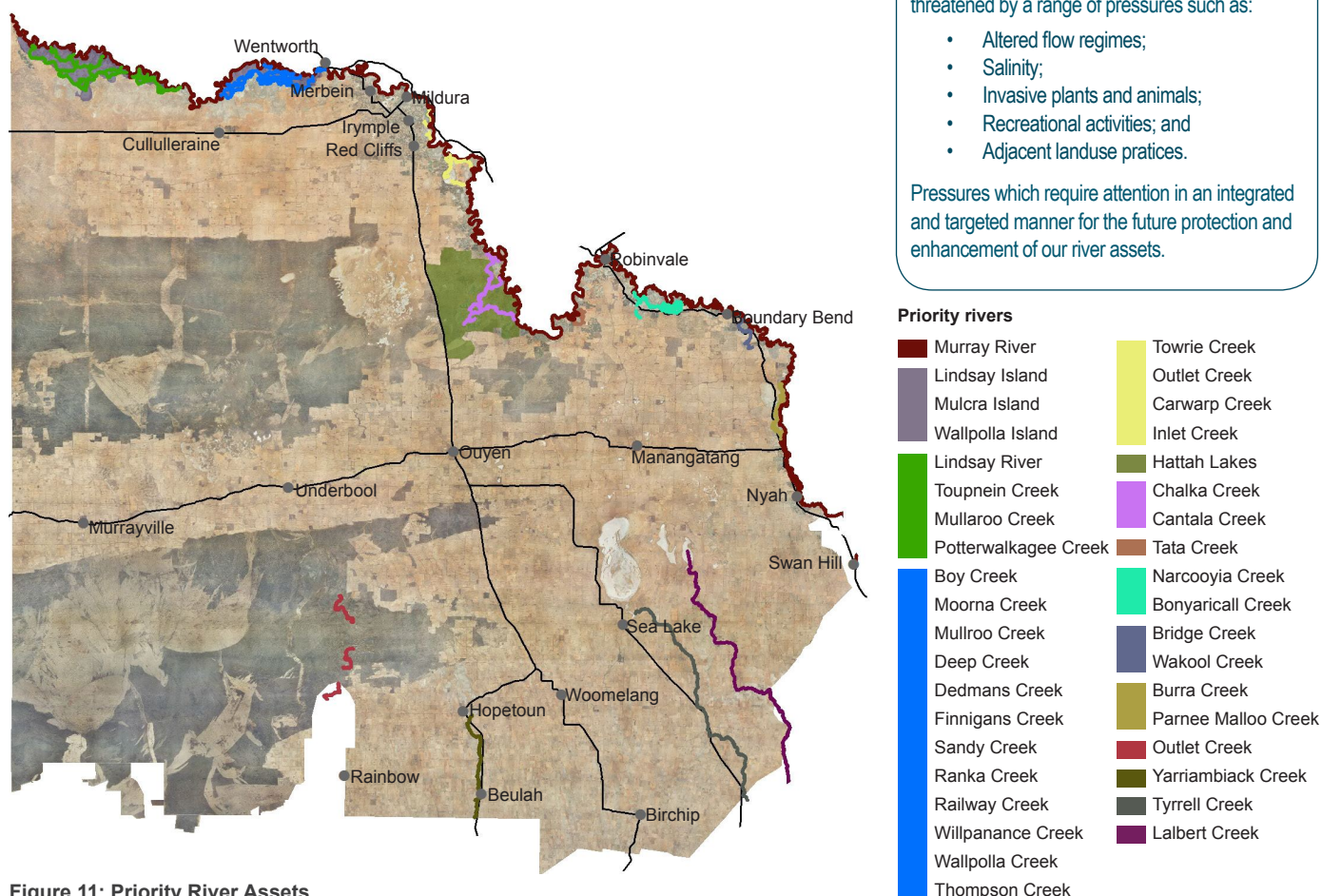


Figure 11: Priority River Assets.

Objectives (20 year)	Strategic actions (6 year)
To protect and enhance the environmental values of the Mallee's watercourses, their associated riparian ecosystems and, in turn, the social, economic and environmental services that they provide to the community.	Review the Mallee River Health Strategy, and develop and implement the Mallee Regional Waterway Strategy.
	Review, update and implement the Mallee Floodplain Management Plan.
	Continue to implement actions from the Northern and Western Region Sustainable Water Strategies that apply to Mallee rivers and riparian ecosystems.

In the south, north flowing intermittent streams of the Wimmera River System, including Yarriambiack Creek and Outlet Creek terminate in a large number of wetland complexes such as the Wirrengren Plain and Lakes Corrong and Lascelles. In the south-east, two effluent streams of the Avoca River system, Tyrrell and Lalbert Creeks, empty into a number of large terminal saline wetlands including Lakes Tyrrell and Timboram.

Dunmunkle Creek represents two separate waterways, a southern section commencing in the Wimmera catchment and flowing north towards Lascelles in the Mallee; and a northern section commencing as a broad shallow area south of Birchip and flowing north-west then north-east through Green Lake, and joining Tyrrell Creek before entering Lake Tyrrell.

Valuing our Rivers

The Murray River plays a major role in sustaining the economy of the region through irrigated agriculture and tourism; as well as being a primary source of reticulated water for regional industries, dryland farming businesses and communities. The river itself provides considerable social value for the local community through its aesthetic value and recreational opportunities.

The ephemeral creek systems of the southern Mallee provides aesthetic value to the visual landscape; while terminal lakes and deeper holes within the systems can provide recreational opportunities such as swimming and boating when water is present from floods or supplied by the Wimmera Mallee Pipeline.

The Murray River and the southern creek systems are socially and culturally significant for Aboriginal people; containing places of spiritual significance as well as archaeological sites that demonstrate an association over many thousands of years.

The environmental services provided by the region's rivers, creeks and riparian lands are as broad and diverse as the systems that provide them. Key examples include: the provision of water for the benefit of in-channel and floodplain ecosystems; the provision of habitat refugia and connectivity opportunities within largely cleared landscapes; the transport of nutrients, carbon, salts and silts through the landscape; and the replenishment of connected groundwater systems to support the associated groundwater dependent ecosystems.

Outside the region, there are the inestimable intrinsic values that the Murray River and the iconography of the Murray Darling Basin impart to the broader Australian population, such as informing the national character, history and heritage, environmental significance, recreational use, and the basin's importance as Australia's food bowl.

The region's priority river assets are those which have been identified as having high social, cultural, economic and environmental values (see Figure 11). Assessment of these values is undertaken for each individual river 'reach' as part of the Mallee River Health Strategy (MRHS) review and renewal process.

The Living Murray (TLM) Icon Sites are also recognised priority river assets on the basis of their significance and floodplain ecosystems. Of the six Icon Sites along the river, two are located in the Mallee region - the Hattah Lakes Icon Site, and the Victorian component of the Chowilla Floodplain and Lindsay-Wallpolla Islands Icon Site; both chosen for their environmental, cultural and international significance.

Threats to our Rivers

The environmental condition of our rivers impacts directly on their capacity to provide the environmental, social and economic services we value. For example, the width, connectivity and vegetation quality of riparian lands determines their 'value' to our rare and threatened species. Similarly, high levels of salt in our rivers and floodplains would impact not only on their environmental condition but may also threaten the quality of the economic service that the river and its water provides to irrigated agriculture. This can in turn impact socially on our community through compromised agricultural productivity.

Therefore, the major threats to our rivers are the ones that impact on one or more of their environmental attributes and can include processes such as altered hydrological regimes, recreational pressures, land use change and sediment, nutrient and chemical contaminants (Appendix 2 provides further detail on potential threats to our rivers).

Condition of our Rivers

The Index of Stream Condition (ISC) measures river condition according to five sub indices (hydrology, physical

form, streamside zone, water quality and aquatic life) that contain 19 key indicators; to provide a summary of the extent of change from natural or ideal conditions.

Rivers in the Mallee have been assessed approximately every five years since 1999 using the ISC. The most recent survey in 2004¹ found that of the 57 river reaches assessed, 38% were in moderate condition and 57% were in poor condition. The general trend in river reach scores to date suggests relatively stable (poor) river health, a significant achievement in light of the climatic conditions and altered hydrology experienced by the region over this period. The high number of reaches with poor scores is largely attributable to the hydrology and physical form sub-indices which give poor scores for seasonally regulated flows and physical barriers to flows (such as weirs). Most of the Mallee river reaches are subject to seasonal flow regulation to benefit irrigated agriculture and many are under the influence of weirs.

Strategic Directions for the Management of our Rivers

The Victorian Waterway Management Strategy² sets out the state-wide framework upon which to base the management of the region's riverine assets. Two Victorian Sustainable Water Strategies, Northern and Western, are tasked with informing strategic water management within their respective coverage areas (Northern covers the Murray River Corridor, while much of the dryland Mallee lies within the Western).

Consideration of these strategies has informed the development of the region's long-term (20 year) objective for the condition of our river assets, and the short-term (6 year) strategic actions to be delivered over the life of this RCS (see previous page)³.

Regional priorities and management targets will be further informed through development of the 2014-2022 Mallee Regional Waterway Strategy.

¹ Most recent ISC survey was undertaken in 2010, the data from this has not yet been made available for inclusion in the RCS.

² The Victorian Waterway Management Strategy is currently in draft form and due for release by mid 2013.

³ It is anticipated that any impacts of the final Murray Darling Basin Plan in regards to how our rivers are managed will not be fully understood prior to commencing the implementation phase of this 2013-19 RCS. As such, all regional documentation on the 'rivers' asset class developed to support this RCS will be amended when and as appropriate.

Our Wetlands

Individual wetlands, wetland complexes, and their associated floodplain ecosystems (including groundwater dependent ecosystems and the groundwater flow systems and aquifers they are reliant on).

There are over 900 wetlands greater than one hectare within the region, occupying some 43,000ha. Mallee wetlands are diverse and include: riverine wetlands; natural saline wetlands fed by groundwater; shallow depressions in the south of the region filled by local catchment runoff; and artificially maintained wetlands such as the Cardross Lakes and Koorlong Basins.

Some 82% of our wetland area occurs on public land; with the remaining located on freehold land used primarily for either dryland farming or irrigated horticulture.

Semi-permanent saline wetlands are the most prevalent wetland type in the Mallee region. These wetlands have increased in both number and area since European settlement due to altered hydrological regimes, clearing of native vegetation, changes in surrounding land use and the use of natural wetlands and low-lying areas for salinity management.

Wetlands associated with the Murray River or its anabranches are primarily

Our wetlands are significant environmental assets, which are also fundamentally important to the regional, state and national economy providing:

- Ecosystem services such as aquatic habitat, trapping of sediments and nutrients and the replenishment of connected groundwater systems to support the groundwater dependent ecosystems that rely on them;
- Water storage for irrigation, stock and domestic water supplies and collected irrigation drainage;
- Flood mitigation by storing floodwater and releasing it slowly back into our waterways; and
- International and national recognition of the Mallee region through the Ramsar listing of Hattah Lakes.

The condition of wetlands continues to be threatened by a range of pressures such as:

- Altered flow regimes;
- Salinity;
- Invasive plants and animals;
- Recreational activities; and
- Adjacent landuse practices.

These pressures require addressing in an integrated and targeted manner.

Priority wetlands

- Lindsay Island
- Lake Wallawalla
- Wallpolla Island
- Lake Ranfurly
- Worgan Basins
- Kings Billabong
- Cardross Lakes
- Raak Plain
- Hattah Lakes
- Belsar Island
- Heywoods Lake
- Major Mitchell Lagoon
- Pink Lakes
- Lake Tyrrell

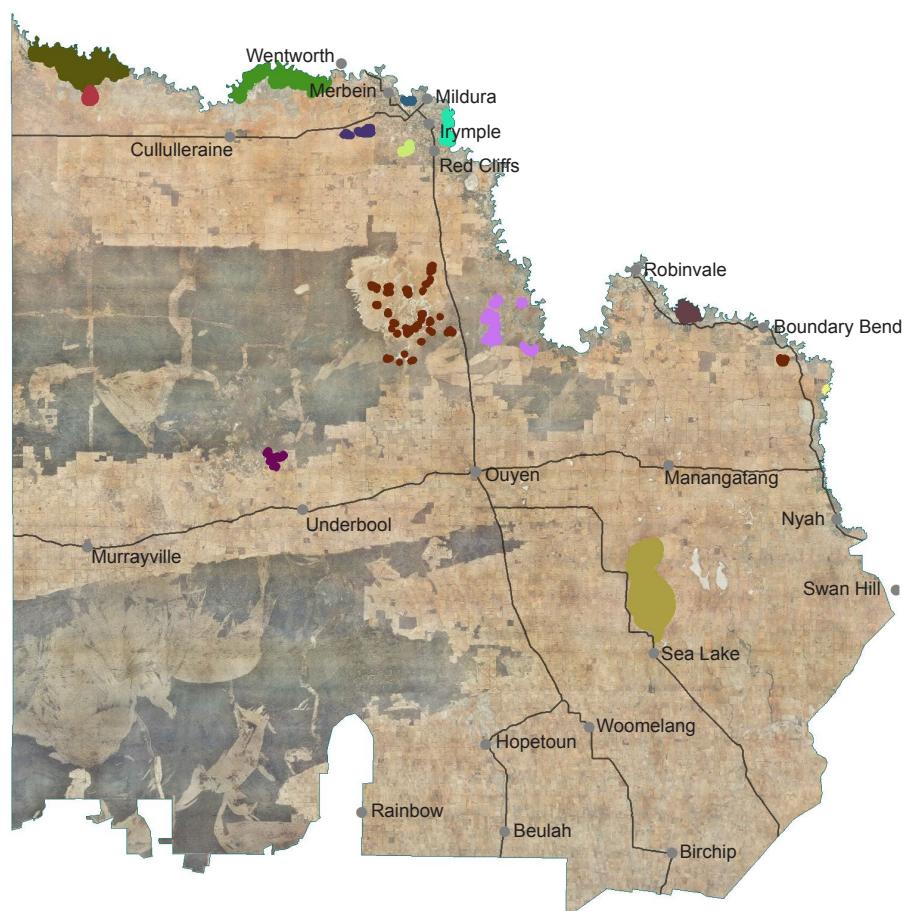


Figure 12: Priority Wetland Assets.

Objectives (20 year)	Strategic actions (6 year)
To protect and enhance the environmental values of the Mallee's wetlands and, in turn, the social, economic and environmental services that they provide to the community.	Review the Mallee Wetland Strategy, and develop and implement the Mallee Regional Waterway Strategy.
	Continue to implement actions from the Northern and Western Region Sustainable Water Strategies that apply to Mallee wetlands and groundwater dependent ecosystems.

seasonal, intermittent or ephemeral wetlands that fill when the Murray River floods; although under natural or pre-regulation conditions some would have been inundated more or less permanently.

The few saline wetlands occurring alongside the Murray are largely the result of secondary salinisation, caused by disposal of saline irrigation drainage water or intrusion of saline groundwater.

Wetlands in the centre and south east of the region are primarily saline systems (salinas and boinkas) that are typically associated with natural groundwater discharge sites. These wetlands are generally semi-permanent and are characterised by salt tolerant flora. Large terminal saline wetlands like Lakes Tyrrell and Timboram are significant features of the region.

In the south-west of the region, most wetlands are freshwater marshes restricted to the Outlet Creek system within the Wyperfeld National Park; although a few saline wetlands do occur northwards of Outlet Creek. The far south contains almost a quarter of the Mallee's most depleted wetland type - freshwater meadows. Historically, these ephemeral wetlands would have been inundated by local catchment runoff. However, the hydrology of this area has been significantly altered through the historical development of the area for agriculture.

