MALLEE
DROUGHT RESILIENCE PLAN

Acknowledgement of Country

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We acknowledge the First People of Millewa-Mallee, the Latji Latji, Ngintait, Wotjobaluk, Jaadwa, Jadawadjali, Jugagulk, Wergaia, Wamba Wamba, Tatti Tatti, Waddi Waddi, Barapa Barapa and Yorta Yorta Peoples as the Traditional Owners of Country that the activities of the Mallee Regional Drought Resilience Plan are being held on.

We honour Elders past and present, whose knowledge and wisdom have ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

This Plan was jointly funded by the Victorian and Commonwealth Government under the Future Drought Fund.

Preface

Drought causes significant financial, social and environmental impact on people, communities and the region. The Mallee region is committed to taking steps now to ensure well considered strategies are in place to prepare for and manage through future dry periods.

The Mallee Drought Resilience Plan (the Plan) is one of 9 regional drought plans developed in Victoria, as part of the Regional Drought Resilience Planning (RDRP) Program, under the Future Drought Fund (FDF).

The aim of the Plan is to empower and enable communities to collectively identify and address their needs so they can be better prepared for and able to manage future dry seasonal conditions and droughts. The Plan may also inform future investments in building regional drought resilience.

The $5 billion FDF invests in a wide range of drought resilience initiatives to help Australian farms and communities prepare for the impacts of drought. These are implemented through a suite of programs under 4 focus areas:

- Better climate information
- Better planning
- Better practices
- Better prepared communities

The RDRP Program is included under the 'better planning' focus area. However, regional drought resilience includes elements that cover all focal areas. The Mallee Plan therefore bridges all FDF categories, informing future investment in actions that build regional drought resilience.

This Plan is founded on historic and recent experiences of drought within the region as well as relevant existing regional strategies, programs and activities that aim to manage, mitigate or adapt to a drier climate. All 9 of Victoria's plans were developed using a consistent methodology across Victoria:

- **Drought impact analysis** to understand the prevalence, severity and frequency of past, present and future drought impacts
- **Stakeholder engagement** to identify and collate issues and develop actions to build drought resilience

Contents

Collaboration

The Plan is the culmination of a co-design process led by the Mallee Regional Reference Group, with wider community engagement sought through stakeholder interviews and the open online platform, Engage Victoria. Members of the Reference Group and other stakeholders were drawn from a broad range of organisations and sectors within the region that have responsibilities for, or interests in, agriculture, water, liveability, regional and local communities, and regional development. Consultation with a broad range of regional stakeholders was critical to the development and aggregation of themes and actions that will achieve the overall vision for the region.

Organisational members of the Mallee Regional Reference Group:

- Agriculture Victoria
- Birchip Cropping Group
- Buloke Shire Council
- Department of Energy, Environment and Climate Action
- Department of Families, Fairness and Housing
- Department of Health
- First People of the Millewa Mallee Aboriginal Corporation
- Gannawarra Shire Council
- Goulburn Murray Water
- Grampians Wimmera Mallee Water
- Lower Murray Water
- Mallee Catchment Management Authority
- Mallee Regional Innovation Centre
- Mallee Regional Partnership
- Mildura Regional Development
- Mildura Rural City Council
- Rural Financial Counselling Services
- Swan Hill Rural City Council

The Reference Group met 5 times between July 2022 and December 2023. The members guided the RDRP development approach, identified key regional strategies and plans containing existing public participation summaries and actions related to drought resilience building, provided input in past regional drought impacts, identified stakeholder groups to be engaged, and contributed to the contents of the Plan.

Individual meetings with key stakeholders were also held in person or using online tools, and input from these meetings was used to populate the initial thematic framework. This framework was then used in a series of online workshops, inviting representatives of stakeholder groups identified by the Reference Group to provide feedback. The improved regional thematic framework was then opened for broad public engagement using the Engage Victoria online platform.

The process was paused from October 2022 to April 2023 due to major flooding in the Mallee region, which shifted the focus of Reference Group members and stakeholder groups to flood relief and recovery.

Development of the Plan was facilitated by Agriculture Victoria and jointly funded by the Victorian and Commonwealth Government under the FDF.

Summary

The long-term objectives of the Plan are to build regional, community and individual resilience to drought through recognising and mitigating risks, strengthening preparedness, and recognising opportunities for change that will improve the economic, environmental and social opportunities in the Mallee region.

A list of actions was developed and agreed by the Mallee Reference Group. The actions were grouped in themes and contribute to specific outcomes that together build regional drought resilience.

The key **themes** and corresponding **outcomes** that emerged through the Plan's development are:

- **Collaboration:** Regional networks are maintained to ensure open channels of communication and promotion of engagement from a diverse representation of sectors, communities and industries.
- **People and community wellbeing:** The physical heath and mental wealth of communities is strong and supported during all phases of drought.
- **Culture:** A culture of inclusiveness, collaboration, cooperation, support and equality builds stronger resilience for people and communities and is maintained across the region.
- **Farming:** Farms are resilient to droughts as individual businesses, land and soil managers, and as a sector.
- **Finance:** A financial sector that understands the large fluctuations of income and expenses in agricultural businesses and provides support to farms and businesses through all phases of drought.
- **Rural economy**: The rural economy can diversify and bounce back from droughts, with direct impacts of droughts on the agricultural sector buffered by the larger regional economy. Tourism remains an important part of regional economies during droughts.
- **Sustainable use and management of natural resources:** Landscapes remain vibrant and can recover from droughts. Droughts do not permanently damage natural resources, which are shared equitably between users, even when in limited supply.

Photo: Anthony Plummer

INTRODUCTION

Drought is a recurring feature in the Australian landscape, and has been for thousands of years. However, the impacts of climate change are increasing the frequency and severity of drought.

The Commonwealth and Victorian governments have partnered to support regional areas to ensure they are better prepared to manage and build resilience to future droughts, with an increasing focus on adaption and change. The Commonwealth Drought Response, Resilience and Preparedness Plan's vision is farm businesses and rural communities that are prepared for, and capable of managing, drought in pursuit of a prosperous and sustainable future.

The Mallee Drought Resilience Plan seeks to facilitate a cohesive and coordinated approach to building community drought resilience. The Plan aims to build:

- economic resilience for an innovative and profitable agricultural sector
- environmental resilience for sustainable and improved functioning of landscapes
- social resilience for resourceful and adaptable communities

Given the existing work related to drought and water management in the region, one of the main objectives of the Plan is to align, strengthen and coordinate existing drought-related strategies, plans, actions and aspirations to increase overall drought resilience in the region.

The Plan was developed through engagement with regional stakeholders and local community groups. The Plan aligns with Commonwealth and Victorian government principles and approaches to drought preparedness and response. The Plan supports Mallee communities to be better prepared and more resilient to future drought events. The Plan leverages regional strengths and addresses vulnerabilities in the region's ability to prosper during dry seasons and droughts.

Agriculture Victoria coordinated the development of the Plan, utilising a Reference Group comprised of representatives from community (including Traditional Owners), industry and government. Consultation with other community groups with an interest in drought resilience was also undertaken.

Reference Group members and their affiliated organisations guided drought resilience thinking to ensure that the Plan will accommodate changes through adaptive planning and community engagement processes. Workshop-style meetings were also held by the Reference Group to guide development of Plan content and actions. The Group also provided access to local reports, regional priorities, organisational strategies and ensured coordination of place-based strategies. Additional regional stakeholders were engaged to inform development of the Plan, and public consultation was completed through an online platform.

This Plan considers the broad need for the regional community, environment and economy to be resilient to drought.

VISION

The Mallee region is prepared for future droughts, with reduced drought impacts and improved guidance for regional communities, economies and environments to cope with droughts in a long-term and sustainable manner.

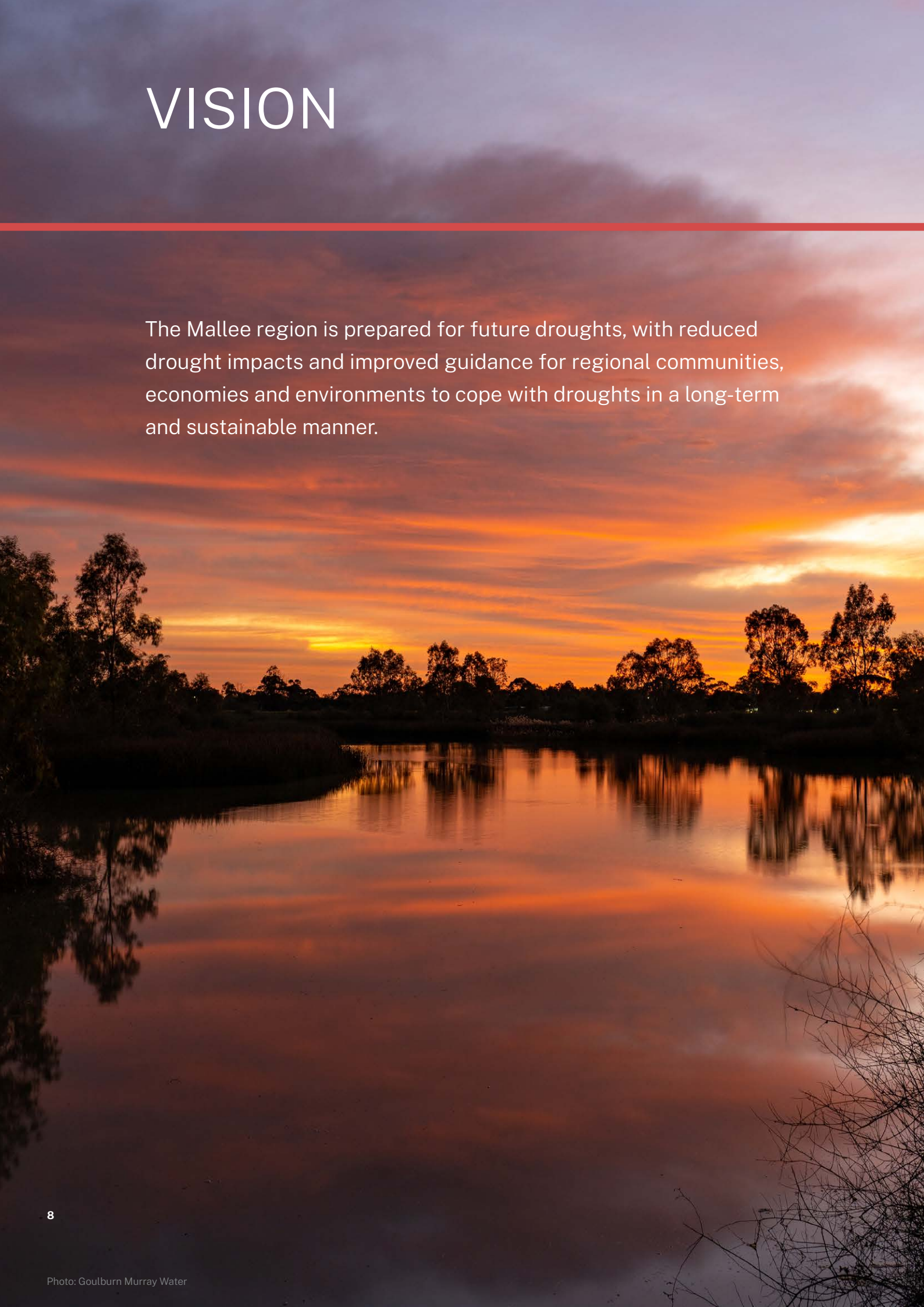


Photo: Goulburn Murray Water

Regional principles, drivers of change and goals

The Plan's goals of building drought resilience are based on a set of guiding principles. These principles guide actions for the Mallee region and are:

- **Self-reliance and risk mitigation:** drought is not an exceptional circumstance, but a risk to be managed along with other business threats. Primary producers and other small businesses mitigate the impacts of drought by understanding and reducing risk and impacts.
- **Encourage preparedness:** investment should focus on encouraging preparedness in good years and supporting community connectedness and wellbeing in times of drought.
- **Collaboration and co-design:** drought preparedness and resilience programs should be co-designed with Local Government Authorities (LGAs), Traditional Owners and other relevant stakeholders to ensure they effectively address local community priorities. Co-design means that the programs are developed *with* local stakeholders – not by an external party *for* local stakeholders.
- **Improved decision-making:** business skills and improved access to timely drought-related information is essential to support evidence-based decision-making for businesses and communities.
- **Integration:** foster collaboration between organisations to deliver timely, place-based, integrated services which simplify processes for, and access by, users.
- **Leadership and community networks:** the Mallee region has a strong record of collaboration and community leadership. Drought programs should be designed and delivered in partnership with those established networks.
- **Traditional Owner Self-Determination:** Traditional Owners will be provided opportunities to be involved in, and have their self-determined goals reflected in, drought preparedness and resilience activities.

The Mallee is a region in constant flux and development. Drivers of change identified for the region include:

- Larger farm sizes that require less labour per area
- More frequent and severe weather extremes such as drought, flood, heavy frosts, hail, heat waves and high winds
- Different greenhouse gas profiles impacting plant growth
- Emerging carbon markets and the opportunities for land managers to participate, including carbon sequestration through revegetation and land management practices
- Increased competition in the water market and risk to supply if irrigated horticulture continues to expand without associated reductions in water demand (i.e. adaptive management, industry restructuring).
- Changing demographics; for example, small rural communities in the Mallee continue to experience population decline and increasingly older age profiles
- Enhanced connectivity, together with increased awareness of the efficiencies that new technologies can provide
- Commitment to First Nations' self-determination and their connection to Country and culture
- Connections to nature, which are important for the wellbeing and social fabric of our communities
- Salinisation of soils in agricultural landscapes

A SNAPSHOT OF THE MALLEE

In this Plan, the Mallee region is defined by the Mallee Regional Partnership boundary and includes the 4 LGAs of Mildura Rural City, Swan Hill Rural City, Gannawarra and Buloke.

