



GOULBURN
DROUGHT
RESILIENCE
PLAN

Acknowledgement of Country

We acknowledge the Traditional Owners of the lands and waters on which we live and work, and pay our respects to their Elders past, present and emerging. We acknowledge that the Goulburn region is on traditional lands, including those lands of the Taungurung, Wurundjeri and Yorta Yorta Nations, as well as other Traditional Owner groups in Victoria who are not formally recognised.

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



Preface

Drought inflicts major financial, social and environmental costs on farm businesses and communities. The Goulburn region is committed to taking steps now to ensure good strategies are in place to prepare for and manage through future drought and dry seasonal conditions.

The \$5 billion Future Drought Fund 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 five focus areas:

1. Harnessing innovation
2. Better risk management
3. Better climate information
4. More resilient communities
5. Better land management.

The Regional Drought Resilience Planning (RDRP) program falls under the 'better risk management' focus area and supports the development of regional drought resilience plans throughout Australia over 2021 to 2024. Regional drought resilience includes elements that cover all focus areas. The Goulburn Regional Drought Resilience Plan therefore, bridges all Future Drought Fund focus areas and identifies a broad variety of actions the community in the Goulburn region need to build drought resilience.

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

This Plan builds on the Goulburn region's historic and recent experiences of drought and related strategies, programs and activities. It has been 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.

Agriculture Victoria in partnership with regional communities facilitated the development of this Plan, which was jointly funded by the Victorian and Commonwealth Governments under the Future Drought Fund.



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GOULBURN REGIONAL DROUGHT RESILIENCE PLAN

Purpose

Drought is a regular occurrence in many areas of Australia and best planned for on a regional scale based on landscape, community, economy and climate, rather than defined borders. It has varying timeframes and impacts and should be managed as a risk at a regional level by members of the community with support from government and industry.

This Goulburn Regional Drought Resilience Plan (the Plan) provides an opportunity to identify and outline a set of actions to build social, environmental and economic resilience to future dry seasons and drought.

Given the amount of existing work related to drought in the region, one of the main objectives of the Plan is to align, strengthen and coordinate existing drought related strategies and activities to increase drought resilience in the region.

Plan development

Agriculture Victoria facilitated the development of this Plan with guidance from a core reference group (the Reference Group). The Reference Group comprised of stakeholders from the community, regional organisations, and sectors that have a key role in dealing with drought and its impacts. In addition to input from the Reference Group, the Plan was co-developed through broad consultation and engagement with the wider Goulburn community, including:

- farmer representatives
- industry groups
- water, health, education and financial sectors
- Local, state and Commonwealth government agencies.



The Plan was also informed by various community organisations that support the agriculture sector and the broader community during drought.

The initial stages of developing the Plan involved gathering information from the community on their experience of past droughts. This included highlighting what worked, what didn't work and identifying what the community believes is needed to increase drought resilience in the future. The exploratory phase of the project included scanning existing strategies, plans and programs related to drought and drought resilience. This Plan builds on, extends and seeks to avoid duplication with existing planning and strategic work in the region. All this information was organised into topical areas and led to the development of a thematic framework under which the Plan's actions are now arranged.

Several engagement strategies were used to consult with community throughout the Plan's development including:

- periodic meetings of the core Reference Group to guide the process and content
- targeted interviews with key stakeholders to provide content and advice
- a survey of farmers and farming families from the Greater Shepparton area on potential actions for the Plan
- a broad-reaching survey to community members and key stakeholders in the Goulburn region for feedback on the thematic framework for the Plan
- micro-workshops with key stakeholders and sectors in the Goulburn region to gather feedback on the thematic framework and actions.

Plan design

The Plan is a thematic framework with a set of tangible actions that will guide and assist the Goulburn community to reduce the social, environmental and economic impacts of future droughts by building drought resilience.

Though the main focus of the Plan is on agriculture and allied industries, community feedback highlighted that drought resilience should be considered more broadly due to the interconnection of social, economic and environmental impacts of drought and the ripple

effect of drought on agricultural enterprises and people in the broader community.

The Goulburn community identified a wide range of actions to improve resilience by looking back at previous droughts. These related to farming and land management, farm businesses, health and wellbeing, water, infrastructure, the natural landscape, the built environment, people, communities, connectivity, networks, coordination, knowledge and information.

Considering these, five themes with clear outcomes are proposed for the basis of this Plan:

| | |
|----------------|--|
| THEME 1 | People and community wellbeing |
| OUTCOME | People and communities develop resilience through proactive, efficient and well-established health and wellbeing support services and networks |
| THEME 2 | Coordination, connectivity and knowledge |
| OUTCOME | Coordinated, connected, and informed communities throughout all phases of drought; pre, during and post drought |
| THEME 3 | Farm and other businesses |
| OUTCOME | A drought resilient Agriculture sector supported by a skilled and stable workforce that is more attractive as a vocational pathway, especially for youth, and that will better withstand employment shocks caused by drought |
| THEME 4 | Landscapes |
| OUTCOME | Landscapes and the natural resources within them are better able to withstand the impacts of drought |
| THEME 5 | Infrastructure |
| OUTCOME | The agriculture sector and regional communities have the infrastructure and established management systems to better cope with periods of drought |



THE GOULBURN REGION

Taungurung, Wurundjeri and Yorta Yorta First Nations peoples have inhabited the Goulburn region for over 60,000 years with deep connection to Country and the natural environment through traditional knowledge, spiritual beliefs and cultural practices. The lands, rivers, wetlands, forests and grasslands provided shelter, food, fibre, tools and medicinal plants as well as the place to carry out spiritual and cultural activities.

Traditional lands of the Taungurung People range from Kilmore in the west, Wangaratta in the north, Mount Beauty in the east, through to the Great Dividing Range in the south. Traditional Yorta Yorta lands cover about 20,000 square kilometres and lie on both sides of Dunghala (the Murray River), tracing from Cohuna to the regional city of Albury-Wodonga. They include towns of Echuca, Shepparton, Benalla, Corowa and Wangaratta and extend northwards into New South Wales to just south of Deniliquin. Both Taungurung and Wirindjeri are part of the Kulin Nation. Traditional lands of the Wurundjeri People are primarily in metropolitan Melbourne, but expand into the southern parts of Mitchell Shire.

The geographical area for the Goulburn Regional Drought Resilience Plan includes Mitchell, Moira, Murrindindi, Strathbogie and Greater Shepparton. These are the local government areas within the

Goulburn Regional Partnership established by the Victorian Government (Figure 1). It is currently home to approximately 170,000 people with the highest population bases in Greater Shepparton and Mitchell Shires with agriculture, forestry and fishing being the second highest employment industry after health care and social assistance. It is home to the largest Aboriginal¹ population in regional Victoria.

The region falls predominantly within the catchment areas of the Goulburn and Broken rivers and is renowned for fertile soils, mild climate, good water resources and, growth opportunities for population and business.² It extends from Melbourne's northern growth corridor to the Murray River and is diverse in culture, landscape and economic enterprises. Like many rural regions of Victoria and Australia, it has a large agriculture sector underpinning the economy and is often described as the 'food bowl of Australia'. Manufacturing, health care and social assistance also contribute largely to jobs and the economy.

Shepparton, the largest city in the region, is the primary location for health, cultural and higher education services. It, along with other towns including Yarrawonga, Euroa and Seymour, is culturally diverse and has a strong Aboriginal population.