Valuing our Wetlands

The environmental values associated with the Mallee's wetlands include: the provision of specialised habitat for the region's biodiversity assets; the cycling of nutrients, carbon, salts and silt through the landscape as part of the water cycle; and the replenishment of connected groundwater systems to support the groundwater dependent ecosystems that rely on them. The region's priority wetland assets are those which have been recognised as being significant at an international (i.e. Ramsar) or national (Directory of Important Wetlands) level (see Figure 12).

The economic value of our wetlands is derived mostly from the services they provide in terms of flood mitigation (by storing floodwater and releasing it slowly

back into waterways), and tourism and recreation opportunities.

Several of the region's wetlands (such as Kings Billabong and Lake Cullulleraine) provide water for irrigation, stock and domestic supply. Others (such as Psyche Lagoon, the Wargan Basins and Lakes Hawthorn and Ranfurly) provide an important role in regional salt interception and irrigation drainage disposal.

The aesthetic value and recreational opportunities (e.g. fishing, boating, swimming, hunting, bird watching, camping and bushwalking) provided by our wetlands is of considerable social value to the region and beyond. Many wetlands also have archaeological and cultural significance, such as Major Mitchell Lagoon, and are listed as historic reserves.

Threats to our Wetlands

The health and functional capacity of wetland systems in our region impacts directly on their capacity to provide the environmental, social and economic services we value. A prime example is the Hattah Lakes, which are recognised internationally for their environmental significance; valued as a regionally important tourism destination and provides substantial flood mitigation opportunities in high river events. If its functionality as a wetland system were significantly compromised then the value of many of these important services may be diminished.

Therefore, the major threats to our wetlands are the ones that impact on their capacity to provide essential environmental services to our region. These include such processes as: altered hydrological regimes; land and water salinisation; invasive plants and animals; recreational pressures; and land use change. Appendix 2 provides further detail on potential threats to our wetlands.

Condition of our Wetlands

The Index of Wetland Condition (IWC) is designed to identify significant changes in wetland condition. The method assigns wetlands to general condition categories that are based on the concept of departure from a theoretical reference

condition (unmodified by human impacts associated with European settlement). IWC uses a hierarchical index with six sub-indices (wetland catchment; hydrology; water properties; soils; biota; and physical form) based on key ecological components of wetlands.

Fifty-one wetlands across the region were assessed using the IWC method between October 2006 and May 2007¹. Some 75% of these surveyed wetlands were ranked at either reference or slightly below the reference condition. Therefore, the condition of these wetlands at the time of the assessment was quite good especially when we consider the prevailing grip of the 'Millennium Drought' at the time.

Strategic Directions for the Management of our Wetlands

The Victorian Waterway Management Strategy² sets out the state-wide framework upon which to base the management of the region's wetland assets. Two Victorian Sustainable Water Strategies, Northern and Western, are tasked with informing strategic water management within their respective coverage areas (Northern covers the Murray River Corridor while much of the dryland Mallee lies within the Western).

Consideration of these strategies has informed the development of the region's long-term (20 year) objective for the condition of our wetland assets, and the short-term (6 year) strategic actions to be delivered over the life of this RCS³.

Regional priorities and management targets will be further informed through development of the 2014-2022 Mallee Regional Waterway Strategy.

¹ It is intended that IWC assessments are undertaken every five years at a state wide level to detect condition change. The most recent IWC survey of Mallee wetlands was in 2010, the data from this has not yet been made available.

² The Victorian Waterway Management Strategy is currently in draft form and is due for release in mid 2013.

³ It is anticipated that any impacts of the final Murray-Darling Basin Plan in regards to how our wetlands are managed will not be fully understood prior to commencing the implementation phase of this 2013-19 RCS. As such, all regional documentation on the 'wetlands' asset class developed to support this RCS will be amended when and as appropriate.

Our Threatened Species and Communities

Populations of threatened or significant species; occurrences of threatened communities.

Our region supports a diverse and unique range of flora and fauna, with many species associated with the more arid interior having their southernmost distribution in the Mallee. Several species occur here which are found nowhere else in Victoria; and many others, which are at the edge of their range, are genetically distinct from their northern or southern relatives.

Development of the Mallee for agriculture and other human enterprises over the last 150 years has seen significant change in the structure and connectivity of our landscape. Habitat loss and fragmentation impacts on the distribution and abundance of our flora and fauna species and communities; and ultimately threatens their long term viability.

For the purposes of the RCS, this Asset Class considers only those species and communities which are listed as threatened at either a federal (under the *Environmental Protection and*

Biodiversity Conservation Act 1999 (EPBC Act)) or state (under the *Flora and Fauna Guarantee Act 1988* (FFG Act) or Victorian Rare Or Threatened Species (VROTS)) level; of which the Mallee has a high number.

Table 4 shows the numbers of flora and fauna species and communities currently listed in these instruments. Further information on these is provided on the RCS website: rcs.malleecma.vic.gov.au

Of particular importance are our non-eucalypt woodlands which contain significant remnants of an EPBC listed ecological vegetation community (Buloke Woodlands of the Murray-Darling Basin Depression Bioregions), and four communities listed under the FFG Act¹.



Figure 13: Malleefowl. Photo: Mallee CMA.

Threatened species and Communities are an important part of our natural heritage with the Mallee being home to a diverse and unique range of flora and fauna providing:

- Ecosystem services such as nutrient and carbon cycling and storage;
- Aesthetic values and recreational opportunities;
- Important cultural and spiritual values; and
- Research and educational opportunities.

The condition of threatened species continues to be threatened by a range of pressures such as:

- Invasive plants and animals;
- Inappropriate fire regimes;
- Constrained regenerative capacity; and
- Land use change.

These pressures need to be addressed in a co-operative manner for effective mitigation of risks across the region.

Objectives (20 year)	Strategic actions (6 year)
To protect and enhance the present diversity of Mallee threatened species and communities.	Continue to implement actions consistent with federal, state and regional prioritisation frameworks.
	Continue to support the development, implementation and review of Action Statements and Recovery Plans for the region's threatened species and communities.
	Support the implementation of ecologically appropriate burning regimes for protection of threatened species and communities.

Table 4: Number of threatened species and communities at each level of listing.

	National (EPBC Act)	State (FFG Act)	State (VROTS)
Flora	11	54	355
Fauna	16	79	133
Flora Communities	4	4	
Fauna Communities		2	

The Lowland Riverine Fish Community of the Southern Murray-Darling Basin (which includes 15 species such as the Murray Cod and the Murray Hardyhead); and the Victorian Mallee Bird Community (which includes 20 species such as the Malleefowl and the Red-lored Whistler) are listed under the FFG Act.

The Mallee also provides key habitat for 27 individual species which are listed at the federal level, this includes four (all fauna) which are categorised as endangered: the Mallee Emu-wren; the Black-eared Miner; the Spot-tailed Quoll; and the Swift Parrot.

Valuing our Threatened Species and Communities

The environmental, social and economic value we derive from our threatened species and communities are primarily associated with the ecosystem services that they provide. These services include pest control, clean air and water, flood mitigation, resilience against land degradation, protection from extreme weather events, recreation, and amenity and aesthetic values for residents and tourists.

The region's threatened species and communities assets are prioritised in line with their conservation status, with those species at greater risk of extinction being of higher priority. The DEPI Actions for Biodiversity Conservation (ABC) database provides the framework by which high priority locations and associated high priority actions are identified for individual species.

Existing datasets for these assets are largely based on site specific surveys which do not necessarily provide a 'whole of region' perspective when spatially documented. As such we are not able to provide a map depicting the distribution or relative value of our priority threatened species and communities assets.

Threats to our Threatened Species and Communities

In general, historical habitat loss has been the primary circumstance for so many of our species and communities to now be considered as threatened. This loss of habitat has not only compromised the abundance and distribution of our species, it has also increased the incidence and subsequent impact of other threatening processes such as: land and water salinisation; invasive plants and animals; altered hydrological regimes; soil erosion; land use change; and constrained regenerative capacity. Further detail on potential threats to our threatened species and communities assets is provided in Appendix 2.

Condition of our Threatened Species and Communities

It is difficult to give a generalised picture of the current health and condition of this Asset Class given its fragmented nature within the Mallee landscape and the scope, scale and nature of the various indicators of condition.

Some populations of threatened species and communities are comprehensively observed and reported on, while others remain somewhat cryptic due to insufficient resources or the nature of the species itself.

Given the challenges associated with monitoring all threatened species and communities, proxy condition indicators are being developed for the purposes of this RCS. These indicators are both species and communities that were selected on the basis that (a) the presence and population structure of these species or communities reflect the health of other threatened species that may rely on the same habitat and (b) there is sufficient scientific confidence

in the available dataset for the chosen indicator.

Further detail on these proxy condition indicators for our threatened species and communities is available on the RCS website: rcs.malleecma.vic.gov.au

Within this context we are not yet able to provide an evidence based statement on current condition or any trends in condition of this Asset.

Strategic Directions for the Management of our Threatened Species and Communities

The ongoing protection and conservation of threatened species and communities at a national level is afforded in the EPBC Act. It provides a legal framework to protect and manage nationally and internationally important flora, fauna and ecological communities. The Act also produces Conservation Advice or Recovery Plans for listed species and manages the listing of key threatening processes.

Within Victoria, the FFG Act plays a similar role in protecting and conserving biodiversity within Victoria.

Consideration of the legislative requirements of these two Acts, along with national, state and regional planning strategies (such as Australia's Biodiversity Conservation Strategy 2010-2030, Species Recovery Plans, and Action Statements) has informed the development of the region's long-term (20 year) objective and short-term (6 year) strategic actions to be delivered over the life of this RCS.

¹ Three other EPBC listed ecological vegetation communities are present within the Mallee the White Box-Yellow-Box-Blakely's Gum Grassy Woodland and Derived Native Grassland and the Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia have only a very small proportion of their total extent in our region. While the Natural Grasslands of the Murray Valley Plains has only recently been listed under the Act.

Our Terrestrial Habitat

Individual ecological classes or spatial occurrences of ecological vegetation classes based on their intrinsic value to their contribution to landscape processes.

The terrestrial habitat of the Mallee is primarily defined by the prevailing native vegetation community at any particular location. In Victoria, these communities are classified into Ecological Vegetation Classes (EVCs).

An EVC represents one or more plant (floristic) communities that occur in similar types of environments (i.e. soil type, climate, topography) and

which tend to show similar ecological responses to environmental factors such as disturbance (e.g. bushfire). There are around 300 different EVCs in Victoria and 50 in the Mallee region. Further information on Mallee EVCs is provided on the RCS website:

rcs.malleecma.vic.gov.au

These EVCs represent a complex mosaic of vegetation communities and associated terrestrial habitats including: Mallee woodlands and shrublands; Heaths; Slender Cypress-Pine; Buloke, and Belah woodlands; Riverine forests and woodlands; and Chenopod shrublands and grasslands.

Just over half (2,047,654ha) of the region's native vegetation has been cleared since European settlement, particularly those vegetation communities growing on the more fertile alluvial soils (i.e. suitable for agriculture). Timber was also felled during early European settlement for the construction of both private and public infrastructure throughout the region (e.g. homesteads, fencing, stockyards and wharves).

Large contiguous blocks of terrestrial habitat do remain, predominantly in large parks such as Murray-Sunset and Wyperfeld National Parks, which are characterised by their infertile sandy soils. As such, these large remnant blocks do not represent the entire diversity of the region's original habitat. Of the 1,872,233ha of remaining vegetation, only 12% occurs on private land.

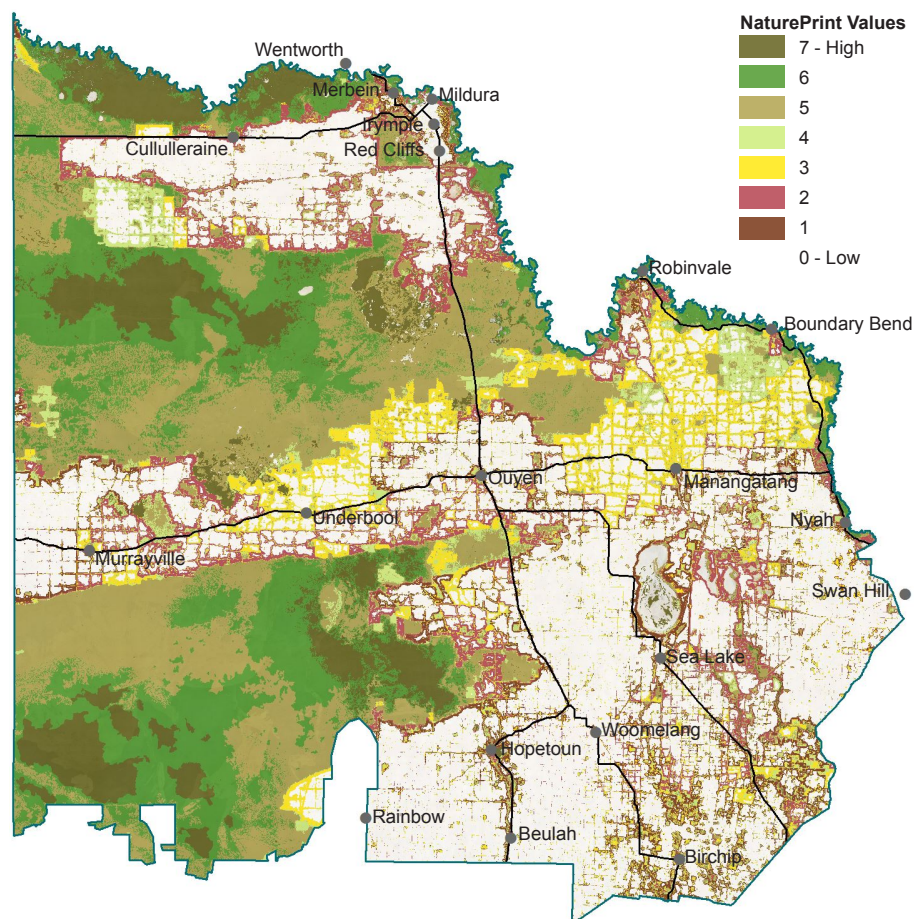


Figure 14: Relative priority of terrestrial habitat assets (NaturePrint).

Our Terrestrial Habitat plays a fundamental role as the basis of all biodiversity, providing:

- Our agricultural lands with protection from dryland salinity and erosion;
- Tourism and recreational opportunities;
- Links to our cultural and natural heritage; and
- Biolinks and habitat refugia across the landscape; which are essential for the ongoing viability of our threatened plant and animal species.

The condition of our Terrestrial Habitat is threatened by a range of pressures such as:

- Constrained regenerative capacity/fragmentation;
- Recreational pressures;
- Invasive plants and animals;
- Inappropriate fire regimes; and
- Land use change.

These pressures are intrinsically linked and require an integrated and targeted approach for effective management.

Objectives (20 year)	Strategic actions (6 year)
To protect and enhance the extent, condition and ecological connectivity of high value terrestrial habitat across all Mallee land tenures.	Review, update and implement the Mallee Native Vegetation Plan.
	Develop and implement a Regional Biolinks Plan to guide the delivery of cross tenure habitat enhancement programs.

Valuing our Terrestrial Habitat

Terrestrial habitat is the basis of the Mallee's broad, complex and unique biodiversity, and as such is of significant economic, social and environmental value to the region. It provides resilience against land degradation, protection from extreme weather events, carbon storage, recreational opportunities, positive landscape aesthetics, and sites of cultural significance (both Indigenous and non-Indigenous). The survival of many native plant and animal species is directly dependent upon the extent and condition of our terrestrial habitat.