The Mallee is a culturally diverse area, with a strong Aboriginal heritage and community and a growing number of new migrants and humanitarian visa holders.

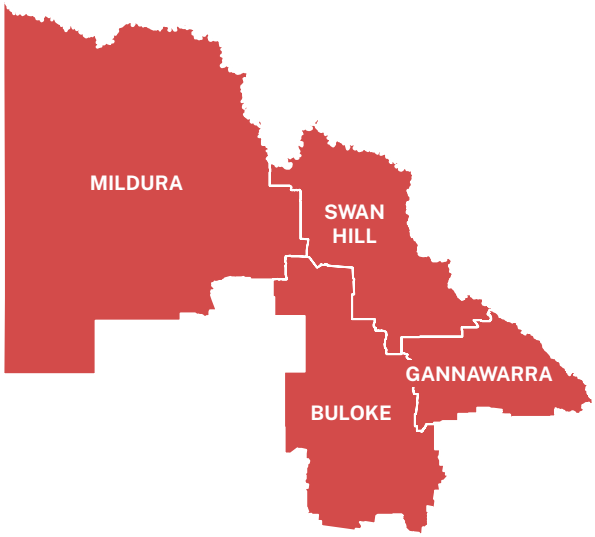
The Murray River, which runs along the northern border of the region, provides a substantial irrigation water supply. It also attracts tourists and people seeking a lifestyle change.

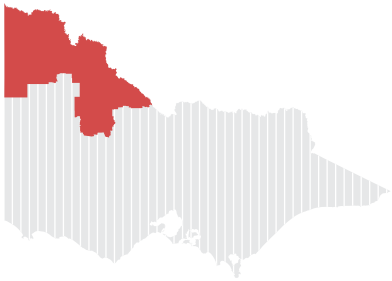
Bordered by New South Wales to the north and South Australia to the west, the region is home to some of Victoria's most remote communities. For 3 of the region's 4 LGAs, prosperity is driven by their proximity to the Murray River. The region's two regional cities, Mildura and Swan Hill, are located on the river's banks and the waterway remains vital for driving economic, socio-cultural, and environmental outcomes. Agriculture and related industries such as food and beverage manufacturing are the principal engines for economic activity. Areas proximate to the Murray typically produce horticultural goods like fruit, citrus and grapes, while inland areas focus on dryland farming for commodities such as grains (Infrastructure Victoria, 2021).

The Mallee Catchment Management Authority (CMA) covers the largest area of the region, with North Central CMA covering a large part of the Gannawarra Shire, and Wimmera CMA covering a small part in the south-west of Buloke Shire. Lower Murray Water and Grampians Wimmera Mallee Water (GWM-Water) are the water corporations that service the Mallee region.

Local Government Area	Population (2020)	Area (km^2)	Economic Output ($ Million)[2]	Main shire service centres
Mildura	55,900	22,083	7,311	Mildura, Ouyen
Swan Hill	20,500	6,115	3,293	Swan Hill, Robinville
Gannawarra	10,400	3,735	640	Kerang, Cohuna
Buloke	6,100	8,000	782	Wycheproof, Birchip, Charlton, Donald, Sea Lake

Source: Mallee Regional Economic Development Strategy (2022)





POPULATION
(2020)

92,900

POPULATION GROWTH
(2011–2020)

3.8%

GROSS REGIONAL PRODUCT
(2020)

$5.3 billion

Source: Mallee Regional Economic Development Strategy (2022)

Environment

Mallee is found on flat-to-undulating landscapes on sandy soils, old sand dunes, heavy clay or rocky calcareous soils in north-western Victoria. The altitude range is generally between 50 and 200 meters above sea level and rainfall varies between 250 and 400 mm a year. About 45% of Mallee is public land, of which a little under one third comprises conservation parks and reserves. About 35% of Mallee has been permanently cleared for agriculture, urban development or mining.

Many of Mallee's birds are not permanent residents of any one place, following food and water over often large distances. Some frog species found in the region employ a burrowing lifestyle, where adults can remain in a low-energy state beneath ground for long periods between rains and then emerge to breed during wet weather.

Of all the regions that have been successfully converted to agricultural, the Mallee stands out as having caused the greatest amount of ecological change. Along with dryland salinity caused by clearances, there are other salinity problems related to irrigation, soil erosion problems caused by overgrazing on fragile soils in drought years and high-level weed invasion of both crops and pasture land (Viridans Flora and Fauna System).

The Mallee contains some 1,600 km of river assets, which can be divided into 3 distinct groups according to the river basin in which they are located: the Mallee, Avoca or Wimmera Basin. The Mallee Basin contains the Murray River, which forms the northern boundary of the region, as well as the boundary between Victoria and New South Wales.

Photo: Mallee CMA

There are some 900 wetlands in the Mallee, occupying almost 50,000 hectares. Mallee wetlands are diverse and include riverine wetlands, natural saline wetlands fed by groundwater, shallow depressions in the south of the region filled by local catchment run-off, and artificially maintained wetlands such as the Cardross Lakes and Koorlong Basins (Waterwatch Victoria).

Semi-permanent saline wetlands are the most prevalent wetland type in the Mallee. These wetlands have increased in both number and area since European settlement due to altered hydrological regimes, clearing of native vegetation, changes in surrounding land use, and the use of natural wetlands and low-lying areas for salinity management (Mallee CMA, 2022).

Climate trends

Climate projections based on climate change scenarios indicate that the climate will change with:

- Average maximum temperature increase of 2.8°C
- Twice as many days above 40°C
- Annual rainfall decreasing by as much as 19 mm
- More intense extreme rainfall and flooding events
- Longer fire seasons and 50% more “very high” fire rating days
- Mildura’s climate trending towards the current climate of Menindee, New South Wales (roughly 250 km north of Mildura)

These projected climate scenarios will have implications for agriculture in the region.

Communities and Culture

The Mallee has been occupied for thousands of generations by First Peoples, with human activity currently dated as far back as 23,400 years ago. The region is home to Latji Latji, Ngintait, Nyeri Nyeri, Wotjobaluk, Jaadwa, Jadawadjali, Wergaia, Jupagalk, Barengi Gadjin, Dja Dja Wurrung, Taungurung and Yorta Yorta Nations who have lived, worked and cared for their lands and waters for thousands of years. First People of the Millewa-Mallee, Barengi Gadjin Land Council, Wamba Wemba and Yorta Yorta Nation Aboriginal Corporations are the Registered Aboriginal Parties of the Mallee region.

The region's rich and diverse Aboriginal heritage has been formed through the historical and spiritual significance of sites associated with this habitation, together with the strong connection Traditional Owners continue to have with the Mallee's natural landscapes (Mallee CMA).

The Murray River and its associated waterways were important habitation areas for multiple First Nations groups, containing many places of spiritual significance. The high number of cultural heritage sites throughout the Murray floodplain is unique in Victoria, for both concentration and diversity. They include large numbers of burial, midden and hunting sites (Mallee CMA, 2018).

Mildura and Swan Hill are the main regional centres. Mildura is a major centre for jobs and services for the Mallee's smaller towns and rural areas. The Mallee is one of Victoria's more remote regions and one of the furthest from Melbourne (DJPR, 2022b).

Demographic changes, such as an ageing population, are affecting the scope and mix of services councils need to provide. Regional councils can lack the revenue to upgrade and repurpose existing infrastructure, often relying on Victorian Government grants.

The Mallee faces challenges in ensuring that residents have access to the services that they need. For instance, smaller rural councils such as Buloke and Gannawarra have a small (and declining) ratepayer base, which is further constrained by below average incomes of residents. These councils face additional complexities in continuing to provide services over a relatively dispersed area. Areas of relative socio-economic disadvantage such as Buloke, the tenth most disadvantaged LGA in Victoria, have a higher per capita need for a range of health and community services. As regional centres for relatively remote communities, it is important that Mildura and Swan Hill provide a range of services to the wider region, and that these services are accessible to all (Infrastructure Australia, 2021).

Industry and employment trends

In 2020, there were 41,400 employed persons in the region. Agriculture, forestry and fishing was the largest employing sector in the region until 2020, when it was overtaken by health care and social assistance. Consistent with trends across the state and supported by population growth and ageing, the health care industry has now become the major employment sector, currently employing 13.9% of the region's total workforce. Other population-driven sectors, including retail trade, education and training and construction, have similarly experienced steady growth and are among the region's 6 largest employing sectors.

The agriculture, forestry and fishing sector has experienced a steady decline in employment since 2003, with employment levels beginning to level out in 2013. Although underpinned by the region's diverse production systems of irrigated horticulture, dryland cropping and livestock grazing, the sector has felt the impacts of the Millennium Drought and consolidation of farming enterprises, as well as technological advancements that have increased capital intensity in production.

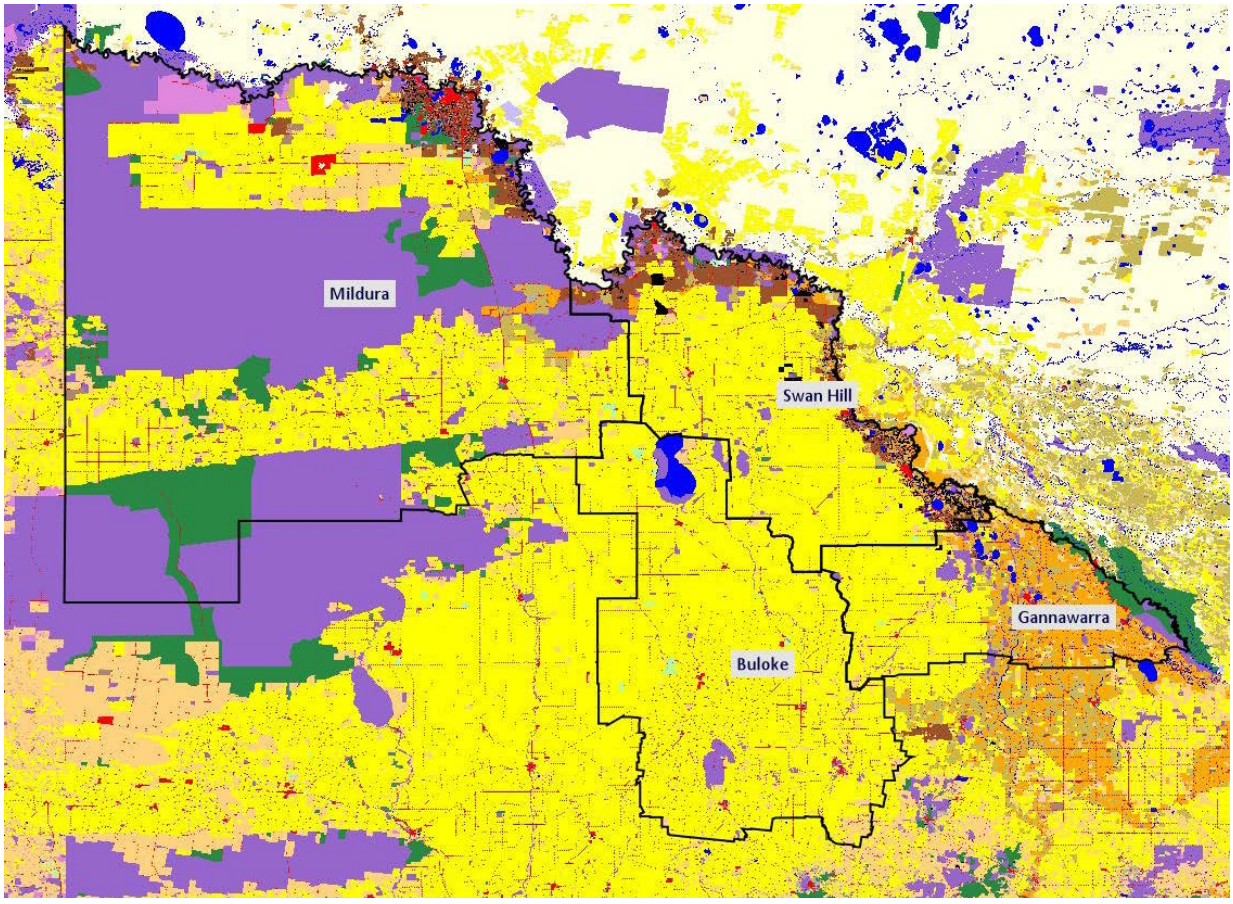
With a long history in agricultural production, the food industry is the region's most important sector by output and employment. The region's diverse production systems of irrigated horticulture, dryland cropping and livestock grazing support significant outputs of high value fruit, nuts and grains. The food industry's success is attributed to the warm climate and unique water infrastructure

provided by the Murray River, while extensive land zoned for agricultural use, modern infrastructure, a skilled workforce and access to markets provide beneficial economic conditions.

The region has many small-scale farms which contribute towards local food systems. Fostering the continued success of these farms may create further agritourism opportunities which directly connect primary producers of food and drink with the end consumer and showcase the region's amenity and produce. Supporting small-scale activities, including connecting businesses through farmgate trails and enhancing major food and wine events will attract visitors to the region, raise the profile of the region's produce and benefit other tourism businesses. Identifying export pathways for smaller producers and niche products could increase the profile of the region as well (DJPR, 2022a).

Catchment Scale Land Use of the Mallee

Source: ABARES 2021



- Nature conservation
- Managed resource protection
- Other minimal use
- Grazing native vegetation
- Production native forests
- Grazing modified pastures
- Plantation forests (commercial and other)
- Dryland cropping
- Dryland horticulture
- Land in transition
- Irrigated pastures
- Irrigated cropping
- Irrigated horticulture
- Urban intensive uses
- Intensive horticulture and animal production
- Rural residential and farm infrastructure
- Mining and waste
- Water

DROUGHT IMPACTS IN THE REGION

Many definitions of drought exist, generally depending on what indicators are used to describe it.

