NARCliM

Riverina Murray

Climate Change Snapshot

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Acknowledgement of Country

The NSW Government acknowledges First Nations people as the first Australian people and the traditional owners and custodians of the country's lands and water. The NSW Government acknowledges the Barapa Barapa, Nari Nari, Ngarigu, Ngunawal, Wolgalu, Wemba Wemba, Wiradjuri, Yita Yita and Yorta Yorta Aboriginal people from the Riverina Murray region as having an intrinsic connection with the lands and waters. The landscape and its waters provide the First Nations people with essential links to their history and help them to maintain and practise their traditional culture and lifestyle.

Australia's First Nations people have lived in NSW for over 60,000 years and have significant spiritual, cultural and economic connections with its lands, waters, seas and skies.

They are the first astronomers and scientists who have been listening to and caring for Country for generations.

We pay respects to Elders past and present and acknowledge the significance of their traditional knowledge in adapting to changes in climate over tens of thousands of years.

We recognise the importance of their wisdom at this pivotal moment in time.

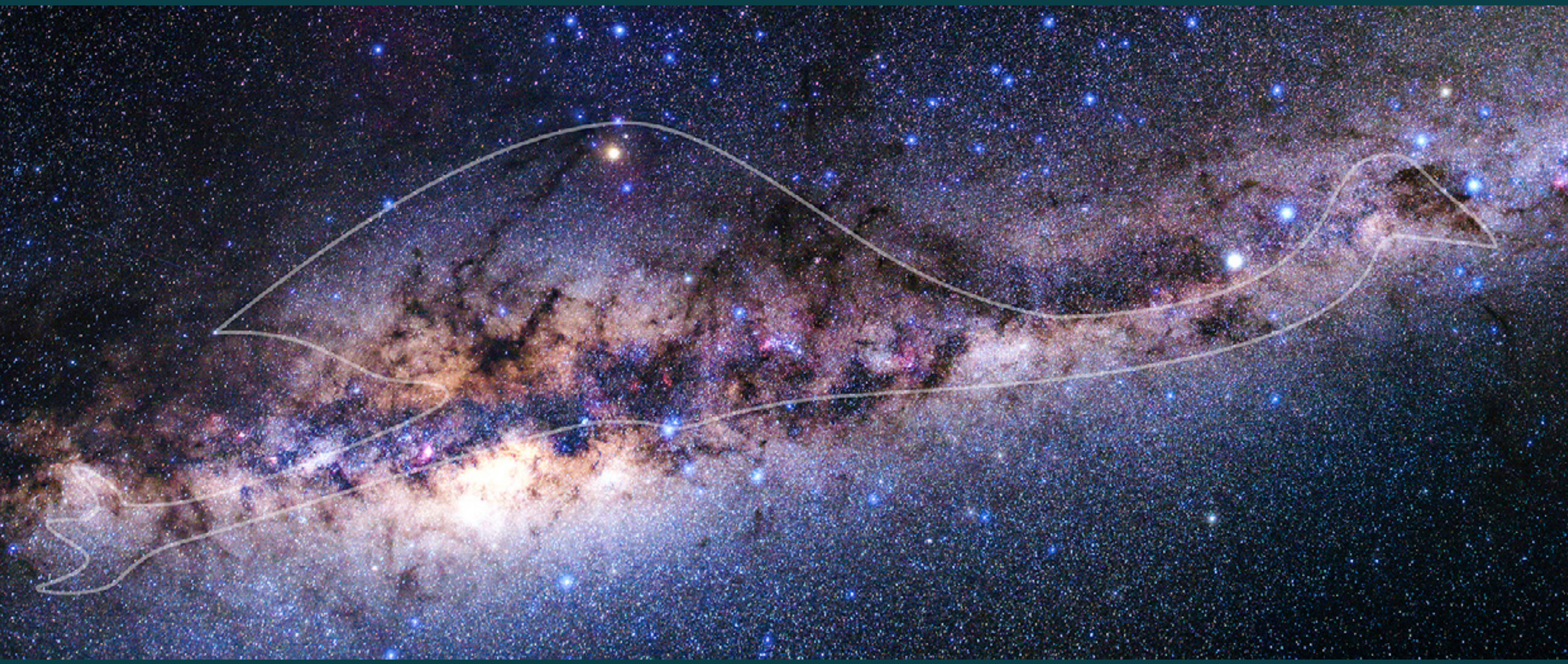

Photo caption:
The Emu in the Sky is an Aboriginal constellation that is made up of the dark clouds of the Milky Way. With the movement of the earth, the position of the Emu in the Sky changes throughout the year. Aboriginal people in some nations across NSW and Australia relate the position of the Emu in the Sky to the breeding behaviour of the emu on the land. Cultural astronomy teaches us about the relationship between the sky and land; and that we are all interconnected.

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About this snapshot

The New South Wales (NSW) and Australian Regional Climate Modelling (NARCliM) project delivers high-resolution climate change projections for NSW and south-east Australia.

This snapshot summarises the latest NARCliM2.0 projections for temperature, average rainfall, hot days 35°C and above, cold nights under 2°C and severe fire weather (Forest Fire Danger Index greater than 50) at a 4km resolution for NSW and the Australian Capital Territory (ACT). There is information for both a low-emissions scenario (SSP1-2.6), and a high-emissions scenario (SSP3-7.0) to the year 2100 to show the range of plausible climates that may be experienced, depending on our actions to reduce greenhouse gas emissions.

Understanding current warming

NSW and the ACT have already warmed by 1.4°C since national records began in 1910.[1] This local warming figure represents surface air temperature over land in NSW and is not directly comparable to average estimates of global warming which include surface air temperature over both land and ocean. Surface warming occurs faster over land than the ocean. Significant impacts from climate change are already occurring in NSW and are expected to be felt more widely in the future, particularly if concerted global effort is not taken to reduce greenhouse gas emissions and adapt to the expected impacts of climate change.

How to use this snapshot

This snapshot provides a summary of plausible future climate change in the Riverina Murray region relative to a baseline of average climate from 1990–2009. The projections for 2050 represent averaged data for 2040–2059 and projections for 2090 represent averaged data for 2080–2099. In translating the projections, it is important to consider the previous historical changes that occurred prior to 1990–2009. For example, national temperature records indicate that NSW has warmed by 0.84°C between 1910–1930 and the 1990–2009 baseline.[1]

Modelling climate change at a local level provides detailed insights into how NSW communities, built environments and natural environments will continue to be impacted by climate change. Information in this snapshot can be used in conjunction with detailed information that is available through the AdaptNSW Interactive Map and the Climate Data Portal.

NARCliM climate projections

NARCliM2.0 projections provide nation-leading climate model data that span the range of plausible future changes in climate for south-east Australia at a 4km resolution, and for the broader Australasian region at a 20km resolution. NARCliM2.0 projections are the next generation of NARCliM, building on previous generations delivered in 2014 and 2021. NARCliM is the NSW Government's trusted source of climate information and data for all audiences and sectors. Detailed information on NARCliM can be found at AdaptNSW.

Methods and uncertainty

To help address future uncertainty, NARCliM2.0 is built on a selection of emissions scenarios, global climate models and regional climate models that, together, capture a range of climates that could occur. This is referred to as the NARCliM model ensemble. The NARCliM2.0 model ensemble is made up of different combinations of 5 selected global climate models and 2 regional climate models, giving 10 model combinations in total. Unless otherwise specified, the presentation of data in this snapshot is averaged across a 20-year period from the NARCliM model ensemble.

Combining multiple models through averaging and other statistical methods produces better projections by providing a comprehensive range of possible future climate scenarios. To ensure that NARCliM models adequately simulate regional climate, scientists use them to simulate the past climate and compare the results with actual observations. Outputs undergo rigorous quality control and scientific technical peer review. There is more information on the modelling project and scientific methods at AdaptNSW.