In general, native vegetation has an important role to play in mitigating the impact of threats such as dryland salinity; wind and water erosion; and salinity on our productive, cultural and natural landscapes.

The region's priority terrestrial habitat assets have been identified using the DEPI NaturePrint model which identifies the relative contribution of areas to the protection of the full range of biodiversity values and biodiversity conservation in a state-wide context (see Figure 14).

NaturePrint demonstrates that a significant proportion of the Mallee has substantial importance for biodiversity and terrestrial habitat conservation in Victoria. Of particular value is our large tracts of public land given the largely cleared and fragmented landscape in which they occur. Further information on NaturePrint is provided on the RCS website: rcs.malleecma.vic.gov.au

Threats to our Terrestrial Habitat

The removal of native vegetation for the agricultural development of the Mallee and the resultant loss and fragmentation of biodiversity makes much of the Mallee's terrestrial habitat vulnerable to a range of threatening processes.

Without effective connectivity and access to regenerative material, many fragmented and isolated habitats lack the necessary resilience to respond successfully to the current suite of threatening processes.

These habitats are not necessarily confined to small areas – they can be very large blocks, even the size of

Murray Sunset National Park, which has been subject in recent times to fire events that have burned a significant proportion of this one contiguous remnant in a very short space of time. Such events substantially reduce the resilience of these areas for months, years, even decades afterwards. This can threaten the future of these habitats, the biodiversity that relies on them, and the ecosystem services that they provide us.

The major threats to our terrestrial habitat includes: invasive plants; invasive animals (particularly rabbits); recreational pressures; land use change; inappropriate fire regimes; and constrained regenerative capacity.

Further detail on potential threats to our terrestrial habitat assets is provided in Appendix 2.

Condition of our Terrestrial Habitat

The health and condition of terrestrial habitat in Victoria has been evaluated through the use of a state-wide modelled view of native vegetation quality based on Habitat Hectare assessment data. The model combines two datasets. The first is the Site Condition Assessment that examines the condition of a patch of habitat. The second is the Patch-based Landscape Context Assessment that examines the connectivity of that patch of habitat. The result is a 'score' for the relative condition of native vegetation.

The model demonstrates that most native vegetation in the Mallee is in better than average condition. Much of this good quality habitat is confined to the large contiguous blocks in the west of the region. Patches of habitat isolated in the cleared portions of the region are typically in much poorer condition.

Strategic Directions for the Management of our Terrestrial Habitat

The ongoing protection and conservation of terrestrial habitat at a national level is afforded in the *Environmental Protection and Biodiversity Conservation Act 1999*. It provides a legal framework to protect and manage nationally and internationally important ecological communities. Within Victoria, the *Flora and Fauna Guarantee Act 1988* plays a similar role in protecting and conserving biodiversity.

Australia's Biodiversity Conservation Strategy 2010-2030 provides the strategic framework at a national level to implement federal legislation and federal government policy with respect to biodiversity and therefore, terrestrial habitat. Victoria's Native Vegetation Management: A Framework for Action, was developed to implement the objectives of Victoria's Biodiversity Strategy (1997) and the Australian Biodiversity Conservation Strategy¹.

Consideration of these strategies, their intentions and their currency has informed the development of the region's long-term (20 year) objective and short-term (6 year) strategic actions to be delivered over the life of this RCS.

The review and renewal of the Mallee Native Vegetation Plan and the development of an accompanying Regional Biolinks Plan is expected to inform regional priorities and the necessary management actions to deliver upon them.

¹ Both the Victorian Vegetation Management Framework and Biodiversity Strategy are due for review and renewal.



Figure 15: Examples of different vegetation communities found within the region. Photos: Mallee CMA; bottom: Deakin Uni.

Our Soils

All soils in our region regardless of the tenure and type of land systems to which they are subject.

The majority of soils in the Mallee (88%) have been formed by aeolian (wind) processes; 8% are grey floodplain clays, while the remaining 4% are comprised of saline plains, copi rises and lunettes. Six main soil categories occur in the region: Sodosols; Vertosols; Rudosols; Tenosols; Hydrosols; and Calcarosols (see Figure 16).

Sodosols (or Texture Contrast Soils) are often characterised as 'scalded country' with erosion frequently removing their surface to expose red, somewhat saline clays that seal on wetting. These sites

are difficult to reclaim and are primarily found near our southern creeks, the Murray River, and on lunettes in the Tyrrell Basin.

Vertosols (or Grey Cracking Soils) occur on broad low-lying plains in the northern Mallee and are thought to have formed from ancient lake deposits, fed by the Murray River system. Profiles are typically coarsely structured, sodic, gypseous and somewhat saline. These features limit suitability for cropping.

Rudosols and Tenosols represent the widespread sandy soils of our region. Rudosols are the pale aeolian sands of the Big Desert and Sunset Country thought to have originated as

coastal sands when the seas retreated westwards from the Murray Gulf. Part of these areas have high parabolic dunes with wide intervening sand plains, apparently formed in a recent period of wind activity. Interspersed with these Rudosols are Tenosols deep loose sands found in closely spaced east-west dunes. Both soils have low fertility and a high wind erosion hazard.

Hydrosols (or Wet Soils) are seasonally or permanently saturated (for at least 2-3 months per year); occurring naturally in low-lying parts of the central and northern Mallee region where saline regional groundwater reaches the surface. Soil surfaces are variably saline, depending largely on depth to the watertable. The area of Hydrosols is increasing in both dryland and irrigated areas because of changed hydrological conditions since European settlement.

Calcarosols represent the region's dominant soil type and vary considerably in texture from the sands of the northern and central Mallee to those in the southern Mallee that are clayey throughout. Soil texture has a big influence on the agronomic performance of the land. Sands are easily worked,

The health of a soil is a product of its inherent properties and its management of use. Healthy soils provide:

- Water storage, filtration and release services;
- Nutrient recycling and carbon sequestration;
- Support for plant growth and productivity; and
- Cultural and heritage values.

The condition of our soils continue to be threatened by a range of pressures such as:

- Invasive plants and animals;
- Salinity;
- Erosion; and
- Land use change.

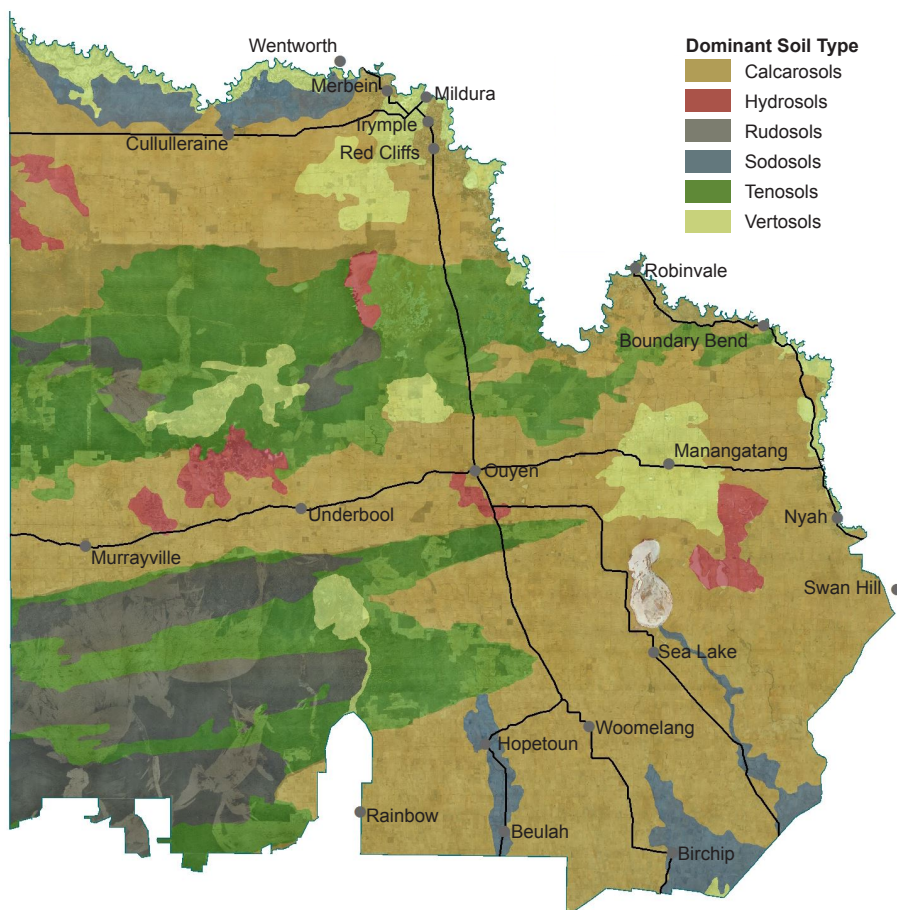


Figure 16: Dominant soil types.

Objectives (20 year)	Strategic actions (6 year)
To protect and enhance the environmental values and ecosystem services provided by all Mallee soils.	Develop and implement a Regional Soil Health Plan for the Mallee.

but they have low fertility reserves and are very prone to wind erosion. Heavier textured soils are more fertile and less erodible, but more prone to salting and hardsetting when over-cultivated.

Valuing our Soils

Soil underpins all of our terrestrial ecosystems. There is an immense diversity of life that exists within soils ranging from micro-organisms, invertebrates such as worms, and the plants which we rely upon for life.

Soils are rich ecosystems composed of both living and non-living matter and play an important role in all of our ecological cycles (e.g. carbon and nitrogen cycling).

Soils also provide benefits through contribution to a number of ecosystem services ranging from the decomposition of organic debris and other waste materials, through to acting as a water retention and filtration system.

Our agricultural landscapes value soil for its productive potential with Mallee agricultural production, and the local economies it supports, relying on fertile and stable soils.

Soils have also played an important role in the region's Indigenous cultural heritage by influencing settlement patterns, and supporting important archaeological sites such as burial sites and ochre pits.

No criteria is currently available to differentiate the relative value of our soils, and as such it is considered as a dispersed asset of equal value for the purposes of this RCS. Processes undertaken to prioritise and target management actions will rely on assessments of risk likelihood and impact.

Threats to our Soils

Mallee soils are vulnerable to a number of processes. While the extent and severity of these vary across the region; land use and land management practices (both historical and current) play a major role in determining the impact of threats such as salinity, erosion, and invasive plants and animals on the health of our soils.

If not managed appropriately, these processes have the potential to degrade both private and public land, threatening our natural habitat and reducing the area

of land available for production in the long term (Appendix 2 provides further detail on potential threats to our soils).

Condition of our Soils

The Mallee monitors four key soil condition indicators; area threatened by shallow or rising groundwater, area of induced salinity, area at risk of soil erosion, and organic carbon levels; from which the region can make evidence based assessments of both current condition and trends over time.

Some 39% (55,460ha) of total saline surfaces are classified as induced and associated with land use change. With regional groundwater levels generally reversing the stable to declining trend seen in recent years, there is potential for salinity impacts to increase.

Widespread changes in land management practices over recent years has dramatically increased groundcover levels in the region, significantly reducing the risk, incidence and severity of soil erosion.

Overall, data suggests a general trend of stable to improving soil health for the region. Further detail on Mallee soil condition indicators is available on the Mallee RCS website: rcs.malleecma.vic.gov.au

Strategic Directions for the Management of our Soils

The Victorian Soil Health Strategy (2012) sets out the state-wide framework upon which to base the management of the region's soils on both public and private land. Consideration of this strategy has informed the development of the region's long-term (20 year) objective for the condition of our soil assets, and the short-term (6 year) strategic actions to be delivered over the life of the RCS.

Regional priorities and management targets will be further informed through the development of a Soil Health Plan for the Mallee.



Figure 17: Jim Rowan and David Rees providing valuable insights into the geomorphology of the Mallee and its relation to wind erosion susceptibility. Photo: DEPI.

Our Agricultural Land

All parts of the landscape that have been developed for the purpose of dryland and irrigated agricultural production.

Some 62% of our region is under agricultural production, with an estimated 2.4 million ha of dryland farming and a further 72,500 ha of irrigation. There are approximately 2,415 rural land holdings involving both the dryland and irrigation industries.

Dryland agriculture occurs in the northern, central and southern parts of the region (see Figure 18) and includes the cropping of a wide variety of cereals

and pulse crops such as wheat, barley, triticale, vetch, lupins and canola.

Livestock also forms a part of many farm operations and primarily includes sheep for their wool products and lambs for their quality meat. Cattle and goats are also present in smaller numbers.

Irrigation in the Mallee region extends adjacent to the Murray River from Nyah to the South Australian border (see Figure 18) and encompasses private diverters and the pumped irrigation districts of Mildura, Merbein, Red Cliffs, Robinvale and Nyah. A groundwater irrigation district also exists centered on the town of Murrayville.

The major irrigated sectors are wine grapes, citrus, table grapes, almonds, dried fruit and vegetables. Almonds have become the single largest crop by area and water demand, and olive plantings continue to expand.

Agricultural industries have largely been established where they can be supported by our regional soils. For example, the saline soils of the Raak Land System are very rarely used for agriculture, although some are grazed. Agricultural use of the grey clay areas associated with the Murray River is low, whereas the floodplains of our southern creek systems are extensively used for mixed dryland farming enterprises.

The large blocks of remnant vegetation which remain in our landscape (such as in our parks and reserves) are often represented by their sandy infertile soils, which are unsuitable for agriculture.

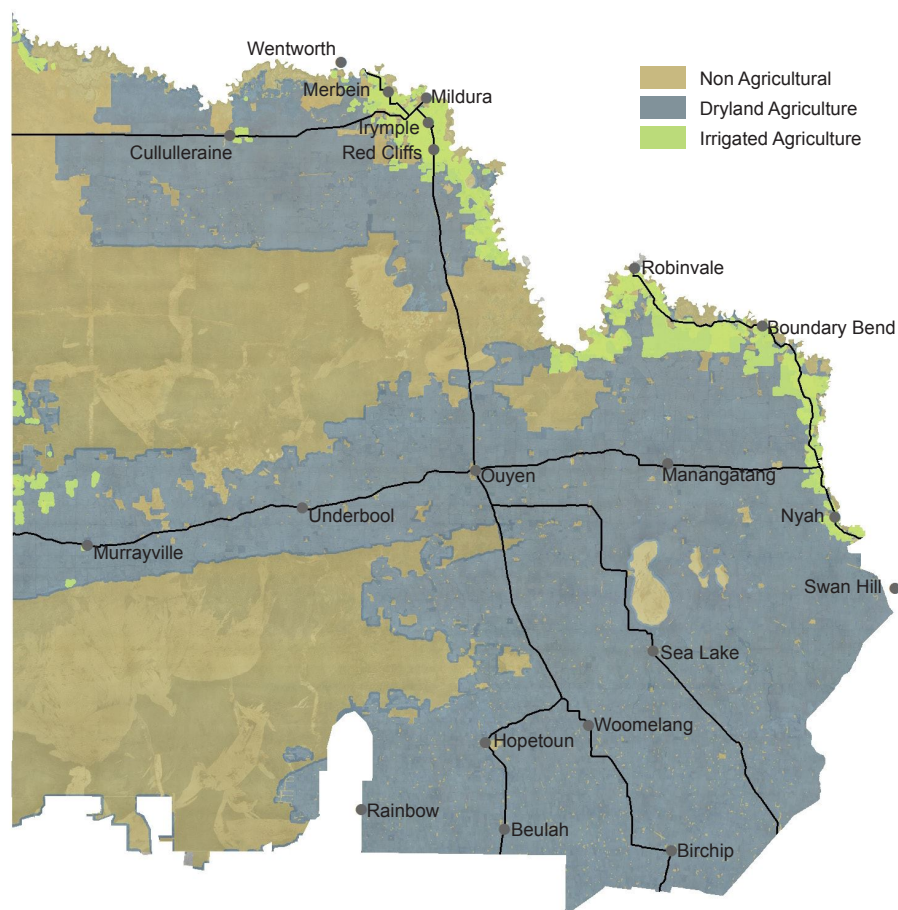


Figure 18: Distribution of dryland and irrigated agriculture.