- Meteorological drought relates to the lack of rainfall, at least below expected rainfall.
- Hydrological drought relates to the lack of runoff, measured by river and creek flow volumes, a lack of groundwater availability, and a lack of water storage in catchments.
- Agricultural drought can be defined by reduced productivity on-farm resulting from a lack of water.
- Institutional drought is where decisions on water allocation have induced a water shortage.
- Economic drought can be defined as an economic downturn resulting from a lack of water availability.
- Green droughts exist where limited rainfall shows the appearance of green paddocks, but insufficient water is available for agricultural crop production.

Photo: Mallee Catchment Management Authority

Definitions of drought are important because they help define the issues to be addressed. No single definition will be used for this Plan, as every individual, business, organisation and community will have their own unique drought experience. For example, the impact of drought is felt differently in broadacre cropping than in livestock farming, while the health care sector requires a different approach to the educational sector to cope with drought.

Droughts also pose a key threat for Traditional Owners, impacting the health of Country, and affecting their rights and responsibilities in caring for Country. For Traditional Owners and Aboriginal Victorians, caring for Country extends beyond physical landscapes and involves the natural waters, animals and resources and how they influence and impact each other. Healing Country in the wake of drought events is essential to ensuring positive health and wellbeing outcomes for Aboriginal Victorians.

While this Plan aims to build resilience across communities, businesses and sectors, each experiences the impact of drought differently and a range of different resilience-building actions is required.

It is important to note that duration and intensity of drought has an impact on how resilient a community can be. While on-farm drought management can be effective for a seasonal drought, it may be less effective for a 5 year drought. A meteorological drought with “only” low rainfall may have less impact than a hydrological drought combined with heatwaves, dust storms and fires.

In developing this Plan, organisations and individuals came together to discuss drought and chart a course for a smarter, more resilient future. The Plan was not developed to deal with an emergency, or an acute drought. It was developed to assist the Mallee community to prepare for, and become more resilient to, drought across a range of future scenarios. The Plan proposes actions that individuals, communities, industry and government can take to achieve this.

The region has recently experienced extended drought and dry seasonal conditions, including the Millennium Drought (1997 to 2009), 2014 to 2015 (notably in southern Mallee), and from 2017 to 2019.

Water allocations in the Murray system were significantly decreased during the Millennium Drought, dropping to 43% in 2007 to 2008, and 35% in 2008 to 2009. 2017 to 2019 also saw significant reductions in rainfall and increased hot temperatures, however water allocations were only decreased for the Murray system in 2019 to 2020.

The variance of agricultural employment in the region, and the diversity of agricultural enterprises (from irrigated horticulture near the Murray River and dryland cropping and grazing further south), means that communities within the Mallee will be impacted differently. There is a high proportion of agricultural employment in the Buloke and Gannawarra LGAs, making them highly susceptible to drought. Although somewhat more economically diverse, the LGAs of Mildura and Swan Hill also have relatively high reliance on agriculture for direct employment. However, there may be other opportunities for a secondary income for affected agricultural workers during a drought.

The Mallee Region is heavily dependent on irrigation. Drought periods are associated with lower water availability and high prices. Horticultural farmers will seek to access water to maintain their production (through trade and carryover), which may not be as significant for farmers who have larger reserves (of cash or entitlements). Annual allocations compound the issue, as during dry years allocations are lower and prices higher, despite more water being required.

The impacts of the 2017 to 2019 drought were mitigated somewhat by the experience and lessons farmers learnt from the Millennium Drought. Farmers had some actions and strategies to be more prepared and resilient. For example, livestock producers have honed drought preparedness and operational practices such as buying and/or storing fodder and utilising on-farm dam storages.

Towns in the Mallee were faced with prolonged periods of Stage 3 and Stage 4 urban water restrictions[1] during the Millennium Drought. This was a challenge for towns such as Mildura with a legacy of typical “English gardens” of lush green grass and gardens.

The Millennium Drought also had negative impacts on riverbank and in-stream vegetation in the rivers, lakes and dams of the Mallee. Furthermore, drought has impacted the habitats of native wildlife in the region. Particularly impacted species include the Mallee Emu-wren, with conservation areas providing refuge for many native animals.

Studies have found that smaller communities have a greater reliance on the agricultural sector, with larger communities being less reliant. As a result, drought is likely to have a greater negative impact on the small communities (Frontier Economics, 2022) of the Mallee.

Photo: Gannawarra Shire

[1] Water restrictions can be implemented in 4 stages from 1 - Mild to 4 - Severe. Stage 4 water restrictions prohibit the watering of public, residential and commercial gardens, lawns and playing surfaces at all times. Stage 3 restrictions prohibit types of urban water use outside of set days and times (e.g. watering of residential gardens is only permitted on alternate days, from 6 to 8 am, using a hand-held hose fitted with a trigger nozzle). Source: www.water.vic.gov.au/for-households/water-restrictions-and-rules/stage-3-water-restrictions

Photo: Gannawarra Shire

Resilience in the region

Drought resilience in the Mallee is described for this Plan as communities that are able to adapt, modify and transform their practices, knowledge and attitudes to overcome climatic adversity or the "new normal" of a drier climate.

Resilience is used in this Plan to shape intended outcomes and actions, with an understanding that there is an opportunity to *strengthen* communities rather than simply maintain existing systems, processes and culture.

There is no one-size-fits-all route to becoming a resilient community. However, certain community characteristics are known to contribute to resilience. These characteristics have been used to build the suite of outcomes and actions documented in the Plan.

Similarly, it is acknowledged that for many Traditional Owners, connection to Country is more holistic and not bound by the region and constructs of the Plan. Impacts are also likely to be broader than the Mallee region and what can be addressed by the actions identified in the Plan.

Resilient regions have:

- a common vision and goal
- cooperative and interconnected leadership and governance
- strong connections and relationships through formal and informal networks
- genuine collaboration

Resilient communities have:

- local leadership and initiative
- governance that embraces change
- willingness to work together in the pursuit of common goals
- drive for self-responsibility
- a willingness to be adaptable and learn lessons from change
- the skills needed to anticipate issues and effectively manage risk
- foresight to consider different perspectives and options to solve complex problems

CONCEPTS CONSIDERED IN THE PLAN

Cultural and Environmental Flow

Cultural flow is a concept in water management that recognises the importance of water to Traditional Owners for cultural, economic, customary, and spiritual purposes. It refers to the quantity, quality, timing, and variability of water flows that are required to maintain and enhance Traditional Owners cultural values.

Traditional Owners in the Murray–Darling Basin have a strong spiritual connection to water, and a moral obligation to care for it, as they have done for many thousands of years.

Cultural flows benefit practical activities like fishing, hunting, ceremonies and harvesting medicinal plants and herbs. They also preserve and protect important assets including burial mounds, scarred trees, and campsites which help maintain connections to Country. Identity, wellbeing, capacity building and inter-generational teaching are also key components of cultural flows.

The Victorian Government is committed to working with Traditional Owners to recognise and protect cultural flows. This includes developing and implementing water management plans that incorporate cultural flow considerations.

While cultural flows can also be used to improve the health of the rivers, that is not their only purpose – cultural flows is therefore different to environmental flows.

Environmental flows are used to improve the health of our rivers, wetlands and floodplains. Water is allocated to federal and state environmental water holders across the Basin. In Victoria this is managed by the Victorian Environmental Water Holder, who make decisions about when, where and how much water is released for the environment, and with measurable environmental outcomes in mind.

Mental Wealth and Mental Health

Mental health is a state of wellbeing in which an individual realises their own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to his or her community.

Mental wealth is a term used to describe the emotional, psychological, and social well-being of an individual or community. It goes beyond the absence of mental illness to encompass the positive aspects of mental health, such as resilience, coping skills, and a sense of purpose.

Another way to think about the difference between mental health and mental wealth is that mental health is about managing symptoms and conditions, while mental wealth is about thriving and flourishing.

While mental health and mental wealth are related, they are not the same thing. It is possible to have good mental health but not great mental wealth. For example, someone with a chronic mental illness may be able to manage their symptoms and live a fulfilling life, but they may still experience some challenges that impact their mental wealth.

Mental wealth is important because it can help people to live happier and more fulfilling lives. It can also help in terms of individuals being more resilient in the face of adversity. Good mental wealth supports a better ability to cope with stress, manage our emotions, and build positive relationships.

Climate Anxiety

For most young people, the awareness and concern about the impact of climate change is a healthy response to a serious problem and doesn't impact their mental health. This awareness can motivate young people to be actively involved in positive change. Examples of young people's contribution to positive change include attending public marches, raising awareness through conversations, and reducing their 'carbon footprint' through changes in lifestyle.

'Climate anxiety' and 'eco-anxiety' are terms being used to describe feelings of helplessness, stress, worry and frustration about the effects of climate change. There is growing research in this area to understand how concerns about climate change can significantly interfere with some people's daily lives. Young people may experience 'climate anxiety' because they are aware that it is their generation and future generations that will be most affected by climate change. They can feel a sense of urgency to create immediate change and make a difference to future generations.

Green-Blue Infrastructure

'Green' infrastructure refers to living vegetation such as gardens, nature strips, trees, parks and green open spaces. 'Blue' infrastructure are the assets associated with managing stormwater, such as gutters, pits, pipes and drains, ponds, wetlands and waterways. Green-blue infrastructure (GBI) is a term designed to help explain that these green and blue infrastructure assets are as critical to a town's liveability and resilience as are roads, buildings and carparks. GBI principles aim to protect and enhance a town's natural assets, combined with better retention, treatment and use of rainwater where it falls. By improving the way urban stormwater is conveyed, stored and used, a town can make the most of the water that falls within its boundaries. The combination of GBI provides the space to retain stormwater close to where it falls and use it to irrigate the living assets valued for liveability while improving downstream water quality. This in turn supports strengthening drought resilience.

The principles of GBI can be applied at 4 scales: lot, streetscape, precinct and township. At the lot scale, these techniques include gardens, green roofs, green walls, water tanks and raingardens. At the streetscape scale, techniques include nature strips, footpaths, roadside raingardens, street trees and swales, shallow channels that convey and treat stormwater. Techniques at the precinct scale include parks, green links, open drains, wetlands, detention basins and sport grounds. The township scale techniques include urban forests, expansive open spaces, waterways and lakes.

Social, environmental and economic benefits include improving township amenities and liveability, reducing urban heat for cooler streets, and contributing to improved community physical and mental health. GBI also enhances urban and aquatic biodiversity, increases tree canopy and decreases air pollution, and increases stormwater and rainwater infiltration and improves soil water retention. The economic benefits include an improved township entrance to make it attractive for visitors, better and more significant use of open spaces, and increased use of alternative water, freeing up domestic water.

THEMES, OUTCOMES AND ACTIONS FOR A DROUGHT RESILIENT COMMUNITY

The Plan's themes and outcomes were developed and agreed by the Mallee Regional Reference Group. Themes provide the broad areas of interest of regional stakeholders related to building drought resilience. The outcome for each theme reflects the overall goal for a set of actions that have a common purpose, beneficiary or instigator. Although theme headings may appear similar to those in other Regional Drought Resilience Plans, the content of themes have regional context.

The actions listed under each theme drive the region towards its overall vision to be prepared for future droughts, with reduced drought impacts and improved guidance for regional communities, economies and environments to cope with droughts in a long-term and sustainable manner.

Some actions are the responsibility of an individual agency or organisation; however, most actions will require a collaborative approach by several organisations, businesses and communities. A partnership approach will be needed with Traditional Owners, in line with the Government's policy and legal commitments, which include the Victorian Aboriginal Affairs Framework and the Department of Energy, Environment and Climate Action's *Pupangarli Marnmarnepu 'Owning Our Future' 2020–2025* self-determination reform strategy.

Themes and actions are not prioritised in this Plan. Rather, the holistic approach to resilience building and strengthening requires simultaneous investment in all themes – a drought resilient farming system without a resilient community and financial system does not result in regional drought resilience.

Themes also have overlapping areas for action, which reflect and support the need for integrated approaches, collaborative efforts and strong networking and linkages.

Outcomes and actions draw on the local experiences of people who live in the community. They also draw on existing plans and strategies, which drive the actions and priorities of the organisational members of the Regional Reference Group.

The 7 themes for the RDRP in the Mallee are:

- Collaboration
- People and community wellbeing
- Culture
- Farming
- Finance
- Rural Economy
- Sustainable use and management of natural resources

Photo: Mallee Catchment Management Authority

Theme 1

COLLABORATION

Before, during and after drought, collaboration between sectors, organisations, and service providers is critical to ensure a broadly integrated approach to drought resilience building and response. As the Mallee borders South Australia and New South Wales, and with urban centres providing regional and cross-state services, collaboration needs to extend further than the Mallee itself. The region identified the importance of single-point information access combining the services and information available from a variety of initiatives.

Outcome:

Regional networks are maintained to ensure open channels of communication and promotion of engagement from a diverse representation of sectors, communities and industries.

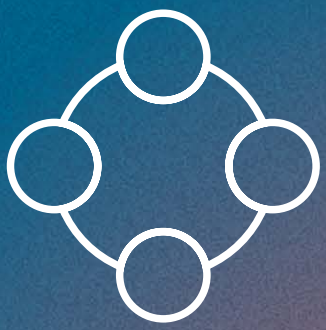
Actions

1.1	Establish or use existing networks, committees or forums to ensure continuing, broad sector drought resilience building that incorporates Traditional Owner and local knowledge.
1.2	Convene partnership meetings between government, industry and Traditional Owners to coordinate and share information on measures applicable to phases of drought.
1.3	Co-design (with local communities) coordinated information hubs that link individuals and communities to organisations that encourage, enable and support people to build drought resilience into their personal and/or business planning.
1.4	Communicate and support region-specific actions contained within Sustainable Water Strategies.
1.5	Support and expand climate leadership capacity building programs within the region, including a drought resilience advisor/ambassador program.
1.6	Support opportunities for Traditional Owners to build drought resilience and preparedness efforts, in line with their self-determined values, goals and aspirations for Country and community.

