



Wimmera **Regional** Catchment Strategy

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

2013- 2019



Victorian
Catchment
Management
Council



Wimmera CMA



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The level of government investment in this strategy is contingent on budgets and government priorities.

Pictures supplied by Christine Bull & David Fletcher.

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Welcome to the Wimmera's Regional Catchment Strategy

The Regional Catchment Strategy (RCS) is the overarching strategic framework for natural resource management (NRM). It builds on and acknowledges the visionary leadership, community ownership and practical on-ground outcomes that have occurred. It defines the future objectives and priority management measures applicable to all NRM practitioners, including community groups, individuals, government and non-government organisations.

Presentation of the strategy has been divided into two sections:

Local government natural assets — natural assets that lie within the context of local government boundaries. This recognises the importance of community ownership, participation and management.

Natural assets — these assets have been identified under five thematic classes, including:

- Rivers and streams
- Wetlands
- Native vegetation
- Threatened plants and animals
- Soils

A section on fire management and emerging opportunities and challenges for NRM in the region has also been included. While these are not a requirement under the state guidelines, they are issues that the community raised as being fundamental to the future management of NRM in the region. For this reason, they have been included as stand-alone sections.

The RCS links and integrates with other strategic documents that influence NRM across the catchment. One example is the Wimmera Southern Mallee Regional Growth Plan, which identifies opportunities for future growth and aims to manage change that will occur over the next thirty years.

Overwhelming support and feedback was received from the community during the development of this strategy.

Vision

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

This vision is driven by a triple bottom line approach, where the aim is to improve the environment while providing the greatest social and economic benefits for the community.

RCS aim

The RCS aims to provide focused, integrated and coordinated direction for all NRM activities in the Wimmera.

Inclusiveness and working together

The RCS sets twenty-year objectives and six-year management measures. Many of these desired outcomes will require a partnership approach across a range of industries and disciplines.

Groups and individuals are encouraged to use this strategy to assist in developing funding proposals and guiding NRM activities.

RCS framework

Catchment Management Authorities (CMAs) in Victoria are required to develop a RCS, the overarching strategy for natural resource management in a region, under the *Catchment and Land Protection Act 1994*. The strategy is consistent with guidelines set out by the Victorian Catchment Management Council (VCMC) and the Department Environment and Primary Industries (DEPI).

It is also informed by a suite of other state and federal government legislation and policy (listed in Appendix 1, available at www.wcma.vic.gov.au) and gives a regional context to state and federal legislation and policy.

The RCS is an umbrella strategy that encompasses several other regional strategies. The broad objectives of the RCS (and regional strategies) are to link each of the strategies together.

Determining investment priorities

Action plans — will be developed in consultation at the completion of the RCS. The action plans will be based on existing works, identified gaps, market research and policy direction. They will provide a clear outline on how each objective and management measure will be met and by whom. The action plans will guide investment, be based on collaboration and focus on value for money.

Investment plans — are funding proposals that deliver on action plans and investor priorities. They will be developed by a range of partner organisations including Wimmera CMA.

Triple bottom line

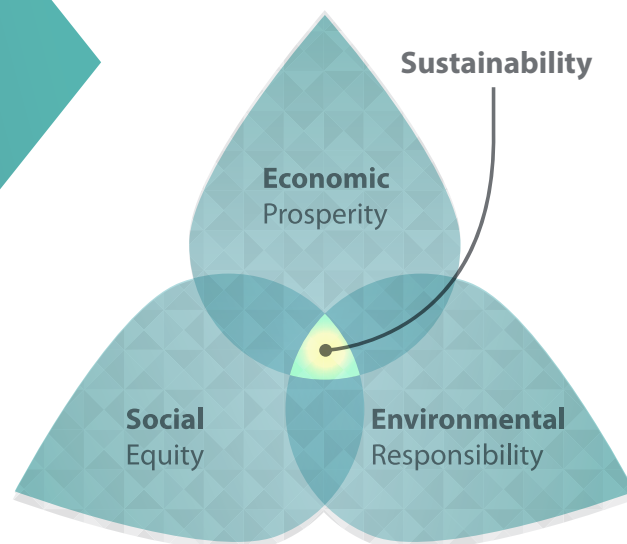
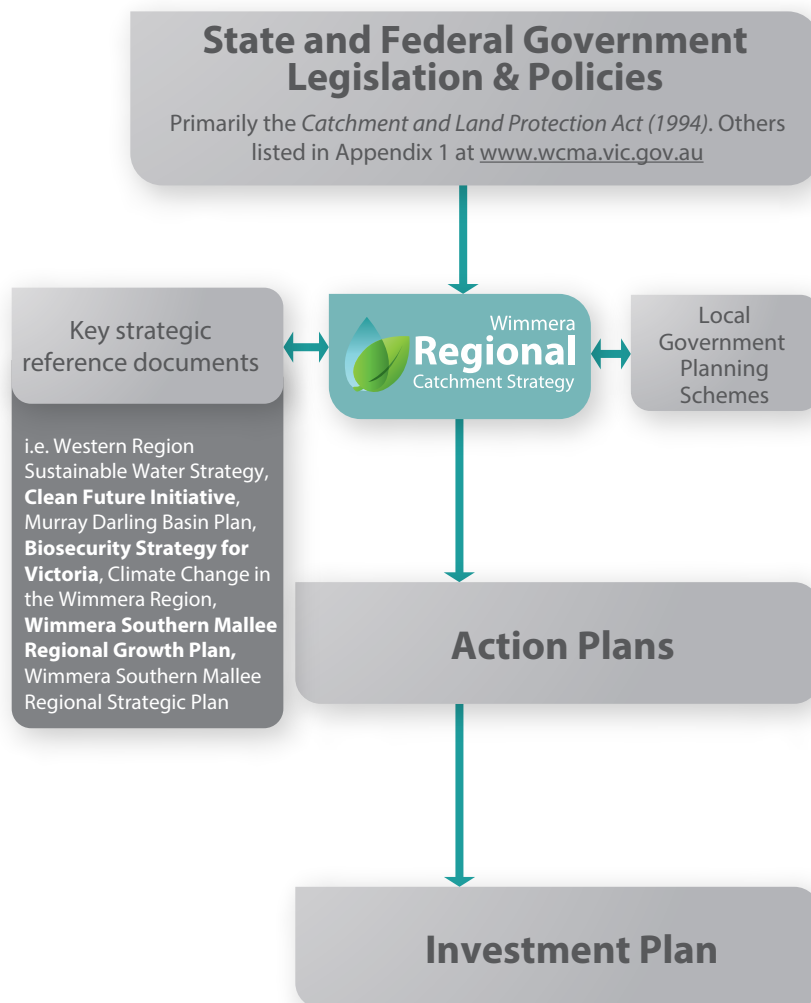


Figure 1: Policy context for the RCS



RCS development process

Key findings of 2003–2008 strategy review

A review of the previous RCS was conducted in 2010 through a series of meetings with partners and stakeholders. The review found a number of areas for improvement:

- A need for greater flexibility to enable adaptation.
- Greater emphasis on strategic direction.
- A perception was that there was little delineation of order of importance around the action items and targets. There did not appear to be a clear rationale for priority setting.
- Meaningful, ongoing engagement with stakeholders is required in order to successfully implement an RCS.

The development process for the 2013 RCS

1. Charles Sturt University (CSU) undertook market research, providing baseline NRM information and social trends. This was the third regional study undertaken of its kind, and surveyed 496 landholders.
2. Community consultation took place with more than 50 meetings with stakeholders and community-based organisations, using the natural assets as a basis for discussion. Consultation objectives were to: clarify NRM agency roles, communicate the intent of the RCS, ensure a collaborative approach would be taken between partners in setting priorities, understanding community views around social, economic and environmental value of assets, and their aspirations for future NRM work. Wimmera Catchment Management Authority (Wimmera CMA) consulted with groups and received their input (listed in Appendix 2, available at www.wcma.vic.gov.au)
3. Wimmera CMA Board and advisory committees reviewed the first draft.
4. Comment from DEPI and VCMC was sought and received.
5. A draft for public review was widely advertised and released for public comment over a five week period, including five public meetings. The draft was also taken to partners for comment and roles and responsibilities were adjusted as necessary.
6. Individual comments and editorial responses will be tracked and made available on request.
7. Wimmera CMA Board approved the final draft.
8. Minister for Environment and Climate Change and Minister for Water approval has been granted.
9. Once released, the community will be engaged in the development of action plans and implementation strategies through Wimmera CMA advisory committees. These committees will also contribute to monitoring and evaluation against RCS management measures and objectives.

Monitoring, evaluation & reporting process

The *Catchment and Land Protection Act 1994* requires CMAs to track and report on the implementation of management measures articulated in the RCS. To achieve this, Wimmera CMA will aim to collect data from all partner organisations delivering RCS objectives and management measures.

Wimmera CMA will manage, develop and implement a monitoring plan for partner organisations in accordance with DEPI Monitoring, Evaluation and Reporting (MER) framework (see Figure 2).

This data will be collected, where possible spatially, reviewed and reported on towards the end of the annual reporting period. Partners will be included in the review process.

Using this data, a review of the management measures will be assessed by the relevant Wimmera CMA advisory committee. The five advisory groups are aligned directly with the five key natural assets of the RCS. These groups are guided by a framework of analysis, design, delivery and review for all natural asset projects.

Action planning for the subsequent year will be informed by that evaluation. This mechanism will allow for implementation tracking and adaptive management as required. It will also encourage collaboration and partnership building between stakeholders and the community.

The nominal period of the RCS is six years. It is expected that a formal review process will take place at the end of that period (end 2018).

Pragmatic condition change

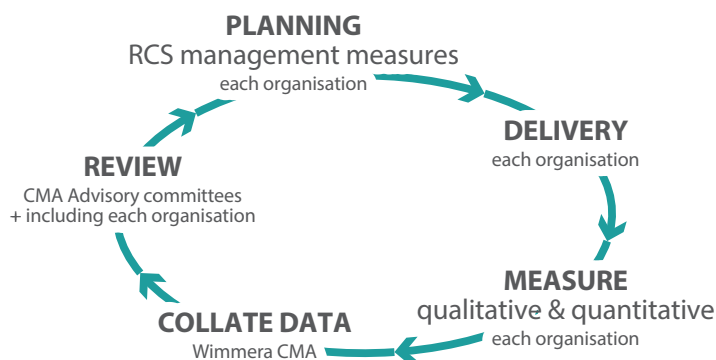
The response of the environment to NRM activities, known as 'condition change', occurs over long time frames and is also subject to other factors beyond the control of NRM organisations, such as drought and flood.

Similarly, influencing change in farming practices is subject to other factors, such as external economic factors, that are beyond the influence of NRM organisations.

The measurement of condition change and landholder practice change will be undertaken where specific funding is allocated for that purpose, recognising that the measurement of these changes is relatively resource intensive.

With this in mind, this strategy can be reviewed at any time and will undergo a mid-term review after three years (end 2015).

Figure 2: Process for MER



Regional overview

The Wimmera catchment boundary is located in western Victoria and covers an area of 30,000 km². It includes the Wimmera River catchment and the eastern part of the Millicent Coast Basin. The Wimmera River is the largest Victorian river that does not flow to the sea, but instead flows into a series of terminal lakes, the two largest of which are Lake Hindmarsh and Lake Albacutya.

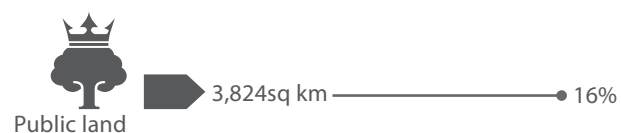
Environmental diversity ranges from mountains and plains, to desert; from moist foothill forest to Box–Ironbark Forest, Buloke Woodland, grasslands, wetlands and Mallee Heath. The average annual rainfall varies from 1,000 mm in the Grampians to as low as 300 mm across the Northern Plains.

The landscape is highly modified and is dominated by broadacre agriculture. Today approximately a quarter of all residents rely directly upon agriculture for their income. The best soils for agricultural productivity exist on privately owned farms, with the national parks and reserves generally containing less productive soils. Most of the vegetation that once covered the landscape is now rare or endangered. The national parks, reserves and state forests contain the more common vegetation types with The Grampians and Little Desert National Parks, the Black Range, Mt Arapiles–Tooan State Parks and the Pyrenees Range being the largest of these areas.

Strips of riparian vegetation along waterways connect these parks, particularly in and around the Grampians and Pyrenees. The Wimmera also contains 25 percent of Victoria's wetlands, which are predominantly in the south–west. In the West Wimmera Shire there is good connectivity of native vegetation because it holds a combination of wetlands in the swales and remnant stringybark vegetation on the adjacent dunes.

Region land mass

The Wimmera covers **10 percent** of Victoria's land mass and is the **fifth** largest catchment management area in Victoria, encompassing part or all of **eight** local government authorities.



Cultural

Wetlands provided an abundance of bush tucker and the big red gums made excellent canoes. Before European settlement the Mardidjali people resided here, now recognised as the broader Wimmera–Mallee Wotjobaluk people.



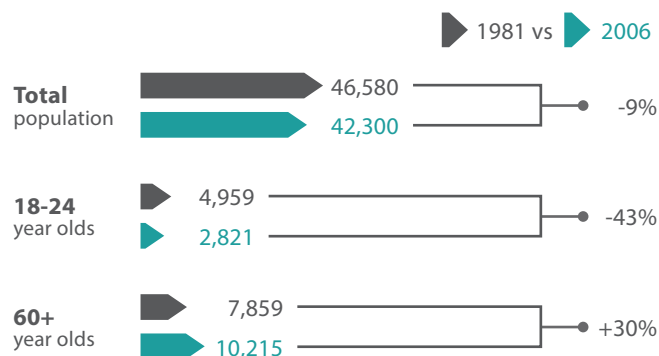
Cultural

There are 3 archaeological sites registered with Aboriginal Affairs Victoria within the Ramsar-listed site – Lake Albacutya, including scarred trees and stone artefact scatters. It is likely that there are more archaeological sites to be discovered.

Region demographics

The population is around 50,000 with almost a third of residents living on farms or in small townships of less than 2,000 people.

The median age of farmers is 57 and 10 percent are 75 years or older. Rural landholders live where they do because of the lifestyle it provides. This is true whether a farmer, a retiree, or living on a lifestyle property.



Region economy

The economy is worth **\$5.7 billion** annually with **25 percent** of residents relying directly on **agriculture** for income.

Large employment sources include:

 **4,936 people**
Agriculture

 **1,637 people**
Manufacturing

 **1,620 people**
Education

 **2,591 people**
Retail

 **3,158 people**
Health care



Cultural

Indigenous people living here traditionally into the 1900s. Fish Stone traps have been found on the Yarriambiack Creek.

Mallee CMA
border



Cultural

Yanga Track replicates an important gathering place for communities who traversed up and down the Wimmera River – the site houses many native plants that grew along the river's edge for food, tools and shelter.

North central CMA
border



This map has been designed for illustrative purposes only. It is not to scale.

Glenelg Hopkins CMA
border



Cultural

Grampians, traditionally known as Gariwerd, has ancient oven mounds, scatterings of stone left over from tool making, rock art sites across the area.

Indigenous participation

The community acknowledges that land is fundamental to Indigenous cultural heritage and wellbeing. The Wimmera NRM community is committed to exploring opportunities to incorporate and increase Indigenous participation in NRM.

It is essential that the NRM practitioners continue to build strong ongoing partnerships and working relationships with the Barengi Gadjin Land Council Aboriginal Corporation. This underpins management of the legal native title and cultural heritage obligations, as well as recognising opportunities to expand their role and interests in:

- Land and natural resource planning and management.
- Cultural recognition activities such as 'welcome to country' acknowledgements, use of traditional knowledge, language, lore and custom.
- Employment, business, training and economic development opportunities that affect traditional owners.

Promoting the establishment of Indigenous Landcare groups and improving cultural heritage and native title knowledge of NRM practitioners are key goals.

Links to adjoining CMAs

Mallee CMA borders the north of Wimmera CMA's boundary where the two CMAs share an interest in healthy and productive cropping soils, Yarriambiack Creek and Outlet Creek and the scattered buloke pine woodlands and Mallee woodlands throughout. To the east of the catchment, together with North Central CMA, there is a joint interest in improving the health of catchment headwaters and the understanding of floodwater movements that can cross boundaries.

Glenelg Hopkins CMA in the south is a key partner in planning for the use of environmental water given the two CMAs share water from a common water entitlement. There's a joint interest in conserving biodiversity, including threatened species in the parks, forests and wetland systems that border the catchments. Wimmera CMA also maintains close ties with natural resource managers in South Australia who share an interest in cross-border catchment assets, particularly Mosquito Creek which is the primary water source for Bool and Hacks Lagoons Ramsar site in South Australia.

Victoria
Melbourne

West Wimmera Shire



Native Vegetation

Has the highest percentage of native vegetation out of all council areas.

Healthy patches of Buloke woodlands (*Environment Protection and Biodiversity Conservation Act 1999* listed) remain here. Existing native vegetation, particularly in Little Desert, and on dunes spread to the south.



Rivers & Streams

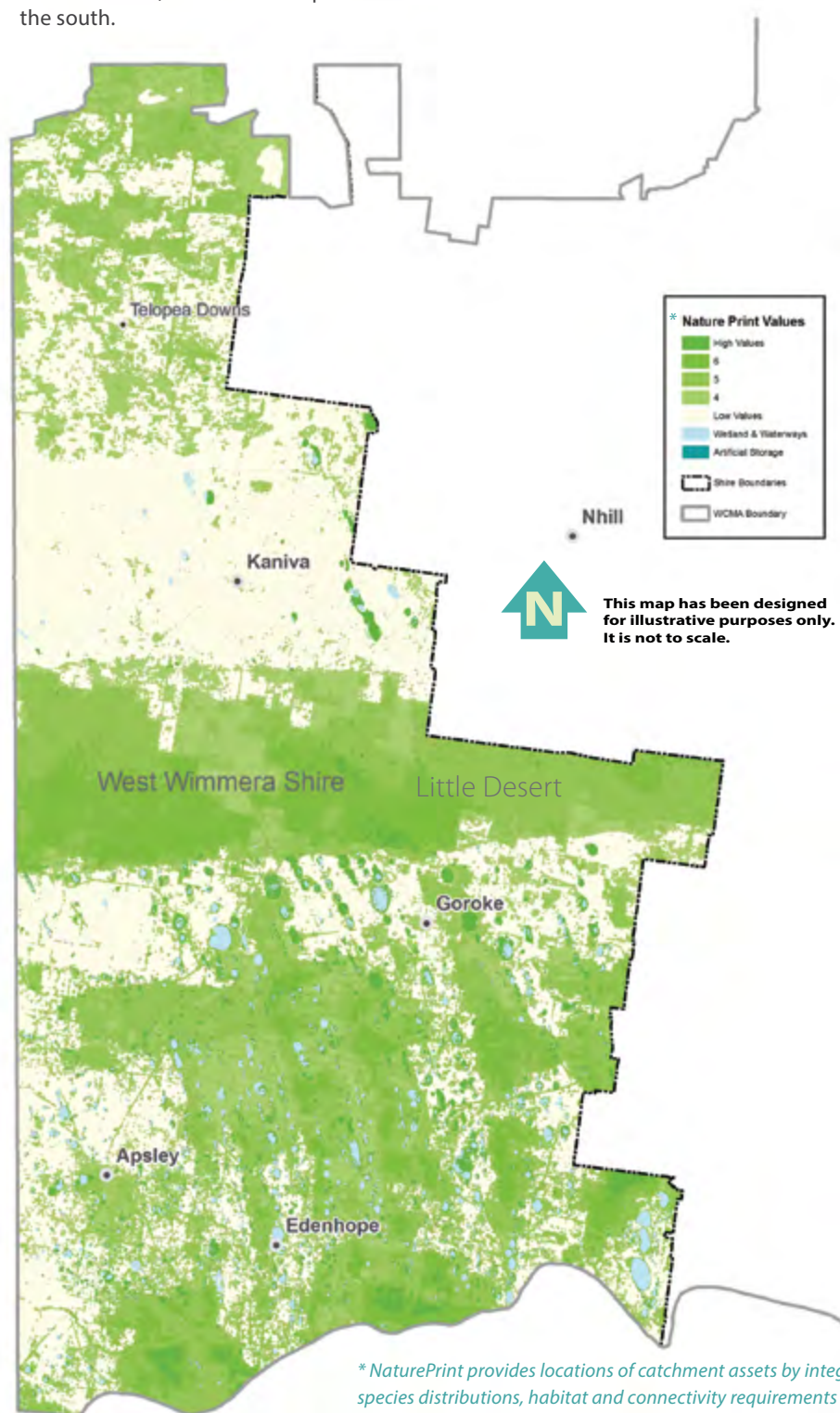
Mosquito Creek is the most substantial stream, discharging into south-east South Australia. It is the key surface water source for Ramsar-listed Bool Lagoon and sustains threatened species like the Yarra Pygmy Perch.



Soils

Soils are susceptible to water and wind erosion.

Historically, grazing occurred south of the Little Desert with cropping north of the Little Desert, however recent drought conditions have seen an increase in cropping and an increased risk of soil erosion.



Threatened Animals

- Growling Grass Frog
- Red-tailed Black Cockatoo
- Bush Stone-curlew
- Malleefowl
- Brolga
- Migratory wetland birds



Threatened Plants

- Elegant Spider-orchid
- Southern Pipewort
- Large-headed Fireweed
- Whipstick Westringia
- Jumping Jack Wattle



Wetlands

High density & high diversity of wetlands. Shallow Freshwater Marshes & Freshwater Meadows are declining. Larger lakes have high recreational value. Internationally listed migratory waterbirds are present and Indigenous sites exist on wetland lunettes.