¹ Throughout this document the term 'Aboriginal' is used to refer to both Aboriginal and Torres Strait Islander people

² Department of Jobs, Precincts and Regions (DJPR), 2022, *Goulburn Regional Economic Development Strategy*

Figure 1: The Goulburn region

DJPR, 2022



GOULBURN FARMS PRODUCE

29.4%
of Victoria's fruit
(excluding grapes)

12.6%
of Victoria's dairy

11.5%
of Victoria's beef

POPULATION
(2020)

POPULATION GROWTH
(2011-20)

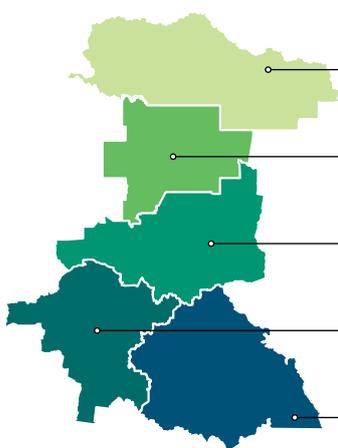
GROSS REGIONAL PRODUCT
(2020)

15%

\$8
billion

170,400

Table 1. Key geographic and demographic details of the Goulburn region

| | GOULBURN | AREA SQ KM | POPULATION | EMPLOYEE JOBS IN AGRICULTURE (%) |
|---|--------------------|------------|------------|----------------------------------|
|  | Moira | 4,045 | 30,018 | 8.7 |
| | Greater Shepparton | 2,422 | 67,070 | 8.3 |
| | Strathbogie | 3,303 | 10,992 | 13.3 |
| | Mitchell | 2,862 | 47,647 | 1.8 |
| | Murrindindi | 3,880 | 14,661 | 5.0 |

Agricultural and other land use across the region is extremely diverse (Figure 2), as is the landscape. Forested and hilly upland areas in the southeast give way to flatter areas and flood plains in the north that includes a large irrigation area within the Goulburn Murray Irrigation District. The agricultural enterprises across the region include dairy, livestock (sheep, cattle and pigs), horticulture (fruit, nuts, olives and grapes), cereals and other broadacre cropping. In addition to the more traditional agricultural enterprises, there is a significant number of equine ventures and lifestyle farms, particularly in the south. Aquaculture is also a significant contributor to the economic fabric of the region with 80 per cent of Australia's trout being produced in the Murrindindi Shire.

Irrigation infrastructure within the region has typically supported dairy and horticulture. These industries are integrated in local supply chains that include processing, manufacturing and distribution, all contributing to the regional economy and employment opportunities.

Despite the theoretical boundary that the Plan encompasses, it is recognised that communities don't exist and function within hard boundaries, nor do the organisations and businesses that support them. Land and resource management may have inter-regional impacts and effects. Therefore, many aspects of the Goulburn Drought Resilience Plan will be applicable to neighbouring communities and regions. It will be important to cooperate and share information on drought

resilience between regions through the FDF Regional Drought Resilience Planning program, not only with immediate neighbours such as bordering shires, but also state and nationwide.

In the Goulburn Broken Regional Insights Paper,³ the community identified several drivers of change in the region. They include climate change, technological innovation, transition to a service economy, an aging population, the increasing role and recognition of Traditional Owners and First Nations peoples, water as a tradeable commodity and the changing role of government. They pointed to the following emerging trends in agriculture in the region:

- Next generation of farmers have higher education levels and greater environmental awareness
- Big farms are getting bigger in dryland areas
- More corporate farms
- Reduced dairy and increased cropping in the north
- Emergence of new industries, such as solar farms
- Increased off-farm income
- More lifestyle and hobby farms
- Urban expansion in the south.

These factors have been considered in developing drought resilience in the region.

³ Goulburn Broken Catchment Management Authority, 2020, *Goulburn Broken Regional Insights Paper*

Table 2. Employment in the largest employing industries by workers (2020)

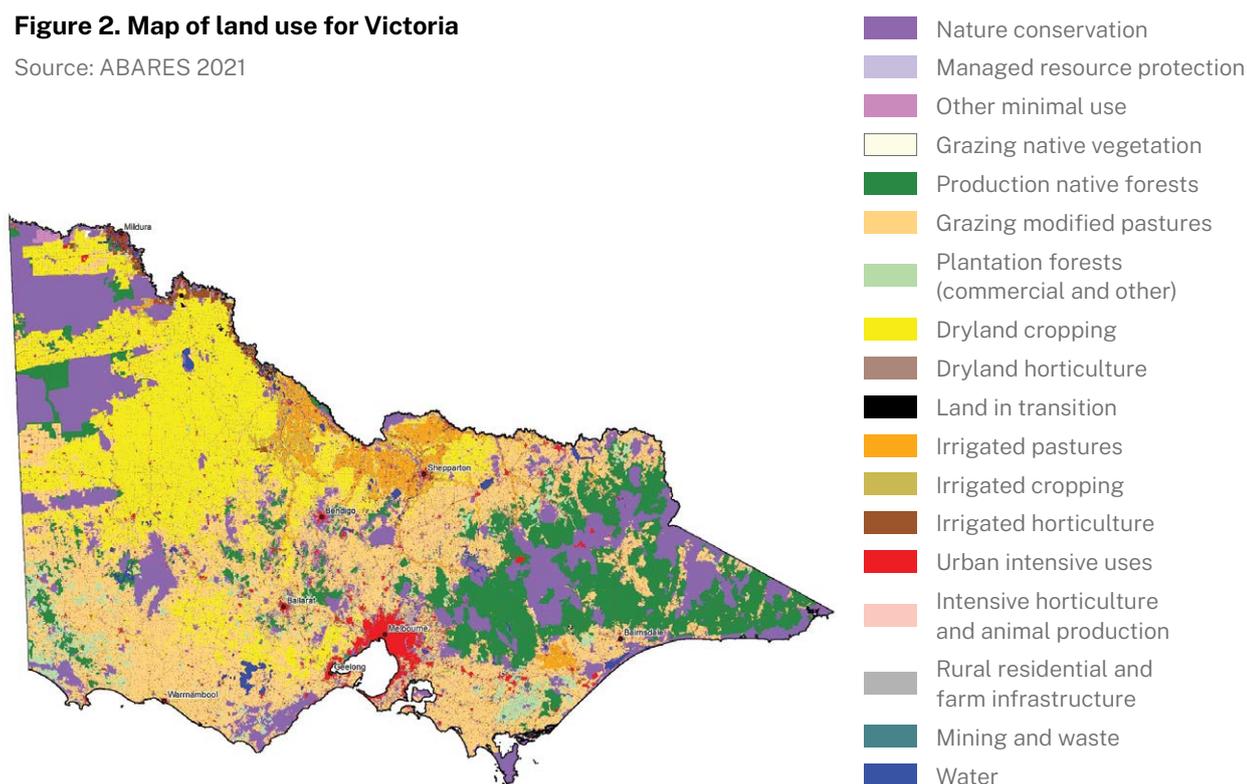
| TOP EMPLOYING SECTORS (2020) | WORKERS |
|-----------------------------------|---------|
| Health care and social assistance | 9,300 |
| Agriculture, forestry and fishing | 9,200 |
| Construction | 7,200 |
| Retail trade | 7,000 |
| Manufacturing | 6,900 |
| Education and training | 5,700 |

Table 3. Employment rates in the Goulburn region

| EMPLOYMENT | GOULBURN (%) | REGIONAL AVERAGE (%) | METRO MELBOURNE (%) |
|--|--------------|----------------------|---------------------|
| Unemployment rate (September 2021) | 4.0 | 4.2 | 6.0 |
| Average annual employment growth (2011–20) | 1.3 | 1.0 | 2.1 |

Figure 2. Map of land use for Victoria

Source: ABARES 2021



DROUGHT IN THE GOULBURN REGION

A brief history

The impacts of drought on Country have a large affect and implications on Aboriginal customs and Lore and the mental health and wellbeing of the community.

The region has witnessed multiple droughts of varying duration and extremity over this time and its farming families have first-hand experience of the impacts of drought on their businesses, land and wellbeing. The impacts also extend to

non-farming community members through the interdependence of farms, other businesses, services and the social networks that constitute and bind the communities.

The following excerpts from newspaper articles capture snapshots of the droughts in the Goulburn region in the late 19th century and early 20th century evidencing post contact history of reoccurring drought and dry conditions across the region.