Photo: Gannawarra Shire

Theme 2

PEOPLE AND COMMUNITY WELLBEING



Many people and communities in the Mallee have experienced severe drought. The mental and physical impact of droughts on people and communities has been identified as an important aspect that requires strategic preparedness. Local communities, in some cases isolated through remoteness, are best situated to develop initiatives to be better prepared for drought and the changing climate. Focusing on mental wealth, as a continuous effort to build resilience, rather than mental health, which may be associated with incidental responses, and a focus on the most vulnerable people living in the Mallee has been identified as a priority.

Outcome:

Physical and mental wealth of people and communities is strong and is supported during all phases of drought.

Actions

2.1	Support community driven drought resilience initiatives that address the needs of our diverse communities, particularly those initiatives that utilise existing local networks.
2.2	Invest in mental wealth-building and support programs throughout the region.
2.3	Invest in targeted support for people living with disabilities, health issues and the elderly during drought events, including the creation of mobile climate wellness clinics.
2.4	Co-design support projects with youth that address climate anxiety.
2.5	Support continued availability and accessibility of green spaces during drought.
2.6	Partner with Traditional Owners to support culturally appropriate practices in emergency events.

Photo: Gannawarra Shire

Theme 3

CULTURE

The Mallee has a diverse population, including Traditional Owners, people with different cultural backgrounds, and seasonal workers. This provides opportunities to use knowledge exchange to learn, but also requires a multitude of approaches when raising awareness about drought preparedness and resilience-building. Differences between drought preparedness of urban centres and rural communities is also identified as requiring tailored approaches to drought resilience building and strengthening. The strong communal sense and peer-support by neighbours is exemplified by strong volunteerism in the region, but economic and societal changes may require a reduction of reliance on volunteers.

Outcome:

A culture of inclusiveness, collaboration, cooperation, support and equality that builds stronger resilience for people and communities is maintained across the region.

Actions

3.1	Recognise the importance of partnering with Traditional Owners to incorporate their knowledge and practices into building drought resilience across the region at individual, business and community levels.
3.2	Recognise and protect culturally and spiritually important sites and locations from the impacts of drought.
3.3	Recognise and address diversity in communities with respect to drought information, including language, cultural heritage and gender diversity.
3.4	Recognise different approaches for urban and rural areas with respect to drought resilience building, with a particular emphasis on ground up approaches that incorporate local knowledge.
3.5	Address the risk posed by decreased volunteerism across the region and the consequence of this on community cohesion during times of drought.

Theme 4

FARMING

Several farming systems (e.g. broad-acre, horticulture, dairy, etc) exist in the Mallee, each having their own needs in terms of drought resilience-building. Research and innovation have developed a range of guides and options that support agribusinesses, both at the systems-based level as well as commodity based. On farm infrastructure, ranging from improved water management through to stock containment and fodder storage, helps to build drought resilience. Traditional Owners' knowledge of drought tolerant native food could drive transformational change in Mallee farming systems. Improved land management operations, e.g. low or no-till, support maintaining soil fertility and reduce risk of dust storms.

Outcome:

Farms are resilient to droughts as a business, as land and soil managers, and as a sector.

Actions

4.1	Ensure literature and information that summarises experiences and research in specific commodity farming and horticulture systems is available in a manner that suits the requirements of our diverse farming communities.
4.2	Support new research and development, new technology and innovations on-farm.
4.3	Promote infrastructure improvement on-farm and advocate for off farm infrastructure improvements.
4.4	Improve business and land management practices to aid landowners in managing natural resource assets.
4.5	Support participation in local and wider networks for learning and growing.
4.6	Support the development of drought tolerant native foods, including research into the development of a staple food from native grains, in partnership with Mallee Traditional Owners.

Theme 5

FINANCE

The finances of households and businesses across the region are often impacted by the fluctuations in farm production during drought. While the impact of high year-to-year financial fluctuations can be reduced by maintaining financial buffers, efforts by households and businesses must be recognised and supported by the financial sector.

During drought, sourcing alternative off-farm income can help but often needs to be supported by the local economy. Trigger points exist for an individual farm or agribusiness to reduce stock, limit cropping, or exit the industry permanently; however, farmers and businesses may require advice or support to make these decisions.

Outcome:

A financial sector that understands the large fluctuations of income and expenses in agricultural businesses and provides support to farms and businesses through all phases of drought

Actions

5.1	Encourage involvement of the local and regional financial sector in drought planning and support of primary producers and other small businesses.
5.2	Co-design (with local communities) solutions and support services to assist primary producers who wish to exit the industry.
5.3	Encourage business owners to consider what alternative income streams may be available to them that can be established during non-drought years to provide greater overall business resilience.
5.4	Encourage the building of financial buffers during non-drought years that can be used to support businesses during droughts.

Photo: Gannawarra Shire

Theme 6

RURAL ECONOMY

While financial decisions can be made on an individual basis, the regional economy needs to be developed to support individuals and businesses. A diverse economy is more resilient to sector-specific fluctuations. The Mallee, and Mildura and Swan Hill in particular, has developed a strong tourism and hospitality sector related to local products. Special employment programs during droughts help to provide an alternative income stream, and a diverse industrial sector allows for continually vibrant communities during droughts. To enable this diversity, all economic activities benefit from being drought prepared.

Outcome:

The rural economy can diversify and bounce back from droughts, with direct impacts of droughts on the agricultural sector buffered by the larger regional economy. Tourism remains an important part of regional economies during droughts.

Actions

6.1	Support networking of industry, businesses, and the financial sector to focus on drought preparedness.
6.2	Promote regional economic diversification as a way to build resilience for local businesses and local economies.
6.3	Advocate for consideration of drought resilience in existing industry, business and government plans and strategies.
6.4	Support food-tourism through combined advertising of food production and regional hospitality industry.
6.5	Co-design (with local communities, including Traditional Owners) targeted programs that support long-term local employment opportunities for those most disproportionally impacted by drought.
6.6	Support the establishment of equitable funding or financing opportunities for businesses to invest in technology or equipment that increase drought resilience.
6.7	Develop mechanisms to allow businesses to collaborate with government agencies and industry partners to identify opportunities that lead to faster restoration and recovery works and services critical to their business operations.

Photo: Gannawarra Shire

Theme 7

SUSTAINABLE USE AND MANAGEMENT OF NATURAL RESOURCES

The Mallee region contains several national and regional areas of natural importance, as well as an agricultural landscape that transforms depending on seasonal conditions. Natural resources, such as water, must be managed and shared equitably, particularly in dry periods. Landscape drought resilience can be strengthened by maintaining and growing the diversity of natural capital in non-drought years. Green-blue infrastructure in urban areas maximises urban land and water management to provide benefits of green spaces. A reliable energy production, supply, storage and transport network supports the region during times of peak demand caused by heat waves, which are often associated with drought periods.

Outcome:

Landscapes remain vibrant and can recover from droughts. Droughts do not permanently damage natural resources, which are shared equitably between users, even when in limited supply.

Actions

7.1	Support Traditional Owners to lead healing Country practices in accordance with any Land Use Activity Agreements or other strategies.
7.2	Identify and encourage adoption of best management practices to avoid adverse consequences of drought.
7.3	Advocate for urban and rural stock and domestic water supply to be maintained at levels that support local communities and cultural practices.
7.4	Advocate for efficient and resilient water conveyance and electricity infrastructure.
7.5	Support programs that aim to create permanent bio links around wetlands and along natural watercourses.
7.6	Support habitat restoration programs on farmland to enhance ecosystem function and conserve threatened species that may be significantly impacted by drought.
7.7	Support the establishment of increased green-blue infrastructure in urban developments, which in turn supports native flora and fauna populations and provides urban cooling.
7.8	Identify locations suitable for renewable Stand-Alone Power Systems to improve the electricity grid's strength, reduce emissions and increase energy efficiency to reduce interruptions due to the impacts of drought.

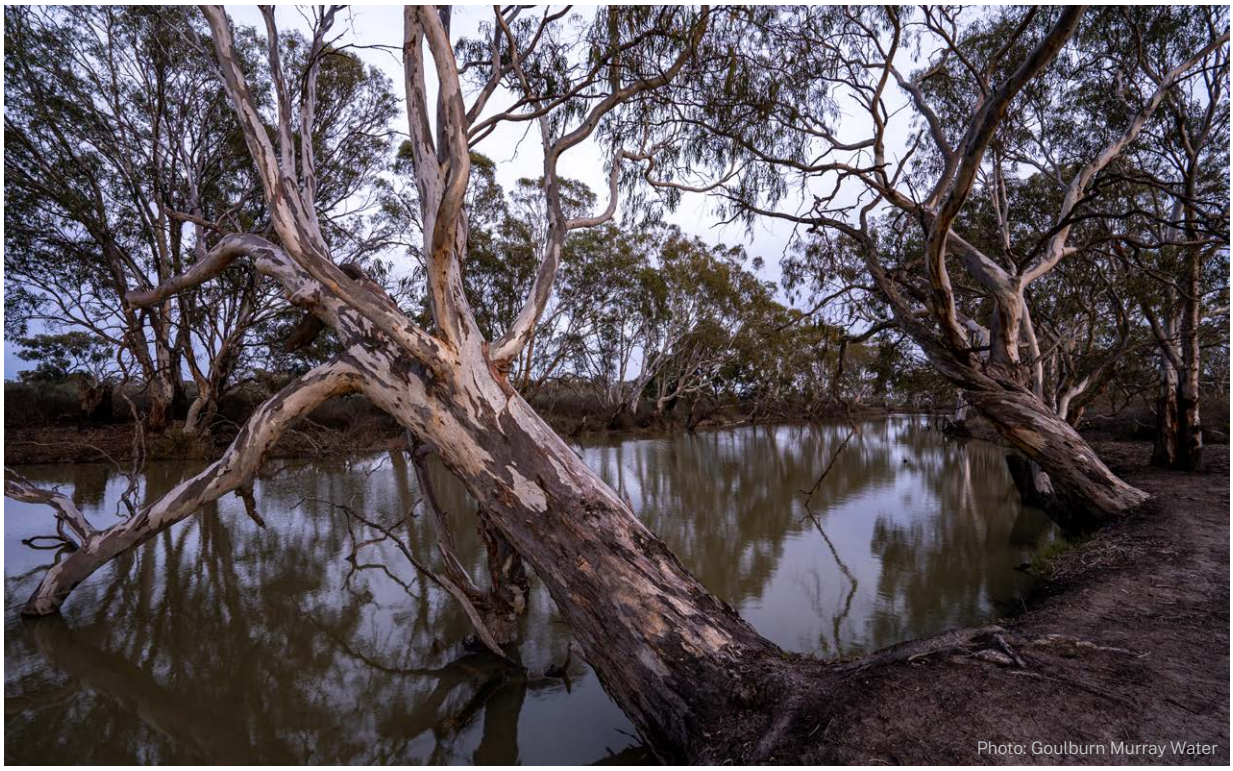


Photo: Goulburn Murray Water

CASE STUDIES

Cultural diversity in Robinvale

Robinvale is a community in the Rural City of Swan Hill on the banks of the Murray River. On the New South Wales side, it borders the township of Euston. The official population of Robinvale was 3,740 at the 2021 census. However, a high proportion of semi-permanent and seasonal workers result in an actual population of approximately 7,000 to 8,800 people. Robinvale has a diverse and culturally rich community made up of some 40 cultures and with over 20 languages being spoken. Several news articles over the past 25 years have listed Robinvale as the most multicultural town in Victoria. There is strong Aboriginal history and culture, as well as an art centre in the area. The Tongan community is actively involved with the brass band, a choir and Carols by Candlelight.

Robinvale is a hub for food production. The district around Robinvale produces approximately 60% of Australia's table grapes, 70% of Australia's almonds and 80% of Australia's olive oil. Agriculture and horticulture also make up 38% of jobs in Robinvale.

Access to services is a crucial part of making any community liveable. Services like healthcare, telecommunications, specialist medical services, community safety and a range of shops and employment opportunities were all raised during the development of a community plan as important for Robinvale's future.

The community centre, community garden, Rotary Park, museum, river, riverside caravan park, walking paths, tennis courts, pool, pub and golf club were identified as valuable local and tourist facilities. NAIDOC Week, the Mallee Almond Blossom Festival, Lunar New Year, NACHOS community cooking, and the annual ski race were identified as positive and enjoyable community activities.

Engagement, awareness raising, and communication with the Robinvale community, and several other communities in the Mallee, benefit from recognition of the multilingual and multicultural interpretation of information. Drought resilience building needs to be inclusive and actively reach out to ensure the whole community is engaged.

Based on information from Swan Hill Shire and La Trobe University (2016).

Neds Corner

Neds Corner Station is a 30,000 hectare conservation reserve on Ngintait Country in the far north-west of Victoria, bordering Murray-Sunset National Park and the Murray River. The property features numerous important cultural heritage sites including ancestral burials, scar trees, fireplaces and shell middens.

Ngintait Traditional Owners lived on and managed the land that includes Neds Corner for many thousands of years. Prior to becoming a conservation reserve, the area was a heavily grazed agriculture property. Since Trust for Nature purchased the property in 2002, an extensive revegetation program has been undertaken. Neds Corner has shown great recovery from a heavily grazed agricultural property to a conservation reserve of national significance. What were bare sand hills and hard, compacted plains are now vegetated with saltbush and blue bush vegetation, and significant cultural sites are being protected.

In 2022, Trust for Nature committed to enabling the transfer of ownership of Neds Corner Station to its Traditional Owners. Neds Corner Station is frequently visited by nature lovers and educational groups (schools and universities) and is enabling research of the landscape through archaeological digs and engagement with Traditional Owners to further knowledge and conservation science.