Shared Socioeconomic Pathways

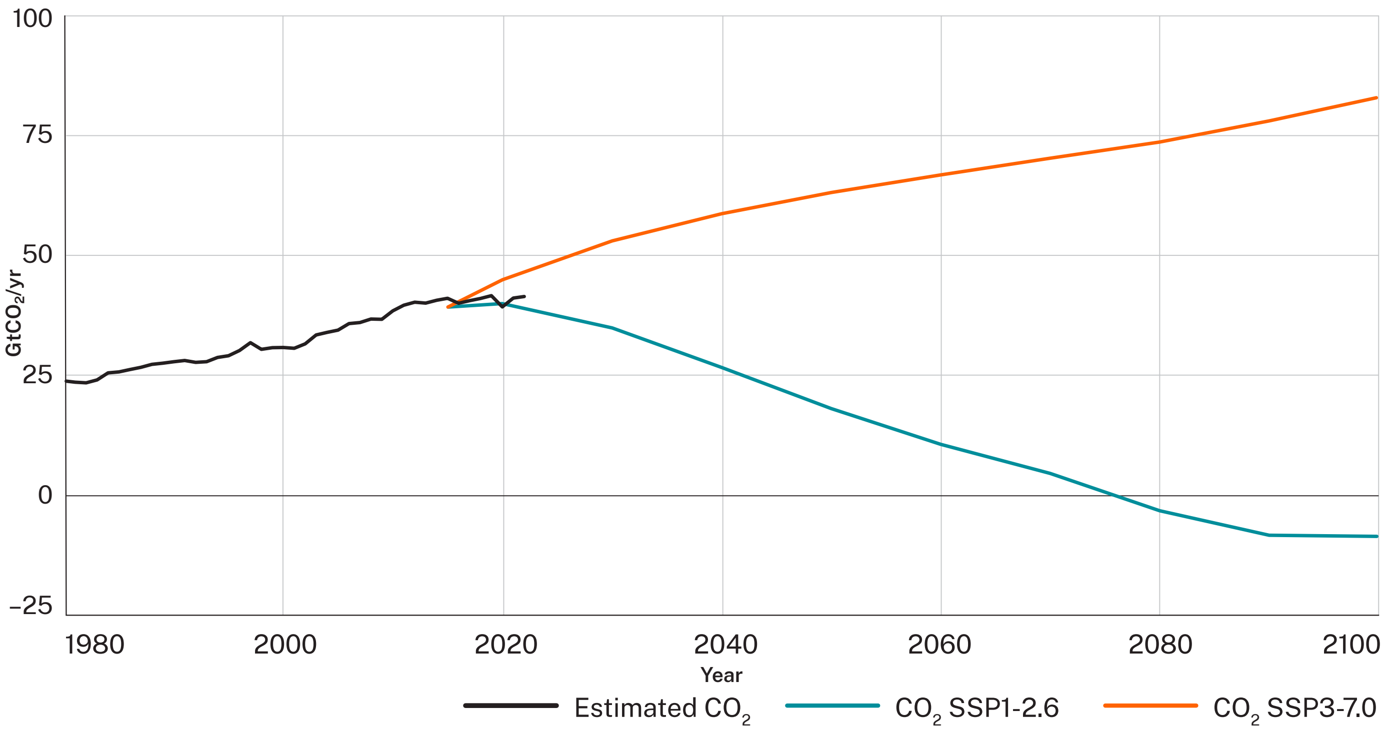
Shared Socioeconomic Pathways (SSPs) are the most recent emissions scenarios adopted in the IPCC's Sixth Assessment Report.

The SSPs describe how greenhouse gas emissions and socioeconomic factors – such as population, economic growth, education, urbanisation and land use – may change in the future. Global carbon dioxide emissions modelled for a low-emissions scenario and a high-emissions scenario are displayed below (Figure 1). For more information on emissions scenarios, visit AdaptNSW.

SSP1-2.6 describes a low-emissions future with a global transition towards sustainable and equitable development.

SSP3-7.0 describes a high-emissions future of regional conflict and development where countries do not collaborate on tackling climate change and do not focus on sustainable and equitable development.

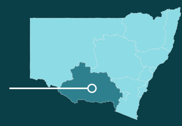
Figure 1. Human-caused global emissions of carbon dioxide – past and projected



Mental health support

Climate change information can be distressing for some readers, with many Australians of all ages experiencing significant eco-anxiety. For supporting information, please visit the Black Dog Institute or Australian Psychological Society or speak with your local healthcare provider.

Projected changes
Riverina Murray



Low-emissions scenario

Average temperature increase

↑ **1.1°C**
2050

↑ **1.2°C**
2090

Hot days per year will increase by:

2050	2090
13.0	13.8

Cold nights per year will decrease by:

2050	2090
12.3	13.5

Severe fire weather days per year will increase by:

2050	2090
2.6	3.1

High-emissions scenario

Average temperature increase

↑ **1.9°C**
2050

↑ **3.7°C**
2090

Hot days per year will increase by:

2050	2090
20.8	41.9

Cold nights per year will decrease by:

2050	2090
18.7	31.7

Severe fire weather days per year will increase by:

2050	2090
4.8	8.0

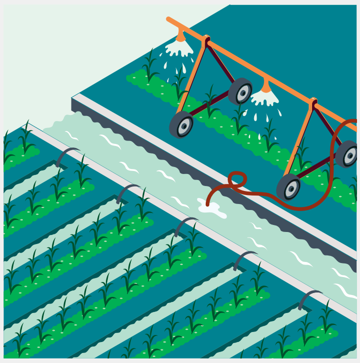
Regional impacts

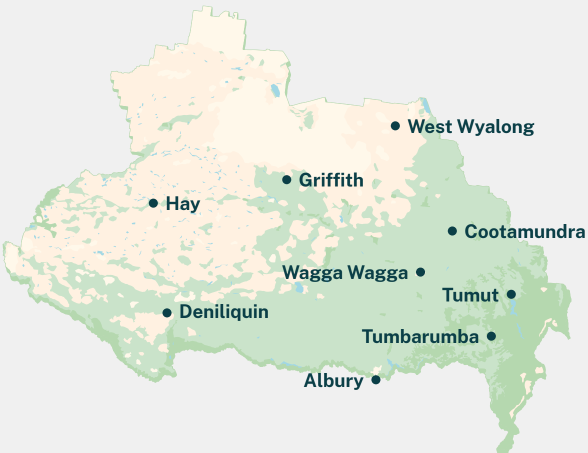
Alpine ecosystems

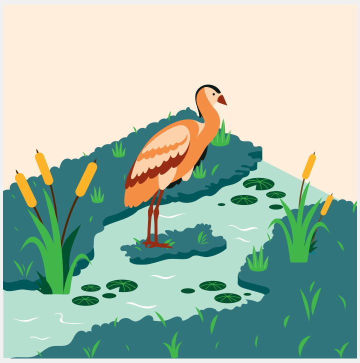
Decrease in cold nights

Irrigated horticulture

Changes to rainfall







Changes to rainfall

Inland wetlands

Increased extreme heat

Viticulture

Data is based on NARCliM2.0 (2024) projections for SSP1-2.6 (low-emissions) and SSP3-7.0 (high-emissions) and is presented relative to the historical climate baseline of 1990–2009. The projections for 2050 represent averaged data for 2040–2059 and projections for 2090 represent averaged data for 2080–2099. Values presented are averages across the NARCliM2.0 model ensemble, and do not represent the full range of plausible climate futures. Regional climate change impacts are used to highlight how the region is likely to be affected by climate change, and impacts are not limited to the examples provided.

Climate of the Riverina Murray

The climate of NSW underpins a diverse array of important industries, lifestyles and natural ecosystems. A stable climate is critical to support a range of values in NSW, including our food systems, recreational activities and unique biodiversity.

The Riverina Murray region stretches across approximately 76,000 km². It includes the major regional cities of Albury, Wagga Wagga and Griffith, which are home to more than 50% of the region's population. Known as Australia's food bowl, the region supports diverse industries including farming, viticulture and tourism.

Current climate

The region features large floodplains and relatively flat river valleys, including some of the longest rivers in Australia such as the Murray, Murrumbidgee and Lachlan rivers. The region's climate varies widely due to its topography, with wetter conditions near the Snowy Mountains and drier climates in the west. Summers tend to be warm to hot in the northwest and cooler in the mountains. Milder temperatures prevail in central areas along the South Western Slopes, featuring cooler summers and warmer winters than surrounding areas.

The range of altitude, rainfall and temperature in the region gives rise to great diversity in natural environments. The region includes some of Australia's rarest and most significant natural ecosystems, which range from the highest altitudes of the Australian continent to semi-arid ecosystems in south-west NSW and on the Hay Plains. In the west of the region, wetland communities associated with the major rivers rely on the snowmelt and rainfall from the highest peaks, including internationally significant Ramsar sites (NSW Central Murray state forests and Fivebough and Tuckerbil swamps). The most widespread species occur on the floodplains of the major rivers that dominate the region.

Table 1. Baseline climate for the Riverina Murray

	Average temperature	Hot days	Cold nights	Rainfall	Severe fire weather days
Observed	16.3°C	29.0	41.7	462mm	7.4
Historical model	16.9°C	28.2	39.7	415mm	7.9

Table 1 outlines the annual average values for the 1990–2009 baseline period in this snapshot. All observed data is calculated from Bureau of Meteorology products. Long-term temperature change data is from the long-term temperature record.[1] Observed information and data in graphs come from Australian Gridded Climate Data (AGCD).[2]

Temperature

The Riverina Murray is getting warmer

Temperature is the most robust indicator of climate change. In NSW, 6 of the 10 warmest years on record since 1910 have occurred since 2013. The warmest year on record for both average temperature and maximum temperature in the Riverina Murray region was 2009, when average temperature was 1.1°C above the 1990–2009 average.[2]

Projections

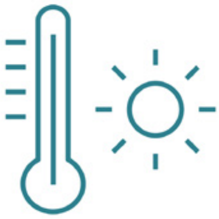
Across the Riverina Murray region, average temperatures will increase throughout this century (Figure 2).