“Evidences of the prevailing drought are to be seen everywhere. The ground is as hard as a brick, and there is not a particle of green vegetation to be seen, except here and there a few small patches of maize or sorghum, which the more far-seeing of the farmers have planted as fodder for dairy cattle, and some fields of lucerne.”

— Leader, Sat 15 Feb 1896 Page 10

“In consequence of the disastrous drought and the fearful condition of the Goulbourn Valley a meeting of the irrigation league was held at Shepparton on Tuesday to consider the position.”

— Kerang New Times, Friday 12 September 1902, page 3

Most recently the region has suffered impacts from both the Millennium Drought and dry seasonal conditions experienced over 2013–2015 and 2017–2019. An integrated assessment of the socio-economic and environmental impacts of past and future droughts is available at in the supplementary report: *Drought in the Goulburn Region; Information to support the Goulburn Regional Drought Resilience Plan*. This assessment is based on an analytical framework that considers how drought affects farms and the wider community. It highlights that due to the large diversity of farming systems and demographics, different areas within the region experienced varying impacts of drought and that small towns are more vulnerable than larger centres like Shepparton.

Several important insights emerged from engagement with the Goulburn community about their experiences of the 1997–2009 Millennium Drought and dry seasonal conditions in 2013–2015

and 2017–2020. A summary of social, environmental, and economic impacts and the interconnection between them is illustrated in Figure 3.

Stakeholders highlighted that economic, social, and environmental impacts of drought were not independent, and rather strongly interconnected. For example, drought related on-farm economic issues were seen to lead to poor mental health and wellbeing of farmers, farm employees, and their families. Similarly, lack of water during drought periods could at times render sporting venues, recreational areas, and greenspaces unusable. This led to reduced opportunities for social interactions which negatively impacted community wellbeing.

Stakeholders also commented on the scope for improved coordination and design of drought support activities to best meet local needs.

These and other key messages were used to inform and shape the thematic framework and actions of the Plan.

“The long-continued drought which wrought such devastation amongst the flocks and herds in the Goulburn Valley and in almost every part of the State, is now a thing of the past. It has gone with other droughts which preceded it, and the bountiful rains that fell in June have effected a complete transformation of the Goulburn Valley district.”

— Elmore Standard, Saturday 29 August 1908, page 1

“The season’s prospects in the Goulburn Valley are not very bright. The country immediately north of Shepparton, right up to Numurkah and Nathalia, seems to have suffered most from the absence of rain.”

— Benalla Standard, Friday 18 September 1914, page 2

Figure 3.

Key social, economic and environmental impacts experienced by the Goulburn community during past drought and dry seasonal conditions



Social impacts

- Reduced recreational activities (fishing, boating)
- Reduced sporting activities
- Farm workers out of work
- Mental health and wellbeing issues in individuals, particularly farmers
- Confusion around drought support (including agencies and grants)
- Emotional repercussions of destocking
- Safety issues from roadside grazing
- Some towns with no potable water
- Lack of water for parks, recreational and sporting facilities
- Lack of coordination in drought support activities

Environmental impacts

- Dry rivers, lakes and wetlands
- Loss of biodiversity (flora and fauna)
- Aboriginal heritage sites exposed to damage
- Damage from roadside grazing
- Damage to Country
- Riparian damage
- Soil loss from erosion
- Decline in soil health and fertility
- Damage to perennial pastures and ground cover

Economics impacts

- High allocation water prices
- Water trading allowed water to flow to higher value crops
- Water prices reached \$1400/ML in 2007
- Water prices averaged over \$500/ML in 2019/2020
- High feed costs and financial stress
- Milk production decline
- Mixed farming enterprises partially offset losses by selling water
- Farm and other businesses closed
- Lack of quality stock and domestic water
- Misalignment of support and funding cycles with drought
- Inability to make timely financial decisions
- Carting water and hand-feeding stock
- Inequity in drought assistance
- Changed farming businesses, e.g. livestock/mixed farming shifting to cropping only, fruit trees pushed out
- Loss of permanent plantings

Looking forward

Though the severity and frequency of future droughts is uncertain, it is certain that there will be future droughts. Dealing with the potential impacts of these will come with other challenges and changes that will affect the agriculture sector and the broader community in the Goulburn region.

The integrated assessment at Appendix 1 highlights factors that indicate or contribute to droughts in the future. This includes increasing temperatures, decreased rainfall and increased fire days, and provides an overview of some of the likely implications. These are both positive, such as increases in water use efficiency, and negative, with impacts such as diversification away from agriculture.



Image credit: Goulburn Broken Catchment Management Authority

DROUGHT RESILIENCE IN THE GOULBURN REGION

A drought resilient community

Building on the existing resilience approaches, a drought resilient Goulburn community should demonstrate some or all of the following:

- Local leadership and initiative
- Governance that embraces change
- Connection through formal and informal networks.

They should:

- Work together in the pursuit of common goals
- Foster responsibility within
- Be flexible and adaptable
- Learn from change
- Anticipate issues
- Solve problems from multiple angles.





What's already being done to build drought resilience?

In light of the frequency of drought, the effects of climate change, the instability of markets, demographic shifts and other pressures, a considerable amount of work is already being done in the region to support social, environmental, and economic resilience applicable to drought.

The concept of resilience has been explored extensively across the region and reflected in several key strategies that underpin work programs and activities that relate to or can be applied to drought resilience.

Driven by the Goulburn Regional Partnership, the concept of resilience was comprehensively studied in the development of the Goulburn Murray Resilience Strategy (GMRS).⁴ Resilience building principles and practices were widely promoted within the community. The GMRS will continue to support the region to position itself for a smoother path into the future and thrive in the face of changes due to challenges or shocks such as drought and climate change.

Similarly, resilience principles were fundamental in the development of the Goulburn Broken Regional Catchment Strategy⁵ (GB RCS), developed by the Goulburn Broken Catchment Management Authority (CMA). The GB RCS aligns closely with the Landscapes theme of the Plan, referring to natural landscapes and their ability to better withstand the impacts of drought and agricultural practices during these times.

The Country Plan of the Taungurung Land and Waters Council⁶ plan specifically aims to strengthen relationships with land and water management agencies and community organisations that also care for Country. It lays out a set of clear aspirations, goals and actions around people, culture, and caring for and connecting to Country acknowledging the resilience and achievements today.

The Whole-of-Country plan of the Yorta Yorta Nation Aboriginal Corporation⁷ outlines a comprehensive set of actions towards healing Country and protecting natural and cultural heritage by resuming cultural authority and undertaking cultural practices to reconnect people with Country. The plan has a strong focus on partnerships, inclusiveness, improving the resilience of Country to cope with climate change and recognition of Aboriginal voice in decision making.



Other strategies, plans and activities with links to planning and implementing drought resilience measures include the Goulburn Regional Economic Development Strategy⁸ (REDS), the Goulburn Murray Regional Prosperity Plan,⁹ the Hume Climate Change Adaptation Plan,¹⁰ and the strategies, workplans and budgets of the Water Corporations, local governments, Catchment Management Authorities and Traditional Owner Corporations in the region.

Several organisations and networks operate to support various resilience-based initiatives in the region including the Goulburn Regional Partnership, the Goulburn Murray Resilience Task Force, the Goulburn Drought Resilience Leaders, the Young Farmers Network and industry leadership groups, to name a few. Specific to drought resilience, Riverine Plains is the north-east node of the Victorian FDF Drought Resilience Adoption and Innovation Hub.

Local governments play a critical role in land and water management. They provide planning services and community engagement and are a significant landholder. They recognise the long term financial and operational planning required to sustain agriculture, local economies and communities through severe climatic events and conditions, such as drought.

In addition, various local and state government departments including the Department of Environment, Water, Land and Planning (DEWLP), Agriculture Victoria, the Goulburn Broken CMA, Water Corporations, the Environment Protection Authority and Landcare provide many on the ground programs for the benefit of the environment, people and communities through a drought resilience lens.