Based on information from Trust for Nature (2017), ABC News (2022) and FPMM (2022)

Drought Employment Program with Mallee and North-Central CMA

In 2016, the CMA Drought Employment Program employed people in communities affected by drought to undertake a range of environmental projects. These included works such as weed and rabbit control, watering revegetation sites, fencing off rivers and native vegetation and activities to improve soil health.

The Mallee CMA worked with regional communities to ensure natural resources are well-placed to recover from the drought. The Drought Employment Program provided employment and training opportunities to drought affected people from the agriculture sector who experienced unprecedented hardships within the dryland farming areas around the Millewa and Carwarp areas.

The program aimed to provide drought-affected people with the opportunity to earn off-farm income to support their families and rural communities, contribute towards local natural resource management outcomes and increase their confidence and skills for the future.

The employment program provided participants with increased financial stability during a difficult emotional time. Participants reported broad personal benefits, including boosted health and morale from being employed, earning an income and subsequently relieving stress from their farm situation. Other benefits included forming friendships with others in similar situations, having an atmosphere where experiences and discussions about the future could be shared, getting useful training and upskilling, increased motivation and a sense of achievement and participation.

The Drought Employment Program employed 92 people across 4 CMAs in western Victoria and provided more than 70,000 workhours. A similar "Working for Victoria" program was implemented by the Mallee CMA during COVID-19 lockdown periods in 2021, which reduced tourism, trade and economic opportunities in the region.

Based on information from North Central CMA (2015b), Premier Victoria (2016), DELWP (2017) and Mallee CMA (2021)

Building drought resilience of vulnerable soils in low rainfall cropping and grazing systems

The Victorian Mallee region presents several challenges for dryland farming communities, particularly during periods of drought and acute rainfall deficiency. Insufficient ground cover often results in severe wind-driven erosion, events impacting soil health, crop potential, native vegetation and the broader region through extensive dust storms.

A two-year project (2022-2024), developed under the Drought Resilient Soils and Landscapes Grants Program and managed by Mallee CMA, is supporting dryland farmers in low rainfall and high wind erosion-risk landscapes to build their capacity to implement best practice strategies that provide for ground cover and productivity gains, while increasing resilience to drought and climate shocks.

The project is delivered in partnership with Agriculture Victoria, and the region's not-for-profit dryland agricultural research and extension organisations Birchip Cropping Group and Mallee Sustainable Farming.

Several demonstration sites have been established across the Mallee in areas which are vulnerable to wind erosion to demonstrate the effective integration of best practice strategies that improve ground cover, which in turn stabilise vulnerable soils. Targeted engagement and capacity activities are delivered to support farmers to improve their cropping and grazing strategies and move towards a system that continues to be productive and profitable even through highly variable climatic conditions.

Based on information provided by Mallee CMA.

NEXT STEPS FOR THE MALLEE

This Plan identifies and communicates the actions and outcomes needed for communities, businesses and people in the region to be resilient to future droughts and a drier climate.

A handful actions in the Plan can be implemented by individual entities. However, most actions, related outcomes and the overall regional vision will only be realised through concerted and continuous collaboration that is driven by communities and organisations within this region. The communities and organisations within the region therefore have a critical role in implementing this Plan.

Some actions in the Plan will need regional stakeholders to reach out for broader collaboration and partnership with other governments, agencies, statutory bodies, not-for-profit organisations, Traditional Owners and the private sector.

The actions in this Plan represent a point in time. As economic, social and environment conditions change, the community will need to adapt the actions in this Plan and introduce new actions to maintain the path towards the overall outcome and vision for the region.

This Plan provides the pathway for the region to move towards drought resilience with:

- an understanding of the regional impacts of drought
- a common regional vision and common goals
- desired outcomes and actions agreed by the community
- a common picture of how existing and new investments are related to each other
- a basis for developing new actions and programs to achieve the regional vision
- a framework to monitor progress towards building resilience to future droughts

Next steps to support the implementation of the Plan include:

- identifying a lead organisation to oversee and coordinate the delivery of activities that align with the region's Plan
- establishing a fit-for-purpose Advisory Group to guide delivery and ensure regional representation
- detailing priority actions, budgets and timelines
- monitoring and evaluation
- reviewing the progress of the Plan and making any necessary updates

MONITORING, EVALUATION AND LEARNING

The collaborative effort and shared expertise used to prepare the Plan is the important first step in building drought resilience in the Mallee. Work has been done by the region to articulate the actions needed to achieve desired regional outcomes. The next step is for the actions and activities identified in the Plan to be implemented, evaluated and adapted as needed to achieve the longer-term outcomes for drought resilience.

Pathway of program delivery through discovery, engagement, development, implementation and evaluation

Monitoring, evaluation and learning (MEL) is a key element of the RDRP program. Program objectives, outcomes and measures of success are clearly articulated at all levels of program delivery (national, state and regional) and are a range of short, medium and long timeframes.

Measuring success

The outcomes identified in this Plan are community and region wide, and dependent on the fourth step of implementation identified in the pathway of program delivery. Given the long-term outcomes of the Plan, the MEL framework below outlines how progress toward success will be measured.

Management and Reporting

The organisation awarded as the lead organisation to coordinate the delivery of the Plan will work with Agriculture Victoria to provide up-to-date data and information to support program implementation and planning. Monitoring and reporting will enable: key learnings to be identified, effective reporting, and adaptive program management.

A range of assessment tools may be used to indicate progress including, but not limited to, surveys, case studies, stakeholder interviews and engagement data analysis. Data and information will be collected at various intervals across implementation planning, and during and after activities are being implemented.

Assumptions underpinning success of the RDRP

Measuring success and reporting on progress toward regionally specific outcomes is dependent on several key assumptions.

Key assumptions affecting short-term outcomes (1–2 years)

- Regional stakeholders have the capacity and capability to participate in strategic planning
- Regional stakeholders are willing to cooperate with each other on regional planning
- Program design is sufficient to give regional stakeholders opportunities to identify and communicate regional drought resilience needs
- Regional communities are motivated to take ownership of completed plans and actively seek to implement them
- There are sufficient learnings to continuously improve program implementation

Key assumptions affecting medium term outcomes (2–4 years)

- Supporting regional stakeholders through program implementation will result in changes in practice in the Mallee
- There are sufficient opportunities and funding for the region to implement elements of the Plan
- Plans contain implementable activities to build drought resilience
- The Mallee Plan Coordinator and regional stakeholders continue to review, update and implement the Plan

MEL Framework

Key regional themes and outcomes are matched with relevant Future Drought Fund (FDF) strategic priorities, regional progress measures (2–4 years) and indicators.

The Framework is aligned with previously developed Program and Fund level MEL Frameworks, to ensure consistency and so that data collection tools provide information across a range of learning and reporting requirements.

FDF[1] Strategic priority	Progress measures (2–4 years)	Indicators
Collaboration Regional networks are maintained to ensure open channels of communication and promotion of engagement from a diverse representation of sectors, communities and industries.		
Social resilience for resourceful and adaptable communities	Improved collaboration and coordination between governments, industry, community, Traditional Owners and primary producers. Communities are coming together to prepare for and respond to drought. Plan actions and opportunities are incorporated into other strategic planning across the region.	Implementation/planning groups and networks function well together. Communities have an improved understanding of drought resilience specific to their region. Stakeholders are working together to plan and deliver on actions across the region. Traditional Owners are increasingly involved in drought programs and activities. Regional drought preparedness activities reflect Traditional Owners' priorities.
People and community wellbeing Physical health and mental wealth of people and communities is strong and is supported during all phases of drought.		
Social resilience for resourceful and adaptable communities	Communities and individuals are coping with the physical and mental stresses of drought.	Improved community awareness of and access to health and wellbeing services.
Culture A culture of inclusiveness, collaboration, cooperation, support and equality that builds stronger resilience for people and communities is maintained across the region.		
Social resilience for resourceful and adaptable communities	Communities are learning and building capability, capacity and expertise through sharing ways to build social resilience. Community preparedness to drought has increased.	Communities are using their knowledge to plan for drought resilience. Leaders in the region are more confident to implement strategic actions. Stakeholders are working together to plan and deliver on actions across the region.

1. Future Drought Fund

FDF[1] Strategic priority	Progress measures (2–4 years)	Indicators
Farming Farms are resilient to droughts as a business, as land and soil managers, and as a sector.		
Environmental resilience for sustainable and improved functioning of our natural landscapes **Economic resilience for an innovative and profitable agricultural sector**	Primary producers and farm businesses better understand their resilience to drought. Primary producers are better able to identify business risks and make timely decisions.	Farmers are learning about and implementing new business strategies and practices. Farmers and agricultural industries have an improved understanding of drought resilience specific to their region.
Finance A financial sector that understands the large fluctuations of income and expenses in agricultural businesses and provides support to farms and businesses through all phases of drought.		
Economic resilience for an innovative and profitable agricultural sector	The financial sector's support to drought impacted businesses has increased.	Increased sector understanding of the region's current and future drought resilience, considering the region's unique economic, environmental and social characteristics.
Rural economy The rural economy can diversify and bounce back from droughts, with direct impacts of droughts on the agricultural sector buffered by the larger regional economy. Tourism remains an important part of regional economies during droughts.		
Economic resilience for an innovative and profitable agricultural sector	Impacts of drought on the economies of region are known and prepared for. Businesses are identifying, managing and planning for the business risks associated with drought.	Increased community understanding of the regions current and future drought resilience, considering the region's unique economic characteristics. Innovative pathways and opportunities for business diversity are identified.
Sustainable use and management of natural resources Landscapes remain vibrant and can recover from droughts. Droughts do not permanently damage natural resources, which are shared equitably between users, even when in limited supply.		
Environmental resilience for sustainable and improved functioning of our natural landscapes	Natural resource management to build resilience to drought across the region is improved.	Partnerships, networks and engagement between stakeholders managing natural resources are ongoing. Stakeholders have increased understanding of natural resource management to build drought resilience.

Appendix 1
Drought resilience insights from Mallee

Regional collaboration

The Mallee borders the Victorian regions of Wimmera Southern Mallee, Central Highlands and Loddon Campaspe. It also borders New South Wales and South Australia. Feedback provided during several engagements pointed to the need to collaborate not only within the region, but also across the region's boundaries. Mallee CMA collaborates with North Central CMA and Wimmera CMA. Mallee Sustainable Farming has members across the Mallee region in Victoria, New South Wales and Australia. Mildura, Renmark, Adelaide and Bendigo provide medical services to Mallee residents.

Dust impact and soil erosion

Previous droughts in the Mallee resulted in wind-blown soil erosion and dust formation. Dust results in lower air quality and associated health concerns, as well as impacting on road infrastructure via sand drifts. Agricultural soil management has changed, e.g. high adoption rate of no or low tillage, and soil erosion prevention projects have been implemented, e.g. through revegetation. Although less soil erosion and dust storms are anticipated, continuous care needs to be taken to prevent wind-blown soil erosion.

Native food and pastoral systems

Native food systems are adapted to local soil and climate conditions. Native food systems are important for Traditional Owners. Production of native foods, but also support of native food industry, is important. Current crop research priorities increases the gap between non-native agricultural systems and native food systems. A drive to staple native food systems is important (e.g. Macadamia nuts, originally from Australian East Coast rain forests). In the USA, some nut crops are failing because their whole production is based on a single genotype system. Native pastoral systems are important for resilience as well. Native grasses also provide food for stock during droughts.

Connection to Country

Drought results in cultural and environmental impact. Cultural and environmental value of the land could be affected by water levels in river. For example, Ned's Corner has lost many blackbox trees resulting in a dead landscape. Spiritual, cultural and environmental values can be revitalised through infrastructure to provide water to dry lands.

Mallee broadacre farming systems

While Mallee crop types in the broadacre farming systems are similar to those in other regions in Victoria, operations are unique in the region. Higher temperatures and less rain impacts grain productivity per area, with larger farms; the average broad-acre farm size in the Mallee is 1400 ha. The relative remoteness of farms requires a high level of independence and a strong interdependence on neighbours and local communities. Larger on-farm storage of consumables is required to reduce dependency on far-away suppliers. The Mallee broadacre farming systems have the highest adaptation of no-till systems, where no cultivation other than seeding is used. This also contributes to a reduction in wind-blown soil erosion.

Carbon-neutral farming

Some farms in the Mallee are asked by their financial institution about their ability to reach carbon-neutral operations. This is different from carbon farming, where a farm operation focuses on increasing carbon storage with an opportunity to monetise. Carbon neutral farming achieves a net-zero emission from farming operations. In RDRP engagement discussions, drought was identified as a threat to the ability to farm carbon-neutral. A possible option to overcome this is to manage carbon-neutral farming similarly to farm finances, where multiple seasons need to be taken into account, rather than a single season, thus allowing for saving of carbon-credits from a good set of seasons to offset carbon losses in a bad set of seasons.

Agricultural systems have changed

Agricultural production systems have changed since the Millenium Drought, with more permanent plantations resulting in higher competition for water. There has also been a shifting to high value crops, which could impact low-value growers during the next drought. Properties have increased in size, thus there are less customers but they can be larger water consumers. These larger properties may have larger capital to be able to manage drought. More diversification has occurred as well. Producers in Gannawarra have shifted to more poultry and pigs as well as dairy.

Domestic water demand has changed

Not only agriculture has changed, but residential consumption has as well. Generally, consumers have reduced their water consumption by 30%, but the total number of customers has increased by 30% also. Community fears the increased competition between agriculture and residential water demand.

Modernisation of water supply infrastructure in the Mallee has resulted in many communities and households in the Mallee connecting to the water infrastructure system. Upgraded piping systems were identified as one of the larger contributions to domestic water security and drought resilience. Water use restrictions still apply during droughts, but piped systems provide for more secure delivery of water.