Under a low-emissions scenario, the average temperature increase across the region is projected to be less than 0.1°C between 2050 and 2090 (Table 2). However, a major temperature increase of 1.8°C is expected during the same period under a high-emissions scenario. Notably, the temperature projections for 2050 under a high-emissions scenario are expected to exceed the projections for 2090 under a low-emissions scenario.

Temperature increases are expected in all parts of the region (Figure 3) and across all seasons. The temperature increase is likely to be uniform throughout the region, with a slightly larger increase in the north of the region. By 2090, Wagga Wagga is likely to experience an increase in temperature of 1.2°C under a low-emissions scenario and 3.7°C under a high-emissions scenario.

3.7°C

rise in average temperature across the Riverina Murray by 2090 under a high-emissions scenario



6 of 10

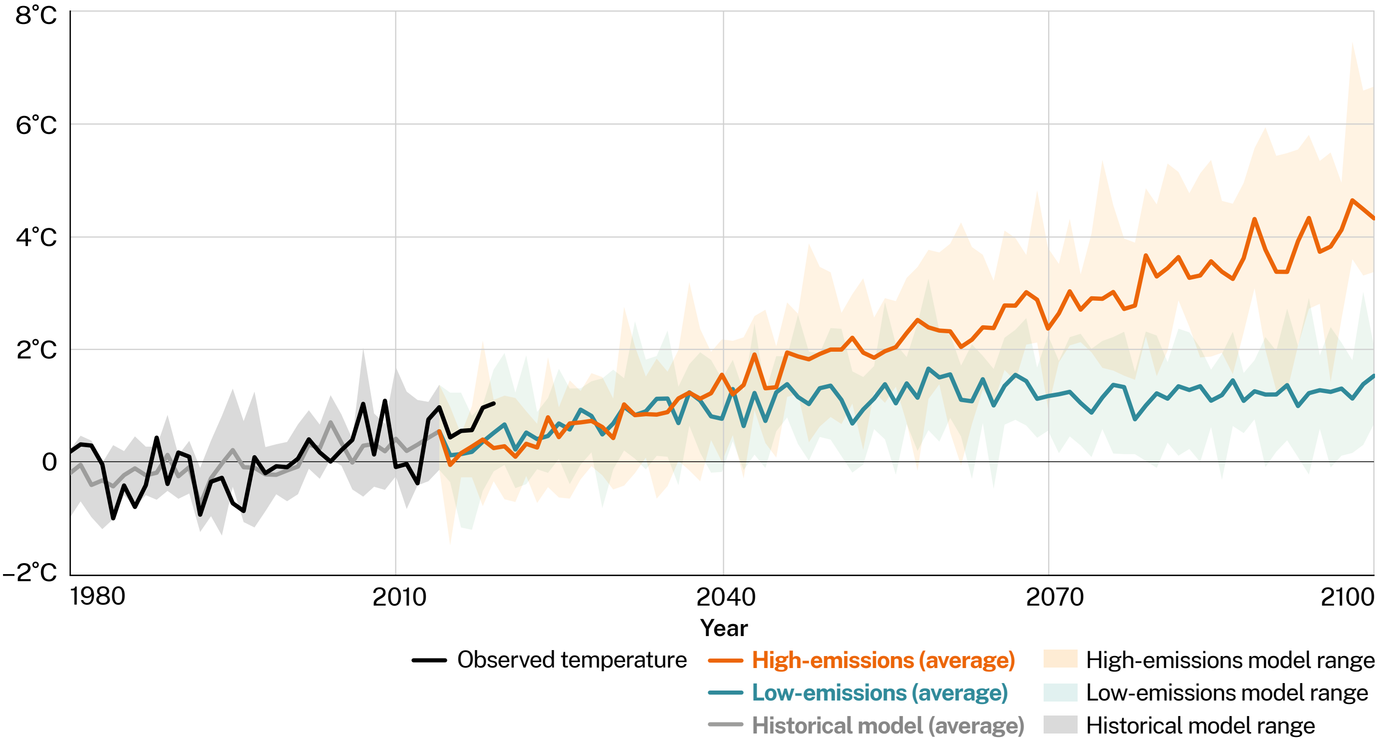
warmest years on record have occurred since 2013

Table 2. Projected annual average temperature increase – Riverina Murray

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Temperature	**1.1°C** (0.6–1.6°C)	**1.9°C** (0.8–2.6°C)	**1.2°C** (0.7–1.9°C)	**3.7°C** (2.5–5.3°C)
Maximum temperature	**1.2°C** (0.6–1.7°C)	**2.0°C** (0.9–2.8°C)	**1.3°C** (0.7–2.0°C)	**3.9°C** (2.6–5.5°C)
Minimum temperature	**1.0°C** (0.5–1.4°C)	**1.7°C** (0.8–2.3°C)	**1.1°C** (0.6–1.7°C)	**3.6°C** (2.3–5.1°C)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 2. Historical and projected average temperature change – Riverina Murray

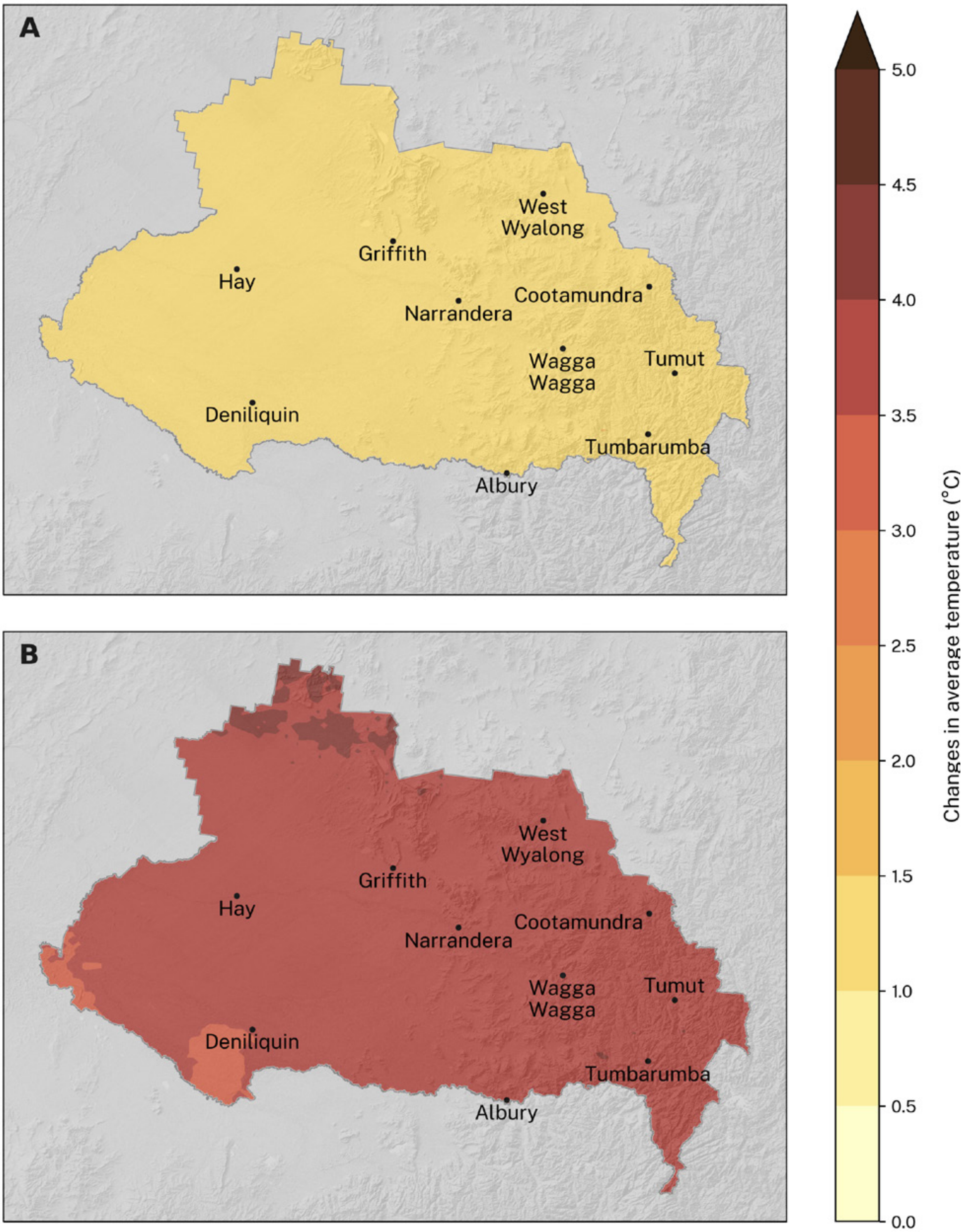


The shading around the graphs

The climate change projections presented in this snapshot are relative to the historical climate baseline of 1990–2009. The graphs provide a projected annual average for the 2 emissions scenarios.