Seasonal herbaceous wetlands are listed as threatened in this area.

* NaturePrint provides locations of catchment assets by integrating a range of complex information, including data on threats, species distributions, habitat and connectivity requirements (see Figure 3, page 20).



Loch Ness swamp, Patyah



The West Wimmera is unique due to the myriad of seasonal wetlands in its landscape. While many wetlands are protected in parks and reserves, thousands of smaller, more seasonal wetlands exist on farms.

The place

West Wimmera is geographically bisected by the Little Desert. South of the desert there is a strong north–south running dune–swale system. The rainfall is relatively high in the southern part of the shire, with a very high density of wetlands. The swales have historically provided the best cropping and grazing country with their heavier clay soils. The lighter sandy country on the dunes was generally undeveloped, and patches of stringybark scrub remain on these dunes. South of the Little Desert, broadacre cropping and sheep farming dominate, with a zone of groundwater sourced for irrigated agriculture and horticulture in the Neuarpurr district. In the higher rainfall areas of the far south–west, blue gum and pine plantations have been established over the last decade. To the north of the Little Desert, the dune–swale system is less pronounced, rainfall is lower and seasonal wetlands are less dense. North of the desert is one of Victoria’s most productive broadacre cropping districts.

The West Wimmera is unique due to the myriad of seasonal wetlands in its landscape. While many wetlands are protected in parks and reserves, thousands of smaller, more seasonal wetlands exist on private land.

There is a large amount of native vegetation remaining in and south of the Little Desert. This provides good connectivity of habitat on a north–south axis, and many of the larger patches of native vegetation are connected by strips on the dunes.

Mosquito Creek feeds into the Ramsar-listed Bool Lagoon in South Australia, making it a high priority stream for the district. This stream supports Growling Grass Frogs and native fish, including the Yarra Pygmy Perch, Blackish and Dwarf Galaxias.

The people

West Wimmera has a population of approximately 4,600, with 70 per cent identifying themselves as farmers. The median duration of residence is 45 years.

As with other parts of the Wimmera, agriculture is becoming increasingly efficient, and a high proportion (38 percent) of farmers are looking to acquire additional land.

In developing this strategy the West Wimmera Shire Council, Kowree Farm Tree Group, Trust For Nature and Greening Australia were specifically consulted. Individual landholders participate in a range of NRM programs, where their feedback has been used to inform and influence the RCS development. The general consensus from this feedback was that priorities for wetland management were sound.

Positive gains in West Wimmera

Over the past decade, Wimmera CMA has run a series of tenders and other incentives. These incentives focused on conserving Red-tailed Black Cockatoo habitat (Buloke woodlands and stringybark feed trees) and wetlands. Parks Victoria manage a large number of reserves, swamps and wetlands in this area.

Additional biolink gains have been achieved by Kowree Farm Tree Group and Trust For Nature, with support from corporate partner bankmecu under the Landbank program.

The Red-tailed Black Cockatoo recovery team is also very active in this area. It conducts an annual count, monitors the population, undertakes programs to increase food supply and runs an incentive for landholders to locate and report new nests.

The West Wimmera Shire Council recognises the importance of protecting wetlands and remnant vegetation and promoting sustainable farming practices. The council is proactive in enforcing planning scheme requirements in the protection of remnant vegetation.

The challenges

Maintaining shallow seasonal wetlands in a production landscape is a most urgent challenge.

Ensuring that an adequate and representative sample of wetlands are preserved without compromising productivity is an ongoing challenge.

Some of the wetlands are *Environment Protection and Biodiversity Conservation Act 1999* listed and are critically endangered.

Reliable groundwater supply is also important for many farms in the West Wimmera. The long term sustainability of aquifers needs to be monitored and managed to ensure sustainable extraction rates, as well as availability to future generations. Understanding the complexity and interactions of groundwater with all other natural resources remains a priority.

Reduced winter rainfall over the last decade saw a change in land-use from pasture to increased cropping. Ultimately, this change increases the risk to soil and waterway health by periodically exposing soil to erosion.

Weeds are an ongoing challenge, as is the management of pest animals, e.g. wild dogs, foxes and rabbits.

Hindmarsh Shire



Native Vegetation

Large tracts of vegetation remain, particularly in the Little Desert National Park.

Environment Protection and Biodiversity Conservation Act 1999 listed Buloke Woodlands are located across the shire.



Rivers & Streams

In this shire the Wimmera River, terminal lakes and Outlet Creek are recognised in the *Heritage Rivers Act 1992*.

High salinity in the lower Wimmera River is the major threat within this shire, and is exacerbated by reduced flows due to water extraction and drought has impacted on aquatic species and riparian habitat.



Soils

Soils are susceptible to wind erosion.

Areas of dryland salinity occur.

There has been significant uptake of minimum and no-till farming practices.



Threatened Animals

- Golden Sun Moth (Nhill)
- Striped Legless Lizard
- Malleefowl
- Regent Parrot
- Australian Bustard



Threatened Plants

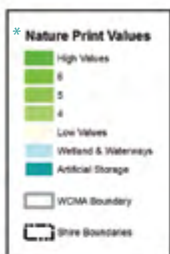
- Wimmera Spider Orchid
- Jumping Jack Wattle
- Floodplain Rusty Hood Orchid
- Rigid Spider Orchid
- Buloke Woodlands



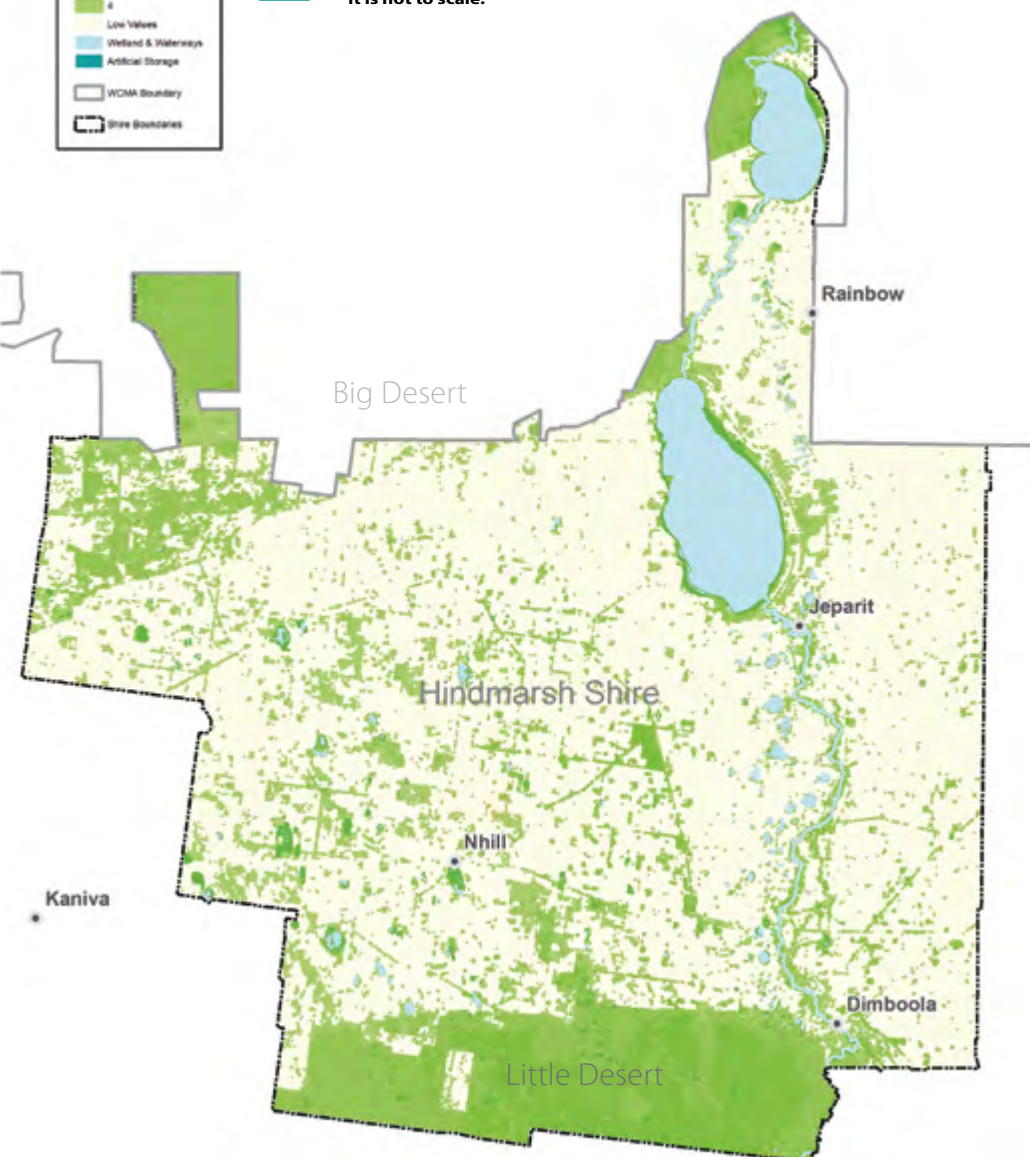
Wetlands

Lake Albacutya is Ramsar-listed; Lake Hindmarsh is a significant tourism and recreation drawcard. Both support massive waterbird breeding events in wet seasons.

There are over 200 wetlands scattered across the shire.



This map has been designed for illustrative purposes only. It is not to scale.



* NaturePrint provides locations of catchment assets by integrating a range of complex information, including data on threats, species distributions, habitat and connectivity requirements (see Figure 3, page 20).



Dimboola locals enjoying a full Wimmera River



Maintaining water quality in the lower Wimmera River is vital for the ongoing prosperity of the community and its environment.

The place

Hindmarsh Shire is one of the most productive cropping regions in Victoria. All of the Wimmera River within Hindmarsh Shire is recognised under the *Heritage Rivers Act 1992*, and along with its floodplain waterholes, support a rich variety of riparian vegetation and aquatic species. The huge terminal lakes of Hindmarsh, Victoria's largest freshwater lake, and Ramsar-listed Lake Albacutya are the venue for massive breeding events of migratory wetland birds. These lakes and the scattered smaller ephemeral wetlands provide habitat for waterbirds, and support endangered flora and fauna, including a salt-tolerant subspecies of River Red Gum. These lakes have provided food and recreation for many generations and their shores are rich in Indigenous heritage. They are hubs for tourism and provide income to towns like Jeparit, Dimboola and Rainbow.

Last century's farming practices relied on cultivating soil repeatedly, which left it exposed after harvest in summer. Clearing native vegetation caused water tables to rise, creating saline areas. Past practices meant that wind erosion was a major issue. Hundreds of thousands of tons of topsoil has been lost from paddocks as a result of soil exposure during extreme climatic events e.g. 1983 dust storm.

Farmers recognised the problems and adapted, resulting in profound changes over the last few decades. Almost 90 percent of farmers now use minimum-till farming practices, with the vast majority leaving stubble in place over summer.

Groundwater is an important resource in the shire for recreation and agriculture.

Remnant Buloke Woodlands still remain in parts and have become the target of management and revegetation work. Native

grasslands support the critically endangered Golden Sun Moth, and elsewhere Malleefowl are still able to find a home.

The people

Hindmarsh Shire has a resilient, adaptable community of approximately 6,000 people, committed to maximising production and protecting their environment. The population is aging, and there are indications that older farmers are retiring and moving into townships.

In developing this strategy the Hindmarsh Landcare Network and the Hindmarsh Shire Council were specifically consulted.

Individual landholders participate in a range of NRM programs and their feedback has been used to inform and influence the RCS development.

Positive gains in Hindmarsh

Natural flows supplemented by Environmental Water Releases in 2010–2011 greatly improved water quality in the lower Wimmera River. With the return of water to the catchment, water related recreational activities have flourished, the Dimboola rowing regatta being one of them.

Hindmarsh Shire Council has proactively protected wetlands through its planning scheme.

Project Hindmarsh is a revegetation initiative and is the longest running planting weekend of its kind in Australia. Its goal is to connect the Little and Big Deserts via roadsides, the Wimmera River and the dune systems of the Lawloit and Propadollah Ridges.

Coordinated by the Hindmarsh Landcare Network, with support from Hindmarsh Shire Council and Wimmera CMA, Project Hindmarsh has fostered action amongst a

generation of landholders and remains a passionate and active group.

Remnant patches of Buloke Woodland are scattered across Hindmarsh Shire. In recent times, incentives have been established to develop agreements with landholders to manage this vegetation and maximise its quality and longevity. There are scattered remnants protected in parks and reserves that are managed for the same aims by Parks Victoria and/or DEPI.

The challenges

Maintaining water quality in the lower Wimmera River is vital for the ongoing prosperity of the community and its environment. The river is a fundamental natural link through the landscape, and in Hindmarsh there are communities that rely almost solely on the river and its terminal lakes for recreation and tourism.

From a productivity viewpoint helping landholders understand their soils, complete the transition to minimum-till, and explore alternative practices to insure against climate variability are among the priorities. Reducing the extent of dryland salinity also remains important.

Conservation priorities include protecting the small remnant patches of threatened plant communities, scattered ephemeral wetlands and undertaking specific works to manage threatened animals.

Reliable groundwater supply is also important for many farms. The long term sustainability of aquifers needs to be monitored and managed to ensure sustainable extraction rates, as well as availability to future generations. Understanding the complexity and interactions of groundwater with all other natural resources remains a priority.

Yarriambiack & Buloke Shires



Native Vegetation

Endangered vegetation communities exist in the Barrabool and Marma Forests.

The best Buloke patches remain on private land.

Large areas of native grassy woodland occur across both shires.



Rivers & Streams

Yarriambiack Creek is very important to the residents of this shire. This creek provides an abundance of recreational activities and brings tourist dollars into the shire.



Soils

Soils are susceptible to wind erosion.

Areas of dryland salinity occur.

There has been significant uptake of minimum and no-till farming practices.



Threatened Animals

- Striped Legless Lizard
- Bush Stone-curlew
- Western Blue-tongued Lizard
- Australian Bustard
- Orange Chat
- Mallee Worm-Lizard



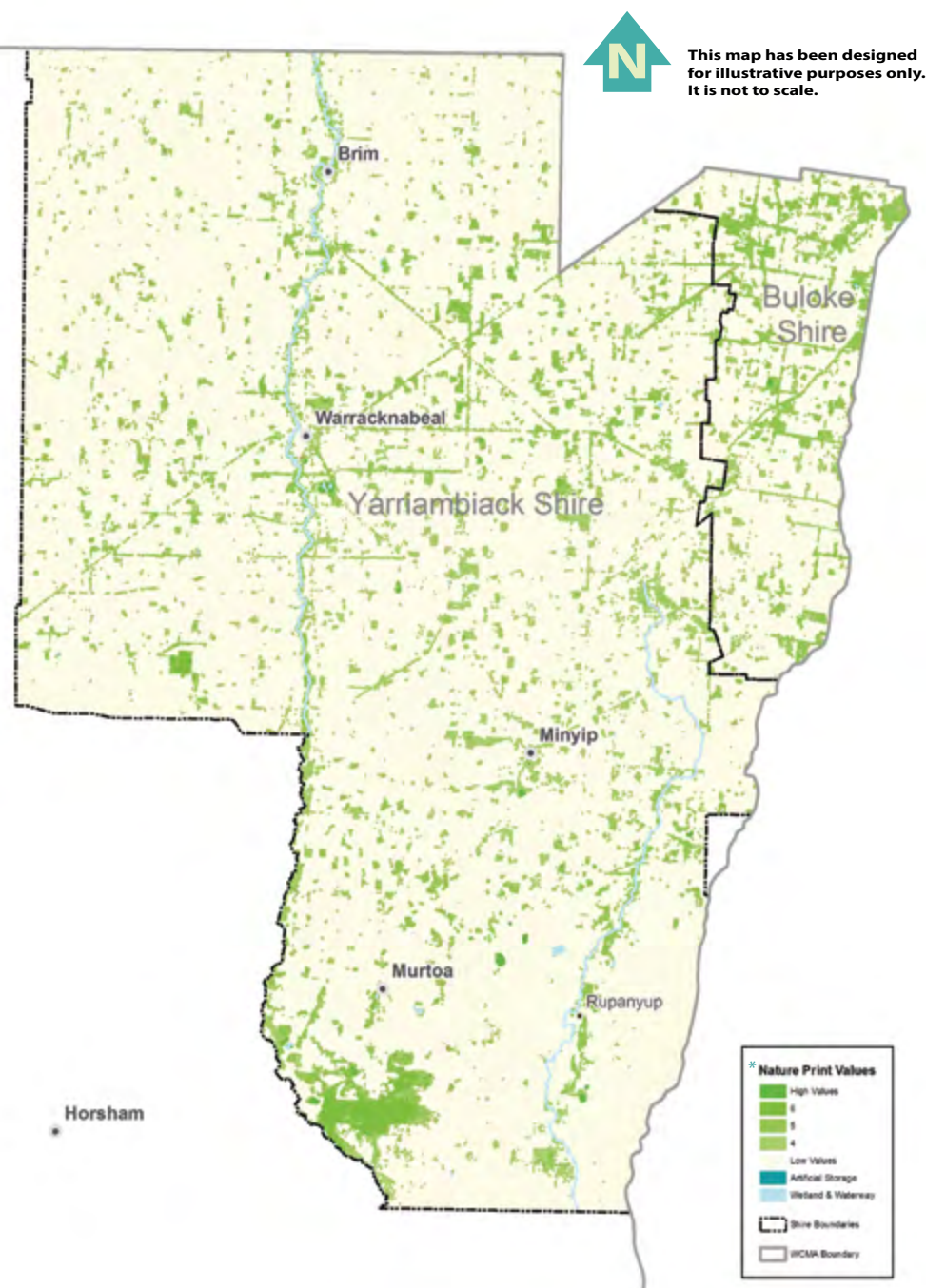
Threatened Plants

- Spiny Rice-flower
- Hairy Pod Wattle
- Winged Peppergrass
- Turnip Copper Burr



Wetlands

A small number of scattered wetlands can be found. Post-Wimmera Mallee pipeline, several wetlands have been earmarked to receive a share of a 1,000 ML entitlement of the Environmental Water Reserve (EWR).



* NaturePrint provides locations of catchment assets by integrating a range of complex information, including data on threats, species distributions, habitat and connectivity requirements (see Figure 3, page 20).



Rupanyup farming family, the Oxbrows



This is predominately a broadacre cropping community, with almost half the landholders looking to expand their farms.

The place

Yarriambiack Shire stretches from the Wimmera River, just north of the Grampians in the south, to the centre of the Mallee in the north. The Yarriambiack Creek is the main natural feature bisecting the Shire.

The Buloke Shire is located in north-west Victoria on the eastern edge of the Wimmera plains and southern Mallee. Only the western part of this shire falls within the Wimmera catchment. Agriculture, specifically grain production, is the primary source of income and employment in both shires.

Many small, fragmented pockets of native vegetation remain on private land. These are predominantly Buloke Woodlands, which is a threatened ecological community. In recent years projects have targeted these patches for ongoing management. Field inspections have confirmed that they represent some of the best examples of these communities in the Wimmera. High quality endangered vegetation communities also exist on private land in a significant patch around the Barrabool and Marma forests. These areas have a rich Indigenous cultural history and Indigenous people were living here traditionally up until the 1930s.

The Yarriambiack and Dunmunkle Creeks provide two lines of connected riparian vegetation running north-south. They are episodic, only flowing when the Wimmera River is experiencing substantial flows and are fundamental links in a heavily modified landscape. The Yarriambiack Creek is a focus for recreation, especially its weir pools. Lakes and seasonal wetlands are spread across the shire attracting visitors when wet. Wetland birds are also prevalent during wet years and in recent times breeding populations have been higher than usual.

The people

Approximately 8,000 people live across the north-eastern plains of the Wimmera in the Yarriambiack Shire and western part of Buloke Shire. This is predominately a broadacre cropping community, with almost half the landholders looking to expand their farms. According to a survey conducted by CSU in 2011, three quarters of landholders identify as farmers, and the majority live on their properties, rather than in the regional centres.

The population is aging and declining. In the recent CSU Survey the major issue of concern raised by landholders was the loss of important services brought about by a declining population.

The Birchip Cropping Group, Brim Landcare Group, Yarrilinks Landcare Network, Yarriambiack Shire Council, and the Yarriambiack Creek Advisory Committee were all specifically consulted during the development of this strategy. Individual landholders participate in a range of NRM programs, where their feedback has been used to inform and influence the RCS development. This consultation highlighted that pests and weeds are significantly impacting farm profitability, as well as native vegetation. Farmers are also eager to understand what lies below the surface of their soils and options available for future management. Concerns were raised by some groups regarding Dunmunkle Creek, specifically that continuous cropping had obscured its line, and in effect the creek is being 'lost'.

Positive gains in Yarriambiack and Buloke Shires

Yarrilinks is a well established, community run project that aims to improve the connectivity of native vegetation in and around the Yarriambiack and Dunmunkle Creeks. The Yarrilinks annual plantout weekend attracts

several hundred volunteers a year, including migrants from many ethnic groups, giving new Australians the chance to leave the city and experience regional Australia for a weekend.

Yarriambiack Shire Council is an active supporter of Yarrilinks, as well as undertaking pest and weed control on roadsides, it is a participant in the implementation of the *Wimmera Invasive Plant and Animal Management Strategy*.

Wimmera CMA's Buloke Tender is providing landholders with funds to improve the management of remnant Buloke Woodlands on private land. There are also a handful of reserves in the area managed with the same goals by Parks Victoria and DEPI.