Water quality

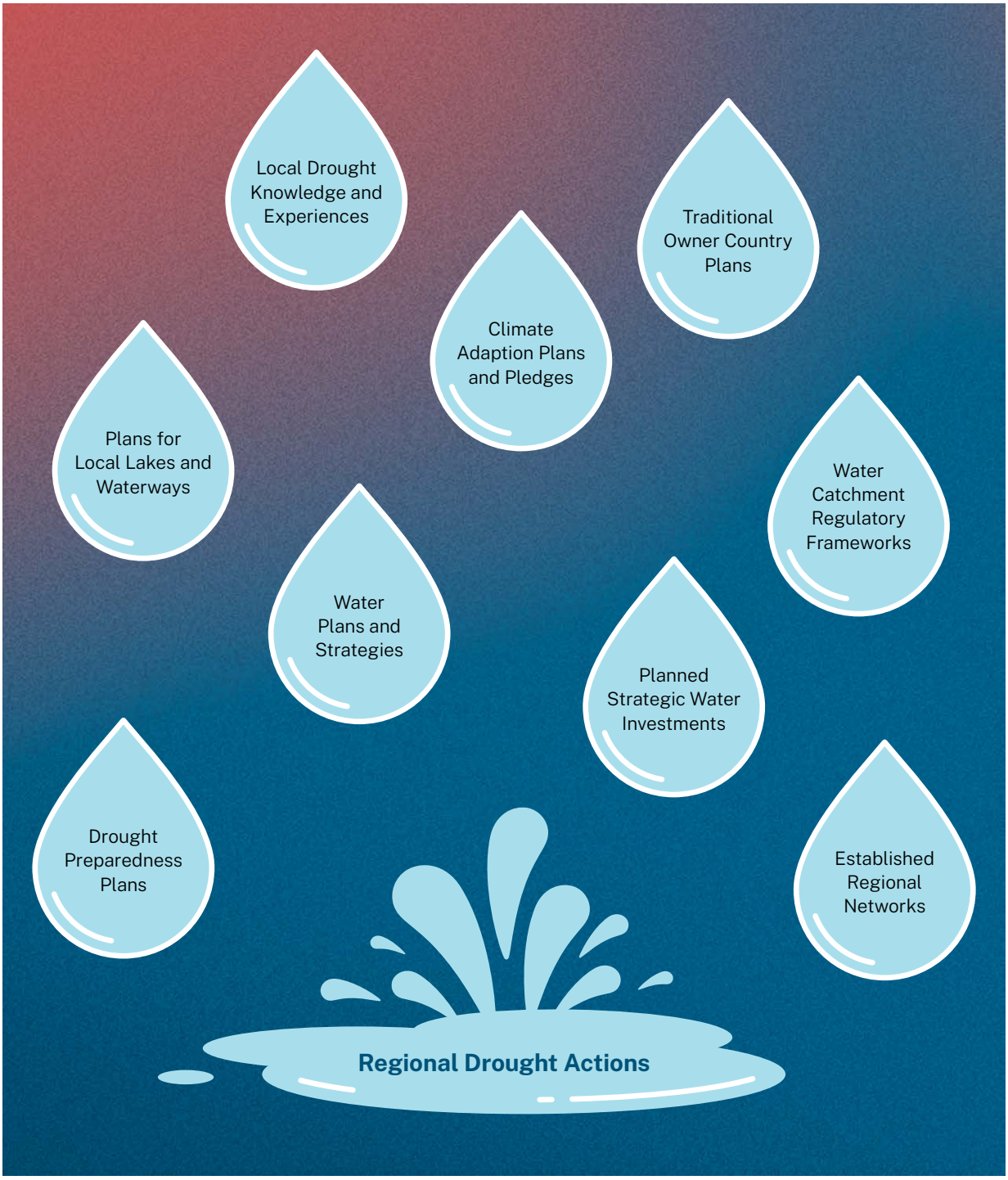
While the focus during drought is often on water quantity, water quality is equally an important aspect of drought management. The occurrence of algae blooms during periods of low water availability and hot periods can have a negative impact on livestock health and require more treatment for urban and rural water supply.

Positive attitude

Feedback received through the Engage Victoria platform stressed that it is important to remain positive and make use of the opportunities that experience, insights and knowledge provide. For example, a long-term focus on healthy soils in farming systems will support the yields through seasonal variability. This may still return good yields, even in dry years.

Appendix 2
Existing actions and strategies in the Mallee

Several region-specific action plans and strategies exist for the Mallee. The review in this appendix does not attempt to be a complete overview. However, a select number of documents are reviewed to support the thematic framework and actions listed in the main part of the drought resilience plan for the Mallee. The reviews in this appendix are ordered by year of publication, with the most recent documents listed first.



Djaara (Dja Dja Wurrung Clans Aboriginal Corporation), 2023. Turning 'wrong way' climate 'right way' – Dja Dja Wurrung Climate Change Strategy 2023–2034

The Climate Change Strategy published by Djaara assesses the actions required to reverse negative climate impacts on Djaara Country. It includes a comprehensive review of existing plans and strategies that come together in the Climate Change Strategy. The strategy focuses on 6 themes – Country, Fire, Water, Trees, People and Sky Country. The strategy includes indicators of success and stresses the need for integration of cultural heritage and joint management practises. The strategy also includes the need to work together and identifies partners.

Djaara (Dja Dja Wurrung Clans Aboriginal Corporation), 2023. Dhelkunyangu Gatjin – Working together to heal water. Djaara Gatjin Strategy

A water economy has evolved that is worth billions of dollars annually, produces food and fibre for Australia and the world, provides drinking water and underpins local and regional communities. This water system is governed by the State resulting in water on Djandak — Djaara's water — being fully allocated to water users. Djaara are excluded from participating and benefiting in these water arrangements. Djaara consider their knowledge is central to informing sustainable water management. Djaara currently own very little water resources and have very little say on how the water is managed on Djandak.

The Strategy outlines 3 key outcomes which have been summarised here:

1 Make decisions for Gatjin (water); To meet obligations to heal and manage Djandak and enjoy traditional rights, Djaara Culture and Lore must be at the heart of water policy, planning and management.

2 Secure a growing share of water rights and entitlements; Increased water entitlement is some restitution of stolen water rights, enables the determination for the best use of water for cultural purposes, and allows direct involvement in the water economy.

3 A Djaara Gatjin Authority; A Djaara water authority is required to manage water and water interests and acknowledges that neighbouring mobs have authority for water on their country.

Mallee Catchment Management Authority, 2022. Mallee Regional Catchment Strategy 2022–2028

The 2022–28 Mallee Regional Catchment Strategy (RCS) aims to provide a 6 year framework for action that supports and focuses the ongoing and coordinated efforts of all regional stakeholders. The RCS sets long-term (20-year) and medium-term (6-year) outcomes for the themes biodiversity, waterways, agricultural land, culture and heritage, and community asset. Each of the 5 themes has a description of the current status, the trends, the priorities and expected outcomes from the RCS.

Climate variability is one of the threats identified in the RCS. It mentions specifically drought in the context of an exception in terms of extreme weather as it typically impacts across large swathes of the landscape. The RCS stresses that is important that there is a range of management responses available to NRM stakeholders that can benefit both the landscape and communities. Drought is also sees as a threat to water availability and water allocation.

One priority decision for agricultural land is listed as: Diverse, adaptable, and resilient agricultural systems that maximise production potential, minimise risk, and enhance viability – including drought preparedness and climate ready strategies. The Catchment Strategy includes several references to previous drought and its impact on the landscape. One beneficial result of drought appeared to be the reduction of soil salinity due to a reduction of irrigated lands in the region.

Lower Murray Water, 2022. Urban Water Strategy 2022

The Urban Water Strategy of Lower Murray Water (LMW) identifies several activities that were involved in the strategy. One of the 8 activities listed is the preparation of a drought preparedness plan. LMW sets an acceptable level of at least 65% of the unrestricted demand as a minimum supply level of service during drought.

To ensure the security of water supply, LMR evaluates options, one of which is to buy water shares. It evaluates this as expensive and having reputational impacts associated with competing with irrigation customers but remains a valid risk management tool during multiple years of drought.

The Drought Preparedness Plan (DPP), which is included in the strategy as appendix 1, details practical approaches for system operating during periods of water shortage. The purpose of the DPP is to detail management actions to meet critical human needs during an extreme dry period, or a water quality event of an intensity, magnitude and duration that is sufficient to render water acutely toxic or unusable for established local uses and values.

In the section on engagement with local councils, input was received that maintaining community assets such as public open spaces, gardens and ovals are important to improve liveability. Based on the millennium drought experience, severe water restrictions can cause significant damage to public green amenities e.g. trees may take a long time to re-establish. Mildura Council is looking at introducing drought tolerant plants for future public green amenities and use of raw water and other alternative water for irrigating public open spaces.

Adapt Loddon Mallee, 2021. Loddon Mallee Climate Ready Plan

The Climate Ready Plan for the Loddon Mallee focuses on People, Places and Sectors, and uses the 4 themes Knowledge, Connection, Wellbeing and Security to identify actions required to adapt to climate changes. The global objectives in the plan include:

- Individuals and communities have the knowledge and tools they need to become climate ready;
- People in Loddon Mallee feel connected to their communities and supported to become climate ready;
- Individuals and communities are happy and healthy; Individuals and communities have the housing, food, financial security and access to the services they require;
- Our region is continuously learning about the effects of climate change on our natural and built environments;
- Places in our region are connected by resilient infrastructure and environmental corridors; Our natural and built environments are healthy and sustainable;
- Our natural and built environments are protected from the impacts of climate change;
- Businesses have the knowledge and resources they need to make confident decisions for operational continuity and competitive advantage;
- Local businesses feel connected, incentivised and rewarded to become climate ready;
- The health and safety of local workforces is protected;
- Local businesses have secure access to climate resilient markets, technologies, financing, and transport channels.

In addition to 111 actions defined under these themes, the plan contains several stories of how people, places and sectors are getting ready for climate impacts.

Barengi Gadjin Land Council, 2017. Growing what is good – Country Plan. Voices of the Wotjobaluk Nations

The Barringgi Gadyin Country landscape varies from undulating grassy plains, rivers and wetlands to sand-hill and Mallee country. Plains are covered by woodlands, heathlands, and to the south-west, many wetlands. The vision of the Plan is explained in 8 statements: A strong and healthy Wotjobaluk Culture; a healthy Wotjoboluk Country; An engaged and connected Wotjobaluk Community; Recognition and respect, economic sustainability; Healthy Wotjoboluk People, A strong corporation with excellent governance; and a strong voice for Wotjobaluk Peoples. A prioirity stated under the Caring for Our Country priority is to care for Significant Places and Reserves.

Several actions identified are focused on strengthening the connection to Country, Culture, Education and Jobs. In the section on partnerships, strategic partnerships are prioritised for Parks management, cultural burning, and influencing land management on private land.

Although no specific references to drought are given, the linkage to improving land management on private land and parks includes drought preparedness and resilience building. Economic strengthening also includes drought resilience strengthening, especially if jobs are focusing on environmental management and tourism.

North Central Catchment Management Authority, 2016. North Central Victoria Regional Sustainable Agriculture Strategy

In 2016 the North Central Victoria Regional Sustainable Agriculture Strategy was published with the aim of productive farming while protecting the natural resources base. Two farming zones are identified that overlap with the Central Highlands region: a mixed farming zone in the west covering Marnoo, St Arnaud, Avoca and Clunes, and a diverse farming zone around Creswick, Daylesford, Kyneton and Woodend. The characteristics of each zone are presented. Three scenarios for sustainable agriculture are discussed; a paradigm shift, where agriculture is shifted to fully adapted to Australian conditions, e.g. moving towards a low input grazing system based on native grasses; a mid-level change where farming aims towards sustainability, e.g. increasing soil carbon through sub-soil manuring; and an incremental change, making small changes and allowing for adaptation to uncontrollable influences, without fully eliminating the risks to sustainable agriculture.

Mallee Catchment Management Authority, 2016. Mallee Natural Resource Management Plan for Climate Change

The Mallee Natural Resource Management (NRM) Plan for Climate Change describes a planning framework to foster adaptation under a changing climate. It provides a summary of climate projections published by the CSIRO and the Bureau of Meteorology and details the potential implications to landscapes and NRM in the Victorian Mallee. The primary aim of the Plan is to re-evaluate the region's priority landscapes and management actions.

The Plan describes the future climate predictions for the Mallee. It then evaluates the natural assets managed by the CMA and identifies the largest threatening processes. The Plan identifies constrained regenerative capacity as the highest threat. The Plan uses a value evaluation for 9 types of impacted areas, including rivers, wetlands, threatened species, terrestrial species, soils, agricultural land, groundwater, cultural heritage and community capacity. A detailed spatial analysis using this value evaluation assigns different natural assets in the region with these values.

The Plan then describes the implementation actions that are to be undertaken to reduce the threats with interventions and responsible actors. An appendix compares the interventions with the overall CMA planning and identifies which actions have an increased priority due to climate change drivers.

North Central Catchment Management Authority, 2015a. North Central Climate Change and Mitigation Plan

In 2015, the North Central CMA published a Climate Change and Mitigation Plan. The process to develop this plan followed climate projections, followed by a vulnerability assessment, community workshops, and the development of a mitigation plan. Mitigation options focus on the topics of vegetation, soil, carbon farming and carbon sequestration options for multiple land uses. Community concerns related to climate change and related to the drought resilience plan include increased fire risk, declining water availability, water quality water security and water pricing, and the impact of extreme heat on human and animal health. The capacity for the community to respond to events is listed as a concern, especially related to service provision, social cohesion and issues faced by smaller rural communities. A specific set of strategic goals is listed for the Goldfields region, covering the Central Highlands, with focus on natural re-vegetation, monitoring of biodiversity, and implementing a large-scale carbon sequestration action across the landscape in the goldfields area.