Our dryland and irrigated agricultural landscapes are fundamentally important to the regional and state economy providing:

- Some 50% of Victoria's cereals, almost 100% of Victoria's dried vine fruits, 30% of Australia's wine grapes, and 70% of Victoria's table grapes;
- 65% of Australia's almond plantations - which are anticipated to reach full production in 2015;
- Employment for 19% of people working in the Mallee; and
- Further employment and economic opportunities through agriculture-related industries, such as transport and food processing.

The condition of our agricultural lands is primarily linked to soil health, and as such is threatened by similar pressures such as:

- Invasive plants and animals;
- Salinity;
- Erosion; and
- Land use change.

Objectives (20 year)	Strategic actions (6 year)
To optimise the productive capacity of Mallee agricultural landscapes, while minimising any adverse impacts of associated management practices (both current and historical) on our natural and cultural landscapes.	Continue to implement the Victorian Mallee Irrigation Region Land and Water Management Plan.
	Develop and implement a strategy for Mallee dryland agricultural land as part of the Regional Soil Health Plan.

Valuing our Agricultural Land

The Mallee is recognised nationally and internationally for its agricultural produce. It is a key part of Victoria's food bowl, producing up to 50% of Victoria's cereals, almost 100% of Victoria's dried vine fruits, 30% of Australia's wine grapes, 70% of Victoria's table grapes and significant proportions of the nation's almond, citrus, avocados, olives, and vegetable crops; supplying both domestic and export markets.

Agriculture plays a major role in sustaining the economy of the region, with the gross value of production for dryland crops in 2009/10 being \$544 million, irrigated crops \$586 million, and livestock enterprises a further \$60 million; contributing 11.5% of total agricultural production value for the state across all industries.

It is also socially important as the major source of employment in the region; with 19% of people working in the Mallee employed in the agricultural sector. Dryland agriculture is particularly important to sustaining the populations of our small rural towns.

Our agricultural landscapes contain many sites of Indigenous significance such as shell middens and burial sites that demonstrate a connection to Country over many thousands of years.

Agricultural land also has intrinsic links to the environment with 12% of the region's native vegetation occurring on private land; vegetation which can provide important habitat and connectivity opportunities for our native flora and fauna. Similarly, 62% of our soils asset occurs on agricultural land.

No analyses are currently available to differentiate the relative value of our agricultural land, and as such it is considered as a dispersed asset of equal value for the purposes of this RCS. Processes undertaken to prioritise and target management actions will rely on assessments of risk likelihood and impact.

Threats to our Agricultural Land

The productivity of our agricultural lands are vulnerable to a number of processes which are largely associated with the health of our soils; with Mallee agricultural production and the local

economies it supports, relying on fertile and stable soils. While the extent and severity of these vary across the region; land use and land management practices (both historical and current) play a major role in determining the impact of threats such as salinity, erosion, and invasive plants and animals on productivity.

If not managed appropriately, these processes have the potential to degrade our agricultural land; and to potentially reduce the area available for production into the future.

Factors such as global markets, seasonal climatic conditions and water availability are also key determinants of our overall productivity. Our capacity to directly influence the nature and potential consequences of these external processes is limited however (see Section 2, Our Challenges and Opportunities).

Land management practices not only have the potential to impact on the agricultural land on which they are employed, but also on their neighbouring assets. Off-site impacts such as soil deposition, spray drift, salinity, and nutrient enrichment can have significant impacts on the health of our natural and cultural landscapes.

In identifying these threatening processes it should also be recognised that both dryland and irrigated landholders have made significant changes to their management practices over recent years, reducing the risk of threatening processes to both on and off site assets.

Appendix 2 provides further detail on potential threats to our agricultural land.

Condition of our Agricultural Land

The Mallee monitors two key condition or productivity indicators for our agricultural land asset. For irrigated agriculture, this is the area of irrigable land irrigated; and for the dryland, the area of productive land cropped or in pasture over time.

Using these long-term annual monitoring datasets, the region can make evidence based assessments of both current condition and trends over time.

Overall, the data suggests an increasing trend for both the irrigated and dryland agricultural areas; which for irrigation has stabilised in recent years. Further detail on Mallee agricultural land indicators is available on the RCS website: rcs.malleecma.vic.gov.au

Strategic Directions for the Management of our Agricultural Land

The Victorian Mallee Irrigation Region Land and Water Management Plan (2012) sets out the framework upon which to base the management of the region's irrigated landscapes. Two Victorian Sustainable Water Strategies, Northern and Western, are tasked with informing strategic water management within their respective coverage areas (Northern covers the Murray River Corridor, while the Murrayville Water Supply Protection Area lies within the Western).

Consideration of these strategies has informed the development of the region's long-term (20 year) objective for the condition of our irrigated land assets, and the short-term (6 year) strategic actions to be delivered over the life of the RCS.

No comparable strategic framework is currently available for dryland agriculture at the state or whole of region scale. As such stakeholder consultation has been the primary mechanism used to inform the development of the region's long term (20 year) objective for the condition of our dryland assets, and the short term (6 year) strategic actions to be delivered over the life of the RCS.

Regional priorities and management targets will be further informed through a dryland agricultural land management strategy; to be developed as part of the Mallee Soil Health Plan.



Figure 19: Dryland and irrigated agriculture in the Mallee. Photos: Mallee CMA.

Our Groundwater

Groundwater resources within the Mallee that are utilised for human use such as irrigation or stock and domestic water supplies.

Mallee groundwater systems are predominately saline and unsuitable for agriculture or human use. The exception to this is the Murray Group Limestone Aquifer, a confined aquifer which lies deep under the western portion of the Mallee, on the Victoria-South Australia border.

The Murray Group Limestone Aquifer is a shared aquifer between Victoria and South Australia and is under management arrangements

pursuant to those set by the Border Groundwaters Agreement Review Committee; established under the Victoria-South Australia Groundwater (Border Agreement) 1985. In Victoria, the aquifer is managed as the Murrayville Water Supply Protection Area (WSPA) and extraction is under licence from GWMWater.

The Murrayville WSPA covers an area of 1,578 square kilometres and is centred on the town of Murrayville, between Murray-Sunset National Park (to the north) and the Big Desert State Forest (to the south) as illustrated in Figure 18. Within this area, groundwater is the

sole source of water for town supplies, stock and domestic use, and irrigated agriculture.

Water quality within the WSPA varies, with the freshest groundwater occurring in the south-west and the poorest in the northern region. Overall aquifer salinity is relatively low, being typically less than 10,000 EC, and mostly below 3,000 EC.

Valuing our Groundwater

The Murray Group Limestone Aquifer supports the economic and social fabric of local communities by providing the sole source of freshwater to the townships of Murrayville and Cowangie, and stock and domestic supply for rural landholders.

The dominant land use within the Murrayville WSPA continues to be dryland agriculture; however, since the early 1990s landholders have taken advantage of the good quality groundwater and suitable soils to diversify into irrigated crops, the most predominant of these being potatoes and olives.



Figure 19: Groundwater asset.

Our groundwater is a finite resource which provides:

- Town water supply for the communities of Murrayville and Cowangie;
- Stock and domestic supply to rural customers; and
- The ability for diversification into horticultural crops such as potatoes and olives; and associated employment opportunities.

The condition of this asset continues to be threatened by a range of pressures such as:

- Salinity; and
- Inappropriate water use practices.

Objectives (20 year)	Strategic Actions (6 year)
To protect the quality and availability of the Mallee's groundwater resource for current and future users.	Continue to implement the Murrayville Groundwater Supply Protection Area Management Plan.
	Continue to implement actions from the Western Region Sustainable Water Strategy that apply to the Murrayville Groundwater Supply Protection Area.

Threats to our Groundwater

The Murray Group Limestone Aquifer is confined by the overlying Bookpurnong Aquitard (or confining bed) which separates it from the saline Parilla Sands Aquifer above.

Current understanding of the Murray Group Limestone Aquifer is that due to its confined nature, rates of vertical recharge and through-flow are very low (considered to be zero).

As per the Victoria-South Australia Groundwater (Border Agreement) 1985, the aquifer is managed as a non-renewable resource and any extraction is referred to as mining. The current total permissible Consumptive Volume of the Murrayville WSPA is 10,883ML per annum.

The most significant threats to our groundwater resource therefore include inappropriate water use practices such as excessive pumping that can lead to considerable localised drawdown of the aquifer; and contamination with saline groundwater from leakage between aquifers (e.g. due to failed bore infrastructure). See Appendix 2 for further detail on potential threats to our groundwater asset.

Condition of our Groundwater

Under the *Water Act 1989*, the land area over the Murray Group Limestone Aquifer was declared a Water Supply Protection Area in 1998. The subsequent implementation of the Murrayville Area Groundwater Management Plan from 2001 and ongoing monitoring of groundwater levels, salinity and metered extraction provides detailed information on groundwater condition and trends.

While there has been some variability over previous years, the current level of use does not appear to be having an adverse impact on the sustainability of the groundwater resource in the longer term; with groundwater levels recovering between irrigation seasons. Salinity levels remain satisfactory and metered usage is declining.

Strategic Directions for the Management of our Groundwater

The Murray Group Limestone Aquifer under the Murrayville WSPA is managed in accordance with the Murrayville Area Groundwater Management Plan (2001), overseen by the Victorian-South Australian Border Groundwaters

Agreement Review Committee. Given the relative stability of the WSPA and its ongoing management as a result of the Plan, a review and update of the Plan and its objectives is not expected until 2018; when greater alignment with the final Murray-Darling Basin Plan may be necessary.

The Western Region Sustainable Water Strategy is tasked with informing strategic water management within much of the dryland Mallee including the WSPA. Its objectives and direction are aligned with, and provide support to, the Murrayville Area Groundwater Management Plan.

Given the structure, nature and stability of the strategic environment with respect to our groundwater asset in the region, regional priorities and management objectives will reflect those of these existing documents.

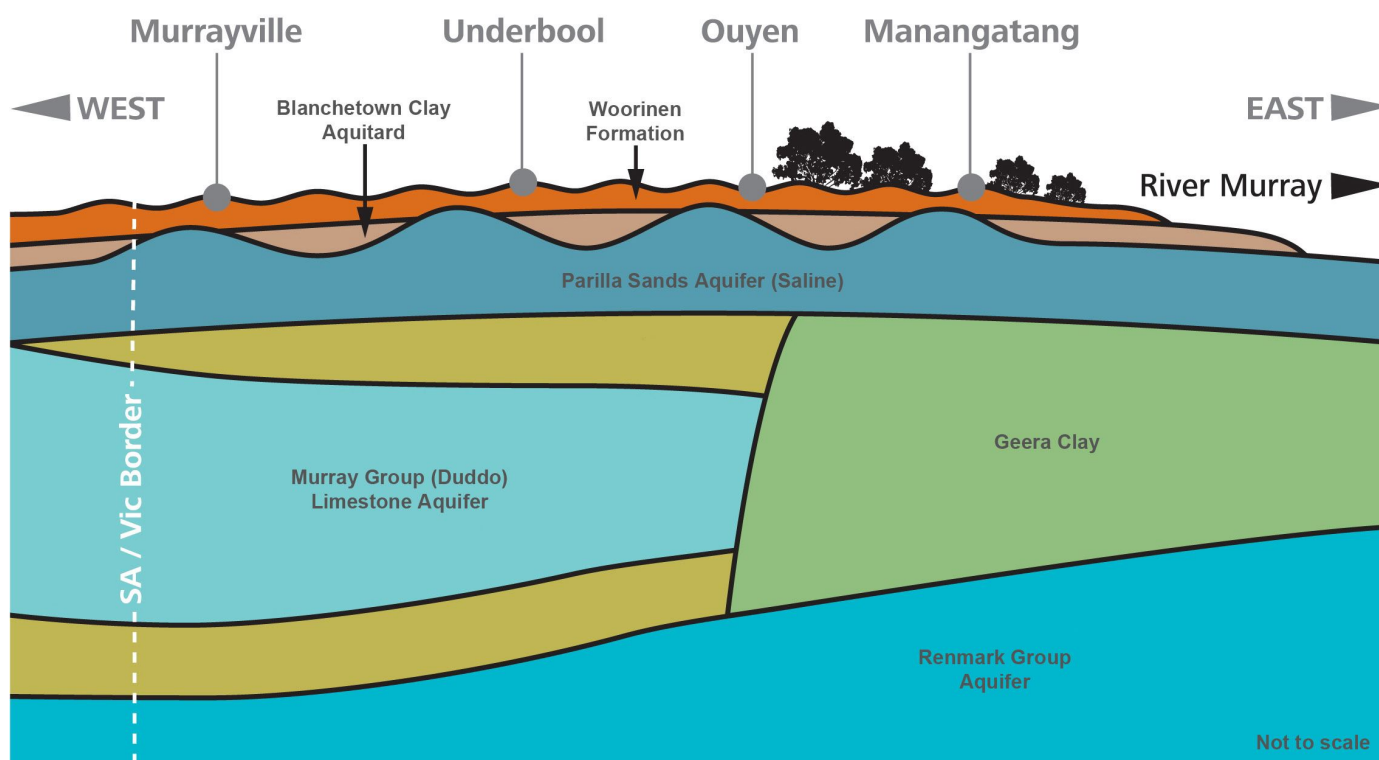


Figure 20: Stratigraphic relationship of the Murray Group (Duddo) Limestone Aquifer under Murrayville, Victoria.

Our Culture and Heritage

Locations that have recognised cultural, historical or spiritual significance to all or part of the Mallee community and/or the Australian community.

The combination of the long history, spanning thousands of years, of human occupation in the Mallee and the growing sense and awareness of the historical significance of the region's far more recent non-Indigenous history, and its place in the development of the nation, has meant that cultural and heritage sites of significance continue to be identified.

The first inhabitants of the Mallee were numerous Aboriginal tribes of several language groups including Latji Latji, Wergaia, Wadi Wadi, Wamba Wamba, Jari Jari, Dadi Dadi, Ngintait and Ngarkat.

The Latji Latji, Wadi Wadi and Wamba Wamba peoples made extensive use of the Murray River; while the Wotjobaluk people (whose main language was Wergaia) occupied most of the southern Mallee. The Yupagalk people occupied the south-eastern Mallee. The oldest dated Aboriginal heritage site in the Mallee region is located at Lake Tyrrell. Carbon dating estimates the area was

occupied around 23,400 years Before Present.

To date, over 4,800 individual Aboriginal features have been identified across 816 registered Aboriginal places within the region (see Figure 21). These include burial sites, freshwater shell middens, scarred trees, ochre pits and stone features.

The Mallee's non-Indigenous history began in the 1830s when Captain Charles Sturt arrived in the region, navigating the Murray River in search of an inland sea. Following Sturt's expedition and that of Major Thomas Mitchell, settlement began along the river corridor to run sheep and cattle on the floodplain and adjoining grasslands. The major drought of 1877-1884 prompted irrigation development in the region; and in 1886 George Chaffey selected a run-down sheep station at Mildura as the site for his first irrigation settlement.