⁴ 2020, *Goulburn Murray Resilience Strategy*

⁵ Goulburn Broken Catchment Management Authority, 2021, *Goulburn Broken Regional Catchment Management Strategy*

⁶ Taungurung Land and Waters Council, n.d., *Taungurung Buk Dabbagi; Taungurung Country Plan*

⁷ Yorta Yorta Nation Aboriginal Corporation, 2021, *Yorta Yorta Whole-of-Country Plan 2021–2030*

⁸ DJPR, 2022

⁹ Kaiela Institute, 2021, *Goulburn Murray Regional Prosperity Plan*

¹⁰ Department of Environment, Land, Water and Planning, 2021, *Hume Regional Climate Adaptation Strategy*

THEMES, OUTCOMES AND FOCUS AREAS



Thematic Framework

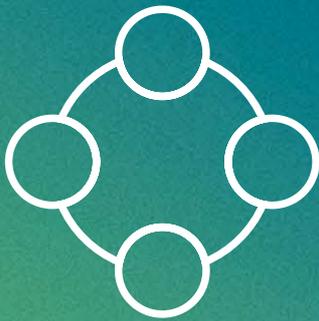
As a result of the engagement with community, the following themes –along with desired outcomes –emerged. The tables contain specific, implementable actions to achieve the outcomes.

Under each theme, focus areas have been articulated with multiple actions to deliver. These include activities to assist farm and other businesses to anticipate and manage drought risk and supporting programs such as networking and leadership training that will contribute to better health and wellbeing of individuals and the community. The Plan also identifies longer term actions such as investments in infrastructure and actions involving partnerships and systems that can be activated to support communities in the lead up to, during, and post drought into the future.



Theme 1

PEOPLE AND COMMUNITY WELLBEING



Outcome:

People and communities develop resilience through proactive, efficient and well-established health and wellbeing support services and networks.

Supporting the health and wellbeing of individuals through the provision of and access to primary care and other services is critical during drought. Similarly, participating in community activities and interacting with fellow community members bolsters and maintains the health and wellbeing of individuals during these times. Sporting activities including football, cricket and golf were badly missed in the last drought due to a severe lack of water for facilities. These establishments play a huge role in the community for social interaction, mental health and exercise.

Established formal and informal community networks often identify farmers and other community members who need wellbeing support during drought. There are opportunities to strengthen these networks as well as educate and train and community members to recognise and appropriately respond to signs of stress in friends, work colleagues or others, thereby contributing to drought resilience within the community.

Focus Area 1:

Strengthen individual and community level health and wellbeing services to be capable of supporting the community before, during and post drought.

Focus Areas for action

- | | |
|-------|--|
| 1.1.1 | Support and advocate for health and wellbeing services to be provided at both individual and community levels before, during and post drought |
| 1.1.2 | Provide early identification and support for individuals to access services and support through proactive and responsive services |
| 1.1.3 | Promote and support connection and links to services and health and wellbeing support programs including the implementation of more coordinated programs, events and actions |
| 1.1.4 | Continue and expand Agrisafe AgriClinics program |

Focus Area 2:

Encouraging and strengthening industry and community networks and activities that support people's health and wellbeing.

Focus Areas for action

- | | |
|-------|---|
| 1.2.1 | Invest in community infrastructure and support access to water supply to maintain irrigation of sporting and recreational facilities and other community assets during drought |
| 1.2.2 | Establish an event-based program for municipalities and shires in the Goulburn region to host social events to maintain connectedness within the farming community, particularly during periods of hardship |
| 1.2.3 | Advocate for and promote mental health first aid programs to increase the capacity of the region to deal with health and wellbeing issues in the community |

Theme 2

COORDINATION, CONNECTIVITY AND KNOWLEDGE



Outcome:

Coordinated, connected, and informed communities throughout all phases of the drought cycle.

Community, industry and government have a shared responsibility in building drought resilience in the Goulburn Region. All stakeholders must be proactive and work together to prepare for and be more resilient to future drought. To do this, coordination is required at the regional, state and national levels, as is connection between individuals, communities, industry and all levels of government while recognising the diverse landscapes and needs of the region and shires within the region.

To support long term preparedness and address the social, environmental and economic aspects of drought resilience, an ongoing community-led governance group needs to oversee the implementation and delivery of the Goulburn Regional Drought Resilience Plan. This group will share information, coordinate, schedule and

prioritise actions and foster partnerships across industry, community and all levels of government, pre, during and post drought. Proper engagement with Traditional Owners is complex as is the Lore and customs of Aboriginal peoples. It is recognised that Traditional Owner groups are over-stretched and may require support to meaningfully participate in coordinating and implementing the Plan.

A central information repository would provide a platform for collecting and sharing information and resources for community members in the Goulburn region pertaining to drought preparedness and resilience. It may include resources related to research, education, health and wellbeing, Indigenous knowledge, grant and funding opportunities and an up-to-date list of contact points for various topics for assistance.

Focus Area 3:

Strengthening existing networks that identify, support and coordinate the collective needs of the community.

Focus Areas for action

- 2.3.1 Secure funding to support the region to establish an on-going coordination group to oversee the delivery of the Goulburn Regional Drought Resilience Plan
- 2.3.2 Support Traditional Owners to participate in coordinating, implementing and delivering the Goulburn Regional Drought Resilience Plan
- 2.3.3 Define and prepare relevant working groups to inform the coordination group on industry specific drought resilience management through each stage of drought
- 2.3.4 Define and articulate the responsibilities of all stakeholders in drought preparedness
- 2.3.5 Engage municipal based drought planning and project implementation coordinators and support committees to plan and co-ordinate drought preparation
- 2.3.6 Advocate for the employment of Community Liaison officers dedicated to engaging with community and assist coordination between various programs that build drought resilience
- 2.3.7 Continue to develop drought resilience community leaders and mentors in the Goulburn region
- 2.3.8 Establish services to support grower conversations with supply chains during times of drought

Focus Area 4:

Increasing technical knowledge, information sharing and expertise in the region through human and economic resources.

Focus Areas for action

Support digital access to key information that enables community to better understand, and provide easier access to, drought and broader business resilience information including:

- Social, economic and environmental impacts of drought and climate change in the region
- Relevant policies and plans
- Climate change impacts and forecasting
- Climate change scenarios and possible technologies, services and land use that may become relevant
- Drought preparedness case studies and success stories
- Drought preparedness education opportunities
- Drought resilience research, development and extension (RD&E) information
- Indigenous knowledge and practices
- Resources to help understand drought and climate change and their impacts on business and the region

2.4.2 Build the awareness and skills of community about drought preparedness

2.4.3 Strengthen forecasts and communication about water availability under predicted climate scenarios including drought

2.4.4 Identify and seek investment in RD&E gaps related to drought

2.4.5 Support innovation and the co-development of research which is translatable to practical on-farm solutions and aligns with drought resilience principles

2.4.6 Strengthen awareness of and investigate new technologies and practices to adapt to and mitigate climate change and increasing drought risk

2.4.7 Support the capability, adaptation and adoption of farm management practices to better cope with drought and climate change through extension and access to knowledge

2.4.8 Produce education and communication materials on water use (efficiency, allocations and its distribution) to the various users in community (urban, rural, brokers, groundwater)



Image credit: Greater Shepperton City Council

Theme 3

FARM AND OTHER BUSINESSES



Outcome: A drought resilient Agriculture sector supported by a skilled and stable workforce that is more attractive as a vocational pathway, especially for youth, and that will better withstand employment shocks caused by drought.

The economy of the Goulburn region is heavily reliant on agriculture. Allied industries such as processing, transport and supply, as well as other businesses in the community are interdependent and may all be impacted by drought.

Farm businesses require support through financial advice, farm planning, succession planning and farm management to be more drought resilient and economically viable. Financial counselling and business planning services to support confidence in decision making should extend beyond primary producers and farms to other non-agricultural and tourism businesses run by community members who also experience economic impacts of drought.