Djaara (Dja Dja Wurrung Clans Aboriginal Corporation), 2014. Dhelkunya Dja Country Plan 2014–2034

The Dhelkunya Dja - Dja Dja Wurrung Country Plan 2014–2034 describes 9 goals the Djaara aspires to. The Plan provides Country and cultural background and provides an approach for the implementation of the Plan. The 9 goals and themes are framed around Djaara (our People), Cultural Practises and Customs, Cultural Heritage, Bush Tucker (edible and medicinal plants and animals), River and Waterways, Land, Self-determination, Traditional Owner Economy and Joint management.

87% of the Dja Dja Wurrung Country is privately owned; 65% of land is used for agriculture. The other 13% is a combination of parks, forests and reserves. A historical transformation of the natural landscape has been driven by agriculture, urban settlement and mining. The transformation is continuing, both driven by natural and human caused factors. The Vision for Country described in the Plan includes a strong health and wellbeing of Dja Dja Wurrung People, underpinned by a living culture:

- Lands and water that are in good condition and actively managed to protect Dja Dja Wurrung values
- Laws, culture and rights of all Dja Dja Wurrung People are promoted.

While there is no specific reference to drought, the themes of Rivers and Waterways, and Land are related to drought management.

The aspirations in the Plan for Rivers and Waterways are to ensure that rivers and waterways are healthy and meet the needs of our people and land. Actions defined under this theme include the assurance of a meaningful role in the development of water policy frameworks in Victoria and the Murray Darling Basin; the establishment of a formal role in regional water management through participation in development and implementation of Regional Water Strategies.

Actions under the Land theme focus on remediation and restoration of mined land, with the objective that our upside-down country is healthy again.

North Central Catchment Management Authority, 2013. Caring for Country – A sustainable land management guide for rural living in north central Victoria

The North Central CMA (2013) published a document for new and existing landholders to support sustainable choices with the available resources. It contains suggestions for land planning, efficient irrigation and sustainable water sourcing.

In the section on water savings, it is suggested to install and use rainwater tanks for domestic water use, as well as several other domestic water savings tips. For gardens, it is suggested to use grey water for irrigation, reduce lawn areas, use native, climate adapted plants, and use mulching to reduce evaporative losses.

This is followed by a section on how to recycle water, and the best practices to manage recycled water. The chapter on biodiversity includes the benefits of native vegetation, and suggestions on how to manage native vegetation on rural properties.

A large section on soils explains the different types of soils landholders may encounter, and the most sustainable ways to use the different soil systems.

The plant and animal sections suggest best management practices for different land uses.

These are followed by a climate section, explaining the drivers of weather systems and climate.

A summary table shows the impact of a changing climate on the environment, the community, primary production, and water. This is concluded by a heading to prepare for weather emergencies, starting with risk assessment, then risk management, and preparation for specific weather-related events like fire, floods and thunderstorms. This document ends with a chapter on the community, and how to be good neighbours to each other.

Photo: Goulburn Murray Water

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For more information on the Future Drought Fund visit:
www.agriculture.gov.au/fdf

For more information on Victoria's Regional Drought Resilience Planning program visit:
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frontier economics

Drought in the Mallee Region

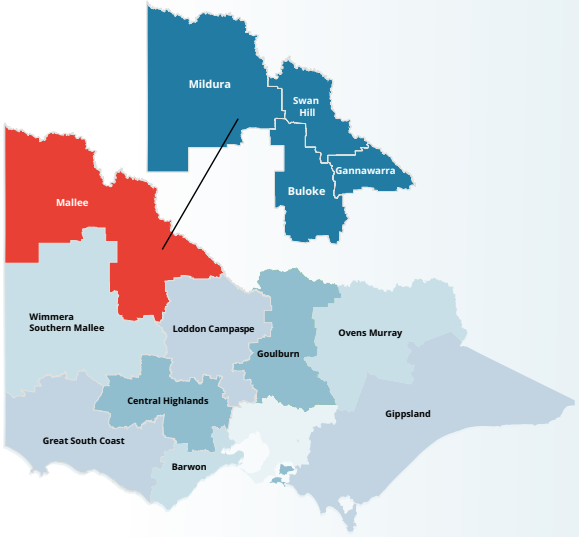
Information to support the Mallee Regional Drought Resilience Plan

November 2022

This research was jointly funded by the Australian Government and Victorian Government under the Future Drought Fund.

Regional summary

The Mallee is considered one of Victoria's most remote regions, bordering the Murray River in the north and South Australia in the west. The region's economy is driven by irrigated agriculture along the Murray River (the region includes Victoria's most productive horticultural areas of Mildura, Robinvale and Swan Hill) and cropping further south. There are large processing, manufacturing, and services sectors to process agricultural products in the region.



The region is home to key road, rail, and air infrastructure, with the main freight route between Adelaide and Sydney passing through the Mildura Local Government Area (LGA).

The Mallee region includes the traditional lands of the First Peoples of the Millewa-Mallee (being Latji Latji, Ngintait and Nyeri Nyeri Traditional Owners); the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupgalk Nations; Dja Dja Wurrung; and Yorta Yorta People, as well as other Traditional Owner groups in Victoria who are not formally recognised.

The Mallee has a Gross Regional Product (GRP) of $6 billion and a population of 93,000. In 2021, key industries for employment in the Mallee were agriculture, forestry and fishing (16%) and health care and social assistance (14%). The 2021 census showed a slight increase in agricultural employment from 2016, following a decrease between 2006 to 2016.

The Mallee region contributed $2.7 billion gross to 15% of Victoria's total gross value.

The region has experienced drought and dry seasonal conditions of extended duration including the Millennium drought of 1997 to 2009, 2014 and 2015 (notably in southern Mallee), and from 2017 to 2019.

Assessing the impacts of drought

The Regional Drought Resilience Planning Program (RDRP Program) is about planning with communities at the regional level to better prepare for the next drought and forms part of the Commonwealth Government's Future Drought Fund.

Economic analysis, research and stakeholder discussions have been undertaken to consider three questions:

The prevalence, severity and impacts of drought in the past

How this may change in the future

The Mallee region's vulnerabilities and gaps in preparedness for drought

Consultation with local stakeholders was a key factor to the analysis, which enabled a better and more localised understanding of how droughts impact the region.

This research was jointly funded by the Australian Government and Victorian Government under the Future Drought Fund.

Drought

The definition of drought varies depending on region, needs and disciplines. Below are four ways to measure whether a region is in drought.

1. Meteorological drought: degree of dryness or rainfall deficit

2. Hydrological drought: precipitation shortfalls on surface or subsurface water supply

3. Agricultural drought: links various characteristics of meteorological (or hydrological) drought to agricultural impacts

4. Socioeconomic drought: associates the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought.

The first three approaches deal with ways to measure drought as a physical phenomenon. The last deals with drought in terms of supply and demand, tracking the effects of water shortfall as it ripples through socio-economic systems.

However, there is no one definition that encompasses all factors that bring rise to drought conditions — and the resultant impacts on regions and communities. Drought is complex and dynamic, meaning a universal 'definition' is near impossible. For example, when referring to the Millennium drought in practice it was a combination of the types of drought listed above.

Assessment framework

In order to consider how drought affects farms and the wider community, the following analytical framework distinguishes between agricultural impacts and non-agricultural impacts of drought. The framework is designed to consider the implications of specific drought impacts and what the outcomes of these implications will be. Within the two distinctions, the framework considers the social, economic and environmental impacts, to develop a more complete understanding of how drought impacts flow through the community.

Figure 1 demonstrates how this analytical framework can be applied to agriculture. Drought reduces agricultural productivity, which results in a change in primary production on farm. This impacts farm income, consumption of farm inputs, and production of farm outputs. These on-farm implications of drought flow through to the community to generate a range of outcomes. The existence of agricultural markets (e.g. sheep and cattle prices, crop prices, etc) means the impact of drought on agriculture is easier to quantify than other non-market impacts of drought.

Figure 1 also considers how drought impacts non-agricultural settings. Drought can lead to significant water restrictions and low availability of water in lakes, rivers and dams. A reduction in water availability may mean community greenspace is reduced which will in turn reduce liveability benefits in the community and the amenity values from the green space. Furthermore, there are flow on effects if parks and sportsgrounds cannot be used including impact on community cohesiveness. A lack of water in lakes, rivers and dams could also hurt tourism in the region as there is a reduced ability to boat, water ski or fish. This in turn reduces the income and spending within the regional economy.

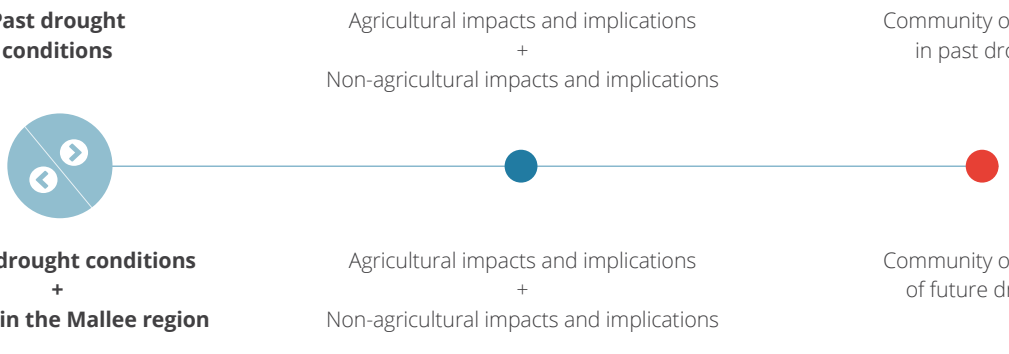
Figure 2 demonstrates the structure of the analysis for both past and future drought periods, with considerations from both agricultural and non-agricultural impacts of drought flowing through to community outcomes

Figure 1 Impacts of drought and flow on effects

Drought impact	Implications	Outcomes	
Change in agricultural productivity	• Change in primary production • Change in farm income • Change in farm inputs • Change in farm outputs	• Reduced spending in the community • Reduced demand for ag farm services (but could increase in demand for feed) • Reduced output associated	• transport, processing/ manufacturing • Reduced primary production for distribution and value-add • Mental toll (and potential migration)
Water restrictions	• Households: outdoor water use • Community green assets: parklands and sportsgrounds	• Liveability and mental health • Mental toll • Potential migration	• Access to green space and flow on effects (i.e. footy clubs, parent groups etc) • Amenity values from green space
Water availability in lakes, rivers & dams	• Less water available for recreation (boating, water skiing, etc) • Reduced fishing opportunities	• Reduced recreation and tourism	

Note: this summary does not provide an exhaustive list of impacts, but rather is about providing a consistent evidence base across Victoria's nine regions

Figure 2 Structure of analysis



01 Past drought conditions

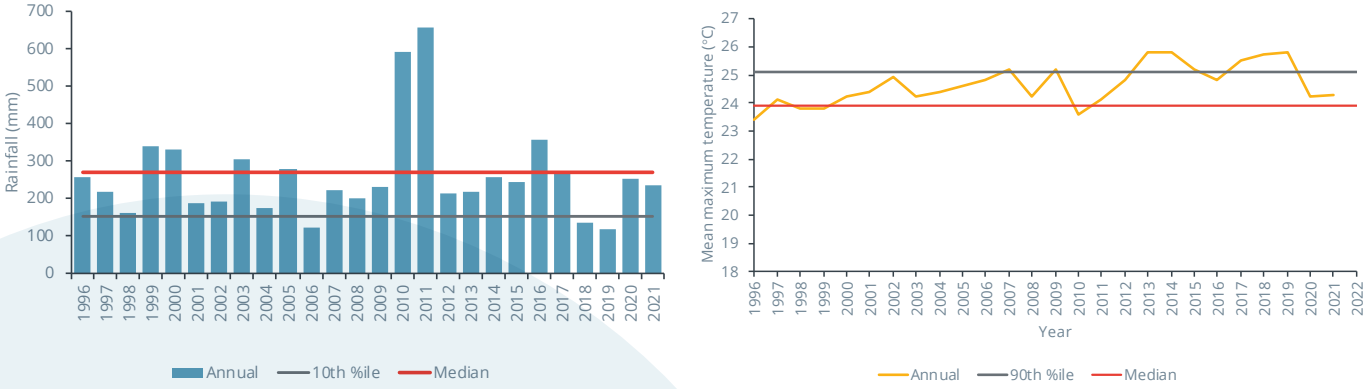
Large drought events have had wide effects across Victoria, with each drought being different in its regional severity and distribution. The last 25 years has seen Mallee experience extensive drought periods, starting with the Millennium drought from 1997 to 2009 and more recently the dry conditions experienced in 2014 and 2015 (in southern Mallee) and from 2017 to 2019.

The historical rainfall and temperature charts for Mildura shown in **Figure 3**, provide evidence of the severity of these recent drought events. Rainfall was below the 10th percentile in 2018 and 2019 coupled with mean maximum temperatures over the 90th percentile. From 2001 to 2009, the region experienced consecutive years of well below median rainfall and above median temperatures.

Agriculture in the Mallee relies on rainfall and regulated surface water (where available) taken from irrigation channels or directly diverted from the river. The above charts show an annual average rainfall, however the success of dryland cropping and grazing is dependent on the timing of rainfall throughout the year. Although not observed in rainfall in Mildura, rainfall in the southern Mallee was also extremely low in 2014 and 2015.

Water allocations in the Murray system were significantly decreased during the Millennium drought, dropping to 43% in 2007 to 2008 and 35% in 2008 to 2009. The years of 2017 to 2019 also saw significant reductions in rainfall and increased hot temperatures, however water allocations were only decreased for the Murray system in 2019 to 2020.