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

The challenges

Climate variability requires adaptive measures from landholders, particularly where current rainfall averages are at the lower end for profitability.

Improving connectivity between existing patches of native vegetation to allow the movement of species is also a challenge. When asked about native animals, landholders commonly expressed their concern at the decline in Bush Stone-curlew numbers over their lifetime.

Finding the right balance between water use in the lakes of the Upper Catchment and environmental flows into the Wimmera River and Yarriambiack Creek, is an ongoing challenge.

Horsham Rural City Council



Native Vegetation

Pine–Buloke Woodlands once covered much of the plains west of the Grampians. Extensive revegetation has taken place in this Shire.

Large, intact patches of native vegetation exist within the Little Desert National Park, Black Range State Park, Mount Arapiles–Tooen State Park and Jilpanger Nature Conservation Reserve



Rivers & Streams

Many important waterways including the Wimmera River, MacKenzie River and Natimuk Creek. The MacKenzie River supports the last known population of platypus in the catchment.



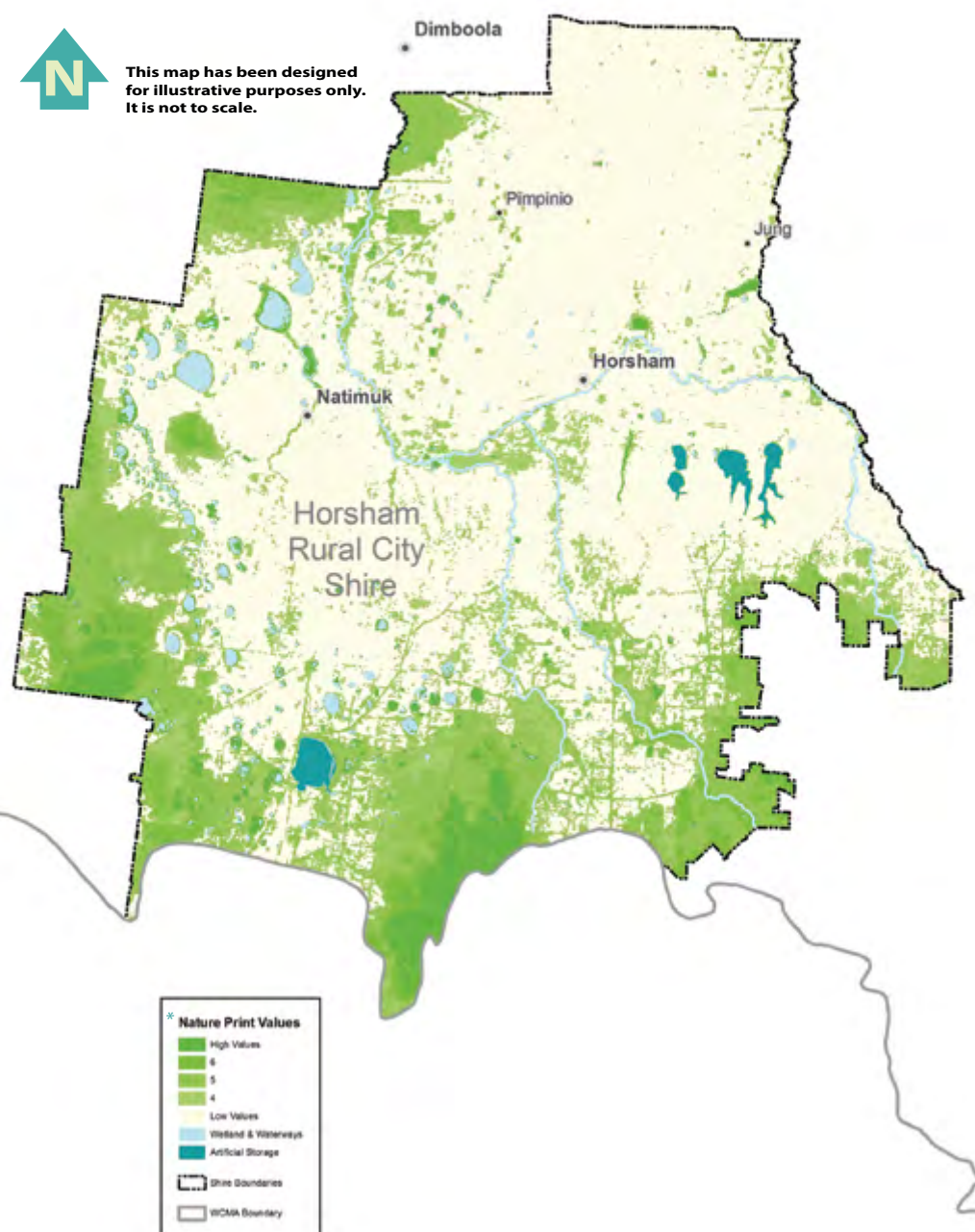
Soils

Can be susceptible to a range of threats including wind and water erosion.

There has been significant uptake of minimum and no-till farming practices.



This map has been designed for illustrative purposes only. It is not to scale.



Threatened Animals

- Striped Legless Lizard
- Bush Stone-curlew
- Growling Grass Frog
- Brolga
- Migratory Wetland Birds



Threatened Plants

- *Environment Protection and Biodiversity Conservation Act 1999* listed Seasonal Herbaceous Wetlands
- Bead Glasswort
- Grampians Duck Orchid
- Wimmera Bottlebrush



Wetlands

Natimuk–Douglas Chain of lakes stretches for 70 km and 11 of these wetlands are listed on the National directory of Important Wetlands. Massive International bird migratory events.



Canola field near Natimuk with Mt Arapiles in the background



Whilst agriculture is the largest industry, tourism is also notable.

The place

Horsham Rural City Council shares characteristics from each surrounding shire. The area has several important waterways. The Wimmera River and its tributaries, MacKenzie River and Burnt Creek, have been identified as important. The MacKenzie River supports a small population of platypus and the recently discovered Wimmera Bottlebrush. Natimuk Creek has also been identified as important for its contribution to the landscape west of the Wimmera River, and its function as the water source for Natimuk Lake and Lake Wyn Wyn. The Wimmera River itself provides a backbone of riparian vegetation snaking through an agricultural landscape, and provides an essential recreation resource for the Horsham district.

South and west of Horsham there are diverse and high density wetlands facing the same pressures as described for the West Wimmera. The Natimuk–Douglas chain of lakes is a unique chain of alternating salt and freshwater wetlands that are important for migratory birds.

A range of endangered plant and animal communities survive here. Pine–Buloke Woodlands used to cover much of the plains west of the Grampians. There are remnant Salt Paperbark communities on the edges of some salt lakes, and along the edges of those lakes the rare Bead Glasswort can still be found.

The people

With a population of approximately 19,000, agriculture is the largest industry however, tourism is also notable with substantial numbers coming to experience camping and fishing on the Wimmera River. The numerous lakes and wetlands are an attraction along with the Grampians and Mt Arapiles,

which tourists come to walk, climb and see their sights.

Rural landholders, through the CSU Survey 2011, nominated the impact of reduced water flows in rivers and streams, together with the decline in soil health as the most important issues affecting this local government area.

In developing this strategy, Horsham Rural City Council, the Wimmera Agroforestry Network, Wimmera–Mallee Sustainability Alliance, Trust for Nature, Wimmera River Improvement Committee, VNTFA, CFA, DEPI, Parks Victoria, GWMWater, Laharum Landcare Group and the Grampians to Little Desert Biolink Committee were specifically consulted. The views of the wider community were sought during several public gatherings, the Wimmera Biodiversity Seminar being one of them.

The main issues raised were:

- Water quality in the Wimmera River.
- Managing stock access to the Wimmera River.
- Maintaining the availability of water for lakes around Horsham.
- Maintaining the natural beauty of the Wimmera River within Horsham in light of development along the river.
- The importance of good floodplain management, particularly with regard to future development.
- Pests and weeds, particularly increased rabbit numbers.
- The impact on biodiversity of burn targets on public land.

Positive gains in Horsham

Significant stream flows from the Upper Catchment, supplemented by environmental water flows, have greatly improved water quality along the length of the Wimmera River.

Incentive programs have encouraged landholders to improve the management of riparian vegetation along rivers, streams and wetlands.

Revegetation and habitat improvement work has been undertaken by Greening Australia. The Grampians to Little Desert Biolink group has been supported by the Horsham Rural City Council and Wimmera CMA to provide a vegetation link between these two large parks. Many patches of high quality native vegetation have received protection through the establishments of Trust for Nature covenants.

The challenges

Protection of water quality and habitat values of the Wimmera River continue to be high priorities. These can be addressed through erosion control, revegetation works and stock control in the Upper Catchment and suitable land use planning around Horsham. The maintenance of environmental flows along the Wimmera River is another vital part of maintaining that amenity.

Floodplain management is a key challenge. A strong foundation of knowledge has been built, however continual improvement and generation of flood knowledge still needs to occur. This is to ensure agencies and the community are as prepared as possible when responding to and recovering from floods.

Helping landholders further understand their soils, continually develop best practice farming techniques and exploring alternative practices, to adapt to climate variability and extreme events, are among the priorities. Reducing the effect of salinity, as well as maintaining the shallow seasonal wetlands in production landscapes in the south and west is also important.

Upper Catchment

Ararat, Pyrenees, Northern Grampians Shires



Native Vegetation

Large intact patches of native vegetation (Grampians, Black Range near Stawell and Pyrenees), with a large proportion of native vegetation on private land, including a number of areas considered endangered e.g. *Environment Protection and Biodiversity Conservation Act 1999* listed Grey Box Grassy Woodland.



Rivers & Streams

Runoff from the Upper Catchment generates streamflows that connect much of the Wimmera River.

High value waterways include the upper Wimmera River, Glenlofty Creek, Mt Cole Creek, Concongella Creek, Mt William Creek, Fyans Creek, Upper MacKenzie River.



Soils

Fire, floods and high intensity rainfall all have significant impacts in this part of the shire.

The biggest threat is generally water erosion when ground cover declines.



Threatened Animals

- Southern Brown Bandicoot
- Long-nosed Potoroo
- Brush-tailed Rock Wallaby
- Growling Grass Frog
- Striped Legless Lizard



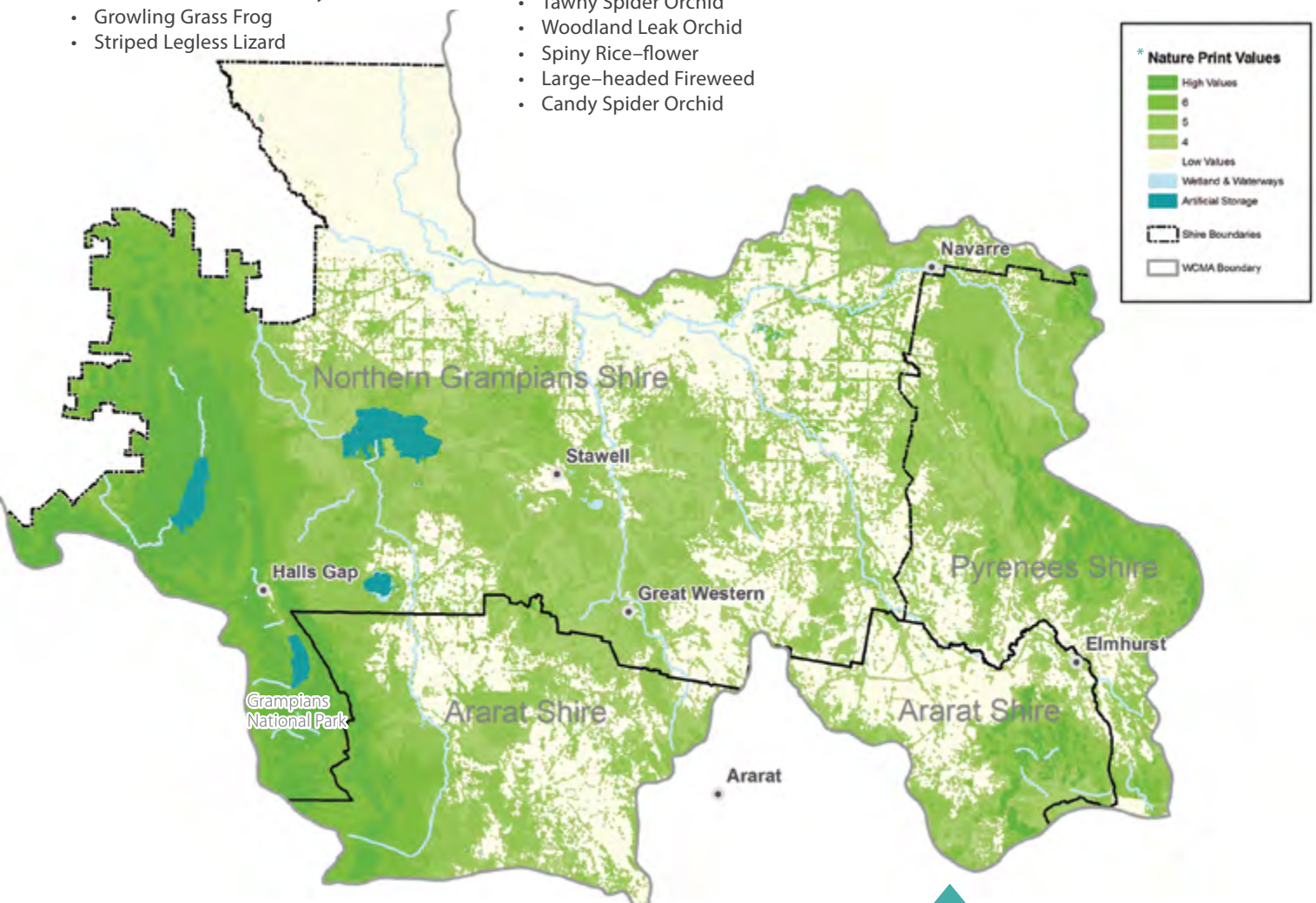
Threatened Plants

- Grampians Bitter Pea
- Grampians Rice-flower
- Tawny Spider Orchid
- Woodland Leak Orchid
- Spiny Rice-flower
- Large-headed Fireweed
- Candy Spider Orchid



Wetlands

Most wetlands are modified and recognised for their social and economic values, acting as both water storage and recreational areas.



* NaturePrint provides locations of catchment assets by integrating a range of complex information, including data on threats, species distributions, habitat and connectivity requirements (see Figure 3, page 20).



This map has been designed for illustrative purposes only. It is not to scale.



Tree planting on the steep hills of Glendhu



This part of the catchment has a strong Landcare movement with high memberships and active groups.

The place

The Grampians are one of Victoria's iconic national parks. Dramatic sandstone cliffs, a varied landscape, unique flora and fauna and cultural heritage are all part of the attraction.

The Grampians are a tourism draw card, providing valuable income to Halls Gap, Stawell and Ararat. The lakes and water storages in and around the Grampians are heavily used for recreation.

Further east, the Pyrenees Ranges provide a backdrop to an area known for its agriculture. The Wimmera River has its headwaters in the Pyrenees. Stream condition varies considerably, with some streams reasonably intact in forested areas, while the majority have eroding banks and beds. This has caused a loss of habitat and a decline in water quality, as well as impacts downstream.

There is good vegetation cover throughout. River Red Gum, Box and Box-Ironbark Forest are found in large patches across this area. Extensive revegetation efforts to stabilise hillsides, reduce saline groundwater intrusion and improve connectivity have added to this vegetation cover over the last decade.

Despite major efforts, weeds and rabbits are still of major concern, contributing to significant soil erosion in some areas. There has been some success in reducing gorse and blackberry, but other weeds still cause concern and recent flooding has seen an emergence of new weeds. Foxes have damaged the populations of small native mammals, such as bandicoots, inside and outside national and forest parks.

The people

The population of the Upper Catchment is approximately 12,000 people.

Consultation on the RCS development included all three Shire councils, Project Platypus, several landcare groups, Perennial Pasture Systems, Upper Catchment Biodiversity Action Group and Victorian Farmers Federation.

Individual landholders participate in a range of NRM programs and their feedback has been used to inform and influence the development of the RCS. Feedback from these groups indicated that pest and weed control needed to be prioritised ahead of revegetation work.

The CSU survey showed that there is a significant change in demographic occurring in this area, with less landholders now identifying as farmers and more identifying as professionals. New people are moving into this area and purchasing smaller blocks.

Positive gains in the Upper Catchment

The Upper Catchment has a highly professional, enthusiastic and long standing Landcare network that bases itself in Stawell, supports Landcare groups and undertakes NRM work across the Upper Catchment. This area has a long history of land stewardship, due predominantly to the commitment of landholders and support of Project Platypus. This part of the catchment has a strong Landcare movement with high memberships and active groups.

With the support of Wimmera CMA and Landcare, there has been a great deal of revegetation work and hundreds of kilometres of waterways have been fenced to manage stock over the past 10 years.

Instream bed and bank erosion control works have been supported by this revegetation activity, which is also reducing gully and stream erosion into waterways and improving instream habitat and water quality.

The challenges

The steep gradients of the hill country are prone to water erosion, particularly if the soil is exposed. The heavy rains of 2010 and 2011 resulted in widespread flooding and damage to buildings and infrastructure. Riparian fences and vegetation were greatly impacted.

There is an ongoing need to understand and mitigate the effects of salinity on natural assets, including environmental, social and economical impacts.

The risks that high intensity rainfall events bring, creates a need to ensure the area is prepared. Improving flood information and warning systems is becoming increasingly important.

During the 2011 floods, significant gully erosion occurred and even within the national parks there was major erosion, landslips and damage.

One of the major challenges is to balance the recreational objectives in the lakes of the Upper Catchment, whilst considering water quality and flows down the length of the Wimmera River, which support ecosystems, recreation and communities downstream.

RCS roles & responsibilities

Achievement of the objectives and management measures is dependent on the collaborative effort of all contributors involved in NRM. The following table identifies key implementation partners and clearly articulates their core functions. The responsibilities of individual organisations in implementing the RCS will be further articulated through action plans (see Figure 1). This approach is based on the principle of delivering efficient and effective services and reducing duplication.

Key implementation partners	RCS roles & responsibilities
Barengi Gadjin Land Council	Legally authorised to represent Traditional Owners and evaluate cultural heritage management plans. Also manages a number of parcels of land granted to traditional owners during native title mediation, and other parcels of land which have been gifted.
Committees of management (committees that have been delegated responsibility by the government to manage crown land)	As well as meeting its obligations under the <i>Crown Land (Reserves) Act 1978</i> , the committee is also bound by the laws that govern the wider community on matters such as employment, taxation, contracts, tenancy, licensing, and providing services. The powers given under the Act enable the committee to manage and develop the reserve, undertake financial transactions, including borrowing money (with the Victorian Treasurer's consent) and entering contracts, enter tenure arrangements, such as leasing and licensing, for part or all of the reserve, subject to Minister's approval, employ people and enforce regulations.
Conservation Volunteers Australia	Recruits and volunteers around Australia and across the world to support participation in diverse projects to protect and enhance the environment.
Department of Transport, Planning and Local Infrastructure	Plays a central role in managing Victoria's growth and development and building stronger communities. Department of Transport, Planning and Local Infrastructure develop long-term plans for Victoria's regions and cities, invest in infrastructure and services and support the development of local communities. They also provides research, policy and planning advice, administers legislation and regulations.
Department of Environment and Primary Industries	Responsible for agriculture, fisheries, earth resources, energy and forestry in Victoria. DEPI design and deliver government policies and programs that enable Victoria's primary and energy industries to sustainably maximise the wealth and wellbeing they generate, by providing essential goods and services, employment, research, investment and recreational opportunities. Responsible for sustainable water management and supply, sustainable catchment management, services for management and governance of Victoria's parks, services for biodiversity, conservation, ecosystem, heritage recreation and tourism, public land and sustainable forest management services, fire prevention operations and planning environment, urban and regional strategies and programs, sustainability and greenhouse policy, sustainable cities, regions and heritage conservation, land information, policy frameworks, regulations and services to protect the environment.
Department of Sustainability, Environment, Water, Population and Communities (SEWPaC)	Federal department responsible for national environment and water policy and strategy, plus funding CMAs to achieve national NRM priorities. Also has a role in the purchase of environmental water and listing threatened species and ecological communities.
Emergency Services: SES, CFA, DEPI, Victorian Police	Responsible for leading relevant emergency responses in accordance to the <i>Victorian Emergency Management Act 1986</i> . Collaboration in times of emergency — flood, fire, plague.
Environment Protection Authority	Responsible for the prevention and control of air, land and water pollution and industrial noise.