With increasing variations in climatic conditions farmers need to consider actions and farm management practices that help increase drought tolerance and recovery such as stock containment,

feed production, purchase and storage of fodder, livestock breeding patterns, orchard management and long-term water security options to ensure long-term economic viability of their business. These actions have large upfront capital expenditure associated with their implementation, and as such, early investment can ensure individuals and communities are better prepared and more resilient to drought.

Education, training and skill development for farmers, farm workers as well as youth and others in the community will contribute to a more diverse and reliable workforce with the flexibility to be able to respond to shifts throughout the drought cycle as well as contribute to better health and wellbeing. In addition, it will encourage the younger generation, including those that have witnessed drought, that farming is a viable and rewarding career path.

Focus Area 5:

Strengthen, encourage and support farm business planning incorporating drought preparedness.

Focus Areas for action

- 3.5.1 Promote, encourage and support a positive culture toward Goulburn community members utilising financial advice and planning service and improve access to these services
- 3.5.2 Provide financial services and advice for primary producers and small businesses that enable timelier and more informed business decisions prior to, during and post drought
- 3.5.3 Assist farm businesses with Whole of Farm Planning including drought preparedness, treatment of drought as a business risk, system and income diversification, and alternative income streams, especially in periods of non-drought
- 3.5.4 Explore options for additional drought resilience related activities to be delivered through Aboriginal Landholder Information Service (ALIS)



Focus Area 6:

Encourage and support on-farm drought resilience and preparedness activities.

| Focus Areas for action | |
|------------------------|--|
| 3.6.1 | Promote, encourage and coordinate programs and learning activities to enhance storage of livestock feed for drought preparedness |
| 3.6.2 | Promote, encourage and coordinate programs and learning activities for water budgeting on dryland farms for drought preparedness |
| 3.6.3 | Promote, encourage and coordinate programs and learning activities for water management on irrigated farms and orchards for drought preparedness |
| 3.6.4 | Support farmers to increase productivity and reduce water use in irrigated agriculture through adoption of technologies and practices to improve water use efficiency and manage changes in water availability |
| 3.6.5 | Support to adopt land management practices that focus on cooling the soil to maintain or increase soil moisture content, and improve resilience to drought |
| 3.6.6 | Support the Traditional Owner Native Foods and Botanicals Strategy and related projects in the Goulburn region |

Focus Area 7:

Create a more diverse, flexible and stable farm workforce that is more resilient to drought through education, training, up-skilling, and alternative employment programs.

Focus Areas for action

- | | |
|-------|--|
| 3.7.1 | Give consideration to an employment program that enables farm businesses to retain employees during drought through alternative temporary or part-time employment |
| 3.7.2 | Provide access to training to maintain currency of a skilled agriculture and natural resource management workforce to better deal with the challenges of drought and other climate related risks |
| 3.7.3 | Establish or strengthen programs such as youth networks, vocational training in high schools and scholarships to make careers in agriculture and natural resource management more accessible and attractive to youth |
| 3.7.4 | Establish a program that identifies transferable skills and skills gaps, fosters confidence, and links individuals to credentialled education, skill development and alternative employment |
| 3.7.5 | Explore potential for a Regional Skills Demand Profile in the Goulburn region through Victorian Skills Authority to address the youth/skills/talent-drain in the Goulburn region |
| 3.7.6 | Support youth and careers in agriculture through workshops, careers days, meet and greets and on-farm traineeships |

Theme 4

LANDSCAPES



Outcome:

Landscapes and the natural resources within them are better able to withstand the impacts of drought.

Management of natural resources including land, soil, water and biodiversity at a landscape scale are important elements of drought resilience, noting that farm management practices and planning contribute to the overall health and functionality of ecosystems.

There are competing uses of natural resources including agriculture, cultural, recreational and tourism activities, as well as the conservation of these resources and preservation of the natural environment. There are opportunities to incorporate Taungurung, Wurundjeri, Yorta Yorta and First Nations bio-cultural knowledge and broader understanding of Country along with that of more recent farming methods in land and resource management.

Therefore, multi-stakeholder dialogue among users is necessary to build understanding and consensus on natural resource management and resource use that will contribute to long term drought resilience to address the social, environmental and economic needs of the community. These stakeholders include farmers and other land managers, Traditional Owners, water users and traders, tourism operators and the community members who live in and use the landscape for economic or recreational activities.

Significant Aboriginal cultural heritage areas such as middens, burial sites and corroboree sites that are exposed during drought and therefore more vulnerable to damage must be protected.

Focus Area 8:

Managing public land, roadsides, riparian zones, wetlands, remnant bushland and other fragile ecosystems adversely affected by agricultural and urban activities during the drought cycle.

Focus Areas for action

- | | |
|-------|--|
| 4.8.1 | Build farmers knowledge base regarding practices that reduce the impact on natural landscapes during drought, e.g., temporary feed-lotting, fencing of waterways and use of whole farm and property management plans |
| 4.8.2 | Identify and build awareness of the native vegetation linkages that are a priority under a range of climate scenarios |
| 4.8.3 | Increase the understanding of tipping points for threatened species and ecological communities to inform management actions considering climate change and extreme events such as drought |
| 4.8.4 | Explore options for community and industry seedbanks and seed orchards and support the growing of genetically diverse revegetation species, improving the capacity of revegetation planting to adapt to climate change and other shocks and disturbances such as drought |
| 4.8.5 | Promote widespread recognition that current waterway management will be challenged under climate change (including increased drought risks) and different and sometimes difficult management decisions will be required |
| 4.8.6 | Encourage continued research into and communication of how climate change will shift rainfall-runoff relationships, inflow volumes and associated ecological change in the Goulburn region |
| 4.8.7 | Invest in research to understand and quantify underground water resources, inflow volumes and associated ecological change, including under climate change scenarios – link to action 10.1 |
| 4.8.8 | Support activities to understand and promote water retention in the landscape, including linkages with other regions |
| 4.8.9 | Support Traditional Owners to protect significant cultural heritage sites vulnerable to drought |

Focus Area 9:

Support and increase dialogue and knowledge sharing on natural resource management between landholders, natural resource experts, Traditional Owners and the broader Goulburn community.

Focus Areas for action

4.9.1 Promote dialogue around managing the often-competing water needs of cities, agriculture, regional communities, Traditional Owners and Aboriginal communities, rivers, wetlands and catchments under a changing climate

4.9.2 Promote dialogue and exchange regarding the management of landscapes, communities, rivers, wetlands and catchments under a changing climate

4.9.3 Encourage continuous public policy review to manage the often-competing water needs of cities, agriculture, regional communities, Traditional Owners and Aboriginal communities, and catchments under a changing climate



Image credit: Visit Victoria

Theme 5

INFRASTRUCTURE



Outcome:

The agriculture sector and regional communities have the infrastructure and established management systems to cope with periods of drought.

Climate change and future drought will impact the availability of water, therefore infrastructure and systems to manage water for various uses by the community is critical to drought resilience. Maximising, optimising and distributing water resources to meet the agricultural needs of the community during drought include maintaining irrigation and water distribution infrastructure, increasing water use efficiency and storage, as well as enabling access to emergency water points. Town water availability and issues related

to water restrictions need to be addressed through water sources alternative to traditional supply and the associated infrastructure for its delivery. Water storage options also need to be considered in areas of the region with existing limitations.

In addition, road, rail, air, power, digital and other infrastructure need to be able to cope with increased pressures and/or fluctuations in use over the drought cycle, including the transportation of inputs such as feed for livestock, produce and other goods.