Figure 3 Annual rainfall and average maximum temperature in Mildura



Recently experienced droughts and dry seasonal conditions in the region:

- Millennium drought
- 2014 and 2015 (in southern Mallee)
- 2017 to 2019

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

The variance of agricultural employment in the region, and the diversity of agricultural enterprises (from irrigated horticulture near the Murray River and dryland cropping and grazing further south), means that communities within the Mallee will be impacted differently. There is a high proportion of agricultural employment in the Buloke and Gannawarra LGAs that makes them highly susceptible to drought impacts. Although somewhat more economically diverse, the LGAs of Mildura and Swan Hill also have relatively high reliance on agriculture for direct employment, however there may be other opportunities for a secondary income for affected agricultural workers during a drought.

Agriculture is the largest exporting sector in the Mallee. Nuts, grains (including cereals, pulses, legumes, and oilseeds) and table grapes are the region's most valuable agricultural products. Along with manufacturing, the two sectors comprise 81.7% of the region's export value.

Water trade into the region has also been an essential drought management tool enabling horticultural production to continue through provision of irrigation water. While the impacts to production of horticultural crops are mitigated, farm income can be significantly affected as high water prices often result during periods of scarcity.

Drought in the Mallee Region

In 2019 to 2020 the highest water price for Mallee irrigators was observed and water prices peaked at $950/ML (compared to <$100/ML in wetter years). This reflected the water scarcity observed across the southern-connected Murray-Darling Basin, across which trade is possible.

The impacts of the 2017 to 2019 drought were mitigated somewhat due to experience and lessons farmers learnt from the Millennium drought. Farmers had some actions and strategies to be more prepared and resilient. For example, livestock producers have honed drought preparedness and operation practices such as buying and/or storing fodder and utilising on farm dam storages. We note that the timing of rainfall has a significant impact on fodder growth.

Town water

Towns in the Mallee were faced with prolonged periods of Stage 3 and Stage 4 urban water restrictions during the Millennium drought. This was a challenge for towns such as Mildura with a long legacy of typical "English gardens" of lush green grass and gardens. Lower Murray Water (LMW) have reported that Stage 4 restrictions had an impact not only on the community but staff with anecdotal stories of LMW staff being accosted in public and blamed for water restrictions). Stage 4 water restrictions prohibit the watering of any outdoor space, amongst other restrictions, which had profound impacts on the community's liveability.

Most greenspaces and playing surfaces in Mildura are on a rural supply so they are not generally subject to urban restrictions although watering occurs in cooler hours for public perception.

Recreation and Tourism

Tourism in the region is both water dependent and non-water dependent. The Murray River and surrounding lakes including Lake Tyrrell and Sea Lake offers a range of water sport opportunities in the region. Increasing temperatures and less rainfall is likely to affect tourist's amenity benefit from visiting the towns and landscapes in the region. Blue-green algae issues associated with drought also presented risks for drinking and swimming.

Environment

There were negative impacts on riverbank and in-stream vegetation in the rivers, lakes and dams of the Mallee during the Millennium drought. Furthermore drought impacts the habitats of native wildlife in the region. Drought particularly impacts species such as the Mallee Emu-wren and conservation areas provide refuge for many native animals.

Traditional Owners

Culturally significant sites, particularly those located on flood plains and/or water dependent, can be exposed and vulnerable to damage during drought. Damage to these sites can lead to distress within the community. Consultation identified that indigenous members of other drought affected communities (such as in the NSW Darling) frequented the Mallee in order to access water in the landscape, given the Murray River was still running.

03 Community outcomes in past droughts

Farming communities are severely impacted during periods of drought, due to:

- Financial pressures from decreased on-farm income and increased costs
- The on-farm challenges mostly relating to lack of water and feed for stock, and poor yields on crops
- Pressures from invasive native and pest animals on farms
- Physical and mental health and wellbeing impacts on individuals and families
- Flow on financial pressures being experienced by supporting businesses in the community.

Economic modelling of the Millennium drought found that the Gross Domestic Product of the Mallee declined by an average of over $350 million each year between 2006 - 2010. The decreased attributed to drought impacts on irrigated and dryland agricultural production plus decreased spending in the regional communities. The modelled production impacts were lessened by net water trade into the Mallee, but still were found to have significant employment impacts (averaging over 1000 jobs annually over the same period).

The impact on agricultural production during drought in the Mallee also affects a range of agricultural farm service providers, support businesses, processing facilities in the region, in turn affecting spending and business activity across the broader communities.

Overall, the cumulation of impacts on production, regional economies, and liveability from drought led to significant impacts on the regional communities. An increase demand for mental health services and Rural Financial Counselling Services was evident.

01 **Future drought conditions + Changes in the Mallee region**

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

03 Community outcomes of future drought

Future Impacts of drought

Future impacts will differ from past impacts depending on the severity of future droughts, and the changes in the characteristics of the Mallee region and its communities.

01 Future drought conditions

Climate change is likely to increase the variability of the weather in the Mallee with future droughts expected to be longer, more frequent and more severe. Climate projections show that by 2050 the Mallee on average will be hotter, drier and be exposed to a growing number of fire danger days. Similar to the past, the region and sub-regions will continue to face variable conditions within and across seasons, however in the future this variability will be around a lower average rainfall and higher average temperature than previously experienced. This means that, compared to current conditions, it is likely that parts of Mallee will face some seasons with rainfall significantly below and temperatures significantly above current averages.

The significant prevalence of dryland agriculture, which relies on timing and quantity of rainfall, does not offer resilience options that irrigated agriculture has access to (as they have continued access to water that can be drawn upon during dry periods).

Changes in the Mallee region

There have been a number of changes in the Mallee that will alter the impacts of drought in the future, including:

- Significant increase in the area of horticultural plantings (and the associated water requirements) since the Millennium drought
- Water recovery for Basin Plan reducing water availability for agriculture, and increasing water for the environment
- On-farm water savings projects
- Town water security planning and investment has increased in the region
- Population changes (including an increase in tree-changers due to Covid19 which will likely increase water demand)
- Continuing diversification of the region's economy.

It is noteworthy that the continued opportunities for water trade mean that the Mallee can access water from the southern-connected Murray-Darling Basin and is influenced by broader 'system level' responses to drought and a changing climate — including interregional water trade and Basin Plan water recovery. There are, however, a number of system constraints (such as the Barmah Choke (which constricts the flow of the Murray River) and trade rule limits from neighbouring river systems the (Murrumbidgee and Goulburn) that are increasingly binding.

Figure 4 Climate projections for the Mallee region

Future droughts are likely to be longer, more frequent and more severe: By the 2050s

1.7 to 2.2 °C

Average maximum temperatures are expected to increase by 1.7 to 2.2°C. Number of days over 40°C in Mildura are expected to increase from 7.8 days to 15-23 days.

5-12%

Rainfall will continue to be very variable. Average rainfall expected to decrease by 5 to 12%.

44%

Number of very high fire dangers days expected to increase by 9.1 days per year.

02 Agricultural impacts and implications of drought + Non-agricultural impacts and implications

In response to the future increase in the likelihood and severity of drought (given expected increasing temperatures and decreasing rainfall), agricultural production in livestock and cropping farming operations will be most exposed. The adaptiveness of these producers, with farmers already having many strategies to manage drought, and their ability to maintain sufficient reserves will be critical to their farm profitability. The prevailing circumstances of a future drought — such as commodity prices, interest rates and fuel and fertiliser costs — will also play a role in resultant impacts.

Irrigated agriculture in the Mallee generally finds it viable to purchase water allocations (and use carryover) to maintain water use during dry periods. However, due to the significant increase in the area of horticulture plantings, in a repeat of the Millennium drought there would not be sufficient water in the entire southern-connected Murray-Darling Basin to meet Mallee water demands[1], no matter the price paid. This means that a severe drought that significantly

1 TCA & Frontier Economics 2017; Aither 2022; Frontier Economics & TCA 2022.

Drought in the Mallee Region

decreases water allocations would be expected to lead to many horticultural developments being dried off and production lost until the vines/trees can be re-established.

Future droughts are likely to continue to impact the wellbeing and mental health of the local communities. Farmers and community businesses are likely to continue to rely on financial counselling services and the broader community will continue to rely on mental health supports and services.

Access to mental health services need to be emphasised moving into the next drought. People trying to make tough decisions in drought are in a vulnerable space and support needs to be readily available. The physical and mental health of the community may also be impacted as community green spaces, trees and waterways are impacted.

Town water

Town water security planning has improved with lessons from drought. Likewise, Urban Water Strategies are now required to incorporate future impacts of climate change (including potential droughts). For example, Lower Murray Water has used the Department of Environment, Land, Water and Planning's 2020 'Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria' to undertake water demand system forecasts and identify a range of climate scenarios to assess potential impacts on water supply and customer demand.

Given that there are no substantial alternatives to sourcing water from the Murray River, the 2022 Urban Water Strategy is looking to ensure the security of supply through the purchase of 360 ML of entitlement per annum out to 2066. This will increase the region's entitlement and provide a buffer for security of supply.

Recreation and Tourism

Tourism will continue to be exposed to fluctuations in water access under future drought. Initiatives that are not dependent on water availability could boost visitors to the region. COVID-19 has provided a boost to regional travel and relocation, evidenced by an increase in population from 2016 to 2021.

Environment

Inland lakes, rivers and dams are likely to be at lower levels during times of drought impacting native biodiversity living in and relying on these water bodies. There is likely to be a lack of food and drinking water for wild animals living in the region.

Traditional owners

Culturally significant sites particularly those located on flood plains and/or water dependent were exposed and became vulnerable to damage. Damage to these sites can lead to distress within the community.

03 Community outcomes in future droughts

Economic modelling of potential future drought in Victoria, undertaken by Victoria University's Centre of Policy Studies, found the Mallee to be significantly affected with GDP falling by 11.4% and a reduction of almost 1,880 jobs in the region (see **Figure 5**).
The modelled three-year drought, while prolonged, is not equivalent to the most severe recorded in Victoria.

Figure 5 Computable General Equilibrium (CGE) Modelling for a future drought

Flow through impacts from ag to the community

The increased likelihood and severity of drought in the future and the increased competition for water under these conditions will mean that the drought impacts on the community from agricultural consequences of drought are expected to be larger than have been historically observed.

Impacts on GDP

Economic modelling of potential future drought in Victoria found the Mallee to be significantly affected, with:

GDP impact:

- Direct agriculture impact -7.8%
- Regional impact -11.4%
- A fall in employment of more than 1,800 jobs.
- This flowed through the region reducing consumption/spending by 5.5%.

11.4% GDP

1,800 jobs

Employment and value add impacts

The effects on employment will not be distributed equally across the regions, with the more agriculturally dependent regions likely to experience larger decrease in employment. The economic modelling finds that the large impact of drought on value-added output of agricultural primary production has significant impacts on the value-added output of:

- the Agricultural Services sector, and food processing (dairy products and meat products)
- construction, wholesale and retail trade, hotels/cafes
- the road transport sector

Access to local mental health services will be vital as drought and dry conditions become more prevalent. Not only are mental health services important during times of drought, but improved mental health increases a person's ability to adapt. This can improve drought resilience by allowing people to effectively plan for future drought conditions.

Greenspace and associated community sport are drivers of community spirit and liveability within local communities. Water Corporations and Councils now have a strong understanding of the importance of greenspace for their communities. However, should town water supply not allow watering of gardens this will have a mental health toll on residents.

The diversity of the Mallee region will continue to mean that some areas will be impacted by future droughts more than others — especially between river communities and those further south. While water trading may enable horticulture in the river communities to maintain production during drought, a severe drought could be devastating. Southern communities will continue to be exposed to dry and drought conditions, and smaller communities that are highly dependent on agriculture and more geographically isolated will be most exposed. Declining populations in smaller towns, due in part to larger farm properties and remote farming, may mean they are more vulnerable to change.

Overall, the Mallee region's high reliance to agricultural industries creates the potential for significant impacts on community from future drought.

Vulnerabilities and gaps in preparedness

The diverse Mallee region already has many drought resilience measures in place or in development. Agricultural research, innovation and extension will remain important to support the ongoing adaptation in agriculture and will aid preparedness to future drought. Farmers capacity to adequately prepare for drought differs significantly within the Mallee region. Farmers can be better prepared for future droughts by addressing gaps in on-farm business and decision-making skills. There is an ongoing need to close the gap in farmers skills and capabilities to be more adaptive and prepared for the next drought.

A significant vulnerability of the Mallee region is the reliance on water trade to meet the fixed water demands of horticulture in the region. The expansion of horticultural development in the region has reached the scale that there are significant deliverability concerns during peak periods of water use, or during periods of peak temperature. Insufficient water to sustain all businesses is likely to be associated with the next severe drought.

Diversification is a key mechanism for the regional economy to contain the drought impacts flowing from agricultural sector. Towns throughout the Mallee have varying degrees of diversification with larger, centrally located towns more likely to experience these benefits. Specifically:

- The regional centres of Mildura and Swan Hill will provide a buffer to some drought impacts as it is a diverse economy providing service and employment centres to the region. Townships near Mildura also benefit from some of this buffering as those within approximate 50 km radius of Mildura experiencing the attraction of living in a smaller community and lower cost of housing, but have access to employment opportunities in the larger centre.

- Smaller communities such as Kerang, Donald, Robinvale are likely to feel impacts of drought due to reliance on agriculture.

However, even Mildura is highly exposed to the flow-on impacts of drought given the prevalence of agricultural support services, agriculture-related processing and manufacturing, as well as transport and logistics.

The Tri-State Murray NRM Drought Resilience Discussion Paper identified that *"to make the appropriate decisions farmers need to not only have the analytical and decision-making skills but also adequate mental health. Stress, delayed decision making, not able to spot opportunities and 'giving up' are all significant issues as a drought builds and during a drought".*

Access to services such as mental health and Rural Financial Counselling are particularly important to manage drought. These kinds of health services have long wait times in the region, even outside of drought. Following the onset of a drought there is a general lag in the provision of additional health services. This means that individuals unable to access these services are having to make drought management decisions under significant stress.

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