Our culture and heritage is a legacy from our past, an integral part of life today, and the stories and places we pass on to future generations providing:

- A sense of identity and continuity;
- Tangible links to the region's past;
- Places of spiritual significance;
- Opportunities for knowledge sharing; and
- Tourism opportunities.

The condition of these assets continues to be threatened by a range of pressures such as:

- Erosion;
- Salinity;
- Recreational pressures;
- Land use change; and
- Misaligned community perceptions.

These pressures require attention through integrated management of our natural and cultural landscapes to ensure effective action and stewardship.

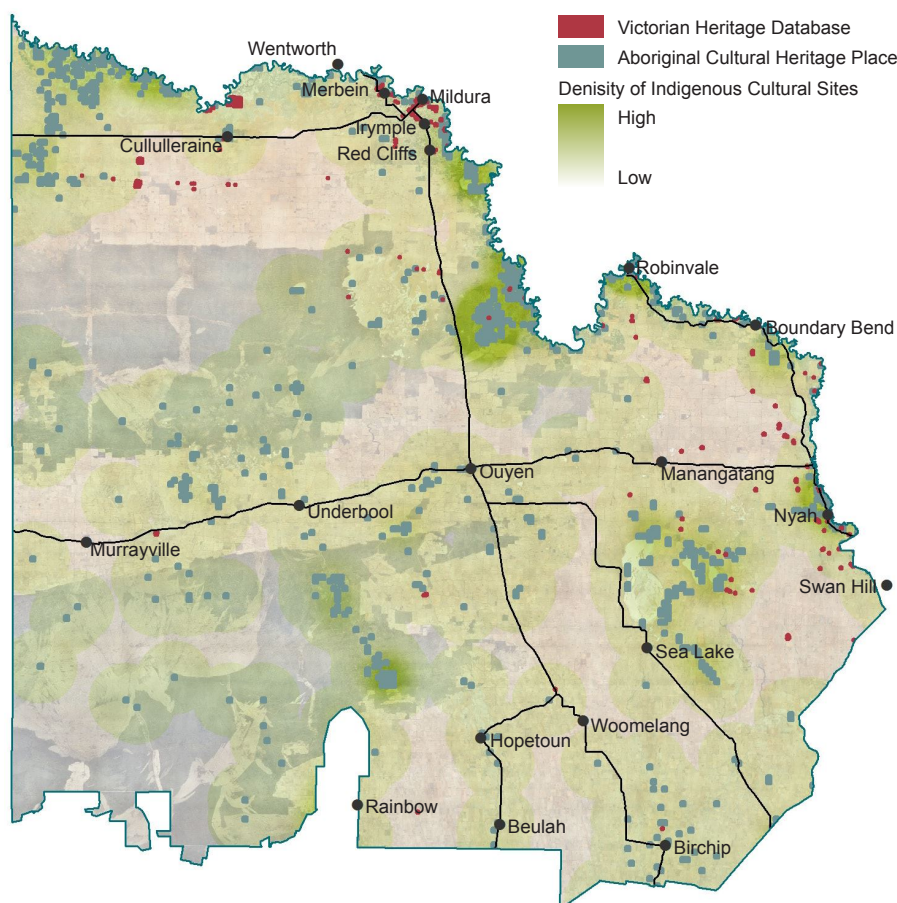


Figure 21: Indicative cultural heritage sites in the Mallee.

Objectives (20 year)	Strategic actions (6 year)
To protect the extent and condition of Cultural Heritage (Indigenous and Non-Indigenous) sites.	Continue to support the development and implementation of Local Government Heritage Overlays in the Mallee.
	Continue to support the development and implementation of Cultural Heritage Management Plans in the Mallee.
	Continue to support the protection and management of cultural heritage sites as an integral component of all land, water and biodiversity management processes.

Much of the dryland Mallee away from the Murray River was originally viewed by early explorers as an impenetrable wasteland. However, by the late 1800s, mechanised clearing techniques and closer settlement meant that large areas of land were able to be cleared.

Non-Indigenous heritage sites, both privately and publicly owned, are scattered throughout the Mallee, and include features such as: historical infrastructure (e.g. buildings, irrigation and river navigation structures); cemeteries; national parks and reserves; and parks and gardens. To date, the Victorian Heritage Database lists some 160 sites of varying levels of significance within the region (see Figure 21). Concentrations of non-Indigenous heritage items generally occur in and around township sites.

Valuing our Culture and Heritage

Cultural heritage values are non-physical and/or physical, and can include: cultural practices; knowledge; songs and stories; art; buildings and infrastructure; and human remains. In addition, natural elements of the landscape including landforms, flora, fauna and minerals can acquire meaning for a particular group.

The region's cultural heritage provides a number of services and values for past, present and future generations including aesthetic, historic, scientific and spiritual values, acting as important sites for cultural purposes, religious significance, knowledge transfer, and recreational tourism purposes. However, the most important values provided are those in terms of community – forging tangible links to the region's past, as well as providing a sense of continuity and identity.

The Murray River and its associated lakes and waterways were important habitation areas for multiple Aboriginal groups as the abundance of food, water and shelter allowed for more permanent occupation; these areas therefore contain many places of spiritual significance. The high number of Indigenous cultural heritage sites throughout the Murray Floodplain is unique in Victoria, both for the concentration and diversity, including large numbers of burial, middens and hunting sites.

In the south of the region freshwater lakes, streams and wetlands were focal points for the region's Traditional Owners.

Many lakes were the sites of large gatherings of several hearth groups that afforded trade and cultural exchanges.

Significant Indigenous heritage sites include southern Raak Plains, Horseshoe Bend Burial Site, Merbein Common, Lindsay Island, Nyah-Vinifera State Park Mounds, Bumbang Island, Robinvale Burial Site, Ross Spring Wells, Hattah-Kulkyne National Park and Murray-Kulkyne Park.

In more contemporary times, places relating to the region's early industries and settlements are often identified as having heritage significance. Examples of historic places within the region that are listed on the Victorian Heritage Register include the Psyche Bend Pumping Station and Kow Plains Homestead.

At present, no criteria is available to differentiate the relative value of culturally significant locations, and as such all recognised sites are afforded equal value for the purposes of this RCS. Processes undertaken to prioritise and target management actions will rely on assessments of risk likelihood and impact.

Threats to our Culture and Heritage

Within the context of cultural heritage, this RCS considers only those threatening processes which also impact on our natural and productive landscapes. For example, altered hydrological regimes may expose sites on floodplains to longer periods of inundation and/or drying. Similarly, soil erosion can have a number of impacts through exposure of burial sites and off-site impacts on built heritage.

Given that Indigenous cultural heritage is inextricably linked to natural landscapes, these threats tend to have a more direct impact on Aboriginal cultural heritage than on non-Indigenous heritage. (Appendix 2 provides further detail on potential threats to our Culture and Heritage).

Condition of the Mallee's Culture and Heritage

The total coverage and current condition of cultural heritage sites within the region is extremely difficult to gauge as information on known sites is variable in quality, and sites themselves continue to be identified through various processes.

No regional scale baseline information currently exists on the condition of our cultural heritage assets, and it is not anticipated that resources will be available in the near future to undertake surveys at the scale required to fill this information gap.

Proxy condition indicators have therefore been established for the purposes of this RCS using the assumption that being listed in the Victorian Heritage Database affords some level of protection; and that similarly, if sites are captured within a Co-Management Agreement or a Cultural Heritage Management Plan, the asset is being protected through associated threat mitigation activities.

Within this context there continues to be an increasing number of sites registered and afforded protection by management plans in the region.

Strategic Directions for the Management of our Culture and Heritage

Protection of Indigenous cultural heritage sites and objects is afforded under the *Aboriginal Heritage Act 2006*¹ (VIC). Under this Act, Indigenous Cultural Heritage Management Plans are mandatory for high impact activities proposed for areas of cultural heritage sensitivity as defined in the *Aboriginal Heritage Regulations 2007*.

Protection of the state's most significant non-Indigenous heritage places and objects is given under the *Heritage Act 1995*; while places of local significance are protected by Local Government Heritage Overlays (HOs), which are developed in accordance with the *Planning and Environment Act 1987*.

Consideration of legislative requirements and local and regional planning strategies has informed the development of the region's long-term (20 year) objective and short-term (6 year) strategic actions to be delivered over the life of this RCS.

¹ The Aboriginal Heritage Act 2006 is currently under review and as such any regional documentation on the cultural heritage asset class developed to support the 2013-19 RCS will be amended when and as appropriate.



Our Community Capacity

The inherent knowledge, understanding and willingness that the community has for effective and sustainable natural resource management.

Communities of the Mallee are at the heart of the current and future management of our natural, productive and cultural landscapes.

NRM is a cooperative endeavour between the community, industry and government; with effective action requiring effective partnerships. To maintain effective partnerships and achieve the goals of this RCS, a well-informed community with the skills and confidence to identify, direct and implement change is essential.

Our communities' capacity is defined by their characteristics and resources which, when combined, determine their ability to identify, evaluate and address key issues.

In a natural resources context, it involves the capability of Mallee communities to work cooperatively, apply economic resources, use networks, and gain knowledge to achieve NRM outcomes. It is dependent not only on the financial, physical and natural resources contained within a community, but also its social resources.

The Mallee has a proud history of the community generating and implementing innovative and complex NRM projects and plans. Examples of the diverse range of groups and individuals involved in NRM in the Mallee include private land

managers, Landcare groups, 'Friends of' groups, industry based groups, sporting and other special interest groups, Indigenous communities, schools, and private businesses.

Our Landcare groups play a major role in harnessing and promoting the interests of local communities in natural resource management issues. Each group provides a connection between the individual managers of separate properties and the wider community; increasing awareness of conservation issues, encouraging coordinated effort, and providing access to shared resources.

The region's industry based groups such as Mallee Sustainable Farming, Birchip Cropping Group, Murray Valley Winegrowers Inc., Murray Valley Citrus Board, Dried Fruits Australia, Australia Table Grape Association, and the Victorian Farmers Federation play an important role in developing and promoting best practice for competitive and sustainable agricultural sectors.

Awareness, concern and engagement of individuals in NRM issues across the Mallee is promoted and advanced by a wide range of special interest groups such as WaterWatch, Friends of Kings Billabong, Mid Murray Field Naturalists, BirdLife Mildura, and the Victorian Malleefowl Recovery Group. These groups play an important role as a means for individuals to become engaged in activities and programs that reflect their particular concerns. They also provide

the region with vital sources of knowledge and understanding on specific issues.

Groups such as the Mallee CMA Aboriginal Reference Group provide opportunities for our local Indigenous communities to have input into how the region's landscapes are managed; and enhance regional awareness of the cultural values inherent within these landscapes.

Further detail on the region's community groups is available on the Mallee RCS website: rcs.malleecma.vic.gov.au

Many of the region's private land managers also continue to individually make significant contributions to the condition of our natural and productive landscapes through the implementation of both targeted actions (e.g. revegetation, stock containment, conservation covenants), and their widespread adoption of improved management practices (e.g. minimum/no till farming, irrigation system upgrades).

Local knowledge and effort is fundamental to the current and future management of our natural, cultural and productive landscapes. A Mallee community with the capacity to identify, direct and implement change provides:

- Landscape scale improvements in the condition of our assets and in the value of the environmental, social and economic services they provide;
- Strengthened social networks;
- Increased community cooperation and mutual respect; and
- Sense of place.

Objectives (20 year)	Strategic actions (6 year)
To increase community capacity for, awareness of, and participation in efforts to protect the Mallee's natural, cultural and agricultural landscapes.	Continue to develop and implement community education programs to increase awareness of the Mallee's natural, cultural and productive assets; and to encourage actions which contribute to their protection and enhancement.
	Continue to develop and implement programs which support land managers to act as responsive and effective stewards of our natural, cultural and productive landscapes.
	Continue to develop and implement programs which support land managers to identify, and where appropriate respond to emerging threats and opportunities.
	Continue to support the development and review of whole farm and landscape scale management plans which consider natural, cultural and productive landscapes.
	Continue to develop and implement programs which support Indigenous communities to promote and apply traditional ecological knowledge.
	Continue to support, enhance and participate in regional NRM partnerships to plan, deliver and report on the Mallee RCS and associated management plans.

Valuing our Community's Capacity for NRM

Community capacity at the regional scale is an essential asset; with positive and long-lasting NRM outcomes dependent on an active, willing and capable community.

While a collective or community-based approach to NRM ultimately benefits the condition of our natural, productive and cultural landscapes (and the environmental, social and economic values associated with these); the skills gained and the strengthened social networks achieved through participation provides for increased community cooperation, mutual respect, sense of place, and education.

Threats to our Community's Capacity for NRM

The majority of processes impacting on the Mallee's community capacity for NRM are a result of external drivers such as population dynamics, market variability and climate change. Drivers which are

largely outside the scope of the RCS to manage (see Section 2, Our Challenges and Opportunities).

In common with our other assets classes, misaligned community perceptions are a key process which threatens the region's capacity for NRM. These are opinions, approaches and values that run counter to the knowledge available about natural resource management and threaten the success of the wider community's efforts to enhance the environment.

Condition of the Mallee's Community Capacity for NRM

No regional scale baseline information currently exists on which to make an assessment of the current condition of our community's capacity for NRM.

Delivery of this RCS will address this information gap, with the establishment and ongoing measurement of condition indicators. Further information on the framework being employed to measure community capacity is provided on the RCS website: rcs.malleecma.vic.gov.au

Strategic Directions for the Management of our Community's Capacity for NRM

A number of federal, state and regionally based plans currently exist across industry and community groups, and all levels of government. These not only aim to increase the community's resilience and capacity, but also include specific objectives in relation to community-driven environmental outcomes.

The key documents considered in the development of the region's long-term (20 year) objective for the condition of our community capacity asset, and the short-term (6 year) strategic actions to be delivered over the life of the RCS include: Victoria's Volunteering Strategy 2009; the Victorian Landcare Program Strategic Plan (2012); and the Loddon Mallee Regional Strategic Plan (Northern Region) 2010.

A number of strategies relating to the region's community capacity for NRM are expected to be reviewed and renewed during the life of the 2013-19 Mallee RCS and as such, regional documentation on the Community Capacity Asset Class developed to support the 2013-19 RCS will be amended when and as appropriate.



Figure 22: NRM is a cooperative endeavour between the community, industry and government. Photos: Mallee CMA.







Section 4

Our Delivery Framework



Integrating and Targeting Delivery

Establishing a framework for integrating and targeting the delivery of actions detailed in this RCS will ensure that available resources are applied effectively and efficiently.

Section 3 sets long-term (20 year) objectives for the condition of each of our nine Regional Asset types and the short-term (6 year) strategic actions to contribute to these objectives over the life of this RCS.

Given the finite resources available to deliver these actions, it is not feasible to expect that they can be implemented individually across the entire region within the timeframes of this RCS.

As such, a framework has been established by which the actions delivered under this RCS will be integrated and targeted to achieve the greatest returns on our efforts.

Table 5 provides an outline of the foundational activities required to implement this framework and the associated strategic actions.

Integrating Delivery

The long-term condition of our Regional Assets is often threatened by a common suite of processes. For example: invasive plants and animals; misaligned community perceptions; and salinity have the potential to impact on many values within our natural, cultural and productive landscapes. Similarly, actions employed in the management of one asset type can impact (both positively and negatively) on others.

In the past there has been a tendency to address the issues facing our assets separately, even though they are interrelated; which in some instances has resulted in duplication and inconsistencies.

Implementation of this RCS will recognise these interrelationships and seek to achieve integrated and multiple outcomes across asset classes where possible. This means developing and implementing programs which consider and manage all significant asset types (e.g. wetlands, terrestrial habitat, and agricultural land) within a specific landscape; across land tenures and management arrangements.