Focus Area 10:

Maximise and optimise the availability of high quality and recycled and/or raw water during drought.

| Focus Areas for action | |
|------------------------|--|
| 5.10.1 | Improve access to reliable stock and domestic water in rural areas with a combination of improved on farm storage, bore water and water gridding |
| 5.10.2 | Review regional emergency water points (locations, operation, ownership, maintenance) to ensure the region can maintain sufficient access during times of drought |
| 5.10.3 | Explore increasing on and off farm water efficiency gains |
| 5.10.4 | Review the current use of raw and recycled water and explore new opportunities to increase its use across the region |
| 5.10.5 | Advocate for the supply of fit for purpose recycled water for urban areas to enable irrigation of green spaces during drought and the installation of recycled and raw water standpipes to substitute the use of potable water |
| 5.10.6 | Promote and enable greater use of recycled water for recreational use |

Focus Area 11:

Resilient infrastructure and systems to better support communities during dry seasonal conditions and drought.

| Focus Areas for action | |
|------------------------|---|
| 5.11.1 | Explore options for community or industry-owned, low-cost silo and fodder storage programs to assist with long term drought planning and ability to store feed off farm at low cost if on farm storage is insufficient |
| 5.11.2 | Improve access to fodder, advance rail standardisation and intermodal construction to make fodder transport more efficient |
| 5.11.3 | Incorporate future climate change and population scenarios in all water and local government planning |
| 5.11.4 | Advocate for improved transport hubs, roads, rail and air enabling the production, purchase, storage and/or transport of produce, goods and inputs during the drought cycle |
| 5.11.5 | Build on digital technology and communication services to increase telephone access and internet connectivity, increasing uptake of drought resilience, preparedness and management technology and providing connectivity in times of drought |
| 5.11.6 | Advocate for improvements to known telecommunication blackspots |



IMPLEMENTATION

This Plan takes the first step in providing the necessary framework for the Goulburn region to communicate its drought resilience needs and priorities.

This Plan can be used by the Goulburn community – in collaboration with industry, the not-for-profit sector, and all levels of government – to:

- coordinate investment
- collaborate for shared outcomes
- inform future drought resilience priorities
- develop drought resilience programs
- monitor resilience to future droughts.

Immediate next steps include securing resources to support the implementation of the Plan, establishment of a coordination group with clear terms of reference for governance of the Plan and collaboration in its delivery.

The Plan is an important step in building regional drought resilience. A supplementary document *'Regional monitoring, evaluation and learning'* is provided to guide how progress towards regional outcomes is measured and communicated.

This coordination group will need to re-engage in ongoing conversations with the many stakeholders in the community, industry, Traditional Owners and local and state government to identify roles and responsibilities in the delivery of the Plan to achieve its outcomes.

It is acknowledged that the Plan will need to be agile, not locked into a single future and continually adapt in response to changes occurring in the natural environment, the operational and policy environments of industry and various levels of government. It will also need to evolve with the needs of the community.

The coordination group will also assist any associated RDRP Grant program to fund immediate high priority actions as well as investigate other opportunities across the funding landscape.

APPRECIATION

On behalf of the reference group, Agriculture Victoria thanks the many individuals, groups, associations, agencies, departments and organisations who contributed to the development of the Plan. Your support and considered input is greatly appreciated and will go a long way to ensuring the Goulburn region is better prepared and more resilient to the impacts of future droughts.

Reference Group organisations

Agriculture Victoria
Department of Education and Training
Department of Environment, Land, Water and Planning*
Future Drought Fund – Drought Resilience Leader
Greater Shepparton City Council
Goulburn Broken Catchment Management Authority
Goulburn Murray Water
Primary Care Connect
Regional Development Victoria
Riverine Plains
Rural Financial Counselling Service – North East
Mitchell Shire Council
Moirā Shire Council
Murrindindi Shire Council
Strathbogie Shire Council

*As of 1 January 2023 the Department of Environment, Land, Water and Planning was abolished. Some agencies within these departments were transferred to the newly established Department of Energy, Environment and Climate Action.



Drought in the Goulburn Region

Information to support the Goulburn Regional Drought Resilience Plan | June 2022



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



Regional summary

The Goulburn region is renowned for its fertile soils and mild climate. The Goulburn Regional Partnership area stretches from Melbourne’s northern growth corridor to the Murray River and encompasses the local government areas (LGAs) of Moira, Greater Shepparton, Strathbogie, Mitchell and Murrindindi. The 2016 census reported a population of 157,873 people and a Gross Regional Product of \$8bn. The Goulburn region is dominated by the city of Shepparton, which is the major regional centre for northern Victoria and parts of southern New South Wales.

Key industries in the Goulburn region include health care and social assistance, agriculture, forestry and fishing, construction, manufacturing and retail trade.

The region features many areas of the Goulburn Murray Irrigation District. Surface water is sourced primarily from the Murray, Goulburn and Broken rivers with the key water storages being Lake Eildon, and Hume and Dartmouth which are upstream on the Murray.

The region recently experienced drought and dry seasonal conditions during the Millennium drought and 2017-2019.

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:



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 4 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 socioeconomic 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.

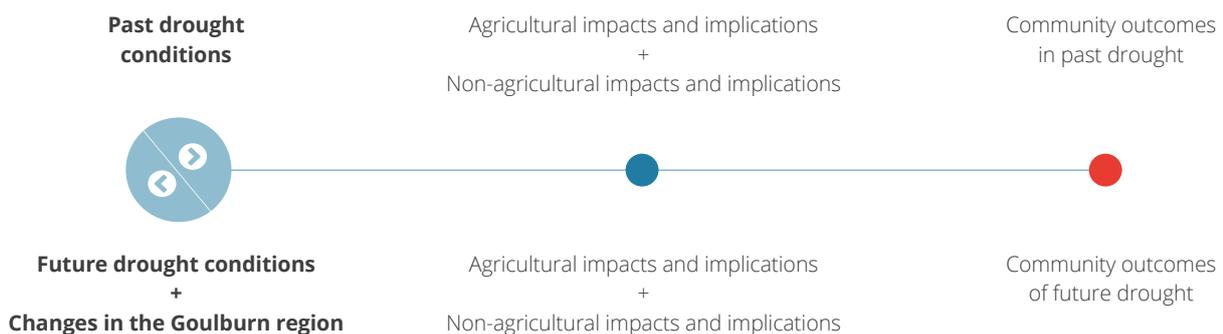
Figure 2 demonstrates the structure of the analysis for both past and future drought periods, with considerations from both agricultural and non-agricultural impacts of drought flowing through to community outcomes.

Figure 1 Impacts of drought and flow on effects

| ➤ Drought impact | ➤ Implications | ➤ Outcomes | |
|--|--|---|--|
|  Change in agricultural productivity | <ul style="list-style-type: none"> • Change in primary production • Change in farm income • Change in farm inputs • Change in farm outputs | <ul style="list-style-type: none"> • Reduced spending in the community • Reduced demand for ag farm services (but could increase in demand for feed) • Reduced output associated | <ul style="list-style-type: none"> • transport, processing/ manufacturing • Reduced primary production for distribution and value-add • Mental toll (and potential migration) |
|  Water restrictions | <ul style="list-style-type: none"> • Households: outdoor water use • Community green assets: parklands and sportsgrounds | <ul style="list-style-type: none"> • Liveability and mental health • Mental toll • Potential migration | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • Less water available for recreation (boating, water skiing, etc) • Reduced fishing opportunities | <ul style="list-style-type: none"> • 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

02 Drought agricultural impacts and implications + Non-agricultural impacts and implications

03 Community outcomes in past drought

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 Goulburn experience extensive drought periods, starting with the Millennium drought from 1997-2009 and more recently the dry conditions experienced from 2017-2019. The historical rainfall and temperature charts in **Figure 3**, provides evidence of the severity of these recent drought events. The period of 2002-2009 was particularly hot and dry (using Tatura as an example), with all of these years receiving less than median rainfall. The years of 2002 and 2006 received rainfall below the 10th percentile. At the same time the average maximum temperature was well above the median for most of significant periods of the Millennium drought.