Key implementation partners	RCS roles & responsibilities
Farming Extension, Outreach & Trial Research Groups: Birchip Cropping Group, Victorian No-Till Farmer's Association, Victorian Farmers Federation, The Wimmera Farming Network.	Provide information and support for landholders on best management techniques for soil conservation and productivity benefits.
Greening Australia	Engages the community in vegetation management to protect and restore the health, diversity and productivity of Australian landscapes.
GWMWater	Responsible for managing groundwater and surface water resources, including water and wastewater services and associated infrastructure. GWMWater also coordinates blue-green algae management in the catchment.
Landcare Networks & Farm Tree Groups	Undertake landholder outreach and extension activities, on-ground works associated with revegetation and invasive plant and animal control.
Landholders	Manage natural assets on private land including measures to conserve natural assets and prevent off site impacts. Consider sustainable farming practices.
Local farming, conservation & waterway protection groups: Landcare groups, "Friend's of" groups, river improvement committees, Waterwatch	Small groups/networks of landholders, community members and volunteers that perform a wide variety of actions such as Invasive plant and animal control, revegetation, waterway monitoring and improving farming practices on a local scale. These groups are critical for the successful delivery of a range of NRM programs in the Wimmera.
Local Government	Responsible for some environment services, emergency management services (such as response and recovery), transport and infrastructure services, planning and building services such as land use planning, economic development and environmental conservation relevant to local government.
Local Indigenous groups	Provide advice and expertise on areas of interest to the local Indigenous community and NRM programs.
Murray-Darling Basin Authority	Legislated Authority responsible for planning the integrated management of rivers, streams and wetlands in the Murray-Darling Basin.
Parks Victoria	Responsible for managing a diverse estate of parks and reserves covering more than 4 million hectares, or about 17 percent, of Victoria.
Research Institutions CSIRO, Universities, DEPI	Provide scientific evidence on the condition of natural assets and information and advice on appropriate management tools/directions.
Trust For Nature	Responsible for helping people protect biodiversity on private land. This includes conservation covenants; land management stewardship; Revolving Fund program; land ownership and management and assistance in arranging native vegetation offsets.
Victorian Environmental Water Holder	Statutory body that manages the environmental water on behalf of the Minister for Environment and issues seasonal watering statements for Catchment Management Authorities to conduct environmental water releases.
Wimmera CMA	Responsible for strategic planning and coordinating actions to improve the management of natural assets. Also responsible for guiding regional investment in catchment management. Provides a link between the Wimmera community and State and Federal Government for NRM. Wimmera CMA also carry out a number of statutory functions, including floodplain management and works on waterways permits. Wimmera CMA also collects baseline data and provides reports to DEPI.
Wimmera CMA advisory committees	Analysis and review of RCS, monitor RCS implementation, provide expert advice on Wimmera CMA work plans.

RCS asset approach

The natural assets, along with objectives and management measures for these assets, have been established in close collaboration with partners and the community. Assets have been identified under five thematic classes: rivers and streams, wetlands, native vegetation, threatened plants and animals and soils.

Twenty-year objectives have been established for each asset. These objectives provide high level and measurable milestones that will guide future management priorities and directions.

Six-year management measures state the actions necessary for achieving steps towards the objectives during the life of this RCS.

Please note the objectives and management measures are not in order of priority.

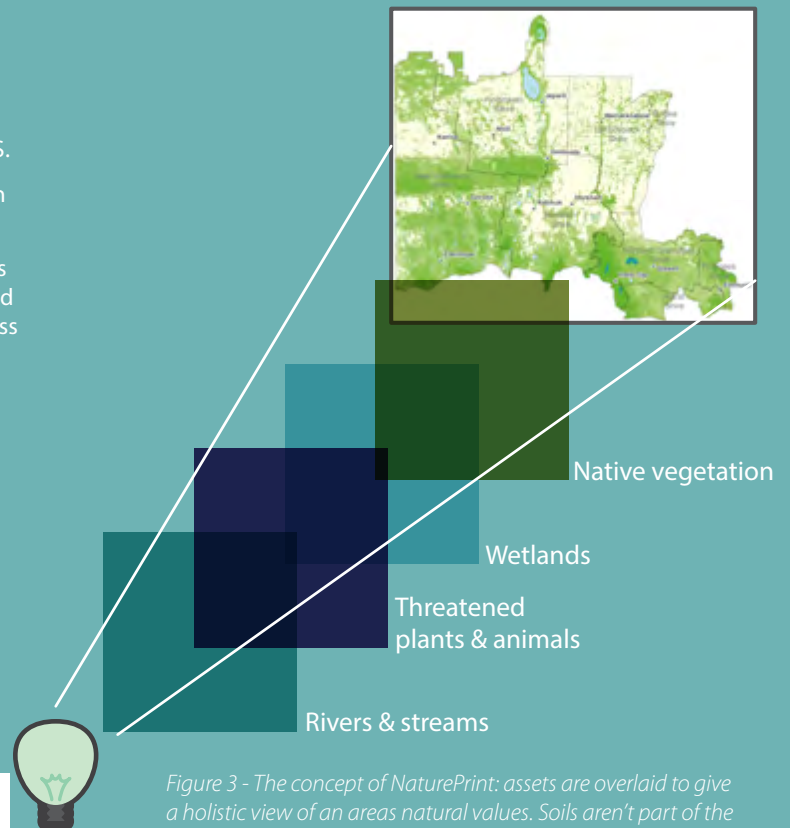
When assessing threats to assets, a risk assessment approach has been taken in which the likelihood of a threat has been evaluated alongside consequences to give an overall risk rating. This process is described below.

Where possible, the strategy seeks to establish “SMART” or Specific, Measurable, Achievable, Realistic and Time-bound objectives and management measures. Consequently, the following factors have been taken into account:

- Best available science on current condition of assets and expected future change in condition,
- The value of assets to the community,
- The risk ratings,
- The ability to cost-effectively achieve objectives and management measures, and
- Potential available funding for implementation.

This approach has been tested with, and validated through, extensive consultation with partners and the community.

The maps located in each asset chapter indicate the thematic areas where priority will be given to action based on the value of the asset and the risk of threat. While efforts will not be restricted to these areas they will be given priority over other areas where investment is limited. This will be done through development of action plans or asset sub-strategies which will set out the detail around implementation of management measures.



Categories

Risk

The risk rating system used in this document takes into consideration **likelihood** of an event against the **consequences** and rates the event into four levels of risk, and the associated priority for action:

- **Very High** — urgent mitigation action required
- **High** — mitigation action and an adaptive management plan required; the precautionary principle should be applied
- **Moderate** — obtain additional information and develop mitigation action if required
- **Low** — monitor threat occurrence and reassess threat level if likelihood or consequences change

Likelihood

Categories for likelihood are defined as follows:

- Almost certain** — expected to occur every year
- Likely** — expected to occur at least once every five years
- Possible** — might occur at some time
- Unlikely** — such events are known to have occurred, but rarely
- Rare or Unknown** — may occur only in exceptional circumstances; OR it is currently unknown how often the incident occurs.

Consequences

Categories for consequences are defined as follows:

- Not significant** — no long term effect on individuals or populations
- Minor** — individuals/specific areas are affected but no widespread or unmanageable effects
- Moderate** — larger areas have ecosystem function impaired, pressure on endangered communities and species
- Major** — function of ecosystem impaired, populations endangered
- Catastrophic** — regional extinctions.

Rivers and streams

RCS (twenty-year) objectives for rivers and streams

1. No decline in rivers and streams classified as good or excellent in the 2004 Index of Stream Condition¹.
2. Improvements in the condition of rivers and streams classified as poor to moderate in the 2004 Index of Stream Condition.
3. Rivers and streams classified as having high social or economic values in the *Wimmera Waterway Health Strategy 2006–2011* will be maintained in value.
4. Eighty percent of riverine floodplain areas have accurate modelled flood mapping incorporated into council planning schemes. Such information is included in council and community supported emergency response plans.
5. Net gain in extent and quality of floodplain Ecological Vegetation Class.

Asset description

The catchment's rivers and streams are distinguished by their location, a temperate to semi-arid climate and the fact that their streamflows do not reach the sea. Instead they flow into lakes of immense environmental and social values.

Highly variable hydrology, with severe droughts and large floods, is a continuing theme. This hydrology has created cycles of 'boom and bust' that has, in turn, led to the development of important and iconic riparian and aquatic ecosystems. Threats posed by salinity and erosion are amongst the most severe in Victoria and require intense management. Other problems such as the impacts of riparian weeds are proportionally less than other parts of the state, but also need ongoing management to contain their impact.

The major waterway in the catchment is the Wimmera River. Its catchment is approximately 2.4 million hectares, with numerous tributaries rising in Mt Cole and the Pyrenees ranges joining the main Wimmera River upstream of Glenorchy. Water is also received from the major sub-catchments of Wattle Creek, Congongella and Mt William Creeks. The Wimmera River flows west to Horsham where it collects the waters of Burnt Creek and just downstream the MacKenzie River and Norton Creek from the south. The MacKenzie River and these other streams flow from the northern part of the Grampians and Black Range, which lie at the southern boundary of the river's catchment. Water is supplied by channels to storages in the Wimmera from Rocklands and Moora Moora Reservoirs on the Glenelg River, and diversion weirs on the upper Wannon River.

Just east of Mt Arapiles, the Wimmera River swings to the north and continues through Dimboola and Jeparit to Lake Hindmarsh, Victoria's largest freshwater lake. During exceptionally wet

periods, Lake Hindmarsh overflows into the ephemeral Outlet Creek and on to Lake Albacutya, a Ramsar-listed wetland, extending to the Wirrengren Plain in Victoria's Mallee. Historic records show flooding of lakes beyond Lake Albacutya, though they have not received floodwater since 1918. The episodic nature of flows into these terminal lakes means that they can be empty for many years before floodwaters fill them for at least a couple of years, watering fringe vegetation and providing a mecca for thousands of migratory water birds.

The Wimmera River between Polkemmet (10 km north-west of Horsham) and Wirrengren Plain has been proclaimed a Victorian Heritage River due to its significant environmental and social values (*Heritage Rivers Act 1992*).

One notable feature of the system is the distributaries, Yarriambiack and Dunmunkle Creeks, which carry water from the Wimmera River. Yarriambiack Creek flows from Longerenong through Warracknabeal, Brim and Beulah into Lake Coorong near Hopetoun. The Dunmunkle Creek, a highly modified stream, carries water north from Glenorchy through Rupanyup dissipating in the southern Mallee.

The Millicent Coast Basin, within the Wimmera catchment boundary, is characterised by a number of streams that flow west into South Australia. Management of these streams including Mosquito, Kojak, Morambro, Tatiara and Thompson Creeks is also important given that rivers, streams, floodplains and wetlands do not end at the State border. Mosquito Creek is a high priority as it flows through to Ramsar-listed Bool Lagoon. There are also a few stand-alone streams that feed wetlands, for example Natimuk Creek.

A large variety of wildlife rely on local rivers and streams for habitat, which act as natural corridors in a largely agricultural landscape. These include waterway dependant species such as Freshwater catfish and platypus.

Most population centres are located adjacent to rivers and streams for historic water supply and aesthetic purposes. Many of which have weir pools, including Horsham, Warracknabeal, Dimboola, Jeparit, Jung, Glenorchy, Great Western, Brim and Elmhurst. Camping, fishing, walking, canoeing, rowing, bird watching and swimming are popular activities that local residents enjoy.

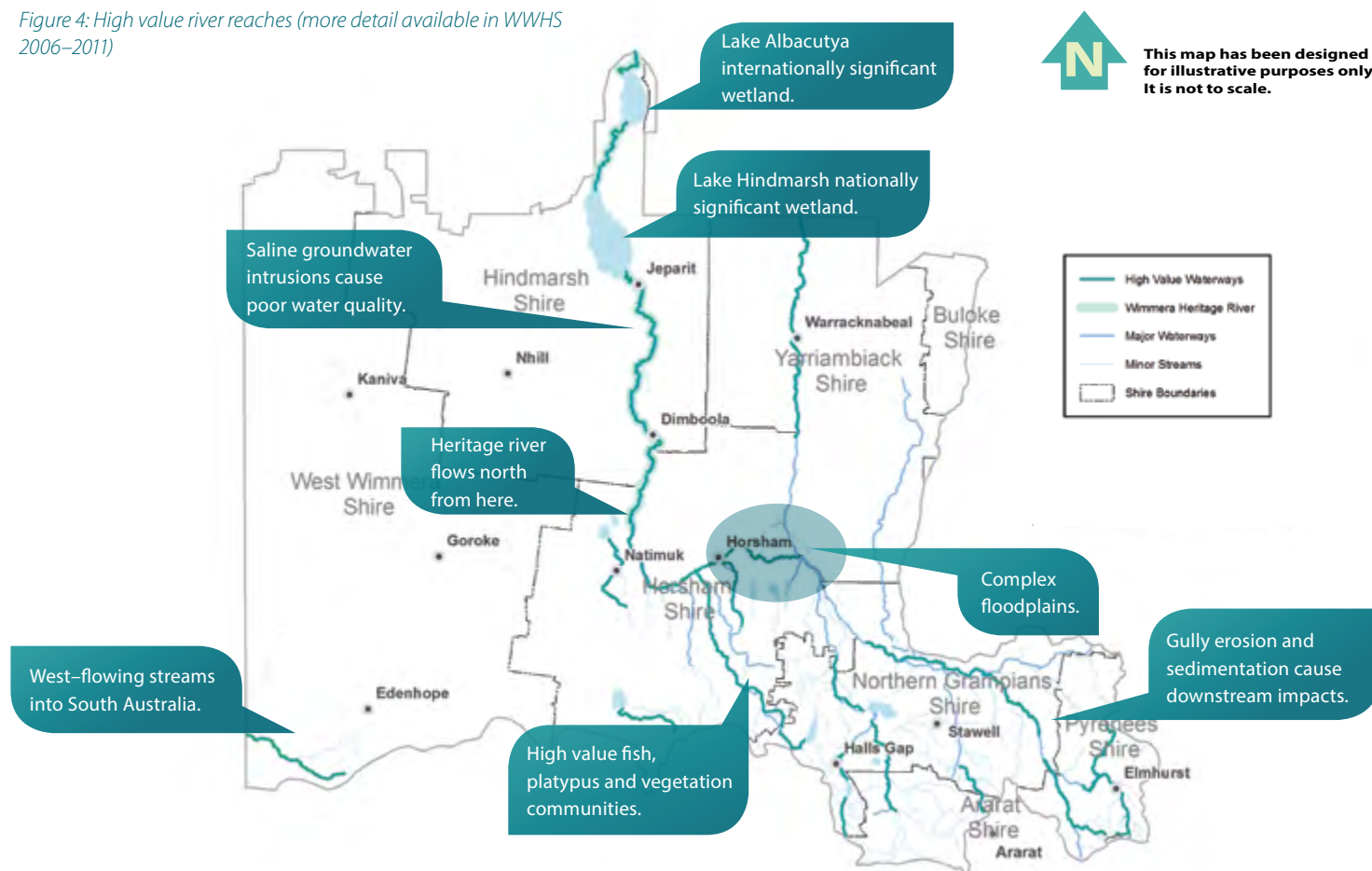
There is a rich cultural history associated with the region's rivers and streams. The local Indigenous community retains a strong connection to rivers and streams; sites of cultural significance abound along riverbanks and floodplains, with a successful native title claim along much of the lower Wimmera River.

The Wimmera's rivers and streams provide much of the water needs for towns and farms, especially via the Wimmera Mallee pipeline. As well as supporting some irrigation of vines, pasture and annual crops. Water is also supplied to local industry and mining enterprises. Local tourism and recreation is underpinned by rivers and streams. People come from afar to enjoy the fishing, rowing, waterskiing and bird watching opportunities afforded, bringing significant tourism dollars.

Figure 4 highlights high value reaches from the *Wimmera Waterway Health Strategy (WWHS) 2006–2011*. These priority reaches were identified based on their relative environmental, social and economic values. Within the next two years, this will be superseded by the *Regional Waterway Strategy*, which will build on additional information and will take into account the comments received through the RCS process.

¹ The Index of Stream Condition is a comprehensive method that has been periodically-applied statewide since 1999 to determine the 'health' of a waterway based on measuring the components for a healthy stream: water quality, aquatic life, hydrology, streamside zone (riparian vegetation) and physical form (erosion and in-stream habitat). Objectives assume ISC will be sufficiently robust to enable classification based on long term condition rather than influenced by short-term climatic circumstances.

Figure 4: High value river reaches (more detail available in WWHS 2006–2011)



Current condition and trend

Most rivers and streams have seen pronounced declines in condition since European settlement. Salinity, drainage works, stock access, vegetation removal, gold dredging, water harvesting and the introduction of invasive species, such as carp, have had significant impacts.

This is overlaid by natural disturbances such as drought, floods and bush fires, as witnessed by the record 1997–2009 drought, 2010 and 2011 floods, and 2006 Mt Lubra and 2009 Black Saturday bushfires.

Results from the 2004 Index of Stream Condition have highlighted that, due to these impacts, most rivers and streams are in poor to moderate condition. Issues around water quality, over-extraction, erosion and depleted riparian vegetation have led to these results. Only parts of Mosquito and Golton Creek are in excellent condition.

However, activities such as ongoing protection of reaches in good condition (as seen in National Parks) and enhancement of reaches in farming land through riparian vegetation, and erosion control works are steadily reversing the trend. This will be quantified in future iterations of the Index of Stream Condition.

Improved availability of environmental water, derived from piping the Wimmera–Mallee stock and domestic channel system, is already leading to numerous economic, social and environmental benefits.

Lastly, there is an ever increasing body of knowledge around flood behaviour, through more accurate flow gauging, flood investigations and community information.

Potential threats to healthy rivers and streams

The threats to river and stream health can be grouped into the following:

1. Altered flow regimes

- Climatic shifts — lower average stream flows, worse droughts, more extreme rainfall events.
- Water harvesting and river regulation — supplying towns, farms and the Wimmera Mallee Pipeline.
- Water harvesting by farm dams — typically in the Upper Catchment.
- Land use change — changes from grazing and cropping to farm forestry and large scale tree planting reduces runoff.
- Fires — regrowth post-fire reduces runoff.

2. Deterioration of water quality

- Diffuse source pollution from sediments, nutrients, herbicides and pesticides that runoff from farmland.
- Increasing salinity and rising water tables from rivers and streams, which intersect with the groundwater table such as gullies in the Upper Catchment and deep pools in the lower Wimmera River.
- Reduced flows (see altered flow regimes, discussed above).
- Point source pollution from industrial locations or chemical spills.
- Disturbance of sediment from livestock movement and carp feeding.
- Faecal matter from livestock contaminating water posing a risk to human health.
- Fires can lead to vegetation loss that allows large quantities of ash to enter rivers and streams during heavy rainfall.

3. Loss of native biodiversity

- Pest plants—for example Bridal Creeper, gorse and other weed infestations.
- Pest animals—for example carp, rabbits, *gambusia*, problem wildlife.
- Riparian degradation—for example inappropriate grazing, salinity impacts, vegetation clearing for agricultural purposes.
- Recreational pressures—for example overuse or inappropriate activities.
- Fires—large bush fires and inappropriate burning regimes.
- Weirs and other structures reducing connectivity for some species (such as platypus).

4. Changed channel form

- Accelerated bed and bank erosion through increased runoff caused by the absence of vegetation.
- In-filling and smothering of pools with sediment.
- Removal of woody habitat.
- Riparian vegetation encroachment into stream channels, especially in the lower catchment due to a lack of flows.
- Major channel change caused by landslips and floods typically when bush fire or riparian degradation reduces the vegetation cover to stabilise streambanks.

The Regional Waterway Strategy will detail the management actions required to achieve the vision, objectives and management priorities outline in the RCS for rivers, streams and wetlands.

It will be developed by Wimmera CMA in consultation with the community, and is scheduled to be completed in 2013.

The strategy will update and replace the WWHS 2006–2011 and be informed by the RCS as well as the Victorian Waterway Management Strategy currently under development.

Table 1: Likelihood and consequence of threats to rivers and streams... continued next page.

Threat	Likelihood	Consequence	Threat rating
Altered flow regimes			
Climatic shifts	Almost certain	Major	●
Water harvesting and river regulation	Almost certain	Major	●
Farm dams	Almost certain	Major	●
Land–use change	Possible	Moderate	●
Fire	Almost certain	Minor	●
Deterioration of water quality			
Potential diffuse source pollution	Almost certain	Major	●
Increasing salinity and rising water tables	Almost certain	Major	●
Reduced flows (see 'Altered flow regimes' above)	Almost certain	Major	●
Sediment disturbance and livestock impacts	Almost certain	Moderate	●
Point source pollution	Possible	Minor	●
Fire	Almost certain	Minor	●

Risk level and the priority for action:

●	●	●	●
Very High	High	Moderate	Low

Table 1 continued: Likelihood and consequence of threats to rivers and streams

Threat	Likelihood	Consequence	Threat rating
Loss of native biodiversity			
Pest plants and animals	Almost certain	Major	●
Riparian degradation	Almost certain	Moderate	●
Recreational pressures	Almost certain	Minor	●
Fire	Almost certain	Minor	●
Weirs and other structures	Unlikely	Minor	●
Changed Channel form			
Accelerated bed and bank erosion — stock access	Likely	Major	●
In-filling and smothering of pools	Almost certain	Moderate	●
Removal of woody habitat	Possible	Minor	●
Riparian vegetation encroachment into stream channels	Almost certain	Minor	●
Extreme events causing channel change	Unlikely	Minor	●

Risk level and the priority for action:			
●	●	●	●
Very High	High	Moderate	Low

Management measures

Taking into consideration the condition, trends and threats to rivers & streams, the following six-year management measures have been developed to deliver the twenty-year objectives for river and stream health:

1. Review, update and implement waterway strategies.

For riparian land:

1. Establish a network of managed and maintained riparian zones with high environmental value.
2. Apply best practice management in riparian zones to improve flora and fauna habitat.

For instream habitat and channel form:

1. Undertake on-ground management actions targeting bed and bank erosion, sedimentation, gully erosion and potential landslips.
2. Restore diversity, habitats, connectivity and movement of instream material, through stabilisation and restoration of channels, banks, substrate and riparian vegetation.
3. Apply best practice management for instream habitat, including adequate structural woody habitat to help native aquatic species such as native fish.

For water quality:

1. Reduce the impact of salinity on river and stream health.
2. Limit nutrients, sediments and other pollutants entering and being remobilised.
3. Work towards meeting *State Environment Protection Policy (Waters of Victoria) 2003* criteria for water quality.
4. Coordinate water quality management projects to improve the quality of water in rivers and streams.
5. Provide information on the trends in river and stream health in relation to water quality.