Targeting Delivery

The Mallee has diverse natural, cultural and productive landscapes which face a great many threats to their condition. The challenge is how we achieve the 'best' results with the limited resources available.

To meet this challenge the RCS will apply a 'targeted' delivery framework; in that the integrated 'whole of landscape' programs discussed above will be implemented in locations that deliver the greatest environmental, economic and social returns on our efforts.

Twenty individual target areas or 'Catchment Assets' have been developed in consultation with regional stakeholders to group our Regional Assets into significant landscapes for priority attention (see Figure 23). The spatial

boundaries allocated to each of these Catchment Assets have been derived from a combination of spatial analyses, expert workshops and stakeholder feedback.

Further detail on the processes employed in the development of these Catchment Assets, their asset values, key threatening processes, existing management plans and delivery partners is available on the RCS website: rcs.malleecma.vic.gov.au

To further focus and direct our efforts, 'highest priority' Catchment Assets will be identified through an assessment of their environmental, social and economic value, the severity and impact of associated threatening processes, and the availability of effective interventions; including the timeframe within which they may substantially reduce the threat.

Landscape action plans for each of the 'high' priority Catchment Assets will then be developed to document the key management actions required, and the roles and responsibilities of regional delivery partners.

To allow ongoing reviews and prioritisation processes, this information will be captured in a three-year implementation plan, as a supporting document to the RCS (see Figure 2). This will allow the region to review and renew our management priorities on an annual basis, and to ensure that best available information is informing the delivery of activities.

Table 5: Foundational activities and strategic actions for integrating and targeting delivery.

Foundational Activities	Strategic (6 yr) actions
Integrate delivery across multiple asset classes (the how) – Develop and deliver landscape (Catchment Asset) scale programs which address key threats to multiple asset classes (e.g. wetlands, soils, terrestrial habitat).	Continue to develop and implement landscape scale programs which address key threats to the Mallee's natural, cultural and agricultural landscapes; and deliver environmental outcomes for multiple asset classes. Continue to develop and implement programs which encourage private land managers to deliver environmental outcomes; and where possible integrate delivery across asset classes.
Target delivery to achieve greatest return (the where) – Direct investment/effort to priority landscapes (Catchment Assets).	Apply regional prioritisation framework to each of the RCS's 20 priority landscapes (Catchment Assets) and identify 'highest priority' for inclusion in targeted delivery programs. Develop a Mallee RCS Implementation Plan to document high priority landscapes (Catchment Assets), their asset values and key threatening processes; the priority management actions required to address these threats, and the roles and responsibilities of regional delivery partners.

As with the Regional Assets, already developed regionally and locally based plans will be reviewed to ensure that existing commitments and priorities for each of these landscapes are captured; and comprehensive stakeholder engagement processes will ensure that government, industry and community expectations and priorities for these Catchment Assets are recognised.

In applying this framework, it is also recognised that many communities

and stakeholders will have areas of interest which are at a local scale and/or outside these priority delivery areas. Several of these 'Local Assets' have been nominated through stakeholder workshops conducted as part of the development of this RCS and recorded on the Mallee RCS website (rcs.malleecma.vic.gov.au) using an interactive map. Stakeholders are able to continue to identify areas of local significance on this interactive map throughout the life of the RCS.

It is important that our communities continue to be supported to deliver management actions for these local priorities by: encouraging and supporting them to apply for grants where available; ensuring they have access to best available information in regards to their local assets; and providing technical advice on best management practice for proposed management actions.

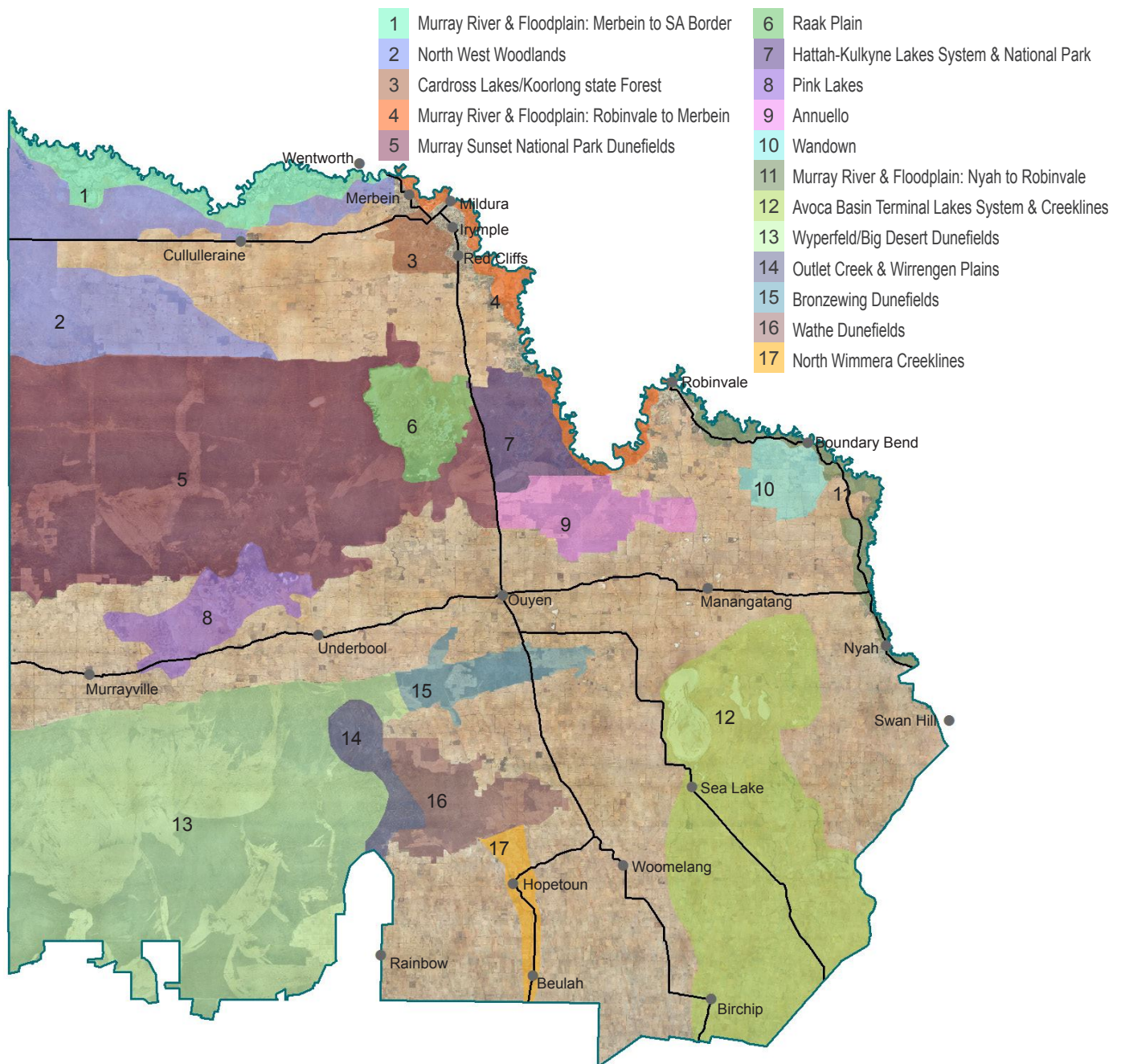


Figure 23: Catchment Assets (*N.B Agricultural land (dryland and irrigated) and the Murrayville Water Supply Protection Area have been identified as priority assets but are not spatially illustrated).

Monitoring, Evaluating, Reporting and Improving Delivery

A critical component of any strategic instrument such as this RCS is the capacity for adaptive management. That is can it be flexible in the face of new information, unexpected outcomes and the uncertainty that is inherent to natural resource management. A monitoring, evaluation, reporting and improvement (MERI) framework is one way to provide that flexibility.

This framework is a simple mechanism that can be used to incorporate the principles of MERI into the implementation of the RCS. It will provide the capacity to understand and record the successes (or otherwise) and knowledge that comes from RCS implementation.

The primary intention of the framework is that it will form the basis to adequately review and report on the RCS at key points throughout its implementation period.

A secondary intention is that it supports all regional stakeholders to incorporate their achievements into the implementation and reporting of the RCS. For this to occur as part of each stakeholders own annual reporting requirements, the framework must provide for a variety of delivery and reporting approaches.

Table 6 provides an outline of the foundational activities required to implement the MERI framework and associated actions to be delivered over the life of the RCS. Delivery of these strategic actions will be incorporated into the wider RCS implementation process.

A detailed MERI Plan will be developed and incorporated into the three year (rolling) Implementation Plan; as a supporting document to the RCS (see Figure 2). This will allow for the annual review of MERI activities and further support continuous improvement and adaptive management processes.

MERI

The RCS MERI Framework will be applied at key intervals: annually, three-yearly (mid-point of RCS implementation) and six-yearly (end point of the RCS implementation).

The *Catchment and Land Protection Act 1994* (CaLP Act) requires the Mallee CMA to report annually on the condition and management of land and water resources on behalf of the region. This annual report provides the opportunity to review the scope and scale of the region's interventions in accordance with expectations, and document any short-term delivery outcomes (e.g. threat abatement at point of investment) at the landscape (i.e. Catchment Asset) scale.

The Act also requires the CMA to assess the effectiveness of RCS implementation in promoting improved use of land and water resources and treating land degradation. To this end, the MERI Framework requires a mid-term and a full-term review of the RCS. These reviews will expand on the annual reporting process through focusing on:

- Examining available evidence on change in asset condition;
- Progress towards the 20 year objectives; and
- Effectiveness and efficiency of RCS implementation.

These annual, mid-term and full-term reviews will be prepared with the expectation that they will provide useful information and mechanisms that will enhance the remaining RCS implementation period and inform the development of the next RCS.

This review and continuous improvement process will be driven by a series of key evaluation questions. These questions provide the background to evaluating the impact, effectiveness, appropriateness, efficiency and legacy of the RCS and its implementation. The questions inform the direction of any information gathering efforts and provide the basis of the scope and scale of such an inquiry (Table 7).

The direction, scope and scale of the inquiry necessary to address the evaluation questions will provide a sense of the activities, actions, and partnerships required.



Figure 24: Monitoring long-term changes in the condition of assets helps identify the impacts of management actions. Photo: Arthur Rylah Institute.

Program Logic

Key to any MERI framework is consideration of the anticipated cause and effect relationships between planned actions and anticipated outcomes. Our program logic for this RCS visualises the expected hierarchy of outcomes that indicate progress towards our regional vision and objectives over time; documenting the region's understanding of how the RCS will impact on our Regional Assets and their management over time.

The RCS logic is informed by a suite of knowledge, science, and experience drawn from right across the region and its community. The development

process has taken this regional evidence base and applied assumptions inherent within the RCS implementation phase to produce a theory of change as detailed in Figure 25.

The key assumptions being that:

- The region's strategic intentions over the life of the RCS are the right mechanisms that have sufficient scope and scale to contribute meaningfully to the 20 year objectives;
- There will be sufficient resources available to the region over the life of the RCS to implement its strategic intentions with sufficient scope and scale to contribute meaningfully to the 20 year objectives;
- Externalities such as climate and market conditions influence the Mallee over the life of the RCS in accordance with long term median expectations; and
- Land managers continue to engage with regional NRM stakeholders and remain enthusiastic and empowered to act on NRM principles.

Table 6: Foundational activities and strategic directions for continuous improvement and RCS evaluations.

Foundational Activity	Strategic (6 yr) actions
Applying an Asset Based Approach: Continuous improvement through enhancement of the regions evidence base on:	Continue to support investigations into the extent and distribution of the region's natural, cultural and agricultural assets.
• our asset values;	Continue to support investigations into the values and services provided by the region's natural, cultural and agricultural assets.
• the incidence, severity and potential impacts of threatening processes; and	Continue to support investigations into the extent, incidence and potential impacts of key threatening processes.
• the effectiveness and efficiency of available interventions.	Continue to support the identification and validation of management actions which address key threats to the region's natural, cultural and productive landscapes.
Monitoring Asset Condition (long-term): Evaluation of the long term changes in the condition of our cultural, natural and agricultural assets at the whole of region scale.	Support the ongoing measurement, and where required development of asset condition indicators to allow for effective and efficient long-term evaluation and reporting at the regional scale.
Monitoring Delivery Outcomes (short-term): Evaluation of the short term impacts of program / project delivery at the landscape (Catchment Asset) scale (i.e. threat abatement at point of investment).	Support the ongoing measurement, and where required development of integrated threat incidence and impact monitoring programs to allow for effective and efficient short-term evaluation and reporting at the landscape (i.e. Catchment Asset Scale).
Adaptive Management: Identify and respond to improved knowledge and new/emerging threats and opportunities.	Conduct annual reviews of Catchment Asset prioritisation outcomes and of the RCS Implementation Plan.
	Conduct mid and full term reviews of the 2013-19 RCS.
Recording and Communicating Outputs and Outcomes: Evaluation of RCS achievements against each of its objectives and strategic directions.	Provide an annual report on the condition and management of the region's natural, cultural and agricultural assets.
	Provide a mid and full term report on progress against the RCS's stated long-term objectives and short-term measures.
	Maintain and update a Regional Evidence Base to record and communicate all aspects of RCS delivery and evaluation.

Table 7: RCS evaluation questions.

Evaluation purpose	Evaluation questions
Impact	What progress towards the 20 year objectives has been identified? What level of progress can be attributed to the RCS?
	What impacts are apparent at the Catchment Asset or Local Asset scale as a result of the strategic interventions arising from the RCS implementation?
	What, if any, unanticipated positive or negative outcomes have resulted from the RCS implementation?
Effectiveness	To what extent have the strategic interventions contributed towards the expected 6 year objectives?
Appropriateness	Have our strategies and intervention methodologies conformed to 'best practice' throughout the project delivery period? If not why not?
Efficiency	Did our strategic interventions produce the expected level of contribution (at the end of each review period) to the 6 year objectives?
	Are there alternative or additional intervention options available to improve the region's contribution (at the end of each review period) to the 6 year objectives?
Legacy	What is the status of and trend in the condition of the Thematic Asset Class identified in the RCS?

50 Year Vision

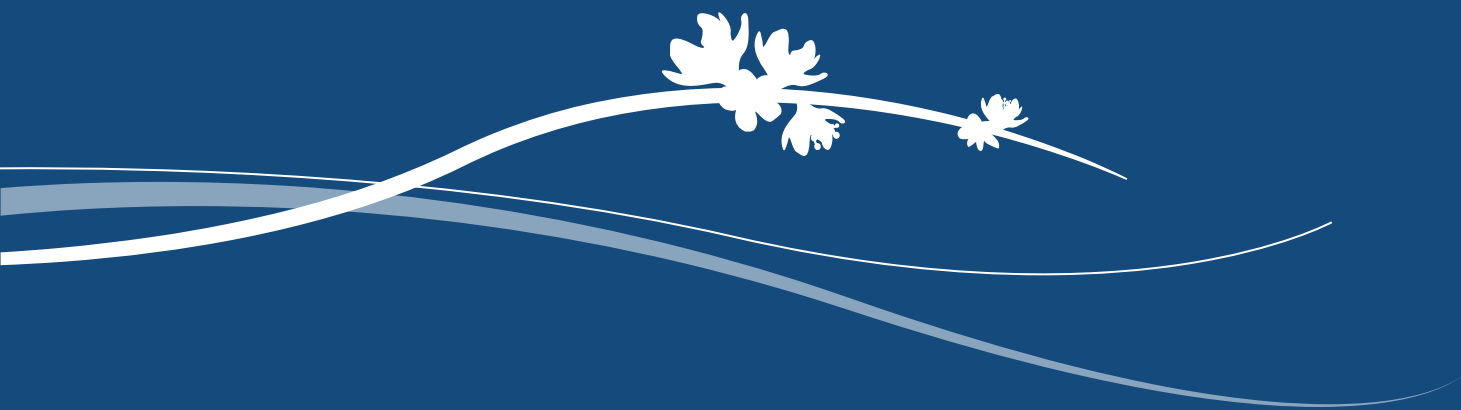
“Informed and active communities balancing the use of resources to generate wealth with the protection and enhancement of our natural and cultural landscapes.”