The lack of rainfall during the Millennium drought resulted in significant reductions in water allocations across the Goulburn region, with high reliability water shares receiving about 30% during 2006-07 and 2008-09 (**Figure 4**). The high levels of irrigation throughout the region is likely to limit the impacts of short periods of drought. Unlike dryland farms which rely heavily on rainfall, farms in irrigation districts have continued access to water that can be drawn upon during dry periods and water storages act as a buffer between years. However, extended periods of drought, such as during the Millennium drought, water allocations may not be sufficient to maintain production levels. Further, dry periods in the Goulburn and connected regions of the southern Murray-Darling Basin result in competition for water and high water prices for those looking to buy additional water.

The period of 2017-2019 also saw significant reductions in rainfall and hot temperatures, however the shorter time period meant that the severity of the drought was limited, leading to only a single year of reduced water allocations in 2019-20.

Figure 3 Annual rainfall and average maximum temperature in Tatura

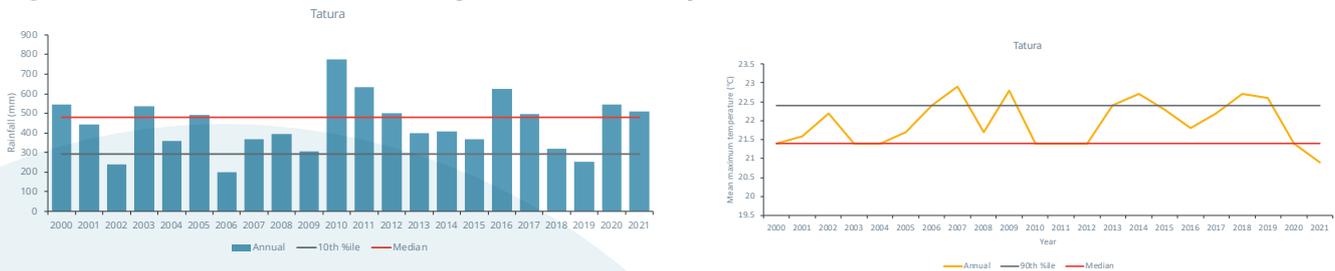
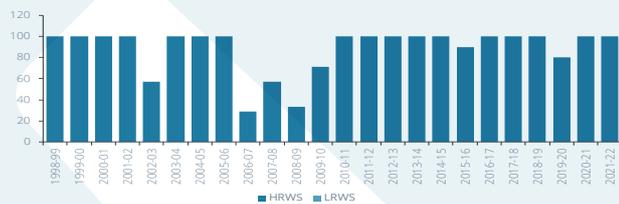


Figure 4 Water allocations in the Goulburn system



Recently experienced droughts in the region:

- Millennium drought
- 2017-19

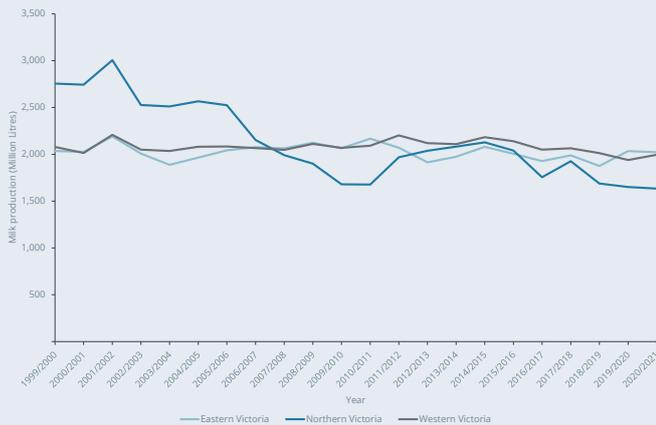
02 Drought agricultural impacts and implications + Non-agricultural impacts and implications

Agricultural production in the Goulburn region is dominated by irrigated agriculture (56% of agricultural production by value), primarily dairy and horticulture. Dryland production is a mix of livestock grazing, cereal crops, hay and other broadacre crops.

Given the region's heavy reliance on irrigated agriculture, production and profitability decreased significantly during the Millennium drought. Irrigated agriculture faced a high 'cost' of water, given the opportunities to sell or the requirements to purchase water from the water market. ABARES data shows that water allocation prices in

the Goulburn-Broken region reached a monthly average of \$1,400/ML during 2007 (compared to <\$100/ML in the wetter conditions of 2021-22). During the Millennium drought, net water allocation trade into the Goulburn region was observed in the most water scarce years of 2006-07 and 2008-09, while net trade out occurred in 2007-08. This means that the Goulburn region was a net buyer during the years where water prices were highest.

Regional milk production in Northern Victoria, which includes the Goulburn region, declined from over 3.0 billion litres in 2001-02 to 1.7 billion litres in 2009-10. This decline was significantly larger than the declines in Western and Eastern Victoria, where production remained relatively flat during this same time period (see Figure 5). ABARES farm survey data in the period from 1999-00 to 2007-08 shows total cash costs for dairy farms increased from \$308,950 to \$645,900.

Figure 5 Victorian annual dairy production

The significant decline in milk production in Northern Victoria created implications for milk processing with reduced factory utilisation, changes in product mixes and retiring of different aspects of processing infrastructure.

Dryland productivity also declined significantly during the Millennium drought and 2017-2019 due to the lack of rainfall. Dryland production was significantly affected — for example, the harvest of cereal crops in 2018-19 was half the recorded tonnage of 2015-16 or 2016-17.

Town water

There were mixed water restrictions during Millennium drought with limited restrictions on Goulburn system towns, however water carting was required to some towns including Euroa/Violet Town & Broadford. There were more severe restrictions in the Murray system towns (such as Numurkah). While restrictions were generally higher in unregulated systems such as Sunday Creek, and the town of Kilmore.

Recreation and Tourism

The Goulburn region has a number of lakes and rivers that are used for water tourism such as Lake Eildon, the Nagambie river, Goulburn weir and the Murray River. These water systems are used for recreational fitness, such as rowing, as well as recreational boating and fishing. The Millennium drought significantly reduced the level of water tourism in the area, including boating at Lake Eildon, taking with it the additional income that enters the region from these activities.

Environment

There were negative impacts on riverbank and in-stream vegetation in the Goulburn River during the Millennium drought. There was also an interaction between drought and water trade which resulted in environmental impacts on the Goulburn River from high summer flows to deliver traded water to the Murray.

03 Community outcomes in past droughts

Agriculture is an important segment of the regional economy — contributing 23% of the 'value add' in Moira and 16% in Shepparton. It is also an important employer, with the 'Agriculture, fishery and forestry' industry contributing 11.5% employment to the region.

This means that the decreases in agricultural production caused by drought creates significant flow-on community impacts through reduced income and employment, especially on-farm labour and agricultural services. The impacts to irrigated and non-irrigated agriculture flow through to impact the wider community through reduced overall spending in the community.

Economic modelling of the Millennium drought found that the GDP of the Goulburn region declined by an average of nearly \$250 million annually in the extended drought of 2006-7 to 2009-10 — being the cumulation of drought impacts on dryland and irrigated production plus negative spending effects in the regions. The modelled production impacts were lessened by net water trade into the Goulburn region, but still were found to have significant employment impacts (averaging 300 jobs annually over the same period).

The dry conditions from 2017-2019 saw net trade of water out of the Goulburn region, which would have exacerbated the reduction in irrigated production. However it should be noted that water allocation trades generate revenues for the owner and farms can instead use the land for alternative production (such as less water intensive or dryland agriculture) — meaning that trade has different impacts on regional spending and production than drought itself.

Many communities in the Goulburn region have a high proportion of people directly affected by agriculture, with smaller communities heavily reliant on agriculture more impacted by drought. Production

impacts also affect the range of milk and fruit processing facilities in the region. This means that the negative impacts of drought are concentrated in those communities. Further, businesses in smaller towns generally do not have many options to respond to a decline in the spending and economic activity. In contrast, Shepparton is a regional hub with a high level of diversification.

The lack of farm income being generated during the Millennium drought meant that farmers needed to seek off-farm income in the community. During this time, the Goulburn Broken Catchment Management Authority implemented a drought employment program, providing more than 70 full-time employment positions (for up to 6-months) to farmers in the region.