For adequate flows:

1. Deal adaptively to climatic impacts on streamflows.
2. Achieve minimum environmental water needs of priority rivers and streams under historic climatic conditions.
3. Provide environmental water releases to improve water quality and enable diversity of aquatic and water dependent flora and fauna ecosystems and maintain channel form.
4. Seek additional environmental water where available such as through improving efficiency of water delivery or other water recovery activities.
5. Prevent additional flow-stress impacts, such as intense water extraction or land-use change activities (e.g. concentrated areas of new farm dams or forestry development) by acknowledging the recommendations of the *Western Region Sustainable Water Strategy 2011*.

— management measure led by Wimmera CMA.

For aquatic ecosystems:

1. Reduce impacts of exotic species on aquatic ecosystems.

For the floodplain:

1. Improve knowledge of floodplains and their flood characteristics, including the improvement of flood overlays.
2. Manage floodplains to minimise flood risk and damage to people and property.
3. Enhance ecological values of floodplains.
4. Achieve a balance between social, economic and environmental values on floodplains.

Floodplain management

Wimmera CMA is the regional caretaker of river health. Part of this role is to provide information about the floodplain so relevant authorities can minimise the risk to lives and infrastructure during flood events. This planning needs to be balanced with the need to ensure floodplains are able to function within the riverine environment and maintain its natural values. Threats of functioning floodplains include:

- Inappropriate development on floodplains.
- Inadequate data currency and availability in some locations.
- Climate changes affecting rainfall and storm intensity.
- Planning deficiencies, such as lack of appropriate flood overlays.
- Inadequate warning systems.
- Implications of poorly managed culverts and drains.
- Implications of a changing water delivery system across the landscape.
- Ageing and poorly managed structures e.g. levees.

The Department of Transport, Planning and Local Infrastructure prepare regional growth plans that influence development opportunities in the context of floodplain management.

Wimmera CMA works with local governments to advise on proposed developments that may be at risk of flooding to ensure that these developments are not likely to flood or make flooding worse on adjacent properties by displacing floodwaters elsewhere. Wimmera CMA also works with agencies and local government to improve preparedness for flooding.

There is the inevitable fact that any activities on the floodplain, be it building a house or dryland cropping, will always be at risk of inundation and damage during floods. There needs to be an acceptance of that risk and feasible efforts to minimise damages. Wimmera CMA uses the following guiding principles when providing advice to councils on developments within the floodplain.

Guiding principles for best practice floodplain management

In order to minimise future risk from flooding (caused by overflows from watercourses) arising from new or replacement development in flood prone areas, the key considerations are:

- No reduction in flood flow capacity.
- No reduction in flood storage capacity.
- Ensuring floor levels are above a certain height to minimise the risk of inundation.
- Application of site safety requirements, including access during floods, consistent with best practice.
- Develop guidelines for vegetation removal from rivers and streams when their presence threatens public and private assets.
- Achieve a balance between economic, social and environmental values floodplains.

Table 2: Likelihood and consequence of threats to floodplains

Threat	Likelihood	Consequence	Threat rating
Climate change	Likely	Major	●
Inappropriate development on floodplain	Likely	Major	●
Planning deficiencies	Likely	Major	●
Aging and poorly managed structures	Likely	Moderate	●
Inadequate data currency and availability	Possible	Moderate	●

Risk level and the priority for action:

●	●	●	●
Very High	High	Moderate	Low

Wetlands

RCS (twenty-year) objectives for wetlands

1. Wetlands with recognised conservation significance are protected and sustained. These include:
 - Lake Albacutya Ramsar site
 - fourteen wetlands listed on the *Directory of Important Wetlands in Australia*
 - wetlands that are known to provide habitat for migratory birds and threatened species²
 - seasonal herbaceous wetlands (freshwater) of the temperate lowland plains³
2. The rate of decline in freshwater meadows and shallow freshwater marshes is decreased, as these meadows and marshes are under the greatest threat.
3. Wetlands continue to provide social, environmental and economic benefits valued by the community.

Asset description

The Wimmera is a hotspot for wetlands and related natural values. Survey data identifies 2,676 wetlands that are greater than one hectare. This equates to roughly 25 percent of Victoria's individual non-flowing wetlands⁴.

Wetlands are highly diverse in terms of their hydrology and salinity, with large numbers of the six wetland categories recognised by Corrick and Norman (1980)⁵ (see Figure 5). This contributes to high wetland biodiversity, with the different categories of wetland supporting a wide range of plant, bird, macroinvertebrate and other wetland species.

Wetlands can be grouped into sub-regions or wetland systems based on similar geographic characteristics and management issues (see Figure 6). Wetlands in all systems provide a major source of recreational opportunity valued by local communities and boosting local economies.

The wetland systems and their key attributes include:

1. Terminal lakes of the Wimmera River

Terminal lakes of the Wimmera River are a series of large lakes, including Lake Hindmarsh, Lake Albacutya, Outlet Creek and Ross Lakes, that are primarily filled by flooding flows from the Wimmera River. The lakes have significant social, economic and environmental qualities, including:

- Lake Albacutya is recognised as a Ramsar site of international significance; Lake Hindmarsh is recognised as a site of importance to migratory shorebirds⁶ and both lakes are recognised as nationally important⁷.
- Home to significant Indigenous and non-Indigenous cultural heritage.

2. Natimuk–Douglas saline wetland system

Natimuk–Douglas saline wetland system contains approximately 200 wetlands that are mostly groundwater fed saline wetlands. It has high environmental, moderate social and low economic values, including:

- Bird numbers attract many bird watchers.
- Recognised as a site of global bird conservation importance⁸ and 11 wetlands within the system have been recognised as nationally important⁹.

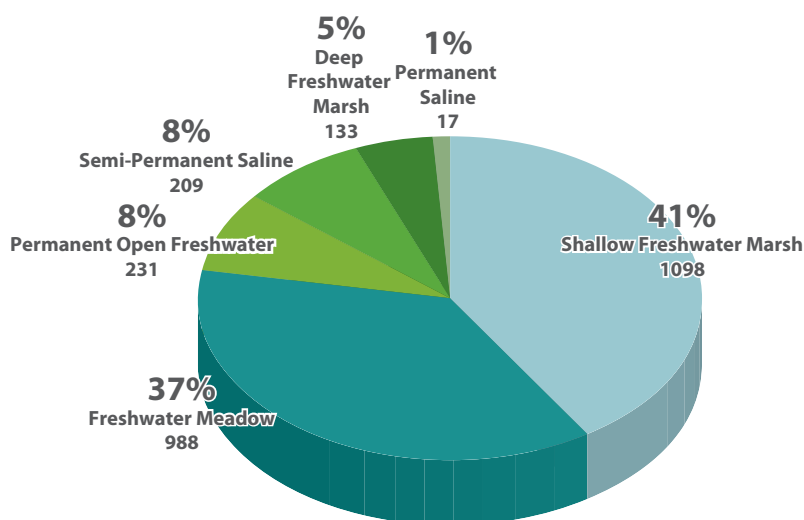


Figure 5: Number of wetlands greater than one hectare in size in each wetland category in the Wimmera.

² This includes migratory birds listed on international agreements between Australia and Japan, China, Republic of Korea and the Bonn Convention. It also includes threatened species listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and Victorian *Flora and Fauna Guarantee Act 1988*.

³ Listed as Critically Endangered under the federal Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

⁴ Sinclair Knight Merz (2006) *Wetland Extent and Drainage Line Mapping Project*. Prepared for Wimmera Catchment Management Authority

⁵ Corrick and Norman (1980) *Wetlands of Victoria. Wetlands and waterbirds of the Snowy River and Gippsland Lakes catchment*. Proceedings of the Royal Society of Victoria. 91: 1-15

⁶ Migratory Shorebird Site (Birds Australia, 2009)

⁷ Listed in Directory of Important Wetlands in Australia (Environment Australia, 2001)

⁸ Important Bird Area (<http://www.birdsaustralia.com.au/our-projects/important-bird-areas.html>). Also supports migratory birds listed for protection under international agreements including JAMBA, CAMBA, ROKAMBA and the Bonn Convention.

⁹ Listed in Directory of Important Wetlands in Australia (Environment Australia, 2001)

3. South-west Wimmera wetland system

South-west Wimmera wetland system is the largest wetland system containing more than 2,000 wetlands, which are mostly freshwater. It holds high environmental, social and economic values, including:

- Forms a major wetland complex that supports a large range of plants and animals.
- High connectivity due to high density and 'chains' of swamps that flow in wet periods.

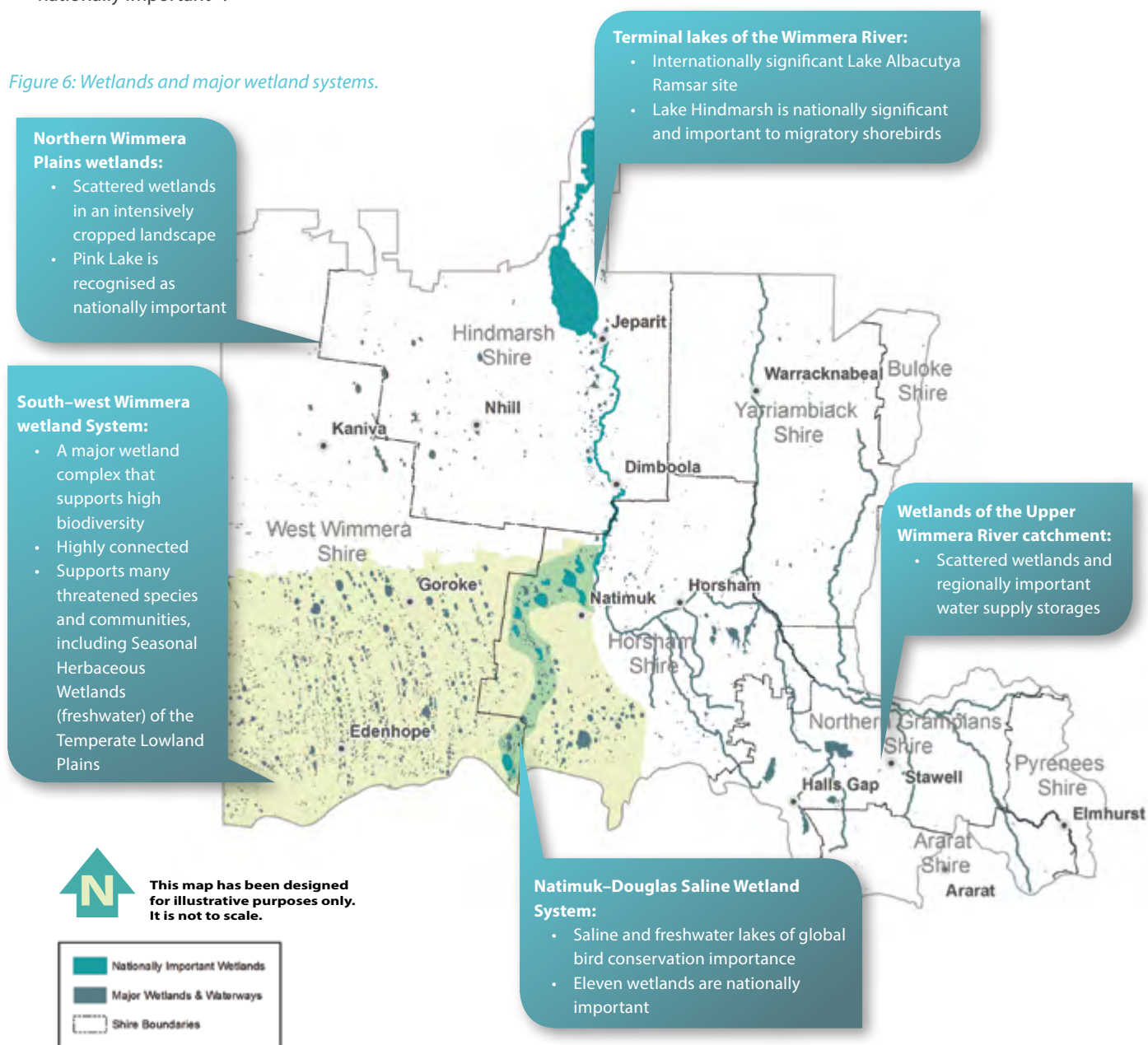
4. Northern Wimmera Plains wetlands

Northern Wimmera Plains wetlands include just over 400 wetlands, mostly freshwater swamps and lakes scattered across the landscape, and includes about 80 groundwater fed saline wetlands concentrated in a depression parallel to the Wimmera River. These wetlands support moderate environmental, moderate social and low economic values. Of particular note, Pink Lake is recognised as nationally important¹⁰.

5. Wetlands of the Upper Wimmera River catchment

Wetlands of the Upper Wimmera River catchment comprises about 250 wetlands, mostly freshwater swamps and lakes. These swamps and lakes support moderate environmental, social and economic values. In particular, Lake Bellfield, Lake Wartook, Lake Lonsdale and Taylors Lake are regionally important for water supply storage.

Figure 6: Wetlands and major wetland systems.



¹⁰ Listed in Directory of Important Wetlands in Australia (Environment Australia, 2001)

Current condition and trend

The condition of individual wetlands varies considerably with many in good to excellent condition, but large numbers have also been moderately to heavily degraded or lost.

Freshwater meadows are under the highest threat, with almost 400 lost since the 1970s and 70 percent modified by dams, drains, banks and crops¹¹. Condition assessments have also found a higher proportion of freshwater meadows in poor to very poor condition than any other wetland category¹².

Over half (57 percent) of wetlands have been modified and 474 or 18 percent have been lost since the 1970s. Wetlands are considered lost because they no longer function as wetlands, primarily due to being drained¹³.

Condition assessments in 2005¹⁴ and 2009¹⁵ found wetland soils, hydrology and physical form to generally be in good condition. The condition of vegetation varied but a large proportion of wetlands were found to be in moderate condition. The wetland catchment was of highest concern, with 61 percent of assessed wetlands in poor to very poor condition, indicating poor 'buffer areas' immediately surrounding the wetlands and potential impacts from neighbouring land.

Potential threats to wetlands

Less than 10 percent of wetlands are protected in public reserves, with just over 90 percent contained on private land. Many wetlands are on or surrounded by farmland managed for cropping and grazing. This presents challenges in striking a balance between agricultural production and wetland management.

The main threats to wetlands are:

1. Cropping — in and around wetlands poses a very high threat, particularly to shallow seasonal wetlands. Cropping can severely degrade wetland health by decreasing the amount of wetland plants, degrading water quality and altering hydrology via changes to drainage. The biggest threat to wetlands from cropping exists in the south-west Wimmera.

2. Changed hydrology — is an issue with almost 60 percent of wetlands altered by a dam, drain or bank, changing the natural timing, duration and extent of flooding¹⁶. These changes have occurred across the region, resulting in complete loss of some wetlands, while others are significantly altered. Groundwater levels have declined by one to five metres in the saline Parilla Sands Aquifer in some parts of the catchment since the early 1990s¹⁷. If declines continue, this could impact on the ecology of saline groundwater fed wetlands in the Natimuk–Douglas saline wetland system. However, future changes are dependent on rainfall recharge, thus difficult to predict or influence.

3. Dry climate — including drought and drying climate, leaves wetlands susceptible to damaging activities like cropping and overgrazing. A recent assessment of climate change vulnerability for wetlands in Victoria¹⁸ found that, under worst case drying scenarios, the interval between wetland inundation events would increase from around once every one to two years to once every four years. However, wetlands should continue to persist in the landscape under other drying scenarios. Impacts on groundwater fed wetlands are more difficult to predict, but a shift in water regime from seasonal to intermittent for at least some of these wetlands is likely with consequent changes in wetland ecology. Wetland managers are unable to directly influence climate, but can influence activities that degrade dry wetlands, such as cropping and overgrazing.

4. Pest plants — such as common weeds found in wetlands and their riparian areas include Bridal Creeper, Perennial veldt grass, African boxthorn, Phalaris, Tall Wheat-grass, Spear Thistle, Yorkshire Fog, Scotch Thistle, Small Nettle and other pasture grasses. Weed invasion can degrade wetlands by out-competing native plants and simplifying vegetation structure, providing harbour for pest animals such as foxes and rabbits and reducing aesthetic appearance.

5. Pest animals — can have a serious negative impact on native wetland plants and animals. Common wetland pest animals include predators like foxes, cats and dogs; non-native fish like Redfin and Mosquitofish and grazing animals like rabbits and hares.

6. Grazing by stock — commonly occurs in wetlands on private land. The impact on wetlands depends on the timing, intensity and frequency of grazing. In some cases, light well timed grazing can benefit some types of wetlands. However, overgrazing and poorly timed grazing can degrade wetland health by destroying vegetation, introducing manure and weeds and pugging, compacting and eroding soils.

7. Urban and recreational impacts — especially stormwater runoff into wetlands and human waste from camping beside wetlands, can degrade water quality if not managed correctly. This particularly impacts on deep permanent lakes that are popular for recreation.

Table 3 summarises the main threatening processes impacting on wetlands and whether they pose a very high, high, moderate or low threat to wetland condition. The threat ratings are based on research, GIS data analysis, expert opinion, local knowledge and field observations. They take into account the likelihood and consequence of the threat occurring and how widespread the threat is across the asset.

¹¹ Sinclair Knight Merz (2006) *Wetland Extent and Drainage Line Mapping Project*. Prepared for Wimmera CMA

¹² Wimmera Index of Wetland Condition Assessment results (2009) and Water's Edge Consulting (2005) *Wimmera Wetland Condition Assessment Project*, Prepared for Wimmera CMA

¹³ Sinclair Knight Merz (2006) *Wetland Extent and Drainage Line Mapping Project*. Prepared for Wimmera CMA

¹⁴ Water's Edge Consulting (2005) *Wimmera Wetland Condition Assessment Project*, Prepared for Wimmera CMA

¹⁵ Wimmera Index of Wetland Condition Assessment results (2009)

¹⁶ Sinclair Knight Merz (2006) *Wetland Extent and Drainage Line Mapping Project*. Prepared for Wimmera CMA

¹⁷ Cooling, M (2009) *West Wimmera Groundwater Dependent Ecosystems*. Prepared for Wimmera CMA by Ecological Associates Pty Ltd

¹⁸ Sinclair Knight Merz (2012) *Indicative Assessment of Climate Change Vulnerability for Wetlands in Victoria*. Prepared for the Department of Sustainability and Environment, Melbourne



Seasonal, freshwater wetlands are a regional asset in need of protection from changes to drainage, cropping and over-grazing by stock.

Table 3: The impact of the highest threats on the condition of different categories of wetlands.

Threats	Freshwater Meadows	Shallow Freshwater Marshes	Deep Freshwater Marshes	Permanent Open Freshwater	Semi-Permanent Saline	Permanent Saline
Cropping	●	●	●	●	●	●
Changed hydrology	●	●	●	●	●	●
Dry climate	●	●	●	●	●	●
Pest plants	●	●	●	●	●	●
Pest animals	●	●	●	●	●	●
Grazing by stock	●	●	●	●	●	●
Urban and recreational impacts	●	●	●	●	●	●

Risk level and the priority for action:

●	●	●	●
Very High	High	Moderate	Low

Management measures

Taking into consideration the condition, trends and threats to wetlands, the following six-year management measures have been developed to deliver the twenty-year objectives for wetland health:

1. Review, update and implement waterway strategies.
2. Actively protect wetlands with recognised conservation significance from threatening processes and sustain their conservation values.
3. Actively promote wetland protection.

4. Assist land managers to permanently protect and manage freshwater meadows and shallow freshwater marshes according to best practice.
5. Increase the number of land managers implementing best practice wetland management.
6. Prevent negative impacts to wetlands from new developments and land-use change by working with local governments and Department of Transport, Planning and Local Infrastructure to implement wetland-specific, planning scheme overlays.
7. Review, update and implement the *Lake Albacutya Ramsar Site Strategic Management Plan*.

— management measure led by Wimmera CMA.

Native vegetation

RCS (twenty-year) objectives for native vegetation

1. Improve the management of existing native vegetation classes.
2. Strategically revegetate with indigenous species.
3. Bring 30,000 ha (45 percent) of endangered vegetation on private land under ongoing and recognised best practice management standards.

Asset description

Although the interdependent nature of native vegetation and threatened species is recognised, they will be addressed separately in this strategy to assist with clarity of assessment of threats and prioritisation. Figure 8 will be used to highlight nature values for both native vegetation and threatened plants and animals.

Native vegetation provides habitat for native fauna. The overall diversity of flora and fauna underpins the resilience of the ecosystem. Natural landscapes provide opportunities for recreation and tourism and a range of other benefits. These benefits include control of dryland salinity, slowing wind speeds, providing ground cover so that soil structure is maintained, controlling erosion and acts as a carbon sink.

In general the larger, more natural and better connected expanses of native vegetation provide the healthiest, most resilient and most value as habitat. Conversely small, isolated patches of native vegetation are less resilient. The fate of native vegetation and the fauna species that rely upon on it are intimately linked.

Since European settlement, more than 70 percent of the land area has been cleared of native vegetation. In some local government areas, less than three percent of the native vegetation remains, and much of this is confined to roadsides. Widespread clearing has dramatically reduced the connectivity of habitat in the landscape.

Many of the vegetation communities that covered the plains are now recognised as endangered. Of these 154,000 ha (or 88 percent) are on private land outside the parks and reserves (see Figure 7). This includes remnant patches of three endangered vegetation communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*:

- Grey Box Grassy Woodlands and Derived Native Grasslands of south-eastern Australia
- Buloke Woodlands of the Riverina and Murray–Darling Depression Bioregions.
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

Current condition and trend

Compared with much of Australia, the overall condition of native vegetation in the Wimmera is average to poor.