The range of plausible climate futures across the NARCliM model ensemble is shown by light shading. For historical climate data, both recorded observational data (dark line) and modelling of the past climate in NARCliM2.0 (grey) are presented.

Figure 3. Projected change in average temperature by 2090 for the Riverina Murray under A) a low-emissions scenario and B) a high-emissions scenario



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Hot days

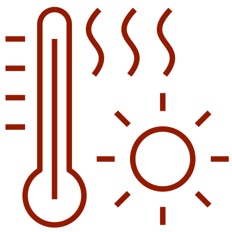
Hot days will become more frequent

Prolonged hot days where maximum temperatures are 35°C or above increase the incidence of illness and death – particularly among vulnerable people. Seasonal changes in number of hot days could have significant impacts on bushfire danger, infrastructure and native species.

Projections

The number of hot days varies widely across the Riverina Murray region. During the baseline period, higher elevation areas such as Tumbarumba had on average less than 5 hot days per year. Lower elevation areas in the east of the region such as Tumut, Wagga Wagga and Cootamundra had on average 10–20 hot days per year, while further inland areas such as Griffith, Hay and West Wyalong had on average 25–35 hot days per year.

Changes to **temperature extremes** often have **more pronounced impacts** than changes in average **temperatures.**



Higher maximum temperatures affect health through **heat stress** and exacerbate existing health conditions.

The number of hot days will increase for the Riverina Murray region by 2050 for both a low-emissions and a high-emissions scenario, with an even greater increase by 2090 under a high-emissions scenario (Table 3). The number of hot days is projected to increase during spring, summer and autumn, with the largest increase in summer.

Under a low-emissions scenario, there is a minimal increase of less than 1 additional hot day projected across the region between 2050 and 2090 (Table 3). However, an increase of 21.1 additional hot days is projected under a high-emissions scenario during the same period.

By 2090, Wagga Wagga could experience nearly triple the number of hot days under a high-emissions scenario.

Increases to hot days will occur across all of the region (Figure 5). Northern areas of the region, including Griffith and Hay, are projected to experience pronounced increases in the number of hot days. By 2090, Wagga Wagga is projected to experience 13.1 additional hot days per year under a low-emissions scenario and 41.5 additional hot days per year under a high-emissions scenario. A high-emissions scenario is projected to nearly triple Wagga Wagga's baseline period average of 22.3 hot days per year. Comparatively, in the east of the region, Tumut's baseline period average is 7.7 hot day per year. By 2090, Tumut is projected to experience an additional 7.7 hot days per year under a low-emissions scenario and 27.9 additional hot days per year under a high-emissions scenario.

Table 3. Projected increase in average annual number of hot days – Riverina Murray

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
13.0 days (2.1 to 23.2 days)	**20.8 days** (3.3 to 33.7 days)	**13.8 days** (5.7 to 23.9 days)	**41.9 days** (22.7 to 67.3 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 4. Historical and projected change in annual number of hot days – Riverina Murray

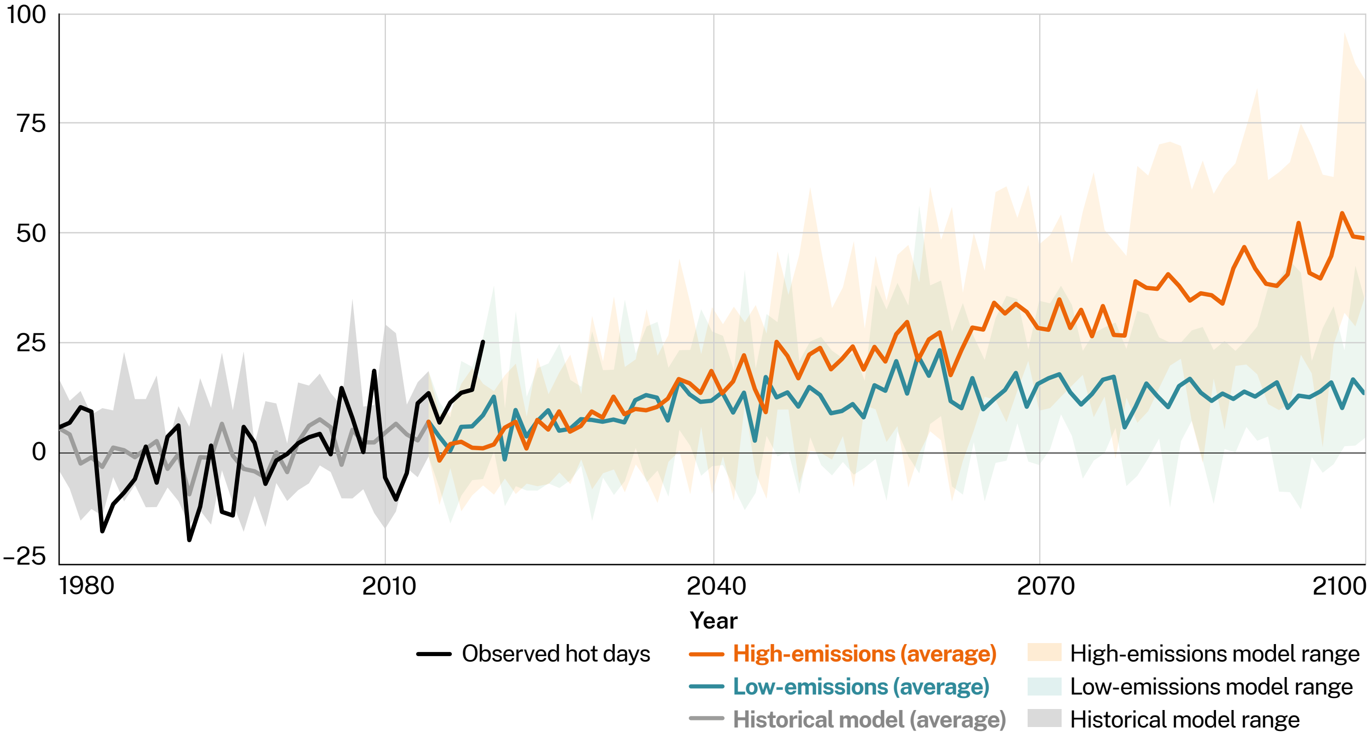
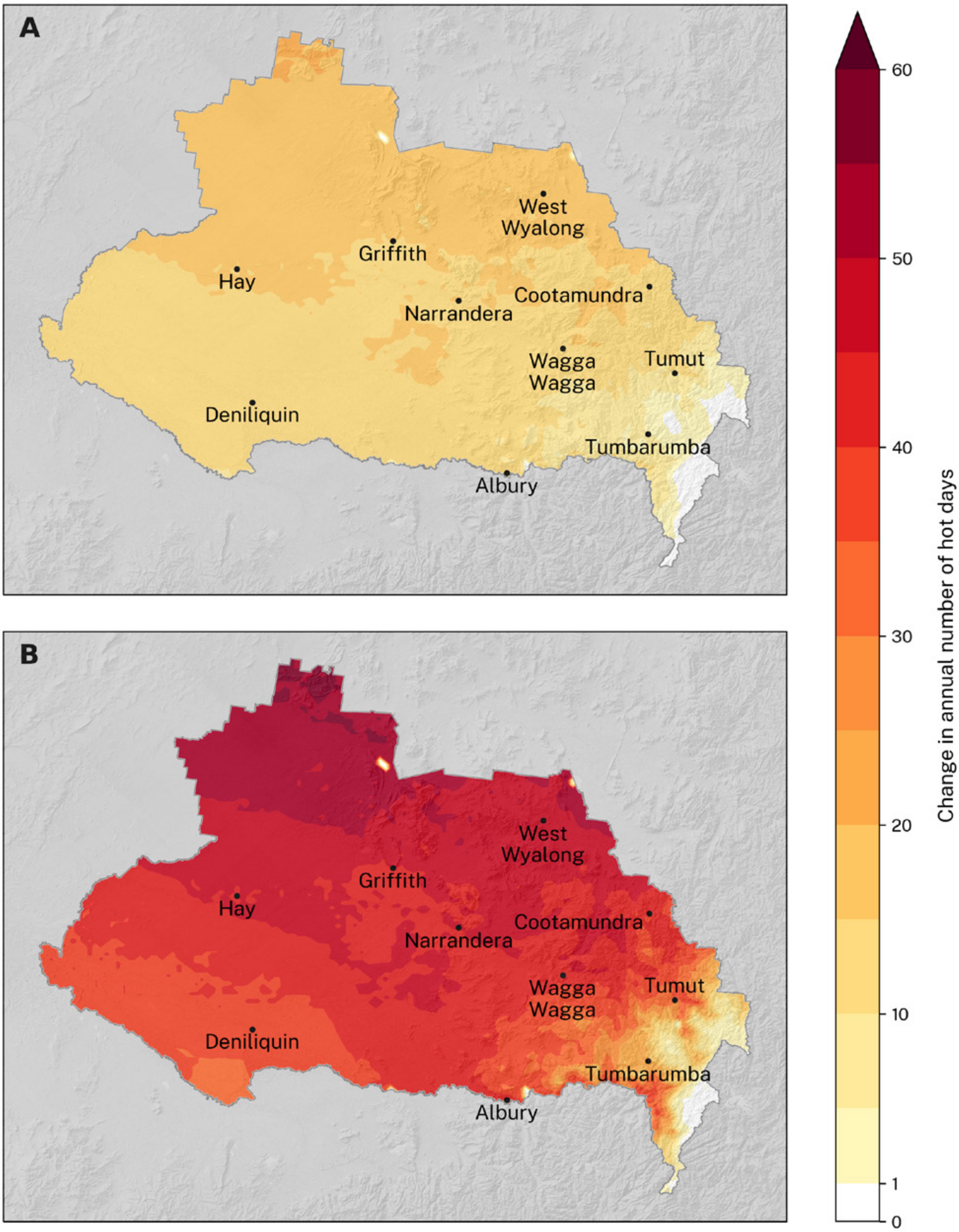