Off-farm income going into drought improves the drought resilience of a given farm, by supporting income during variable farm returns. Over 75% of farms across the region are likely to already be dependent on off-farm income to be economically resilient and viable.

Overall, the cumulative effect of drought both on-farm and in the community led to significant impacts on the Goulburn community during the Millennium drought and 2017-19 period of dry seasonal conditions. This also led to an increase in demand for services such as mental health and Rural Financial Counselling.





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

02 **Agricultural impacts and implications + 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 Goulburn region and its communities.

01 Future drought conditions

Climate change is likely to increase the variability of the weather in the Goulburn region with future droughts expected to be longer, more frequent and more severe. Climate projections in Figure 6 show that by 2050 the Goulburn region 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 Goulburn will face some seasons with rainfall significantly below and temperatures significantly above current averages.

The high levels of irrigation throughout the region is likely to limit the impacts of short periods of drought. Unlike dryland regions which rely heavily on rainfall, irrigated regions have continued access to water that can be drawn upon during dry periods. Although this is unlikely to limit the impact during extended periods of drought where water allocations may not be sufficient to maintain production levels.



Changes in the Goulburn region

Since the Millennium drought, the farming systems in the Goulburn region have become more opportunistic and flexible. For example, dairy farmers can decide to use annual pastures, buy and store fodder and buy or sell water allocations depending on the prevailing conditions. Irrigated farmers have also benefited from increased irrigation network efficiency from the Connections Project and water share owners in the region have recently increased their holdings with the 'Irrigators Share' of water savings being issued. The Goulburn Murray Water (GMW) Transformation Process is also reducing irrigation network tariffs.

However, the competition for water has also significantly increased since the Millennium drought — particularly from Basin Plan water recovery (including water buybacks in the Goulburn and other regions, and on-farm water savings projects) and horticultural growth in Lower Murray.

Town water security planning and investment has increased in the region, and there are also population changes (including an increase in tree-changers due to Covid19).

Finally, there has been a continuing diversification of the region's economy, with ABS Census data from 2006 to 2016 identifying the percentage of the community directly employed in the agricultural industry has decreased across the period.

Figure 6 Projections of future climate in Goulburn

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



Average maximum temperatures in spring expected to increase by up to 3.2°C. Number of days over 35°C increasing from 14.8 days to 19-40 days.



Rainfall will continue to be very variable, around a lower average rainfall (in spring expected to decrease by 12-22%).



Number of very high fire danger days to increase by 11 days per year

02 Drought agricultural impacts and implications + Non-agricultural impacts and implications

Agricultural production in dairy and mixed farming operations are likely to be most exposed to the increasing likelihood and severity of future droughts as they are dependent on certain temperature and rainfall patterns. 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.

Permanent horticulture will increase the competition for water in the region. These farming businesses are expected to seek to purchase water (from other water users and other regions) to source additional water in times of drought. This will be at high water prices and will affect farm profitability.

Further declines in dairy production will have flow on effects to dairy processing facilities, which may need to be rationalised if dairy production levels are not able to recover. A factory closure will have major implications for the town community and will also have a ripple effect through surrounding communities.

The region's response to future drought will be boosted by increases in irrigation network efficiency and reduced network costs and the delivery



of water savings to irrigators. However, these effects are expected to be outweighed by the reduced water use in the region due to Basin Plan water recovery and competition for water with horticultural developments in Lower Murray. During future droughts in the Goulburn and the broader southern Murray-Darling Basin, water trade out of the Goulburn is expected in response to competing demands from water uses in other regions (as seen in 2017 and 2019).

Town water

Town water security planning has improved building on lessons from drought. Likewise, Urban Water Strategies are now required to incorporate future impacts of climate change (including potential droughts). For example, Goulburn Valley 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. The water corporation has also augmented its network to boost water security, including the Tallarook to Broadford pipeline, a 360ML reservoir for Mansfield, and the enlargement of the Abbinga reservoir supplying Euroa. Further, water trade will provide additional flexibility for town water supply in the Goulburn region.

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.

Environment

The recent reforms to the Goulburn-Murray trade rules are expected to reduce future environmental damage to the Goulburn River when water trade responds to future drought events.

03 Community outcomes in future droughts

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.

Economic modelling of potential future drought in Victoria found the Goulburn to be significantly affected, with GDP in the region falling by 9% and a fall in employment of almost 1,100 jobs. This flowed through the region reducing consumption/spending by 4.5%. The modelled 3 year drought, while prolonged, is not equivalent to the most severe recorded in Victoria.

Access to local mental health services will be vital as drought conditions become more prevalent. Not only are mental health services important during times of drought, but improved mental health increase 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 in the region. Water Corporations and Councils have a strong understanding of the importance of greenspace for their communities so water availability will have to be at high risk before community greenspace areas do not receive water. However, should town water supply not allow watering of gardens this will have a mental health toll on residents.

The diversity of the Goulburn region will continue to mean that some areas will be impacted by future droughts more than others. While it is not possible to predict which area within Goulburn will be more affected than others, smaller communities that are highly dependent on agriculture and more geographically isolated will be most exposed. Declining populations in smaller towns may mean they are more vulnerable to change.

Overall the Goulburn region's high exposure to agricultural industries creates the potential for significant community impacts from future drought.

Vulnerabilities and gaps in preparedness

The Goulburn region has built on the comparative advantages of its soils, climate and water access to become a thriving agricultural region. This strength, and resulting dependence on agricultural economic activity presents the greatest vulnerability regarding drought.

The GMID Resilience Strategy (2020) found: *Irrigated agriculture dominates the Goulburn Murray region, and in recent years, economic growth has been at or near zero and productivity is falling. If we don't proactively respond to the challenges of climate change, decline in water resources and farm structural adjustment, the region will continue to stagnate and then decline.*

This suggests that agricultural research, development and extension will remain important to support ongoing adaptation in agriculture, and will aid preparedness to future drought. There is also a wide range in the capacity of farmers, in terms of the skills to maintain more adaptive farming practices and in the ability to maintain buffers of financial assets or feed stocks to manage drought conditions when they arise.

A continued vulnerability to the region is the increasing competition for water due to permanent horticulture plantings in the Lower Murray. This increases the potential for water allocation trade out from the region but also creates opportunities for trading. There is also a lack of information regarding how reliability of water access in the Goulburn, and southern Murray-Darling Basin more broadly, will change given the expected climatic change. The Northern Region Sustainable Water Strategy which was slated for 2019 has been pushed back to 2025.

Fodder management is also an important drought response and transport arrangements (road and rail) have room for improvement.

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

- The major regional centre, Shepparton, will provide somewhat of a buffer to these drought impacts as it is a diverse economy. Shepparton itself will be buffered to some degree from reductions in agricultural output as it has alternative industries (such as health, education, retail). Townships near Shepparton can also benefit from some of this buffering in the face of less agricultural activity because of drought. Townships within an approximately 50 km radius provide people with the attraction of living in a smaller community, lower cost of housing but having employment opportunities in the larger centre.
- Medium sized communities such as Nathalia, Numurkah, Tatura, Cobram and Yarrawonga are all highly dependent on irrigated agriculture but have some buffering capability due to a range of factors, including having a commutable distance to Shepparton, tourism (Cobram and Yarrawonga), desired infrastructure (such as Nathalia having an aged care and hospital for retired farmers), or alternative processing facilities (such as Numurkah's GrainCorp oilseed processing plant).
- Small communities such as Undera, Wunghnu, Waaia, Katamatite and Strathmerton will be more severely affected by drought, as there are limited alternatives that can replace the people and economic activity provided by irrigated agriculture.

The Tri-State Murray NRM Drought Resilience Discussion Paper identified: 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. Waiting for a boost in service provision as a drought response lags the demand and means that individual's seeking these services are necessarily making drought management decisions.



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