There are gains being made through improved management actions, such as reducing rabbit and hare populations and weed

control. However, it appears losses are still occurring as old trees die without the recruitment of a new generation on private land.

Existing patches of native vegetation that are classed as threatened federally under the *Environment Protection and Biodiversity Conservation Act 1999*, or with an endangered status in Victoria (by Ecological Vegetation Class) require careful management (see Figure 7).

The majority of these patches occur on private land. For some vegetation types there is an incomplete understanding of the affect of different management practices. In those cases further research may be required to gain this understanding, such as is occurring with the DEPI led Assessment of Landscape and Floristic Change in Wimmera Buloke Woodlands program.

Improving the connectedness of native vegetation across the landscape will allow native plants and animals to better respond to threats and opportunities, and add resilience to the ecosystem as a whole.

Although much slower than animal life, plant populations also move along gradients over time. Improving connectedness allows native systems to respond or recover from events such as disease, fire and climate variations and ensures their long term viability and health.

Native vegetation planning and management is complex because of the potential adverse impacts, the need to consider unforeseen consequences as well as political and community interests. The NaturePrint natural values map (see Figure 8) provides the starting point for this planning. It is recognised that community-driven works that fall outside strategic priorities are also important.

There will always be support for local initiatives where the major cost is borne by the community, recognising that everyone is determined to do something positive 'in their patch'.

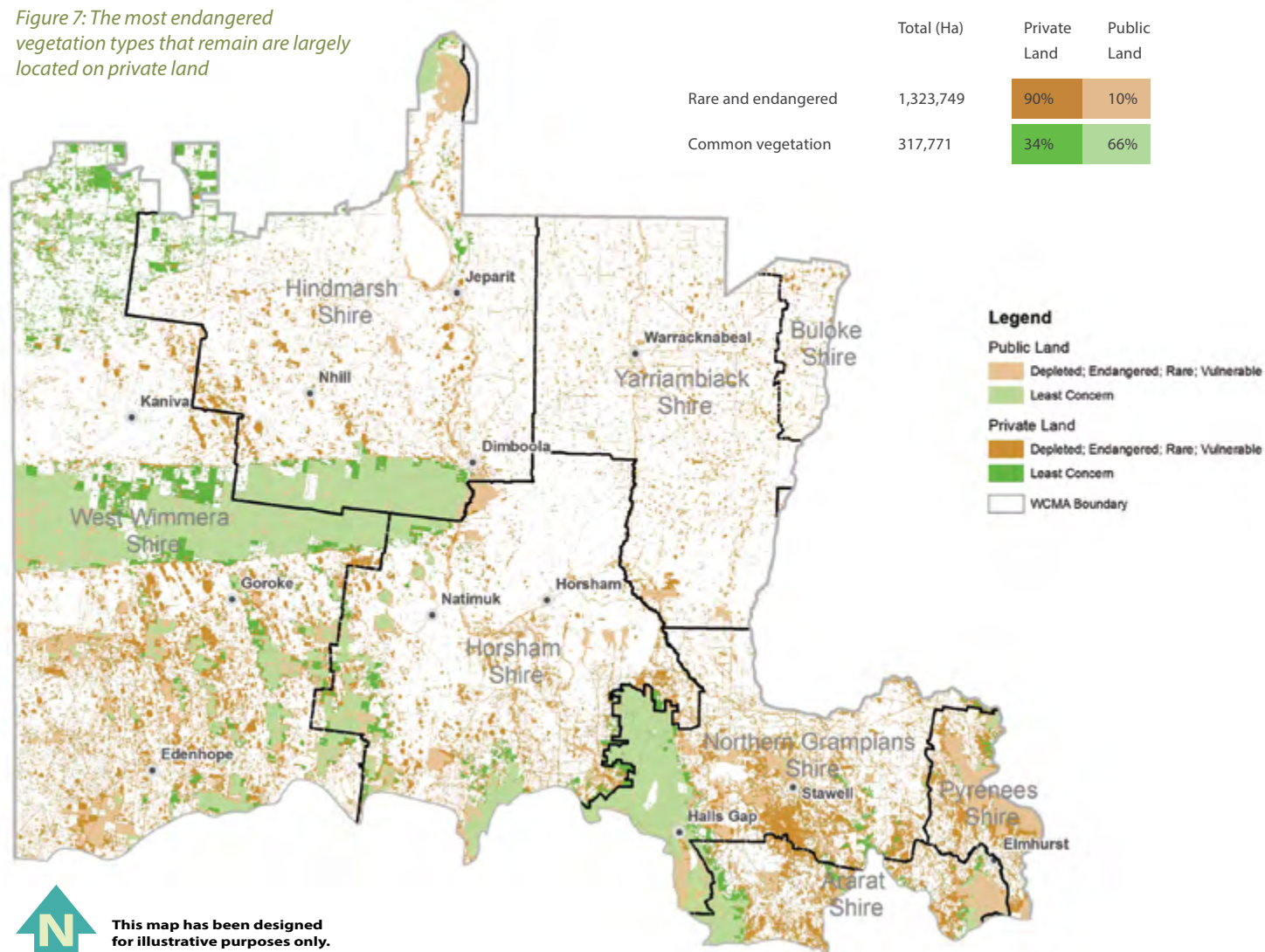
Weeds of local concern

During the RCS development, many community groups expressed concern for the need for more discretionary funding. Specifically, funding to address weed species of local concern, even if these species would not be prioritised under strict biosecurity principles.

Community groups felt that this would be important to maintain morale, as much as making an on-ground difference. While biosecurity principles are understood, community groups thought it equally important to work on the most visible species to boost morale, encourage action and visible on-ground improvements. This strategy recognises that targeted invasive plant and animal control activities can be locally effective on common species, such as regionally controlled weeds, and has its place.

Priorities for actions will be planned through the *Wimmera Invasive Plant and Animal Strategy*.

Figure 7: The most endangered vegetation types that remain are largely located on private land



Roadside weeds

The community have consistently, over several years, raised concerns about the responsibility for the control of weeds on roadsides. In October 2011, the Hon. Peter Walsh, State Minister for Agriculture and Food Security, made public the findings of a report by an independent working group commissioned by the government. The report recommends farmers and landholders not be responsible for managing weeds and rabbits on public roadsides.

The report recommends:

- The Victorian Government (in this case DEPI) is responsible for funding the control of state and regionally prohibited weeds on roadsides.
- Regionally controlled weeds (the most common weeds including Patterson's Curse, gorse and ragwort) are the responsibility of VicRoads on state roads and local government on municipal roads.
- Weeds that are not a priority for the local community do not have to be controlled by councils.
- It recognised that rural councils are disadvantaged in this regard and recommends that the cost of control on municipal roads in these cases should be shared between the Victorian Government and councils.

The Victorian Government has welcomed these recommendations and will work with local government on possible funding and implementation.

Potential threats to native vegetation

Highest threat risks are:

1. Invasive plants and animals — are the greatest threat to native vegetation. During the RCS consultation process, when asked to rank the threats in their area, community groups consistently ranked weeds and rabbits as a significant threat. During the development of the *Wimmera Invasive Plant and Animal Management Strategy* (WIPAMS) the extent of these impacts was analysed and management priorities made. WIPAMS is the guiding strategic document for Invasive plant and animal management.

There are many invasive plants and animals that have a widespread, negative impact on native vegetation. The most disruptive weeds include Bridal Creeper, Blackberry, Boneseed, African boxthorn, broom and gorse. In the worst cases, these weeds displace native species and dominate the landscape. They effectively displace native vegetation through competition. This, in turn, affects food availability and the utility of the landscape for native fauna. Even at more moderate densities, invasive plants can limit the complexity and resilience of native vegetation.

The most destructive invasive animals are rabbits, which interfere with the regeneration of slow growing native flora species such as Buloke and Callitris Pine by browsing young emerging trees.

2. Land-use change — that contribute to native vegetation decline include:

- Cropping in areas previously grazed. In general terms, cropping is replacing grazing in parts of the southern Wimmera that have historically been too wet. The decade prior to 2011 was very dry and landholders took the opportunity to convert land to new cropping areas. Cropping increases the incentive to remove trees and native ground cover to enable machinery use.
- Overgrazing by animals, including ringbarking.
- Burning of paddocks that reduces vegetation.
- Isolated illegal clearing of vegetation still occurs.

- Groundwater used for centre pivot irrigation development has historically resulted in the clearing of native vegetation. Market forces such as commodity prices and input costs, as well as changes to planning schemes, has resulted in less native vegetation removal in recent times.
- Precision agriculture technology and GPS guidance systems ensure that crops are sown and harvested to centimetre accuracy in order to maximise farming efficiency. Paddock trees are comparatively more disruptive to these systems. Therefore the incentive to remove paddock trees increases with an uptake of precision agriculture technology.

As agricultural practices progress there is little incentive to replace paddock trees when they die. This trend needs to be considered when strategically planning revegetation works across the landscape.

3. Extreme climatic events (drought & flood) — has the potential to have a major impact on native vegetation and the scale and nature of impacts is uncertain. Despite the uncertainties the general principles to remember are:

- Landscape fragmentation inhibits some species' movements in response to extreme events. Migration is inhibited when there is less than 30 percent native vegetation cover.
- More severe climatic fluctuations may limit the capacity for native species to evolve or move.
- Long periods of dry or wet are likely to prompt changes to land use that could either benefit or impact negatively on native species. Therefore, there is a need to remain alert and take advantage of opportunities to minimise the impact of changes.

The Wimmera's climate is highly variable, experiencing cyclical periods of drought and flood. There is uncertainty about the impact of more prolonged dry periods or a change in the seasonality of rainfall.

Table 4: Likelihood and consequence of threats to native vegetation

Threat	Likelihood	Consequence	Threat rating
Plants and animals (invasion and grazing)	Almost certain	Major	●
Land-use change	Almost certain	Major	●
Extreme climatic events (drought & flood)	Likely	Major	●
Dryland salinity	Likely	Moderate	●
Disease e.g. Phytophthora and Myrtle Rust	Unlikely	Major	●
Inappropriate fire regimes	Likely	Moderate	●
Development (non-agricultural)	Likely	Minor	●

Risk level and the priority for action:

●	●	●	●
Very High	High	Moderate	Low

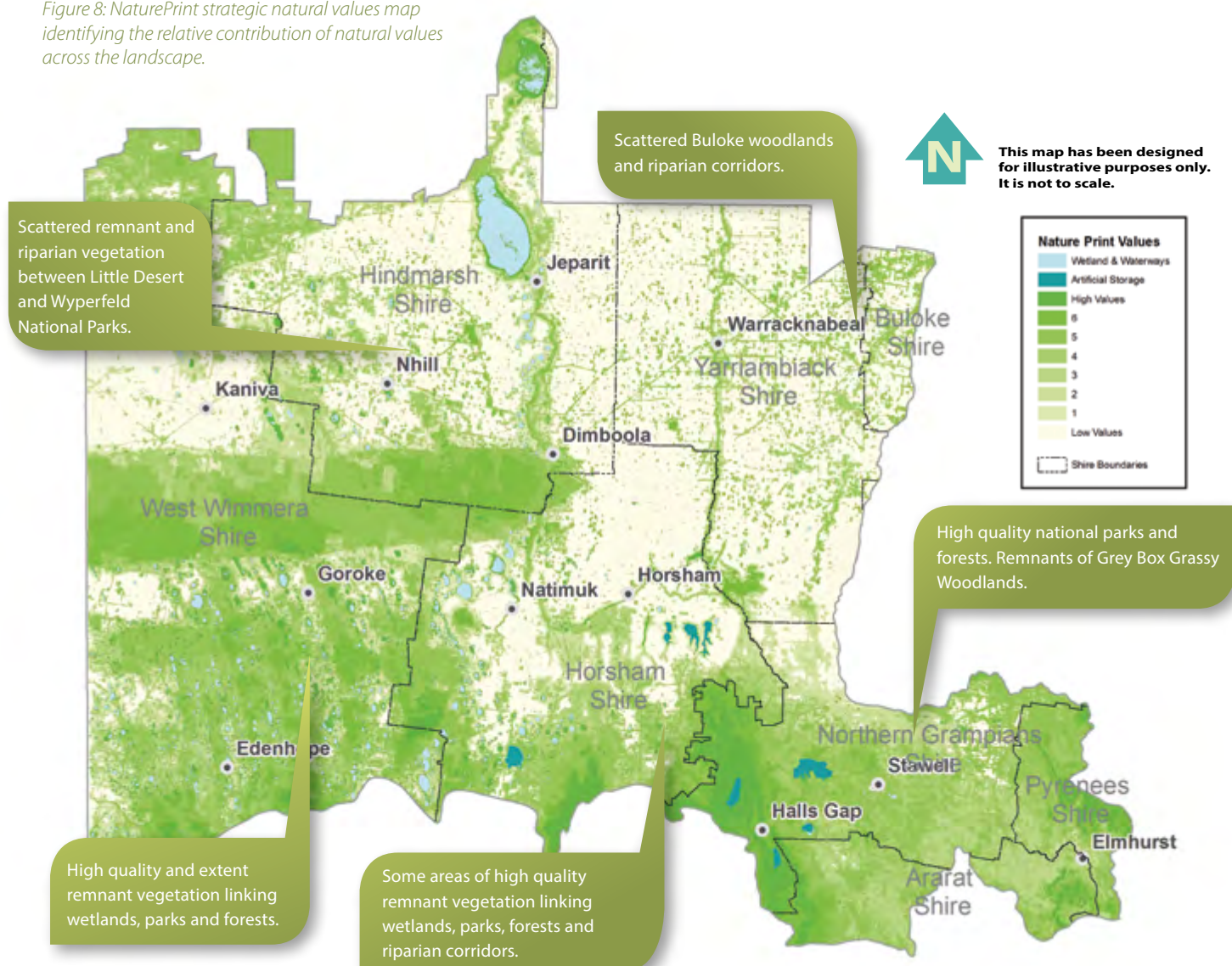
Management measures

Taking into consideration the condition, trends and threats to native vegetation, the following six-year management measures have been developed to deliver the twenty-year objectives for native vegetation health:

1. Update and review the *Wimmera Native Vegetation Plan*, with an aim to provide greater flexibility and strategic thinking in offset requirements under planning schemes, particularly for single paddock trees, connectivity and biolinks.
2. Actively protect high conservation value native vegetation from threatening processes and sustain its conservation values.
3. Ensure current biosecurity approaches adequately address disease threats.
4. Improve coordination with government agencies, local governments, industry groups, landholders and others for landscape-scale planning and planting of native vegetation, including revegetation activities.
5. Continue to implement the *Wimmera Invasive Plant and Animal Strategy*, and communicate information on activities and success to the broader community.
6. Implement recommendations of the report by the independent working group on roadside management.
7. Develop an action plan that will address potential increase in carbon sequestration activities through native vegetation actions.

— management measure led by Wimmera CMA.

Figure 8: NaturePrint strategic natural values map identifying the relative contribution of natural values across the landscape.



Threatened plants and animals

RCS (twenty-year) objectives for threatened plants and animals

1. Demonstrate actions leading to improving the status of 20 percent of listed species occurring in the region.
2. Improve community awareness of local threatened species.
3. Improve coordination of communication and availability of information between agencies and the community to maximise benefits for threatened species.

Asset description

Threatened species are defined as native plants and animals that have had notable population declines, are facing ongoing threats, and may become extinct.

There is a systematic, rigorous approach to recognising and listing threatened species at both state and national levels. These assessments are supported by law, which include the [Flora and Fauna Guarantee Act 1988](#) in Victoria and the [Environment Protection and Biodiversity Conservation Act 1999](#) nationally.

The [Flora and Fauna Guarantee Act 1988](#) requires that action statements be prepared for listed species. The Actions for Biodiversity Conservation database (ABC Database), developed by DEPI, is currently the primary tool used to plan and prioritise species-specific, on-ground actions.

Small, isolated populations of threatened plants and animals are found across the Wimmera (listed in Appendix 3, available at www.wcma.vic.gov.au). Habitat loss, land-use change and invasive plants and animals have been the primary threatening processes. In general, there is an intrinsic relationship between the amount of native vegetation and the wellbeing of the species that rely on it for habitat.

The ABC database facilitates the:

- Recording of management actions for significant species, communities or potentially threatening processes.
- Assigning of priorities to locations and actions.
- Communication of priorities to investors, planning authorities and land managers.
- Monitoring of progress towards implementation.
- Recording and reporting on the state and trends of significant species, communities or potentially threatening processes.

Actions in the database include targeted threat control and habitat improvement for individual species at individual sites, survey work, population monitoring and applied research to better understand and protect these species.

Currently the prioritisation of on-ground actions is developed using a combination of the ABC database, local knowledge and the NaturePrint Strategic Natural Values map (see Figure 8).

The *Environment Protection and Biodiversity Conservation Act 1999* encourages the development of recovery plans for nationally threatened species and communities. Regional-based recovery teams implement these plans. Researchers, public land managers (such as DEPI and Parks Victoria), natural resource managers (such as Wimmera CMA) and conservation-minded community representatives contribute to these teams. The Red-tailed Black Cockatoo, Malleefowl, and threatened orchids are some of the species serviced by regional recovery teams based in western Victoria.

Activities primarily for the improvement of other natural resource assets such as waterways, wetland and native vegetation also benefit threatened species. These activities include:

- Landscape-wide management of invasive plants and animals.
- Strategic replanting of native vegetation to improve connectivity.
- Programs to encourage private landholders to improve the management of existing native vegetation to increase its habitat value.

There are opportunities to improve the coordination of these activities to maximise the benefit for threatened species and build better integrated catchment management. Coordination would be improved by:

- Directing activity in areas where there is likely to be the greatest impact for the largest number of threatened species by using the NaturePrint Strategic Natural Values map.
- Ensuring there is adequate communication and information flow between organisations and the community. This will ensure that the locations of current and ongoing work are known and monitoring of threatened species can take place. Additionally, programs that are aimed primarily at other assets can be adjusted to maximise the benefit for threatened species in that particular area.

Conversely, many organisations work on the land and undertake actions that may benefit or unintentionally disrupt threatened species. For example, councils undertake work on roadsides that may interact with threatened species. Ensuring proper coordination and information flow between organisations is essential to maximise the positive potential of these works.

There are a number of threatened fauna and flora species in the region. Threatened fauna include the Bush Stone-curlew Red-tailed Black Cockatoo, Golden Sun Moth, Malleefowl, Growling Grass Frog and Brush-tailed Rock Wallaby. Threatened flora include the Wimmera Rice-flower, Jumping Jack Wattle and several orchid species. Important threatened communities include Buloke Woodlands, Woodland birds and Grey Box Grassy Woodlands.



Wimmera orchid lab volunteer inspecting one of the many highly endangered orchids the laboratory is growing.

Current condition and trend

Data on population trends, specific to the Wimmera, is limited to some species because it is time-consuming and resource intensive.

An ongoing challenge is the collective ability to measure and demonstrate improvement in the status of populations. In many cases, it's possible to address the threats, but demonstrating the response of these populations remains challenging. Recognising these challenges, it's still important to demonstrate progress towards improving the status of these species.

On-ground actions to assist survival have been prioritised ahead of the assessment of population trends. The assessment of population status and trends is confounded by occasional natural events such as drought, fire and flood. Despite these challenges, there have been regional status and trend assessments for many threatened fauna and flora species (listed in Appendix 3, available at www.wcma.vic.gov.au).

DEPI is currently taking initiatives to review existing prioritisation processes and develop a statewide framework for prioritising this work and for demonstrating progress.

Consultation during the development of the RCS revealed limited knowledge about threatened species in the broader community.

Many of the groups found it difficult to name a single threatened species in their district. Only Bush Stone-curlews were nominated on several occasions as a species that was once prevalent in the region, but now rarely encountered.

Development of new technologies and scientific approaches are enhancing understanding of threatened species, as well as the ability to improve their quality and extent, such as the Wimmera's orchid laboratory facilities.

There is still major concern from the community and NRM groups on the impacts of fox and cat predation.

Potential threats to threatened plants & animals

Table 5: Likelihood and consequence of threats to these species. This table represent the generalised threat rating for all threatened species, not individual species.

Threat	Likelihood	Consequence	Threat rating
Plants and animals (invasion, grazing and predation)	Almost certain	Major — reduces habitat quality and impacts directly on species.	●
Prolonged and severe climatic events	Likely — long periods of drought, extreme rainfall, extreme heat and wind storms.	Major — species will become less well adapted to current location, habitat likely to change with climate extremes.	●
Disease	Unlikely — biosecurity measures are in place	Major — disease can have a major impact on populations i.e. Myrtle Rust.	●
Land-use change modifying habitat	Almost certain — loss of paddock trees without recruitment happening now, otherwise habitat stable.	Moderate — no threatened species rely solely on paddock trees, but these trees are a valuable food resource for Red-tailed Black Cockatoos in south-west Wimmera.	●
Inappropriate fire management and bushfire	Almost certain — occur every season	Minor-catastrophic While fire management is required, both planned burns and bushfires can impact negatively on threatened species.	●

Risk level and the priority for action:

●	●	●	●
Very High	High	Moderate	Low

Management measures

Taking into consideration the condition, trends and threats to threatened plants & animals, the following six-year management measures have been developed to deliver the twenty-year objectives for threatened species:

1. Continue to support on-ground actions to reduce threats at specific sites.
2. Participate in the development of a statewide framework to improve the prioritisation of threatened species work and the communication of successes.
3. Continue to implement WIPAMs to manage pest plant and animals and disease.
4. Ensure current biosecurity approaches adequately address disease threats.
5. Undertake educational programs to improve community involvement and awareness of threatened plants and animals and the relevant threatening processes.
6. Identify flagship species and ecological communities to promote landscape-scale habitat protection and improvement work.
7. Support and participate in existing networks to maximise information flow between agencies (e.g. recovery teams).
8. Establish and maintain a regional threatened species advisory committee that reports to the Wimmera CMA board and includes representatives from key agencies.
9. Ensure that spatial information on threatened species is accessible and used by local governments and fire managers, so that these species are routinely accounted for in planning and operations.
10. Implement actions that directly lead to improving the status of listed threatened species, with a focus on propagating and reintroducing listed flora species.