Figure 5. Projected change in annual number of hot days by 2090 for the Riverina Murray under A) a low-emissions scenario and B) a high-emissions scenario



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Cold nights

Cold nights will decrease

Cold nights are those where the minimum temperature drops below 2°C. These are important for the survival of some important plant species. For example, some common temperate fruit species require sufficiently cold winters to produce flower buds and alpine ecosystems are reliant on cold nights.

Projections

The number of cold nights varies widely across the Riverina Murray region, but generally decreases from east to west. During the baseline period, areas of higher elevation in the east of the region had on average more than 110 cold nights per year. Areas near the centre of the region such as Wagga Wagga and Griffith had on average 30–40 cold nights per year, while western areas such as Hay had on average 20 cold nights per year.

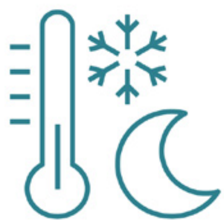
Under a high-emissions scenario, the number of cold nights across the Riverina Murray could reduce by 80% by 2090.

Under a low-emissions scenario, there is a small decrease of 1.2 fewer cold nights per year projected across the region between 2050 and 2090 (Table 4). However, a decrease of 13.0 fewer cold nights per year is projected under a high-emissions scenario during the same period.

Cold nights will decrease across all of the region (Figure 6), particularly in higher elevation areas in the east of the region (Figure 7). The greatest decreases are projected to occur along the western edge of the Snowy Mountains including Tumbarumba and Tumut. By 2090, Tumbarumba is projected to have 22.0 fewer cold nights per year under a low-emissions scenario and 67.6 fewer cold nights per year under a high-emissions scenario. A high-emissions scenario is projected to reduce Tumarumba's 108.5 cold nights per year base period average by more than 60%.

Other areas will also experience notable changes (Figure 7). By 2090, Wagga Wagga is projected to have 13.2 fewer cold nights per year under a low-emissions scenario and 31.0 fewer cold nights per year under a high-emissions scenario. A high-emissions scenario is projected to reduce Wagga Wagga's 35.8 cold nights per year base period average by more than 85%.

High-elevation areas of the region such as Tumbarumba could experience a greater than 60% reduction in the annual number of cold nights.



Under a low-emissions scenario, the number of cold nights across the Riverina Murray could reduce by less than 50% by 2090.

Table 4. Projected decrease in average annual number of cold nights – Riverina Murray

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
12.3 days (7.7 to 17.9 days)	**18.7 days** (8.7 to 23.3 days)	**13.5 days** (5.5 to 18.4 days)	**31.7 days** (24.4 to 36.5 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 6. Historical and projected change in annual number of cold nights – Riverina Murray

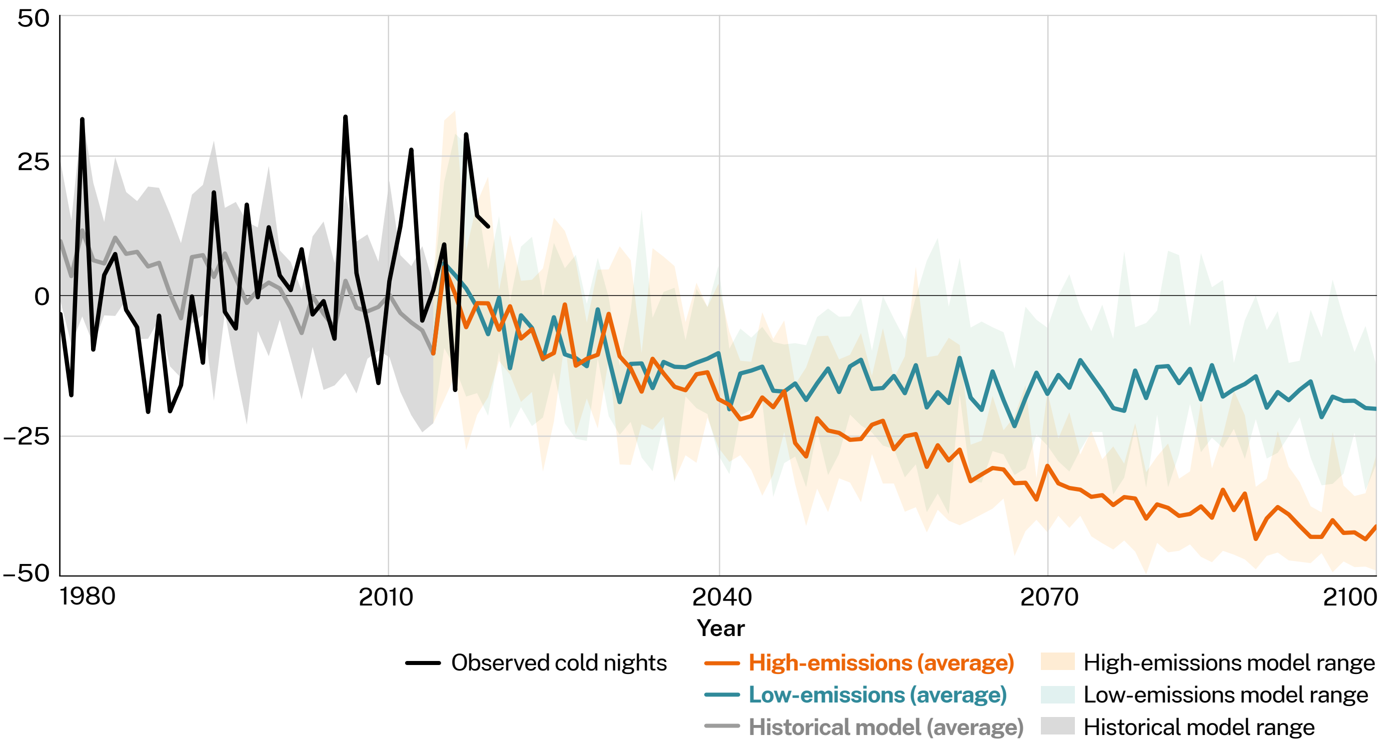
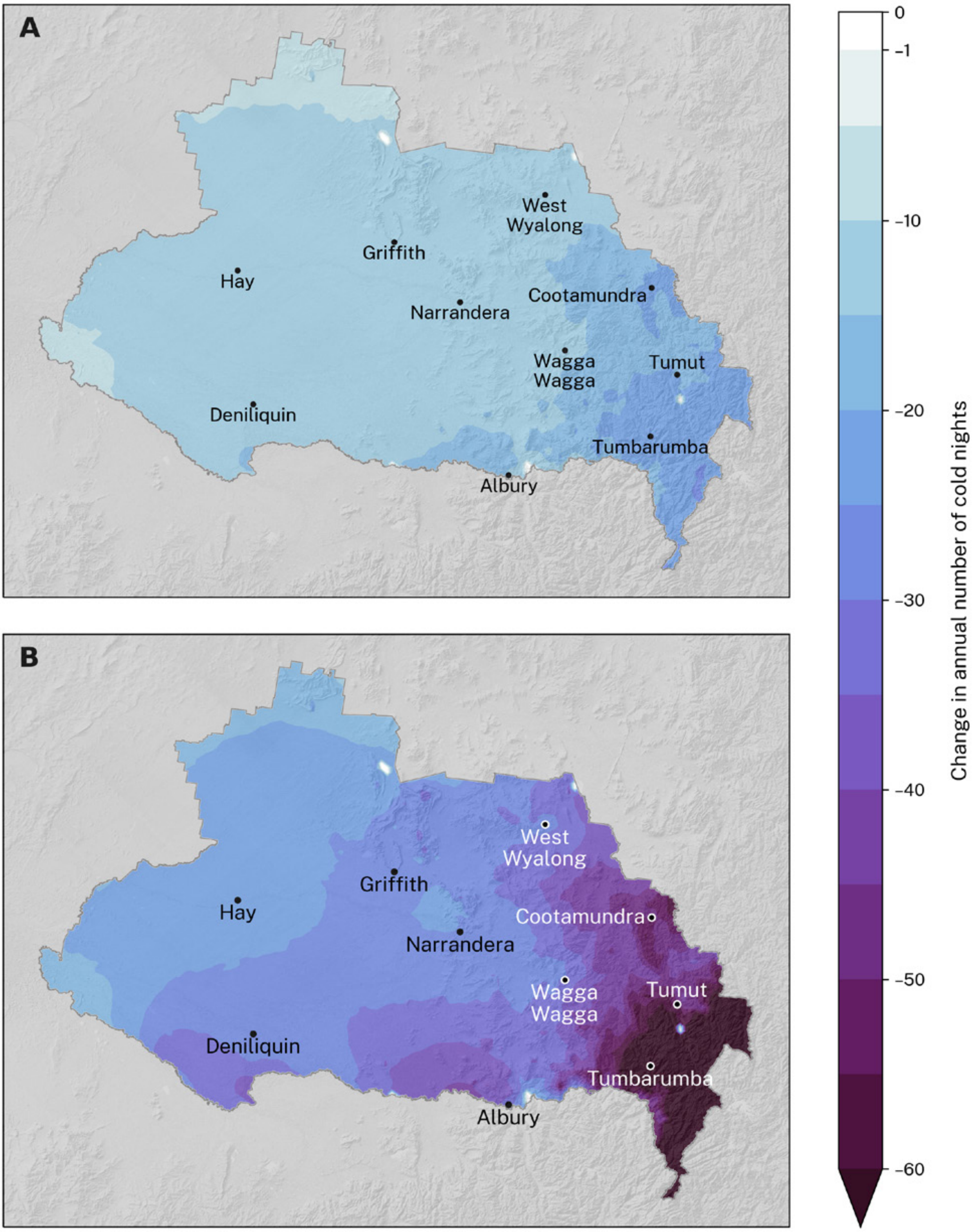