Regional Catchment Strategy Implementation Plan to be developed



Figure 25: Program Logic for the Mallee RCS



Section 5

Implementing the Strategy

Objectives, Actions and Delivery Partners

The RCS sets an aspirational vision, long term objectives, key foundational activities, and short term strategic actions to inform and direct its implementation. The identification of stakeholders primarily responsible for the delivery of these strategic actions provides the basis for ongoing partnership development and coordinated effort.

The RCS is based upon the vision of:

“Informed and active communities balancing the use of resources to generate wealth, with the protection and enhancement of our natural and cultural landscapes.”

The vision provides a long-term (50 year) statement of our community’s aspirations for the region and is based upon the following key principles:

- Recognising that our communities/people are crucial to the effective management of our regional assets, through the behaviours they adopt and support; and
- Recognising that to achieve widespread adoption and sustained environmental improvements in our natural landscapes, our actions should also deliver social and economic benefits to the community.

Long-term (20 year) objectives for each of our nine regional asset types remind us as a community of where we are going and what we want to achieve. They help us to look beyond our immediate work programs and practical tasks to gain a sense of why we are engaged in the vision.

Foundational activities outline the broad processes required to implement the RCS delivery framework. They support our capacity to deliver, but are not attributable to specific outputs.

Strategic Actions detailed for each of the RCS’s long-term objectives and foundational activities identify the short-term (6 year) measures to be delivered over the life of the RCS. They do not identify specific management activities or on ground targets as these are found within supporting strategies and action plans that sit under, and align to, the RCS.

Implementation of this RCS requires the support of Mallee stakeholders; that is all of the groups, organisations, communities and individuals who play a role in managing our natural, cultural and productive landscapes. Collectively they will be responsible for implementing the actions agreed to in this RCS.

An engagement and consultation framework, developed as a supporting



Figure 26: Community members developing environmental management action plans.
Photo: Mallee CMA.

Implementation of this RCS is underpinned by several guiding principles:

- Community engagement and the involvement of land managers is crucial to the effective implementation of programs;
- Prevention of ecosystem damage and species decline is more cost-effective than attempting rehabilitation or recovery;
- Decision making should be based on the best available knowledge and modelling, however decisions should not be avoided solely due to lack of scientific certainty;
- Decision making should recognise the linkages between land, water and biodiversity and that the management of one component can impact on the other;
- Actions should be targeted to where they will achieve the greatest environmental, social and economic outcomes;
- Actions should be planned at the appropriate spatial and temporal scales, recognising the complexity and linkages within and between natural, cultural and productive landscapes; and
- Programs should be flexible enough to adapt to changing circumstances or knowledge.

document to this RCS (see Figure 2), will detail the key communication and whole of community engagement processes to be employed throughout the strategy's implementation phase.

Effective partnerships will support the delivery of priority actions across multiple jurisdictions and scales. The Mallee partnership model is complex, reflecting the diversity of landscapes in which

we operate, and requires all parties to contribute in an integrated way to improving our assets.

Broad agreement among the region's partners regarding their roles in implementing this RCS forms the basis for coordination of effort to improve the condition of our most valued landscapes.

Tables 8, 9 and 10 outline each of the long-term objectives, foundational

activities, and associated strategic actions detailed within this RCS. Regional partners responsible for the delivery of each strategic action are also identified.

Further detail on the specific roles and responsibilities of regional partners in managing our natural, cultural and productive landscapes is provided on the Mallee RCS website:

rcs.malleecma.vic.gov.au

Table 8: Regional Assets - long-term objectives, strategic actions and delivery partners.

Long-term (20 yr) Objective	Strategic (6 yr) Actions	Regional Delivery Partners
1. Rivers: Rivers, streams, their tributaries, and surrounding riparian land (including the floodplain).		
1.1. To protect and enhance the environmental values of the Mallee's watercourses, their associated riparian ecosystems and, in turn, the social, economic and environmental services that they provide to the community.	1.1.1. Review the Mallee River Health Strategy, and develop and implement the Mallee Regional Waterway Strategy.	CMA, DEPI, Water Authorities, PV, DTPLI, Local Government, Community Groups, Private Land Managers.
	1.1.2. Review, update and implement the Mallee Floodplain Management Plan.	CMA, DEPI, Water Authorities, PV, DTPLI, Local Government, Community Groups, Private Land Managers.
	1.1.3. Continue to implement actions from the Northern and Western Region Sustainable Water Strategies that apply to Mallee rivers and riparian ecosystems.	CMA, DEPI, Water Authorities, PV, Local Government, TfN, Community Groups, Private Land Managers.
2. Wetlands: Individual wetlands, wetland complexes, and their associated floodplain ecosystems (including groundwater dependent ecosystems and the groundwater flow systems and aquifers they are reliant on).		
2.1. To protect and enhance the environmental values of the Mallee's wetlands and, in turn, the social, economic and environmental services that they provide to the community.	2.1.1. Review the Mallee Wetland Strategy, and develop and implement the Mallee Regional Waterway Strategy.	CMA, DEPI, Water Authorities, PV, DTPLI, Local Government, Community Groups, Private Land Managers.
	2.1.2. Continue to implement actions from the Northern and Western Region Sustainable Water Strategies that apply to Mallee wetlands and groundwater dependent ecosystems.	CMA, DEPI, Water Authorities, PV, Local Government, TfN, Community Groups, Private Land Managers.
3. Threatened Species Populations and Communities: Populations of threatened or significant species and occurrences of threatened communities.		
3.1. To protect and enhance the present diversity of Mallee threatened species and communities.	3.1.1. Continue to implement actions consistent with federal, state and regional prioritisation frameworks.	CMA, DEPI, PV, Local Government, Water Authorities, Community Groups.
	3.1.2. Continue to support the development, implementation and review of Action Statements and Recovery Plans for the region's threatened species and communities.	CMA, DEPI, PV, Local Government, TfN, Water Authorities, Community Groups.
	3.1.3. Support the implementation of ecologically appropriate burning regimes for protection of threatened species and communities.	DEPI, CMA, PV, Local Government, TfN, Water Authorities, CFA, Community Groups.
4. Terrestrial Habitat: Individual ecological classes or spatial occurrences of ecological vegetation classes based on their intrinsic value to their contribution to landscape processes (e.g. connectivity, refugia, buffering etc.).		
4.1. To protect and enhance the extent, condition and ecological connectivity of high value terrestrial habitat across all Mallee land tenures.	4.1.1. Review, update and implement the Mallee Native Vegetation Plan.	CMA, DEPI, PV, Local Government, TfN, VicRoads, VicTrack, Community Groups, Private Land Managers.
	4.1.2. Develop and implement a Regional Biolinks Plan to guide the delivery of cross-tenure habitat enhancement programs.	CMA, DEPI, PV, DTPLI, Local Government, TfN, VicRoads, VicTrack, Community & Industry Groups, Private Land Managers.
5. Soils: All soils regardless of the tenure and type of land systems to which they are subject.		
5.1. To protect and enhance the environmental values and ecosystem services provided by all Mallee soils.	5.1.1. Develop and implement a Regional Soil Health Plan for the Mallee.	CMA, DEPI, PV, DTPLI, Local Government, Community & Industry Groups, Private Land Managers.
6. Agricultural Land: All parts of the landscape that have been developed for the purpose of agricultural production.		
6.1. To optimise the productive capacity of Mallee agricultural landscapes, while minimising any adverse impacts of associated management practices (both current and historical) on our natural and cultural landscapes.	6.1.1. Continue to implement the Victorian Mallee Irrigation Region Land and Water Management Plan.	CMA, DEPI, Water Authorities, Local Government, Community & Industry Groups and Private Land Managers.
	6.1.2. Develop and implement a strategy for Mallee dryland agricultural land as part of the Regional Soil Health Plan.	CMA, DEPI, DTPLI, Community & Industry Groups, Private Land Managers.

Table 8 continued: Regional Assets - long-term objectives, strategic actions and delivery partners.

Long-term (20 yr) Objective	Strategic (6 yr) Actions	Regional Delivery Partners
7. Groundwater: Groundwater resources that are utilised for human use such as irrigation or stock & domestic water supplies (please note that groundwater within flow systems and aquifers upon which groundwater dependent ecosystems are reliant is captured within the Wetlands Asset Class).		
7.1. To protect the quality and availability of the Mallee's groundwater resource for current and future users.	7.1.1. Continue to implement the Murrayville Groundwater Supply Protection Area Management Plan.	GWMWater, CMA, DEPI, Community Groups, Private Land Managers.
	7.1.2. Continue to implement actions from the Western Region Sustainable Water Strategy that apply to the Murrayville Groundwater Supply Protection Area.	GWMWater, CMA, DEPI, Community Groups, Private Land Managers.
8. Culture and Heritage: Locations that have recognised cultural, historical or spiritual significance to all or part of the Mallee community and/or Australian community.		
8.1. To protect the extent and condition of Cultural and Heritage (Indigenous and non-Indigenous) sites across all Mallee Land Tenures.	8.1.1. Continue to support the development and implementation of Local Government Heritage Overlays in the Mallee.	Local Government, DEPI, PV, VicRoads, VicTrack, Community Groups, Private Land Managers.
	8.1.2. Continue to support the development and implementation of Cultural Heritage Management Plans in the Mallee.	CMA, DEPI, PV, Water Authorities, Local Government, VicRoads, VicTrack, Indigenous Community, Community Groups, Private Land Managers.
	8.1.3. Continue to support the protection and management of cultural heritage sites as an integral component of all land, water and biodiversity management processes.	CMA, DEPI, PV, Water Authorities, Local Government, TfN, VicRoads, VicTrack, Indigenous Community, Community Groups, Private Land Managers.
9. Community Capacity for NRM: The inherent knowledge, understanding and willingness that the community has for effective and sustainable natural resource management.		
9.1. To increase community capacity for, awareness of, and participation in efforts to protect the Mallee's natural, cultural and agricultural landscapes.	9.1.1. Continue to support the development and implementation of community education programs to increase awareness of the Mallee's natural, cultural and agricultural assets; and to encourage actions which contribute to their protection and enhancement.	CMA, DEPI, PV, Local Government, Water Authorities, TfN, Indigenous Community, Community & Industry Groups.
	9.1.2. Continue to support the development and implementation of programs which support land managers to act as responsive and effective stewards of our natural, cultural and productive landscapes.	CMA, DEPI, PV, Local Government, Water Authorities, TfN, Indigenous Community, Community & Industry Groups.
	9.1.3. Continue to develop and implement programs which support land managers to identify, and where appropriate respond to emerging threats and opportunities.	CMA, DEPI, PV, Local Government, Water Authorities, TfN, Community & Industry Groups.
	9.1.4. Continue to support the development and review of whole farm and landscape scale management plans which consider natural, cultural and productive landscapes.	CMA, DEPI, PV, DTPLI, Local Government, Water Authorities, TfN, Community & Industry Groups.
	9.1.5. Continue to develop and implement programs which support Indigenous communities to promote and apply traditional ecological knowledge.	CMA, DEPI, PV, Community Groups, Indigenous Community.
	9.1.6. Continue to support, enhance and participate in regional NRM partnerships to plan, deliver and report on the Mallee RCS and associated management plans.	CMA, DEPI, PV, DTPLI, Local Government, Water Authorities, VicRoads, VicTrack, TfN, Community & Industry Groups.

Table 9: Integrating and Targeting Delivery - foundational activities, strategic actions and delivery partners.

Foundational Activities	Strategic (6 yr) Actions	Regional Delivery Partners
10. Integrate delivery across multiple asset classes (the how)		
10.1. Develop and deliver landscape (Catchment Asset) scale programs which address key threats to multiple asset classes (e.g. wetlands, soils, terrestrial habitat).	10.1.1. Continue to develop and implement landscape scale programs which address key threats to the Mallee's natural, cultural and productive landscapes; and deliver environmental outcomes for multiple asset classes.	CMA, DEPI, PV, DTPLI, Local Government, Water Authorities, TfN, VicRoads, VicTrack, Community & Industry Groups, Private Land Managers.
	10.1.2. Continue to develop and implement programs which encourage private land managers to deliver environmental outcomes; and where possible integrate delivery across asset classes.	CMA, DEPI, TfN, Community Groups, Private Land Managers.
11. Target delivery to achieve greatest return (the where)		
11.1. Direct investment/effort to priority landscapes (Catchment Assets).	11.1.1. Apply regional prioritisation framework to each of the RCS's 20 priority landscapes (Catchment Assets) and identify 'highest priority' for inclusion in targeted delivery programs.	CMA, DEPI, PV, Water Authorities, Local Government, TfN, Community & Industry Groups.
	11.1.2. Develop a Mallee RCS Implementation Plan to document high priority landscapes (Catchment Assets), their asset values and key threatening processes; the priority management actions required to address these threats, and the roles and responsibilities of regional delivery partners.	CMA, DEPI, PV, DTPLI, Water Authorities, Local Government, TfN, VicRoads, VicTrack, Indigenous Community, Community & Industry Groups.



Figure 27: Implementation of this RCS requires the support of all Mallee stakeholders. Photos: Mallee CMA; bottom right: MDFRC.

Table 10: Monitoring Evaluating, Reporting and Improving Delivery - foundational activities, strategic actions and delivery partners.

Foundational Activities	Strategic (6 yr) Actions	Regional Delivery Partners
12. Applying an Asset Based Approach		
12.1. Continuous improvement through enhancement of the regions evidence base on: our asset values; the incidence, severity and potential impacts of threatening processes; and the effectiveness and efficiency of available interventions.	12.1.1. Continue to support investigations into the extent and distribution of the region's natural, cultural and agricultural assets.	CMA, DEPI, PV, Local Government, Water Authorities, Community Groups.
	12.1.2. Continue to support investigations into the values and services provided by the region's natural, cultural and agricultural assets.	CMA, DEPI, PV, Local Government, Water Authorities, Industry Groups.
	12.1.3. Continue to support investigations into the extent, incidence and potential impacts of key threatening processes.	CMA, DEPI, Parks Vic, Local Government, Water Authorities, Community & Industry Groups.
	12.1.4. Continue to support the identification and validation of management actions which address key threats to the region's natural, cultural and productive landscapes.	CMA, DEPI, PV, Local Government, Water Authorities, Community & Industry Groups.
13. Monitoring Asset Condition (long term)		
13.1. Evaluation of the long term changes in the condition of our cultural, natural and agricultural assets at the whole of region scale.	13.1.1. Support the ongoing measurement, and where required development of asset condition indicators to allow for effective and efficient long term evaluation and reporting at the regional scale.	CMA, DEPI, PV, Local Government, Water Authorities, Industry Groups.
14. Monitoring Delivery Outcomes (short term)		
14.1. Evaluation of the short term impacts of program/project delivery at the landscape (Catchment Asset) scale (i.e. threat abatement at point of investment).	14.1.1. Support the ongoing measurement, and where required development of integrated threat incidence and impact monitoring programs to allow for effective and efficient short term evaluation and reporting at the landscape (i.e. Catchment Asset Scale).	CMA, DEPI, PV, Local Government, Water Authorities, Industry Groups.
15. Adaptive Management		
15.1. Identify and respond to improved knowledge and new/emerging threats and opportunities.	15.1.1. Conduct annual reviews of Catchment Asset prioritisation outcomes and of the RCS Implementation Plan.	CMA, DEPI, PV, Water Authorities, Local Government, TfN, VicRoads, VicTrack, Community & Industry Groups.
	15.1.2. Conduct mid and full-term reviews of the 2012-18 RCS.	CMA, DEPI, PV, Water Authorities, Local Government, TfN.
16. Recording and Communicating Outputs and Outcomes.		
16.1. Evaluate and communicate RCS achievements against each of its objectives and strategic directions.	16.1.1. Provide an annual report on the condition and management of the region's natural, cultural and agricultural assets.	CMA.
	16.1.2. Provide a mid and full-term report on progress against the RCS's stated long term objectives and short term measures.	CMA.
	16.1.3. Maintain and update a Regional Evidence Base to record and communicate all aspects of RCS delivery and evaluation.	CMA (maintain), DEPI, PV, Local Government, Water Authorities, TfN, Community & Industry Groups.