■ — management measure led by Wimmera CMA.

RCS (twenty-year) objectives for Soils

The overall outcome for soils will be to ensure that land managers have the capacity, skills and knowledge to improve soil productivity and resilience to environmental change. Resilient soils will in turn, support a productive farming system, and a healthy environment and community that is prosperous in the face of climatic and economic challenges.

This outcome will be achieved by increasing the number of landholders (80 percent) adopting best management practices that improve soil:

1. Productive capacity.
2. Resilience against extreme weather events and economic perturbations.
3. Rainfall use efficiency and water holding capacity.
4. Environmental amenity (e.g. reduced greenhouse gas emissions).
5. Organic matter and biological activity.
6. Resilience against degradation on other natural assets.

Asset description

Soils provide important ecosystem services that support agricultural productivity, as well as the biodiversity and vitality of native flora and fauna. Ecosystem services extend across both public and private land and include water infiltration and storage, soil stability and nutrient availability for plant growth. The majority of soils are used to support a large agricultural industry. Therefore, this section focuses mainly on ecosystem services that soils provide private land, as well as land-use activities that influence soil health.

Most soils have very slow formation rates and are considered a non-renewable resource, necessitating appropriate management if they are to remain productive in the long term. Sustainable management of soils is critical for maintaining Victoria's and Australia's economy and providing national food security.

Sustainable management of soils on private land also influences the health of other natural assets, such as native vegetation and waterways. By reducing the threat of soil to degradation, we improve soil fertility and protect other natural assets.

Wimmera soils are highly variable at both regional and local scales, with multiple soil types often present in a single paddock. Different soil types have different susceptibilities to degradation.

The soil types and their key threats include:

1. Texture contrast soils of the Upper Catchment are naturally susceptible to water erosion

Texture contrast soils have characteristically light, sandy/loamy surface soils that overlay heavy clay subsoils. The heavy clay subsoils tend to be compacted, with limited drainage capacity. Light topsoil that overlays the poorly drained subsurface clay are easily removed by water, especially on steep landscapes where rainfall is high (greater than 500 mm).

2. Sandy soils of the Northern Plains are naturally susceptible to wind erosion

Light, sandy soils with low clay content that form in arid areas are easily moved by wind. In the Northern Plains light, sandy soils are characteristically eroded by wind and moved as sand drifts or, if fine enough, dust clouds.

3. Acid soils are concentrated in the Upper Catchment

Acid soils (with a pH of less than 7) form when calcium, magnesium, potassium and sodium ions are rapidly leached from the soil profile. They are therefore generally restricted to higher rainfall areas (greater than 500 mm). In the Upper Catchment, acidic topsoil is very common and is often associated with aluminium toxicities

4. Sodic subsoils are widespread throughout the Wimmera catchment

Sodic soils have high sodium content and, whilst widespread, are particularly characteristic of ridge and swale systems in the south-west Wimmera and Northern Plains. Dispersion of sodium in the subsoil can cause subsoil erosion, gully erosion, compaction, and waterlogging.

5. Soils throughout the Wimmera catchment are naturally saline

Salinity has accumulated in the landscape over the last few million years (primary salinity) and remobilised due to subsurface water flows. Primary salinity occurs in sedimentary basins, alluvial deposits and sand dunes (south-west Wimmera and Northern Plains). Primary salinity is also associated with deeply weathered granites and fractured rocks from the higher relief areas of the Upper Catchment.

Degradation processes that naturally occur in the environment can be managed on private land through best land management practices. Many farmers acknowledge that adoption of best management practices will improve their soil health and have expressed keen interest in learning more about managing soil health.

Current condition and trend

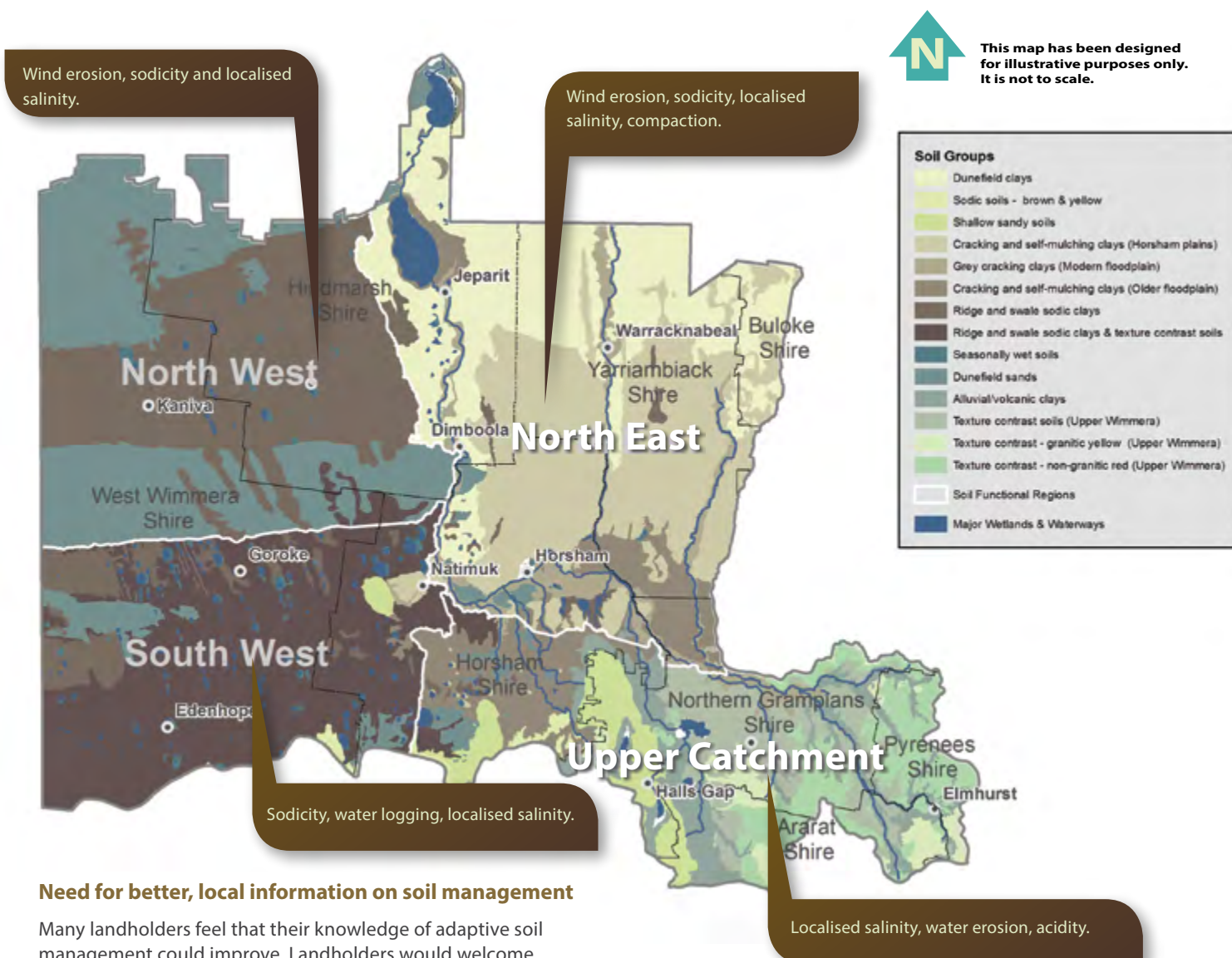
Consultation with community groups, agencies and partners, together with evidence of land use change and scientific data (e.g. mapping) have indicated changes in the condition of soils.

Good work has been done

There is now a common understanding that keeping the ground covered is the single most important thing a landholder can do to protect their soil from erosion.

Increased knowledge of no-till and stubble retention practices has reduced soil disturbance and erosion. It is assumed that widespread adoption of these practices has improved soil resilience. DEPI's annual *Wimmera Cropland Management Transect* reflects the large increase in no-till practices.

Figure 9: Regional soil types and localised threats.



Need for better, local information on soil management

Many landholders feel that their knowledge of adaptive soil management could improve. Landholders would welcome support to conduct trials and want stronger support for research and its translation to on-farm decisions. Landholders want to better understand their soils, as well as have access to a variety of best practice management methods to help adapt to a variable climate.

These methods include alternative systems, such as native pasture cropping and the use of perennial pastures. Best practice techniques are ever evolving and farmers want to keep pace with new technology and innovation.

Seasonal variability influences best management practice in northern Wimmera

In contrast to the peak percentage of stubble retention in the northern Wimmera during 2009, the following two years saw a marked increase in stubble burning to the highest levels since 2004. This was due to fire being used as a tool to manage populations of mice, snails and slugs. Heavy summer rainfall also moved and lodged stubble into inter-row spaces, making the use of machinery challenging.

Further work is needed to improve integrated pest management in no-till cropping systems, as well as adaptive management responses to extreme seasonal conditions.

Land use change in south-west Wimmera may contribute to soil health risks

South-west Wimmera has a long agricultural history of pastures and grazing. During recent dry years, infrequent rainfall and lower prices for wool made pastures less economically viable. As a result, many landholders incorporated cropping into their farming system. Land-use change from pasture to cropping may have implications for soil health in this region.

Cropping systems leave topsoil periodically exposed to the elements and at risk of erosion. This causes the loss of organic matter, in particular carbon, which is one of the lightest elements.

Shifts from pasture to cropping systems may see a drop in organic carbon within a short number of years. The use of pasture cropping elsewhere in Australia has demonstrated far less of an impact on the loss of organic matter and carbon. Further investigation is needed into mitigation options, such as pasture cropping systems that better preserve soil health and fertility.

Erosion issues in the Upper Catchment could be reduced through the use of long term groundcover

Perennial pasturists in the Upper Catchment experienced minimal soil loss during the intense rainfall events in 2010 and 2011. It is thought that adequate perennial ground cover slowed water flow and significantly reduced erosion.

Interest in using perennial pastures for erosion control and production benefits has increased in recent years and there is an improved understanding of how to establish and maintain perennial pastures. However, further trials and extension work are needed for this management practice to become widely accepted.

Heavy rainfall following drought years may increase the risk of dryland salinity

Dryland salinity appears to have stabilised across the catchment, most likely due to the 2002–2009 drought. According to the draft DEPI Salinity Statement, previous severity of salinity trends from the National Land & Water Resources Audit (NLWRD) have recently been downgraded. However, with recent heavy rainfall and flooding, recharging of groundwater systems may lead to expanded areas affected by salt in the near future.

Need for increased productivity in the future




In the future, predicted demand for food and fibre production will influence Victorian landholders to increase productivity limits. This will be challenging, as climate variability and extreme natural events have the potential to impact on even the best prepared farming system.

Reduced growing season rainfall and rising temperatures could potentially lead to drier soils, loss of organic matter and organic carbon, changes to biological activity, sparser ground cover and increased susceptibility to erosion. To deal with these types of challenges, management of soils in the future must involve ways to improve storage of water, organic matter and organic carbon and improve beneficial biological activity and nutrient cycling.





Potential threats to soil condition

Current threats to the condition of soils are listed in Table 6. This table ranks each threat according to likelihood of the threat occurring, the consequence if the threat were to occur and other potential impacts the threat has on other natural resources (assets). Priority threats are those given an overall high NRM threat ranking, which indicates degradation processes that are seen to likely impact on other natural assets. The overall NRM threat ranking may change over the next 20 years with the adoption of best management practices, such as perennial pastures and stubble retention that reduce wind and water degradation.





Table 6: Likelihood and consequence of potential threats to soils... continued next page.





Threat	Likelihood*		Consequence			Threat rating
			Environmental	Economic	Social	
Wind Erosion	High in north-west	High in north-east	<ul style="list-style-type: none"> Sedimentation of waterways and wetlands. Decline in water quality. Smothering of native vegetation. Loss of soil organic matter and carbon. 	<ul style="list-style-type: none"> Loss of soil organic matter and carbon. Loss of soil fertility, biodiversity and productivity. Damage to crops and pastures. Damage to infrastructure. 	<ul style="list-style-type: none"> Health hazard from dust. Impacts on recreational activities (e.g. blue-green algae). 	 Impact on terminal lakes and the Little Desert National Park
	Moderate in south-west	Moderate in upper				
Water Erosion	Moderate in north-west	Low in north-east	<ul style="list-style-type: none"> Sedimentation of waterways and wetlands. Decline in water quality. Reduced instream biodiversity. Loss of soil organic matter and carbon. 	<ul style="list-style-type: none"> Loss of soil organic matter and carbon. Loss of soil fertility, biodiversity and productivity. Damage to crops and pastures. Damage to infrastructure. 	<ul style="list-style-type: none"> Impacts on recreational activities (e.g. blue-green algae). 	 Nutrification and sedimentation of the Wimmera River catchment
	Moderate in south-west	High in upper				
Sodicity	Moderate in north-west	Moderate in north-east	<ul style="list-style-type: none"> Contribute to water erosion, salinity, nutrification and sedimentation of wetlands and waterways. 	<ul style="list-style-type: none"> Contribute to decline in soil structure and water logging. Poor root growth, reduced water efficiencies and loss of productivity. Damage to crops and pastures. 	<ul style="list-style-type: none"> Impacts on recreational activities (e.g. blue-green algae). 	 May contribute to nutrification and sedimentation of Wimmera River catchment and wetlands
	Moderate in south-west	Moderate in upper				

Risk level and the priority for action:

			
Very High	High	Moderate	Low

* The likelihood of each threat has been reported for each sub-catchment area to align with major soil groups and landscapes (Figure 9). This information has been gathered from hazard maps produced as part of the Land Resource Assessment report.

Threat	Likelihood*		Consequence			Threat rating
			Environmental	Economic	Social	
Acid Soils	Low in north-west	Low in north-east	<ul style="list-style-type: none"> Contribute to poor plant growth and soil erosion. 	<ul style="list-style-type: none"> Slow turnover of organic matter. Loss of soil fertility. Damage to plant roots & reduction in productivity. 	<ul style="list-style-type: none"> May impact on recreational activities. 	 May contribute to nutrification and sedimentation of Wimmera River catchment.
	Low in south-west	High in upper				
Salinity	Moderate in north-west	Moderate in north-east	<ul style="list-style-type: none"> Decline in water quality. Loss of flora and fauna. Reduced instream biodiversity. 	<ul style="list-style-type: none"> Loss of productivity on marginal land. Damage to crops and pastures. 	<ul style="list-style-type: none"> Impacts on recreational activities. 	 Impacts on water quality of the Wimmera River catchment and Terminal Lakes
	Moderate in south-west	Moderate in upper				
Water Logging	Low in north-west	Low in north-east	<ul style="list-style-type: none"> Impacts restricted to productive areas. 	<ul style="list-style-type: none"> Reduced plant growth. Increased Nitrogen loss by denitrification and leaching. Damage to plant roots. Higher risks to livestock health. 	<ul style="list-style-type: none"> Impacts restricted to productive areas. 	 Impacts restricted to on-farm & localised areas
	High in south-west	High in upper				
Compaction	Moderate in north-west	High in north-east	<ul style="list-style-type: none"> Impacts restricted to productive areas. 	<ul style="list-style-type: none"> Restricts root growth of crops & pastures. Restricts soil drainage and contributes to water logging. 	<ul style="list-style-type: none"> Impacts restricted to productive areas. 	 Impacts restricted to on-farm & localised areas
	Low in south-west	High in upper				

Risk level and the priority for action:			
			
Very High	High	Moderate	Low

* The likelihood of each threat has been reported for each sub-catchment area to align with major soil groups and landscapes (Figure 9). This information has been gathered from hazard maps produced as part of the Land Resource Assessment report.

Management measures

Taking into consideration the condition, trends and threats to soil, the following six-year management measures have been developed to deliver the twenty-year objectives for soil health:

1. Maintaining or improving ground cover.
2. Increasing soil organic matter (including soil carbon).
3. Improving beneficial soil biological activity.
4. Recovering areas of dryland salinity.
5. Improving nutrient efficiencies.
6. Enhancing landholder knowledge of soil health.
7. Supporting research and development.
8. Improving partnerships between landholders and soil health agencies.

Fire management

Mitigating bushfire risk on public land

The Wimmera is fire prone. Although the risk of bushfire cannot be eliminated, it can be mitigated by effective planning and management actions. The two objectives for bushfire management on public land are:

- To minimise the impact of major bushfires on human life, communities, essential infrastructure and the economy (where human life is the highest priority); and
- To maintain or improve the resilience of natural ecosystems.

Planned burning is the most effective technique for managing fuel hazard over large areas. DEPI runs an extensive fire operations planning process each year in consultation with the community. The process identifies areas proposed for planned burning, and draws on scientific research about bushfire risk and the impact of fire on natural ecosystems. Effective risk mitigation through fuel management on public land should be complemented with efforts on private land.

The final report of the Victorian Bushfire Royal Commission recommended that DEPI should allocate planned burning to five percent of public land on a rolling average basis, in addition to areas burnt by bushfires. This recommendation was designed to achieve an adequate level of fuel management, reducing the threat of bushfire, and to strike a balance between protection of life, property and environmental values. The government has accepted the recommendations of the Royal Commission.

Objectives

Integrated fire management

1. During the development of the RCS an area identified for improvement was a lack of managed burns on private land. Burning for fuel reduction, at a frequency and intensity that is right for the vegetation type, can be a positive management tool for both fire prevention and the environment. The prevention aspect is particularly relevant where patches of native vegetation on private land exist near residential areas.
2. Using fire as a tool in the management of native vegetation is an area that needs further research and development in the Wimmera. Using fire requires ecological knowledge to plan, and there are risks and resource requirements associated with undertaking the burns. Many landholders have patches of native vegetation that have long been un-burnt and are likely to remain so in the future. There are potential benefits for both safety and for native fire dependant species if the relevant authorities can work with landholders to provide information and support.

Management measure

1. Wimmera CMA, CFA and DEPI will investigate opportunities to take a more integrated approach to managing burns that could concurrently benefit safety and environmental values. These organisations will work together to implement more integrated fire management arrangements, including the involvement in municipal fire management plans.

Emergency management

Disasters can pose a significant cost to the community both financially and emotionally. While the main focus of emergency management (or disaster management) is the protection of life and public assets, it also aims to minimise the impacts on the environment and private assets. The key principles for emergency management are prevention, preparedness, response and recovery. While not all emergencies can be prevented, response and recovery costs can be minimised by placing an appropriate level of effort in prevention and preparedness.

Emergency management is a team effort. It's a collaboration between government organisations, business, community and volunteer groups and individuals. The best prepared communities are those that have strong networks and plans before an emergency occurs, this is something the Wimmera generally does well.

The Wimmera has a long history of emergency management partnerships. The alliances have led to the successful management of many different types of emergencies including fires, floods, plagues and disease. However there is always room for improvement.

While Victoria Police have an overarching coordination role, different agencies are charged with different emergency management responsibilities through the Emergency Management Manual Victoria. For example, the SES are the control agency for floods, while a range of agencies including the BOM, CMAs and local government are support agencies. Similarly with fire, CFA take responsibility for fire management of private land and DEPI for state owned land with a range of agencies providing support.

The Emergency Management Green Paper and Comrie Review into the 2010–11 Flood Warning and Response recommended that government agencies need to work together to build capacity particularly around emergency management including fire.

Objectives

1. A well prepared community, with plans in place to respond to and recover from emergencies as efficiently and effectively as possible.

Management measures

1. Regional government agencies work more closely to build capacity for incident management.
2. Continually improve emergency management by implementing best practice management techniques.

Emerging opportunities & challenges

Carbon markets

Australia has taken a path to limit the growth of its emissions. This can be undertaken in two ways: firstly, by simply reducing the quantity of emissions; and, secondly, by removing CO₂ from the atmosphere by sequestration. Victorian Government policy supports landholder engagement with emerging carbon market opportunities. The *Victorian Climate Change Act 2010* provides a legal framework for landholder engagement with the carbon market.

Agricultural and other land can be managed to both reduce the quantity of emissions, and to sequester atmospheric carbon. There are likely to be opportunities for landholders on both sides of this equation, many of which may provide additional production, business and conservation benefits. Sequestering carbon has direct links to NRM.

Activities that landholders might consider adopting to sequester carbon include reforestation, revegetation, manage regrowth of forests and soil carbon capture.

Further planning is required to determine the best management approach to deal with carbon sequestration, recognising that any approach can have positive or negative impacts on the community. The Australian Government proposed regional NRM plans for climate change will provide the planning mechanism to ensure the Wimmera is 'carbon ready'.

Integrating carbon sequestration opportunities into catchment planning

The emerging carbon economy may change perspectives on what is profitable in the landscape, and encourage a range of alternative activities. If this is the case, the community will need to integrate these activities into sustainable catchment management, to build on the opportunities for multiple benefits.

This is particularly true for revegetation activities, given landscape-scale changes have the potential to greatly benefit or disrupt other NRM outcomes and the community's way of life. The process by which planning maximises benefits and minimises impacts can be integrated with other landscape scale biodiversity programs such as biolinks and green corridors, e.g. Habitat 141 (see Figure 10).