Figure 7. Projected change in annual number of cold nights by 2090 for the Riverina Murray under A) a low-emissions scenario and B) a high-emissions scenario



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Rainfall

Rainfall is projected to remain variable

Climate change will impact on rainfall patterns and total amount of rainfall that NSW receives. These changes may have widespread impacts on agriculture productivity, water security and native species' reproductive cycles. For example, eucalypt woodlands and riverine plains in the interior west could struggle to cope with drier conditions.

Modelling rainfall is more difficult than modelling temperature due to the complexities of the weather systems that generate rain. NARCliM projections capture a range of plausible climate futures under the 2 emissions scenarios, including wet and dry outcomes. This means that rainfall is inherently more variable in the NARCliM projections than temperature, and the full range of rainfall projections should be taken into account. This can be explored further on the AdaptNSW Interactive Map.

Annual rainfall across the Riverina Murray region averages about 460mm.[2] Rainfall is highest in the Snowy Mountains and rainfall generally decreases from the east to the west of the region. Rainfall is nearly uniformly distributed throughout the year across most of the region, with slightly higher rainfall in winter and spring, particularly in the Snowy Mountains. The driest year on record was 1967, with an average rainfall of only 210mm. Notably dry years were also experienced in 2018 and 2019, with approximately 290mm of rainfall across the region in each year.[2]

Projections

This snapshot provides data on average rainfall change and does not provide data on rainfall extremes and the impacts of climate change on flooding.

Annual average rainfall in the region is projected to remain variable throughout this century (Figure 8). By 2090, on average, annual rainfall is projected to decrease by 10% under a low-emissions scenario and by 15% under a high-emissions scenario (Table 5). Changes to average rainfall will occur in all seasons, with the largest changes expected in spring and summer.

By 2090, average spring rainfall is projected to decrease across the region by 20% under a low-emissions scenario and by 26% under a high-emissions scenario. There are some minor variations across the region (Table 5).

Under a high-emissions scenario, average spring rainfall could decrease by 26% across the Riverina Murray by 2090.

By 2090, average summer rainfall is projected to decrease across the region under both a low-emissions and a high-emissions scenario, with areas in the west of the region such as Deniliquin and Hay projected to experience a decrease in rainfall of approximately 20%.

On average, autumn and winter rainfall is projected to change by 12% or less across the region by 2090 under both a low-emissions scenario and a high-emissions scenario. On average, summer rainfall is projected to decrease by 18% under a low-emissions scenario and by 15% under a high-emissions scenario across the region. Refer to the Interactive Map for further seasonal information.

Table 5. Projected change to average rainfall – Riverina Murray

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Annual	**–11.8%** (–24.1% to +5.9%)	**–16.1%** (–38.7% to –1.4%)	**–10.3%** (–24.6% to +28.2%)	**–15.2%** (–44.6% to +35.4%)
Summer	**–14.1%** (–35.4% to +50.6%)	**–23.8%** (–48.2% to +52.3%)	**–18.0%** (–47.4% to +57.8%)	**–15.1%** (–53.1% to +68.0%)
Autumn	**–13.6%** (–34.0% to +10.3%)	**–12.9%** (–46.4% to +38.8%)	**–5.5%** (–27.9% to +25.7%)	**–12.2%** (–44.0% to +50.2%)
Winter	**–5.4%** (–26.6% to +19.0%)	**–10.6%** (–33.5% to +22.4%)	**0.0%** (–26.9% to +51.4%)	**–8.2%** (–39.7% to +56.7%)
Spring	**–15.7%** (–39.1% to +13.3%)	**–18.4%** (–40.7% to –4.4%)	**–19.7%** (–35.0% to +14.8%)	**–26.3%** (–53.0% to +22.4%)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 8. Historical and projected change to average rainfall – Riverina Murray