Section 6

Reference Material



Glossary

Aeolian (wind) Processes - The transporting and deposition of sediment particles through wind activity.

Alluvial Soils - Soils formed from sediments deposited on land by waterways, e.g. a river flood-plain.

Aquifer - A layer of underground sediments which holds groundwater or allows water to flow through it.

Biodiversity - Or biological diversity is the variety of life forms; plants, animals and micro-organisms, the genes they contain, and the ecosystems they form.

Biolink - Broad geographic areas identified for targeted action to increase ecological function and connectivity, improving the ability of plants and animals to disperse, recolonise, evolve and adapt naturally.

Biota - All of the living organisms within a specific geographic region or at a specific point in time.

Boinka - Broad, shallow depressions occurring as discrete groundwater discharge features which contain a distinct suite of landforms (i.e. sand plains, gypsum flats, gypsite (copi) hills, salinas, and bordering dunes).

Conservation - To manage, preserve and enhance biological diversity and natural ecosystem functions.

Conservation Status - A description of the rarity of Victorian flora and fauna. The smaller the population, the rarer the species is and the more critical the conservation status.

Discharge Site - Location where groundwater reaches the soil surface.

Directory of Important Wetlands (DoIW) - Identifies nationally important wetlands providing a knowledge base of what defines wetlands, their variety, and the flora and fauna species that depend on them. It also contains information about their social and cultural values and some of the ecosystem services and benefits they provide.

Ecosystem - A diverse and changing set of living organisms within a community, interacting with each other and with the physical elements of the environment in which they are found. Ecosystems are identified at various scales.

Ecosystem Services - The goods and services provided by ecosystems that are valued by people because of the role they play. They include provisioning services such as food and water; regulating services such as maintenance of soil health and resistance against erosion, resistance against pest species invasion; cultural services such as sense of place; and supporting services such as water and nutrient cycling.

EC Units - Electrical Conductivity provides a fast and convenient way to measure relative salinity levels. Sea water has a salinity of about 50,000 EC Units.

Gigalitre (GL) - 1,000 mega litres.

Grazing Pressure - The combined effects of all grazers (both native and introduced) on vegetation and associated habitat

Habitat - The place or environment in which species naturally occur.

Hectare (ha) - 10,000 square metres

Invasive Animal - An introduced animal species declared by the Minister under the CaLP Act 1994 in one of four pest animal classes: 'prohibited pest animal', 'controlled pest animal', 'regulated pest animal' and 'established pest animal'.

Invasive Plant - An introduced plant species declared by the Minister under the CaLP Act 1994 in one of four weed categories: 'State Prohibited Weeds', 'Regionally Prohibited Weeds', 'Regionally Controlled Weeds', and 'Restricted Weeds'.

Macrophytes - Aquatic plants, growing in or near water that are either emergent, submergent, or floating

Megalitre (ML) - 1 million litres.

Native Vegetation - All plants that are indigenous to the region, including trees, shrubs, herbs, and grasses.

Private Diverters - Irrigators licensed to pump water directly from the river.

Pumped Irrigation Districts - Irrigation districts supplied by large pumps capable of supplying multiple irrigators.

Ramsar Convention (The Convention on Wetlands) - An intergovernmental treaty, signed in Ramsar, Iran in 1971. It provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Recharge - Process where water moves downward from the surface to below plant roots, and becomes groundwater.

Regeneration - Natural restoration of plant species and/or communities.

Remnant Vegetation - Native vegetation remaining after an area has otherwise been cleared.

Revegetation - The deliberate planting of vegetation that is similar to pre-existing vegetation types for that area.

Salina - Depressions holding salty groundwater that are often evaporative

Salinity - The concentration of dissolved salts in ground water or surface water, usually expressed as EC Units.

Stakeholder - Any individual, group or organisation having an interest in a field or matter.

Traditional Owner - An Aboriginal person who, in accordance with Aboriginal Tradition, has social, economic or spiritual affiliations with, and responsibilities for, a site or object.

Waterway - A river, creek, stream or watercourse; a natural channel in which water regularly flows, whether or not the flow is continuous; or a lake, lagoon, swamp or marsh (as defined in the *Water Act 1989*).

Appendices

Appendix 1: RCS Engagement and Communications Activities Conducted.

Table 11 provides a summary of the 'direct' engagement activities that have been conducted to inform the development of this 2013-2019 Mallee Regional Catchment Strategy.

Table 11: Direct engagement activities conducted to inform RCS development.

Audience	Representation	No. of Workshops
Mallee CMA Board	Ministerially appointed community members	8
Regional Catchment Strategy Steering Committee	Comprised of representatives from: <ul style="list-style-type: none"> • Dept. of Environment and Primary Industries; • Parks Victoria; • Lower Murray Water; • GWMWater; • Mallee CMA Board; • Mallee Lands CAC; • Mallee Irrigation & Environment CAC; • Aboriginal Reference Group; and • Mallee CMA Management. 	7
Mallee CMA Irrigation & Environment Community Advisory Committee	Comprised of 9 Mallee community members.	3
Mallee CMA Mallee Lands Community Advisory Committee	Comprised of 9 Mallee community members.	3
Mallee Aboriginal Reference Group	Comprised of representatives from: <ul style="list-style-type: none"> • Aboriginal Elders; • Traditional Owner Representatives; • Dept. of Environment and Primary Industries; • Parks Victoria; • Mallee CMA Board; and • Mallee CMA Management. 	5
Local Government	Comprised of representatives from: <ul style="list-style-type: none"> • Buloke Shire Council - Councillors; • Gannawarra Shire Council - Councillors; • Mildura Rural City Council - Councillors; • Swan Hill Rural City Council - Councillor; and • Yarriambiack Shire Council - Councillors. 	5 (1 x each LGA)
Landcare	6 Landcare networks encompassing 22 groups	6 (1 x each network x 22 groups)
	Individual Landcare Group Meetings	2 (Individual groups)
Industry Based Groups	Including: <ul style="list-style-type: none"> • Mallee Sustainable Farming – Staff and community Board Members; • Birchip Cropping Group - Staff; and • Private Diverter Groups - Irrigators. 	14
Other Interest Groups / Organisations	Including: <ul style="list-style-type: none"> • Tri-state NRM Group – CMA Management and Chairs; • Traditional Indigenous Ecological Knowledge Workshop - Participants • BirdLife Mildura • Trust for Nature – Management and Staff 	3

Table 11 continued: Direct engagement activities conducted to inform RCS development.

Audience	Representation	No. of Workshops
Mallee CMA Biodiversity Technical Advisory Committee	Comprised of representatives from: <ul style="list-style-type: none"> • Dept. of Environment and Primary Industries; • Parks Victoria; • Lower Murray Water; • Mallee CMA Board; • Mildura Rural City Council - Staff; • Swan Hill Rural City Council - Staff; • Trust for Nature; • Mallee Irrigation & Environment Community Advisory Committee; • Mallee Lands Community Advisory Committee; • Arthur Rylah Institute; and • Mallee CMA Management. 	5
Mallee CMA Land Resources Technical Advisory Committee	Comprised of representatives from: <ul style="list-style-type: none"> • Dept. of Environment and Primary Industries; • Grampians Wimmera Mallee Water - Staff; • Mallee CMA Board; • Birchip Cropping Group - Staff; • Mallee Sustainable Farming - Staff; • Mallee Lands Community Advisory Committee; and • Mallee CMA Management. 	4
Mallee CMA Regional Sustainability Technical Advisory Committee	Comprised of representatives from: <ul style="list-style-type: none"> • Dept. of Environment and Primary Industries; • Lower Murray Water; • Mallee CMA Board; • Mallee Irrigation & Environment Community Advisory Committee; • Mallee CMA Management. 	4
Mallee CMA Rivers & Wetlands Technical Advisory Committee	Comprised of representatives from: <ul style="list-style-type: none"> • Dept. of Environment and Primary Industries; • Parks Victoria; • Murray Darling Freshwater Research Centre; • Mallee CMA Board; • Mallee Land Community Advisory Committee; • Mallee Irrigation & Environment Community Advisory Committee; • Mallee CMA Management. 	4

A range of 'indirect' communications were also developed and circulated to promote the RCS renewal process and to encourage feedback from all stakeholders on key concepts as they were being developed. A summary of these is provided in Table 12.

Table 12: Communication outputs delivered to promote and inform RCS development.

Medium	Audience	No.
Correspondence & Information Packages	Community & Industry Groups Local Government	87
Email Updates	Mallee CMA Partner Agencies and Local Government Community and Industry Groups	11
Newsletter Articles	Partner Agencies Groups and Individuals with NRM and Production Interest	4
Media Articles	Wider Mallee Community.	2
Field Days	Irrigation Community and Dryland Community	3
Fact Sheets	Partner Agencies Local Government Community and Industry Groups Wider Mallee Community	3

Appendix 2: Key threatening processes by Asset Class.

Threatening Process	Description	Rivers	Wetlands	T S & C	Terr Hab	Soils	Ag Land	G'water	Cult Her	Com Cap
Land & water salinisation	The Mallee contains significant areas of naturally saline landscapes. Some river reaches contain natural linkages to saline groundwater systems. However, over the last century, the region has been altered via agricultural development and river regulation. Salt flows to the Murray River have increased and an additional 55,000 ha of saline (surface) soils has been created.	X	X	X	X	X	X	X		
Invasive Plants	Invasive plants in the Mallee threaten both the biodiversity and the productive capacity of our land and water Assets. Agricultural weeds cause significant losses for horticulture and dryland farming through competition with crops and by reducing the quality of produce. Their control increases the cost of production and, in extreme cases, can diminish the productive capability of the land. Environmental weeds compete with indigenous plants for resources and can change the composition of floristic communities, reduce the quality and extent of native vegetation, and reduce the diversity and availability of habitat for biota.	X	X	X	X	X	X			
Invasive Animals	The Mallee region plays host to populations of European Red Fox, feral cats, rabbits, feral pigs, wild dogs, the house mouse, carp and goats as well as a number of other invasive animal species. Of most significance to the Mallee are the European Red Fox, Carp and the Rabbit. Invasive animals have, or have the potential to have, an undesirable economic, environmental or social/cultural impact. Such impacts may include damage to agricultural crops, livestock predation, indigenous fauna predation, soil erosion and land degradation, spread of weeds, pasture/food and habitat competition, and the potential spread of disease.	X	X	X	X	X	X		X	
Altered Hydrological Regimes	Modification of our river systems natural flow regimes has occurred to meet the various needs of navigation, agriculture and urban water use over time. Flow regulation has resulted in changes in the frequency, magnitude and duration of flows, and the restriction of small to medium flood events. River regulation, including the effect of locks, weirs and dams, has altered wetting and drying phases of many wetlands and ephemeral anabranches, by either permanently inundating the area, or restricting flows. This has significance for floodplain vegetation communities, fish populations, algae, nutrient cycling, biodiversity, water quality, channel shape and form, and submerged and emergent aquatic macrophytes.	X	X	X	X	X	X	X	X	
Soil Erosion	Soil erosion in the Mallee is primarily confined to two processes: wind erosion and water erosion. Wind erosion is typically a regional scale process whereas water erosion primarily occurs in discrete locations on the sides and banks of some watercourses. Mallee soils are highly susceptible to erosion given their light structure and the typical climate. However, the actual likelihood of erosion occurring depends on how the land is managed. Wind erosion degrades the soil, reducing its capacity to sustain biodiversity and to support agricultural production. It can also have significant off-site impacts on infrastructure, air quality and respiratory health.	X	X	X	X	X	X		X	
Inappropriate Water Use Practices	Inappropriate water use practises in agricultural activities in both the irrigation and dryland zones have been demonstrated to result in excessive volumes of deep drainage past the root zone of crops and pasture and therefore contribute to the raising of local and regional water tables.	X	X	X	X	X	X	X	X	
Recreational Pressures	Recreational pressure can contribute to impacts including littering, track proliferation, fishing pressures, firewood collection, soil compaction and site erosion. The nature of the impacts is typically localised around the particular site and is highly dependent on the accessibility, popularity and sensitivity of the site along with the level of management that the location receives.	X	X	X	X				X	
Land Use Change	The change of land management or use practices from either a steady state or from accepted best practice management system. Examples include the removal of native vegetation, conversion of dryland property to irrigation development (or the reverse), change from no-till cropping to inappropriate cultivation practices.	X	X	X	X	X	X	X	X	

Threatening Process	Description	Rivers	Wetlands	T S & C	Terr Hab	Soils	Ag Land	G'water	Cult Her	Com Cap
Direct Off-site Interactions	Direct physical impacts from land management activities on neighbouring off-site assets such as areas of remnant native vegetation or wetlands. Such interactions may include chemical spray drift; parking or storage of machinery and equipment; or incremental drift of cultivation into the asset.	X	X	X	X	X	X		X	
Misaligned Community Perceptions	Community opinions, approaches & values that run counter to the messages & knowledge available about natural resource management AND threaten the success of the wider communities' efforts to enhance their environment. Such perceptions include 'right of unfettered access' that results in removal of traffic management infrastructure installed near river banks; and 'we are doing no harm' where individuals are not aware of the cumulative and incremental harm of some of their actions (along with those of the rest of the community) when they are making use of our assets.	X	X	X	X	X	X	X	X	X
Inappropriate Fire Regimes	Fire is an ongoing challenge for land managers and communities alike. Fire is also a major force determining the structure, function and sustainability of Mallee ecosystems. A substantial proportion of the regions unique biota is dependent, to varying degrees, on fire and the variety of fire regimes for its continued existence and development. In this context, inappropriate fire regimes can mean either too little or too much fire.			X	X					
Constrained Regenerative Capacity	The decline in vegetation cover and habitat complexity within remnant native vegetation can constrain or prevent regeneration which can lead to loss of habitat in the longer term. There are many contributors to this threatening process including weed invasion, excess grazing pressure, and habitat fragmentation. Loss of understorey flora and associated fauna are a possible outcome, also leading to a reduction in the capacity of the remnant to support flora and fauna species or maintain current population numbers, thus impacting on the biodiversity value of the asset.	X	X	X	X					

Abbreviations used in table heading:

T S & C	Threatened Species and Communities
Terr Hab	Terrestrial Habitat
Ag Land	Agricultural Land
G'water	Groundwater
Cult Her	Culture and Heritage
Com Cap	Community Capacity