Considerations by which land should be selected for revegetation and for reforestation include:

- The impact on water runoff and stream flows, including groundwater flows, should be understood and considered.
- Benefits for other natural resource management objectives should be optimised. From this perspective biodiverse planting will always be favoured over single species reforestation.
- Revegetation for biodiversity should be consistent with the Ecological Vegetation Class in that place prior to clearing. For example, reforestation should not occur where there were once native grasslands.
- In areas identified as important for connectivity only biodiversity focussed revegetation should occur.
- Revegetation planning activity should take into account fire risk, especially around towns.

Revegetation should be targeted toward agricultural land of marginal profitability, avoiding highly productive land.

In addition to this, consideration needs to be given to the socioeconomic impacts that potentially large scale land-use change can bring, similar to what has been observed in regions where forestry has replaced agriculture.

Mining

The Wimmera has a long history of mining, in particular gold mining in the upper part of the catchment around Stawell, which stretches back for over 100 years. In recent years there has been a growing interest in the Wimmera as a source of mineral sands. There is also potential for further development as a number of exploration permits have been granted in the region.

Mining has the ability to provide economic benefits to the state and the region through improved infrastructure, employment and service industries. Potential environmental impacts are regulated under a range of state and federal legislation by a range of government organisations, such as DEPI and EPA. The aim is to leave the land in at least the same condition as it was before mining. Where land has previously been degraded, there may be opportunities to rectify some of this damage through the mining rehabilitation process.

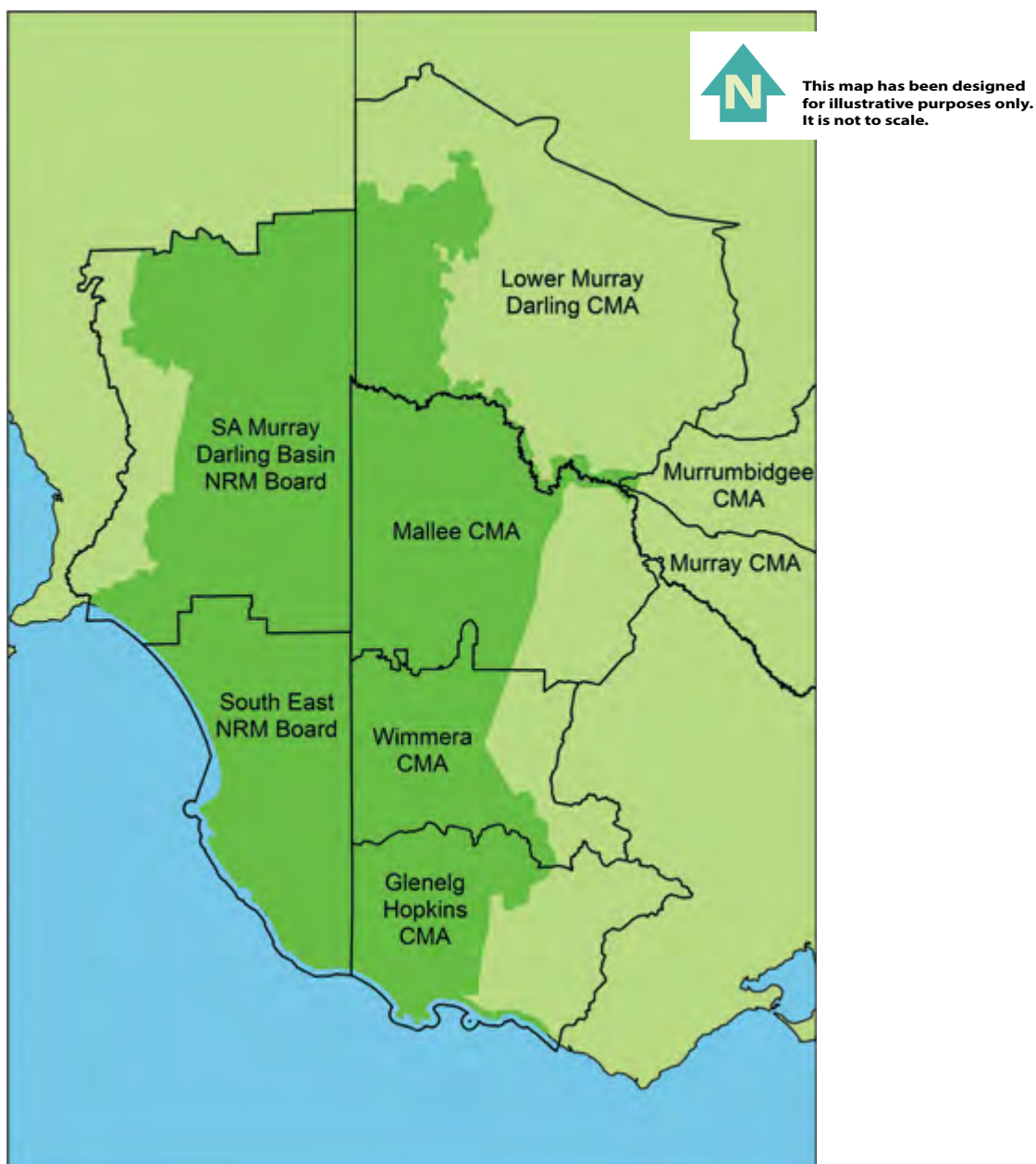
The challenge is to ensure that any planned mining development appropriately meets the environmental and community priorities for such things as food production, tourism development and public amenity.

New technology

As Victoria grows so does the demand for resources and services. Government and industry continue to strive for more efficient and effective ways to deliver these needs. A significant factor in achieving sustainability and productivity in this regard is through the use of new technologies.

New technology provides opportunity for innovation or a change in management practice that can improve the outcomes for natural resource management. While new technology has the potential to provide substantial benefits to business and industry, it will be important to balance its development with the needs of the community and its environment.

Figure 10: identified Habitat141 area .



Improving knowledge

It is widely recognised that there are a range of knowledge gaps across all natural assets. There is a continual effort to improve and share this knowledge so that appropriate management measures can be implemented and improved.

Objectives

1. Work with the community to proactively manage any emerging opportunities and challenges.

Management measures

1. Develop a regional management plan for sequestration and other carbon market activities, so that negative outcomes are avoided, and multiple benefits for biodiversity, productivity and the community are optimised.
2. Ensure the community is aware of, and has the opportunity to contribute to discussions around the future development of the region.
3. Continually improve and share knowledge.

— management measure led by Wimmera CMA.

References

- Australian Bureau of Statistics. (2010). *National Regional Profile: Wimmera (Statistical Division). Industry*. Retrieved from <http://www.abs.gov.au/AUSSTATS/abs@nrrp.nsf/Latestproducts/225Industry12005-2009?opendocument&tabname=Summary&prodno=225&issue=2005-2009>
- Bennett, A, Radford, J, MacReid L (2004) 'How much habitat is enough?' *Brochure: School of Ecology and Environment*, Deakin University, Melbourne.
- Birds Australia (2002) *Management Plan for the Natimuk–Douglas Saline Wetland System*, Birds Australia
- Birds Australia, (2009) *Migratory Shorebird Site*
- BLA (2007), *Wimmera River Red Gum Monitoring, Lower Wimmera River*. Report prepared for Wimmera CMA by Brett Lane and Associates Pty Ltd, 605 Nicholson St, North Carlton: 16 pages
- Braganza, K, & Church, J.A. (2011). 'Observations of global and Australian climate', in: H. Cleugh & M. Stafford Smith et al. (Eds) *Climate Change: Science and Solutions for Australia*. Collingwood: CSIRO Publishing
- Butcher, R.J. (2003) *Assessing biodiversity in temporary and permanent freshwater wetlands in the west Wimmera*, Victoria. PhD Thesis, Monash University.
- Cheal, D., Lucas, A. and Macaulay, L. (2010) *National Recovery Plan for Buloke Woodlands of the Riverina and Murray–Darling Depression Bioregions*. Department of Sustainability and Environment, Melbourne
- Commonwealth of Australia (2005) *National Recovery Plan for the South–eastern Red–tailed Black Cockatoo *Calyptorhynchus banksii graptogoyne**. Canberra, Department of Environment and Heritage.
- Cooling, M (2009) *West Wimmera Groundwater Dependent Ecosystems*. Prepared for Wimmera CMA by Ecological Associates Pty Ltd
- Corrick, A.H. and Norman, F.I. 1980 *Wetlands of Victoria. Wetlands and waterbirds of the Snowy River and Gippsland Lakes Catchment*. Proceedings of the Royal Society of Victoria. 91: 1-15
- CSIRO (2008) *Climate Change in the Wimmera*. Victorian Government Department of Sustainability and Environment, June 2008
- CSIRO (2011) *Climate Change: Science and Solutions for Australia*. Cleugh, H, Stafford-Smith, M, Battaglia, M & Graham, P, eds. CSIRO Publishing, Collingwood. 155pp.
- Curtis, A., McDonald, S., Mendham, E. and Sample, R. (2008) *Understanding the Social Drivers for Natural Resource Management in the Wimmera Region*. Charles Sturt University, Institute for Land, Water and Society. Prepared for Wimmera Catchment Management Authority, Horsham, Victoria.
- Curtis, A., McDonald, S., Mendham, E. and Sample, R. (2012) *Understanding the Social Drivers for Natural Resource Management in the Wimmera Region*. Charles Sturt University, Institute for Land, Water and Society, Albury, NSW. Prepared for Wimmera Catchment Management Authority, Horsham, Victoria.
- Department of Climate Change and Energy Efficiency(2010) *Design of the Carbon Farming Initiative: Consultation Paper*. Department of Climate Change and Energy Efficiency. Canberra, August 2010. <http://www.climatechange.gov.au/en/government/submissions/~media/submissions/cfi/cfi-consultation-paper-pdf.ashx>
- Department of Climate Change and Energy Efficiency (2011) *Securing a Clean Energy Future. The Australian Government's Climate Change Plan*. 135 pages.
- Department of Natural Resources and Environment (1994) *Current Wetlands Environments and Extent (WETLAND_1994)*. Victorian Spatial Data Directory, Victoria.
- Department of Planning and Community Development (2008) *Victoria in Future 2008*. Victorian Government Department of Planning and Community Development, Melbourne.
- Department of Primary Industries (2010) *Biosecurity Strategy for Victoria*. Melbourne The State of Victoria, 2010
- Department of Primary Industries (2010) *Victoria's Grain Industry: Summer 2010*. The State of Victoria, 2010
- Department of Primary Industries. (2006). *Wimmera Land Resource Assessment of the Wimmera Region April 2006*, prepared for Wimmera CMA. Bendigo: State of Victoria.
- Department of Sustainability and Environment (2010). *Advisory List of Rare or Threatened Plants in Victoria - 2010*. East Melbourne, Victoria, Department of Sustainability and Environment.
- Department of Sustainability and Environment (2010). *Advisory List of Threatened Vertebrate Fauna in Victoria - 2010*. East Melbourne, Victoria, Department of Sustainability and Environment.
- Department of Sustainability and Environment, *Draft Salinity Statement*, East Melbourne, Victoria, Department of Sustainability and Environment.
- Department of Sustainability and Environment (2005). *Index of Wetland Condition: Conceptual Framework and Selection of Measures*. East Melbourne, Victoria, Department of Sustainability and Environment.
- Department of Sustainability and Environment (2008). *Native Vegetation Net Gain Accounting first approximation report*. East Melbourne, Victoria, Department of Sustainability and Environment.
- Department of Sustainability and Environment (2011). *Western Region Sustainable Water Strategy*. East Melbourne, Victoria, Department of Sustainability and Environment.
- Dickson, J, Donnelly, D, Mercer R, Wu, E (2009) *Australia's Farming Future. Instinct and Reason*. Prepared for Australian Government Department of Agriculture, Fisheries and Forestry, Canberra
- Earth Tech and Bowler, J. (2004) *Geomorphic Investigation of Wetlands in the Wimmera CMA Section of the Millicent Coast Basin*, Prepared for Wimmera CMA.
- Ecological Associates (2004) *The Environmental Water Needs of the Wimmera Terminal Lakes – Final Report*, Ecological Associates Report BF001-A, Prepared for Wimmera Catchment Management Authority, Horsham, Victoria.

- Ecological Associates (2009) *West Wimmera Groundwater Dependent Ecosystems*, Report prepared for Wimmera Catchment Management Authority.
- EPBC (2010) Environment Protection and Biodiversity Conservation Act 1999. Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-east Australia were listed as an endangered ecological community in 2010.
- Freudenberger, D. and Langston, A. (2006). *Ecosystem services in the Wimmera-Mallee*. Canberra, CSIRO.
- Gott, B. (2006) *Aboriginal Trail: Introduction*, Australian National Botanic Gardens, Canberra, www.anbg.gov.au/anbg/aboriginal-trail.html
- Griffiths, J. (2004). *Report on Soil Health in the Wimmera Catchment for the Land Issues Committee of the Wimmera CMA*. Unpublished.
- Hindmarsh Shire Council website/Community Profile (<http://profile.id.com.au/Default.aspx?id=343&pg=138&gid=10&type=enum>)
- Hunt, N., & Gilkes, B. (1992). *Farm Monitoring Handbook. A practical down-to-earth manual for farmers and other land users*. Nedlands: University of Western Australia.
- James CD, Saunders DA (2001) *A framework for Terrestrial Biodiversity Targets in the Murray Darling Basin*. CSIRO Sustainable Ecosystems and Murray-Darling Basin Commission, Canberra. 104pp.
- Jin, C., Cant, B. and Todd, C. (2010) *Climate Change Impacts on Wetlands in Victoria and Implications for Research and Policy*, Arthur Rylah Institute for Environmental Research Technical Report Series No. 199. Department of Sustainability and Environment, Heidelberg, Victoria.
- Kleiner, K (2008) 'The backlash against biofuels'. *Nature reports climate change*. Vol 2. January 2008. pp 9-11.
- Lawton, K. (2010) *Wimmera Invasive Plant and Animal Management Strategy 2010–2015*. Wimmera Catchment Management Authority, Horsham Victoria 3400
- Lines-Kelly, R. (2004). *How cultivation affects soil*. Retrieved from <http://www.dpi.nsw.gov.au/agriculture/resources/soils/structure/cultivation>.
- Llewellyn, R.S. & D'emen, F.H. (2009). *Adoption of no-till cropping practices in Australian grain growing regions*. Kingston: Grains Research and Development Corporation and CSIRO.
- Maron, M, Fitzsimons, JA. (2007) *Agricultural intensification and loss of matrix habitat over 23 years in the West Wimmera, south-eastern Australia*. *Biological Conservation* 135, pp 603-309.
- Maron, M (2005) 'Agricultural change and paddock tree loss: Implications for an endangered subspecies of Red-tailed Black-Cockatoo'. *Ecological Management and Restoration* 6(3): 206-211.
- Maron, M., Koch, P., Freeman, J., Schultz, S, Dunn, P., Apan, A. (2008). *Modelling and planning to increase future habitat of the Red-tailed Black-Cockatoo, including the endangered Buloke Woodlands*. Report prepared for the Wimmera Catchment Management Authority, Horsham, Victoria: 111 pages.
- McDonald, D. & Rodgers, D. (2010). *Soils Alive. Understanding and Managing Soil Biology on Tasmanian Farms*. Hobart: State of Tasmania.
- McKenzie, N, Jacquier, D., Isbell, R., & Brown, K. (2004). *Australian Soils and Landscapes. An Illustrated Compendium*. Collingwood: CSIRO Publishing.
- Morgan, G (2000) 'Landscape health in Australia: A rapid assessment of the relative condition on Australia's bioregions and subregions'. Canberra, *Australian Natural Resource Atlas*, Australian Government.
- Natural Resource Management Ministerial Council (2010) *Australia's Strategy for the National Reserve System 2009-2030*. Australian Government, Canberra, ACT.
- Norris, J. (2011). *Wimmera Wetlands Asset Strategy*. Horsham: Wimmera Catchment Management Authority.
- Pannell, D, Vanclay, F. (2011) *Changing Land Management Adoption of New Practices by Rural Landholders* Collingwood, CSIRO Publishing.
- Parks Victoria. (2010). *Grampians National Park*. Retrieved from http://www.parkweb.vic.gov.au/1park_display.cfm.
- Pernick, R, Wilder, G (2007) 'The clean tech revolution'. *The next big growth and investment opportunity*. Collins, New York. 320 pages.
- Petheram, J., Pearson, M. & Binns, R. (1999) *Report on Study of Community Views of Wetlands in the South-West Wimmera, Victoria*. For the Department of Natural Resources and Environment, Edenhope.
- Pittock, C., Antonoff, G., & Robson, S. (2010). *Wimmera Cropland Management Transect April 27, 2010*. Horsham: Department of Primary Industries.
- Pouliot, M (2007) *Project Hindmarsh 10 years and Beyond*. Published by the Hindmarsh Landcare Network, Nhill. Vic. 67pp.
- Rees, H.M., White, B. & Laidlaw, J. (2010) *Farming during a period of extreme climate variability: consequences and lessons*, prepared for the Birchip Cropping Group.
- RMCG (2006). *Wimmera Catchment Management Authority Strategic Statement on Soil Health Final Report 24th August, 2006*. Horsham: Wimmera Catchment Management Authority.
- Saunders, G, Coman, B, Kinnear, J, Braysher, M (1995) *Managing Vertebrate Pests: Foxes*. Bureau of Resource Sciences, Australian Government Publishing Service, Canberra.
- Saunders, G, McLeod, L (2007) *Improving fox management strategies in Australia*. Bureau of Rural Sciences, Canberra.
- Scopelianos, S. (2011). *Huge Canola crop sown in Victoria*. Retrieved from <http://www.weeklytimesnow.com.au/article/2011/06/06/341391>.
- Sinclair Knight Merz (2012) *Indicative Assessment of Climate Change Vulnerability for Wetlands in Victoria*. Prepared for the Department of Sustainability and Environment, Melbourne.
- Sinclair Knight Merz (2005) *Social and Economic Drivers of Wetland Rehabilitation*. Prepared for the Wimmera Catchment Management Authority, Horsham, Victoria.

Acronyms

Sinclair Knight Merz (2009) *West Wimmera Hydrogeological Study*. Report prepared for the Wimmera Catchment Management Authority, Horsham, Victoria: 170 pages.

Sinclair Knight Merz (2006) *Wetland Extent and Drainage Line Mapping Project*. Prepared for Wimmera Catchment Management Authority.

Soil Conservation Commission of New South Wales. (1991). *Soils: Their properties and their Management* (P.E.V. Charman, & B.W. Murphy, Eds.). South Melbourne: Sydney University Press in association with Oxford University Press.

Starks, J (2007) *Evaluating the impact of the Wimmera Mallee Pipeline on biodiversity on farms*. A report for the Rural Industries Research and Development Corporation. Barton, ACT. 62 pages.

State Government of Victoria (2003) *State Environmental Protection Policy (Waters of Victoria)*, No. S 107, Melbourne.

State Government of Victoria, (2011b). *Grain production estimates 2010*. Retrieved from <http://new.dpi.vic.gov.au/agriculture/grain-crops/grain-industry-profile/estimates-2010>.

State Government of Victoria. (2011c). *Grains and Other Crops*. Retrieved from <http://new.dpi.vic.gov.au/agriculture/grain-crops>.

State Government of Victoria. (2011a). *Industry Overview*. Retrieved from <http://new.dpi.vic.gov.au/agriculture/about-agriculture/industry-overview>.

State Government of Victoria. (2001d). *Toxicities and Deficiencies*. Retrieved from http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/soilhealth_toxicities.

UN (2004) *World Population to 2300*. United Nations Economic and Social Affairs, Population Division. New York. 85 pages.

VEAC (2011) *Remnant Native Vegetation Investigation*. Final Report to the Minister for Environment and Climate Change by the Victorian Environmental Investigation Council. East Melbourne. 58 pages.

Water's Edge Consulting (2005) *Wimmera Wetland Condition Assessment Project*, Prepared for Wimmera Catchment Management Authority.

White, R.E. (1997). *Principles and Practices of Soil Science. The Soil as a Natural Resource*. Third Edition. Oxford: Blackwell Science Limited.

Wimmera Catchment Management Authority (2006) *Wimmera Healthy Waterways Strategy 2006-2011*. Wimmera Catchment Management Authority, Horsham.

Wimmera Catchment Management Authority (2005). *Wimmera Regional Salinity Action Plan 2005-2010*. Horsham: Wimmera Catchment Management Authority.

Wimmera Index of Wetland Condition Assessment results (2009) and *Water's Edge Consulting (2005) Wimmera Wetland Condition Assessment Project*, prepared for Wimmera CMA.

ABC Database: Actions for Biodiversity Conservation database

AVIRA: Aquatic Value Identification and Risk Assessment

BGLC: Barengi Gadjin Land Council

CaLP Act: *Catchment and Land Protection Act 1994*

CFA: Country Fire Authority

CMA: Catchment Management Authority

CO₂: Carbon dioxide

DEPI: Department of Environment and Primary Industries

DIWA: Directory of Important Wetlands in Australia

EPA: Environment Protection Authority

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999*

EWR: Environmental Water Reserve

GHGs: Greenhouse gases

LGA: Local Government Area

MFMPs: Municipal Fire Management Planning Committees

NaturePrint: landscape scale environmental database developed by DEPI.

NRM: Natural Resource Management

PV: Parks Victoria

Ramsar: the "Ramsar Convention" is a treaty for the conservation of internationally significant wetlands

RCS: Regional Catchment Strategy

VCMC: Victorian Catchment Management Council

WIPAMS: Wimmera Invasive Plant and Animal Management Strategy

Wimmera CMA is one of 10 CMAs working in Victoria under an integrated catchment management approach to achieve sustainability across the state. Each CMA supports the role that communities and government play in protecting and enhancing local natural environments.



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