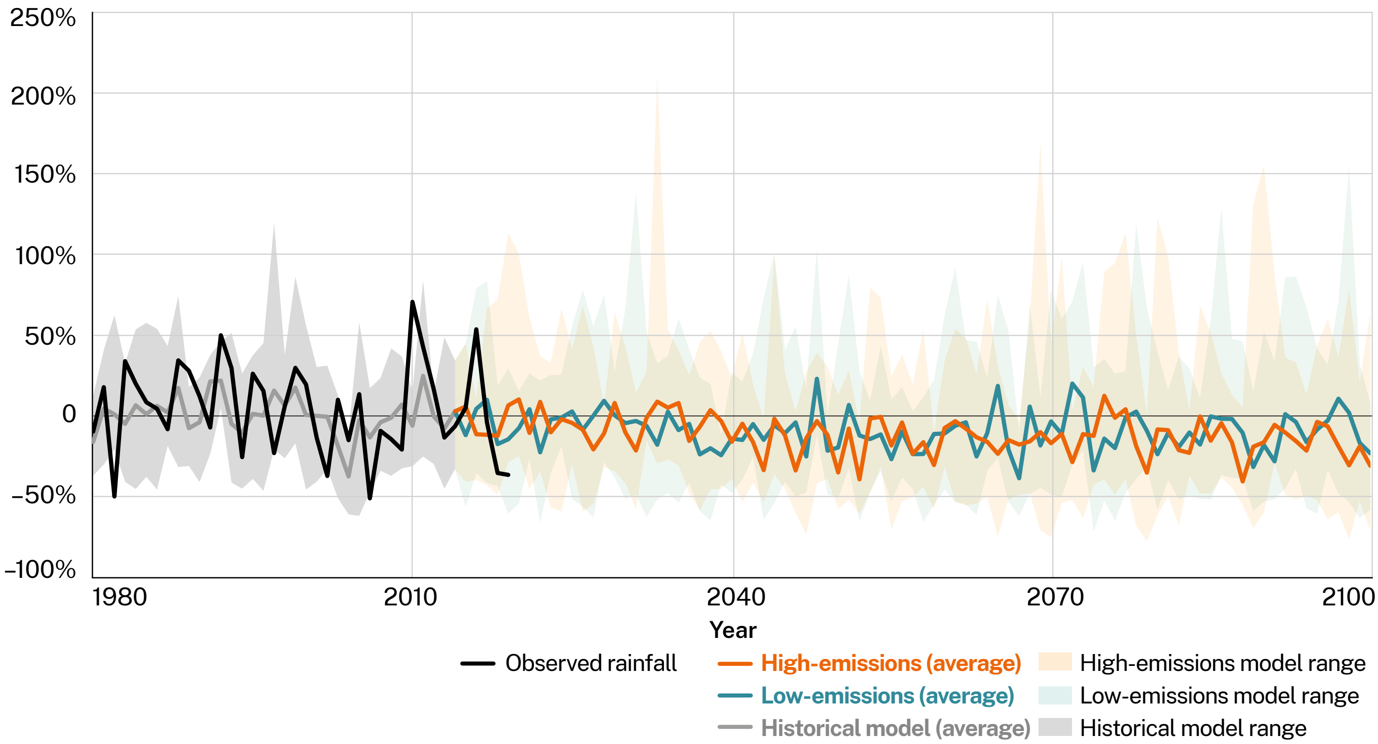
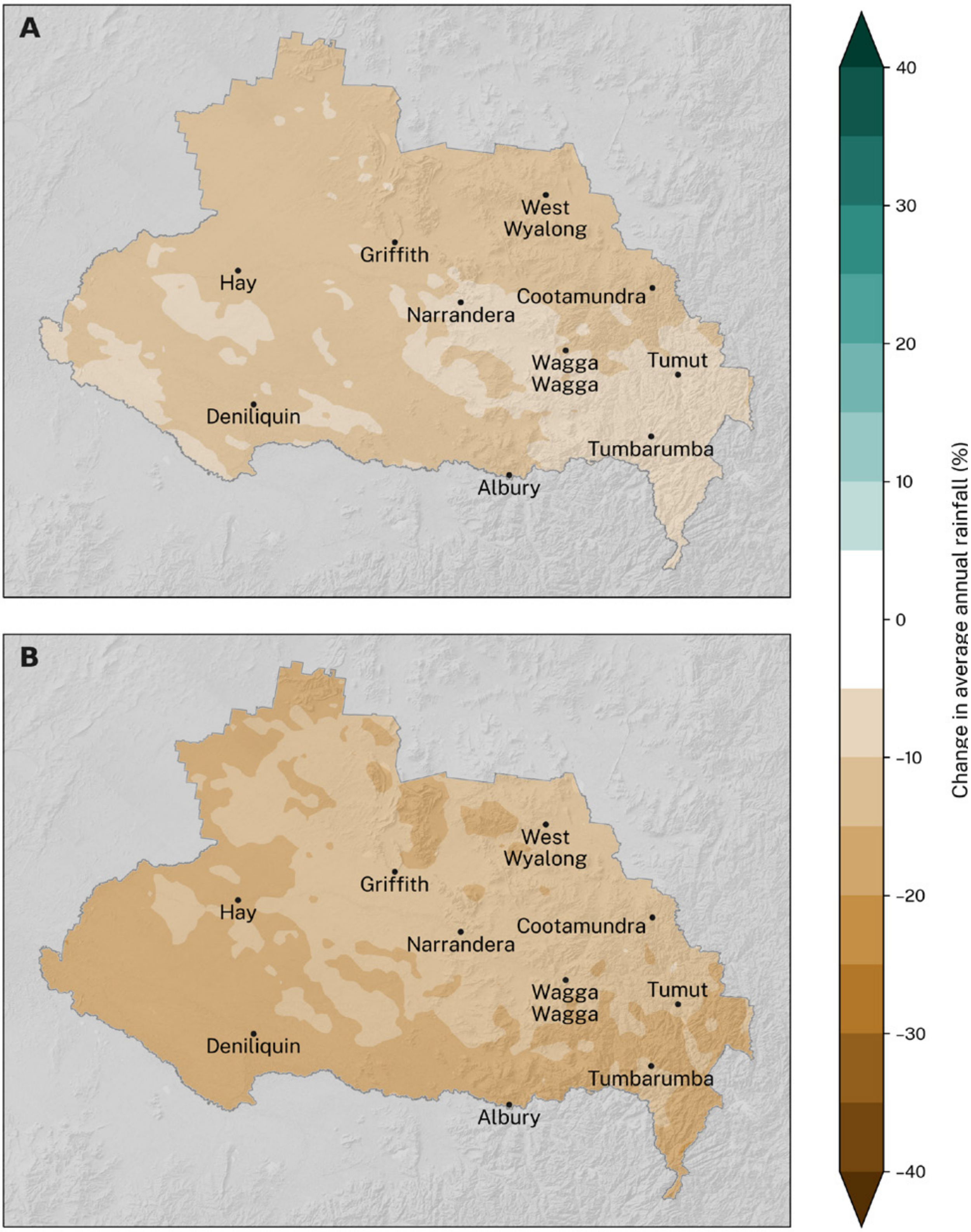


Figure 9. Projected change to average rainfall by 2090 for the Riverina Murray under A) a low-emissions scenario and B) a high-emissions scenario



Severe fire weather

Severe fire weather will increase

The Forest Fire Danger Index (FFDI) represents an estimate of fire weather risk. The FFDI is calculated from temperature, relative humidity and wind speed, as well as a number representing fuel dryness.

Severe fire weather (FFDI greater than 50) is most likely in summer and spring. Fire weather was the strongest determining factor of house loss during the Black Summer bushfires.[3] The number of severe fire danger days observed for the Riverina Murray region is 7.4 days per year on average.[2] The number of severe fire danger days generally increases from the east to the west of the region. The record number of severe fire danger days in a year was 2019 with approximately 24.3 days on average across the region, including 15 days recorded at the Albury station and 50 days recorded at the Hay station.[4]

Fire weather was the strongest determining factor of house loss during the Black Summer bushfires.[3]

FFDI was monitored by weather stations across NSW and the ACT until the introduction in 2022 of the Australian Fire Danger Rating System. FFDI is used in this snapshot as it can be simulated using the NARCliM projections, whereas data used by the Australian Fire Danger Rating System cannot. FFDI also provides a long history of data and gives context to the NARCliM projections.

Projections

The number of severe fire weather days will increase for the Riverina Murray region by 2050 for both a low-emissions and a high-emissions scenario, with an even greater increase projected by 2090 under a high-emissions scenario (Table 6). The number of severe fire weather days is projected to increase during spring and summer, with the largest increase in summer.

Under a high-emissions scenario, the number of annual severe fire weather days across the Riverina Murray could more than double by 2090.

Increases to severe fire weather days are projected to occur across most of the region (Figure 11). The greatest increases will occur in northern areas of the region including Hay and Griffith. By 2090, Griffith is projected to experience 3.7 additional severe fire weather days per year under a low-emissions scenario and 8.8 additional severe fire weather days per year under a high-emissions scenario. A high-emissions scenario is projected to nearly double Griffith's baseline period average of 9.2 severe fire weather days per year. Comparatively, in the east of the region, Tumut's baseline period average is 1.8 severe fire weather days. By 2090, Tumut is projected to experience 1.1 additional severe fire weather days per year under a low-emissions scenario and 3.6 additional severe fire weather days per year under a high-emissions scenario.

Table 6. Projected increase in average annual number of severe fire weather days – Riverina Murray

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
2.6 days (–1.3 to 6.3 days)	**4.8 days** (0.2 to 10.9 days)	**3.1 days** (0.5 to 8.2 days)	**8.0 days** (1.7 to 15.9 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 10. Historical and projected change to annual number of severe fire weather days – Riverina Murray

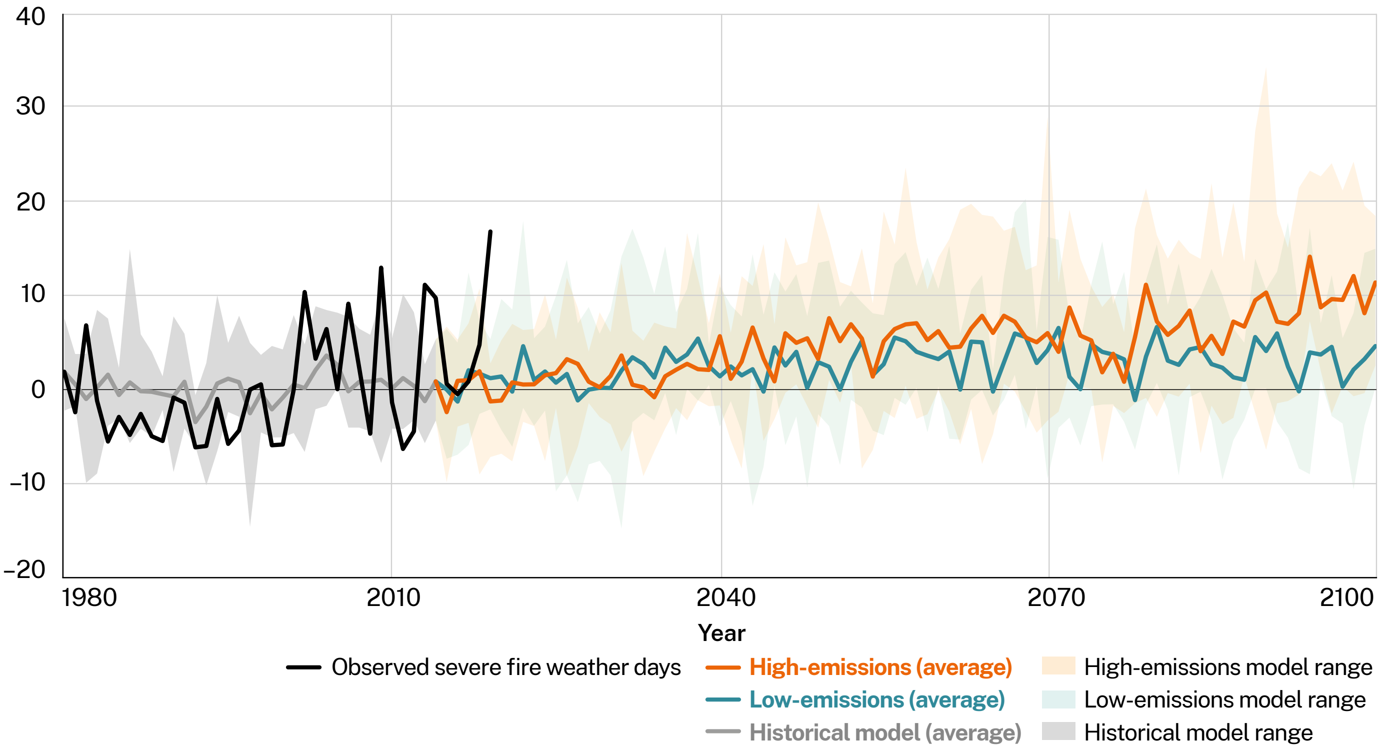
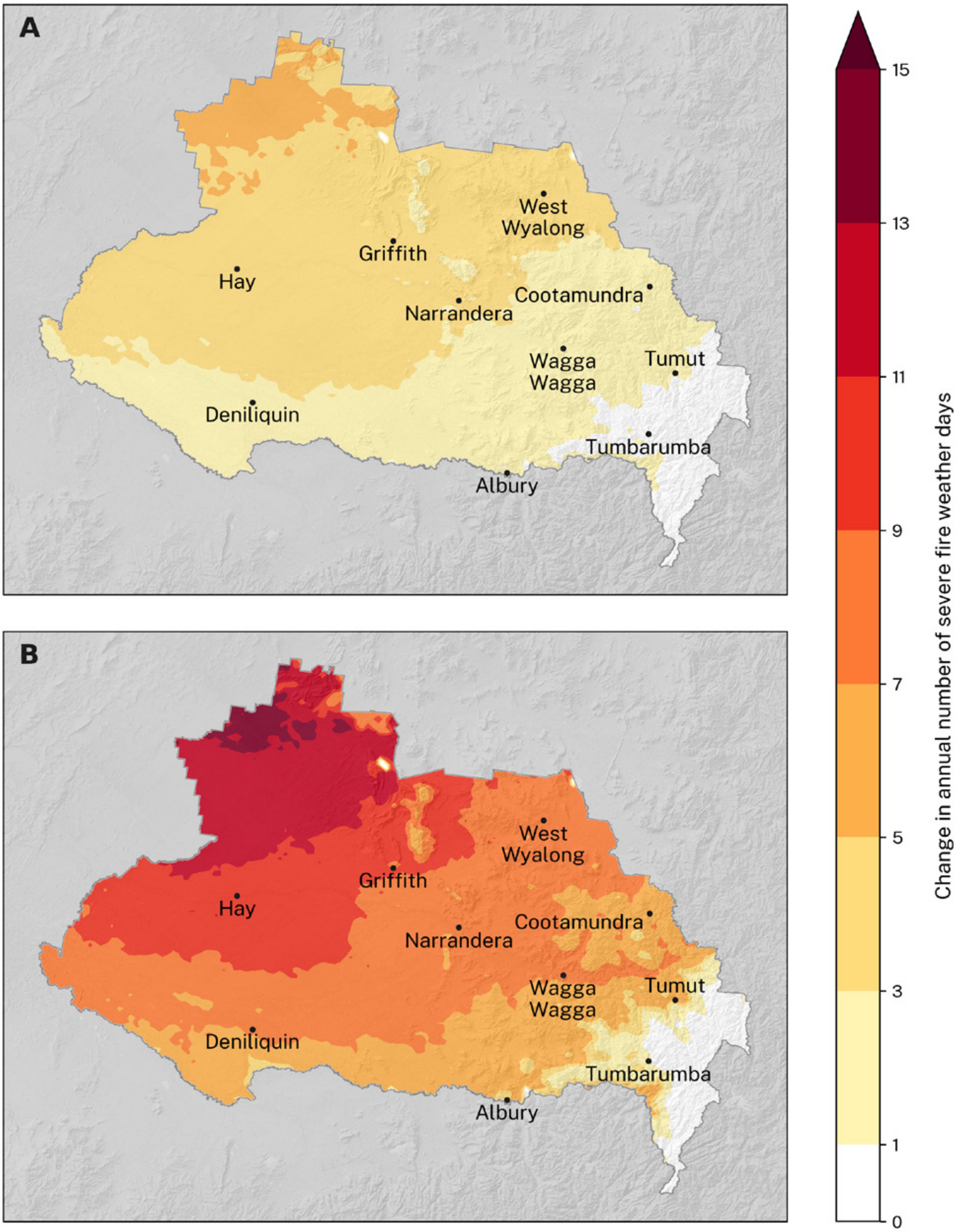


Figure 11. Projected change to annual number of severe fire weather days by 2090 for the Riverina Murray under A) a low-emissions scenario and B) a high-emissions scenario



Climate change impacts on the Riverina Murray

Climate change is already impacting the Riverina Murray region, particularly through increased temperatures and changes to rainfall patterns. Climate change will continue impacting a variety of important economic, cultural and environmental values across the region.

Bushfires

The Riverina Murray experienced significant impacts during the 2019–2020 bushfire season with extensive impacts on communities, infrastructure and natural ecosystems. Over 500,000 hectares of the region were burnt and 4961 buildings were impacted, including 201 homes which were destroyed.[5] Large areas of bushland experienced extreme fire severity, including Kosciuszko and Woomargama National Parks. Over 27,000 hectares or 21% of NSW alpine vegetation was burnt, adding to extensive areas of alpine vegetation still recovering from severe fires that occurred in 2002–2003.[6] Severe fire danger days, which create the underlying conditions for large-scale bushfires, are expected to become more common in the future, particularly under a high-emissions scenario.

Changes to rainfall

Changes to rainfall and increased temperatures from climate change are expected to have significant impacts on the region. There is the potential for an increased risk of lower median inflows in key river catchments such as the Murray and Murrumbidgee rivers. This could significantly impact town water supplies, agriculture and internationally significant wetlands in the region due to increased evapotranspiration and a shift in seasonal patterns.[7] For the NSW Central Murray Forests, the reduced frequency, extent and duration of spring floods from water extraction and climate change have already impacted the ecological character of the site and caused a significant decrease in waterbird breeding.[8] Climate change will further exacerbate these impacts, particularly under a high-emissions scenario.

Decreased cold nights

Increased minimum temperatures and a reduction in cold nights across the region will have significant impacts on snow cover and snow depth. Natural snow depth in alpine areas has declined by over a third since the 1950s and years with persistent heavy snow cover have become rare. Continued decline in snow depth is likely to have significant impacts on the Snowy Mountains Scheme that generates hydro-electric power and provides water for irrigation, which is highly reliant on spring snowmelt and rainfall.[9] Further reductions in natural snow depth are likely to impact alpine biodiversity reliant on long-lasting snow cover, and cause a decline in recreational opportunities, affecting local economies dependent on snow-based tourism.

References

1 Long-term temperature record – webpage

2 About Australian Gridded Climate Data maps and grids – webpage

3 Price et al. 2020, Probability of house destruction. Theme 3A. People and Property Impacts, *Bushfire Risk Management Research Hub* for the NSW Bushfire Inquiry 2020 – webpage

4 Bureau of Meteorology Station Data – webpage

5 Owens & O'Kane 2020, 'Final report of the NSW Bushfire Inquiry', *Department of Premier and Cabinet,* Sydney

6 DPIE 2020, 'NSW fire and the environment 2019–20 summary', *Department of Planning, Industry and Environment,* Sydney

7 Regional Water Strategies Program – webpage

8 SEWPAC 2012, 'Ramsar Information Sheet for Site no. 1291, NSW Central Murray Forests', *Department of Sustainability, Environment, Water, Population and Communities and Office of Environment and Heritage*, Canberra

9 Snowy Hydro – webpage

Climate action and information

Climate action

The NARCliM projections for the low-emissions scenario and the high-emissions scenario highlight the stark difference in climate change impacts that will be experienced under each scenario. The differences provide a reminder of the required action across the world to reduce emissions, and specifically within NSW to meet our legislated Net Zero by 2050 emissions reduction targets. This is our best chance at ensuring the future projections under the high-emissions scenario are avoided. The NARCliM projections highlight the importance of taking action to adapt to the impacts of climate change. For more resources on reducing emissions and adapting to the impacts of climate change, visit AdaptNSW.

Information

NARCliM projections are delivered with support from: the ACT, South Australian, Victorian and Western Australian governments; National Computational Infrastructure; Murdoch University; and the University of New South Wales. Detailed information on the methodology and application of the projections can be found on the AdaptNSW website.

Climate change information in this snapshot is delivered as part of the NSW Government's commitment to 'Publish regularly updated and improved local level climate change projections' under Action 3 of the NSW Climate Change Adaptation Strategy.

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