

Air quality in the Namoi/North West Slopes Region

Air quality in the Namoi/North West Slopes region was mostly good during winter 2022, with all stations except Gunnedah meeting national benchmarks¹ on 100% of days (Figure 1). Air quality at Gunnedah was good on 85% of the days², with fair-poor air quality days likely due to wood smoke. Tamworth reported one 'fair' air quality day but did not exceed national benchmarks. Good air quality across the region was sustained by the prevailing climate conditions. A wet winter season with above-average rainfall in August, cooler temperatures, and improved ground cover reduced dust activity.

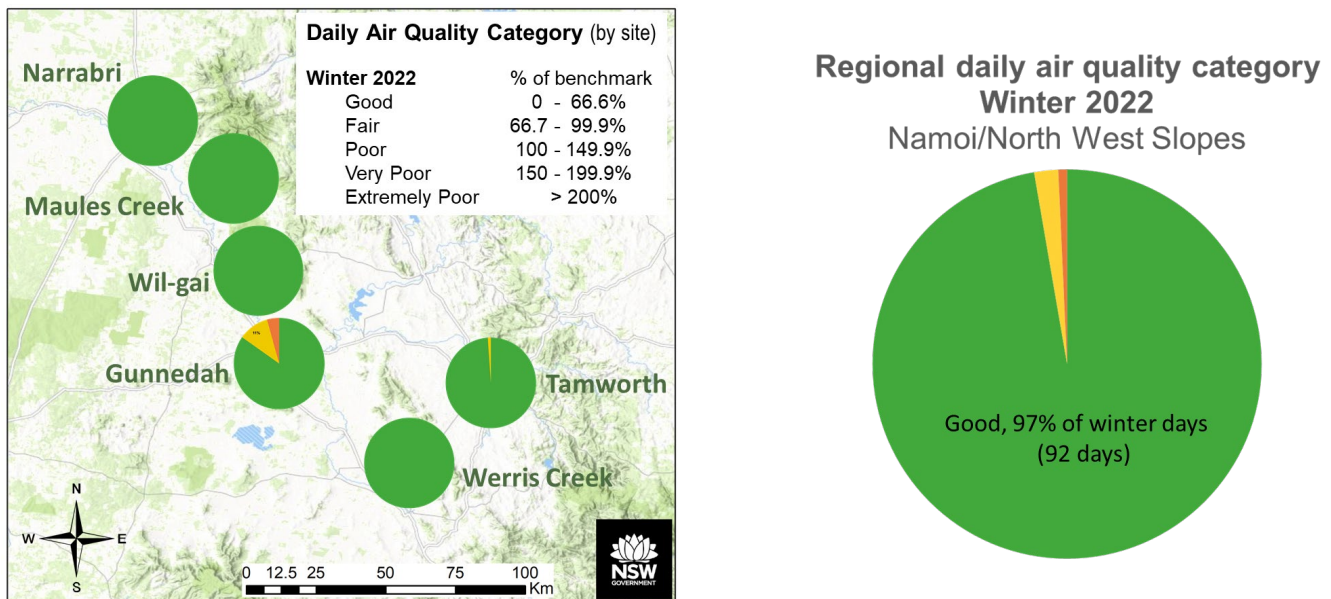


Figure 1 Daily air quality categories at individual monitoring stations (left) and regional air quality in the Namoi/North West Slopes region (right).

Air quality: summary statistics, winter 2022

Gunnedah station recorded 4 days above the daily PM2.5 benchmark during winter 2022.

Table 1 Number of days above each benchmark, by station, 1 June to 31 August 2022

Station	PM10 daily benchmark [50 µg/m ³]	PM2.5 daily benchmark [25 µg/m ³]	NO ₂ hourly benchmark ^{1a} [8 pphm]	O ₃ 8-hourly benchmark ^{1a} [6.5 pphm]
Gunnedah	0 #	4 #	0	0
Narrabri	0	0	-	-
Tamworth	0	0	*	*
Maules Creek	0	0	-	-
Werris Creek	0	0	-	-
Wil-gai	0	0	-	-

= the particle monitor at Gunnedah station did not meet 75% data availability requirement during winter 2022 (see Table 2 for details); * = Tamworth station gaseous monitors were decommissioned on 13 May 2022; - = not monitored; µg/m³ = micrograms per cubic metre; pphm = parts per hundred million by volume (i.e. parts of pollutant per hundred million parts of air).

^{1, 1a} The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) sets national standards for common urban air pollutants, which in this report are referred to as 'benchmarks' for reporting air quality. 1a: the 2021 amended NEPM strengthened the 1-hour NO₂ standard (from 12 pphm), and replaced the previous O₃ standards with this 8-hour rolling average standard.

² Data for particles at Gunnedah AQM station was only available for 59.8% of days in winter 2022 (see Table 2). The AQC chart at Figure 1 does not account for particle contribution on 40.2% of winter days. As such, the reported proportion of 'good' air quality days at Gunnedah (85%) is driven by low gaseous concentrations on 40.2% of winter days.

Air quality: particle pollution winter 2022

The time series of daily average particle concentrations shows PM10 levels remained below the benchmark during winter 2022 (Figure 2).

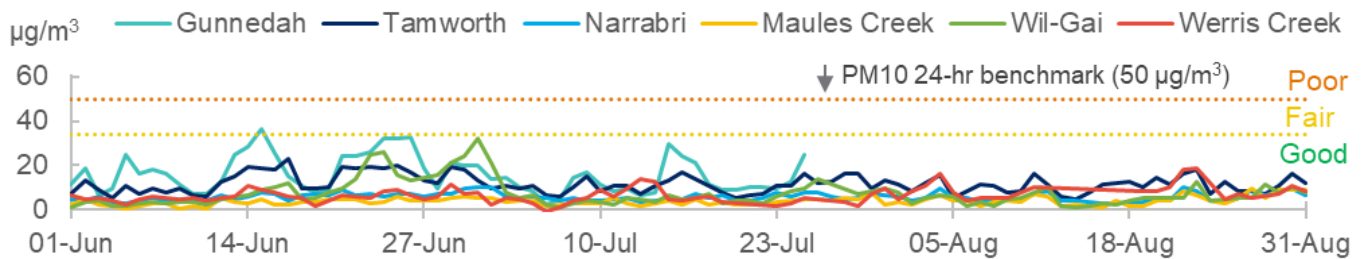


Figure 2 Daily average PM10 in winter 2022, showing concentrations below the benchmark.

Daily average PM2.5 levels exceeded the benchmark at Gunnedah during mid to late June (Figure 3). Tamworth station recorded one day in the fair category during this period. Peaks observed at these stations were likely due to domestic woodsmoke.

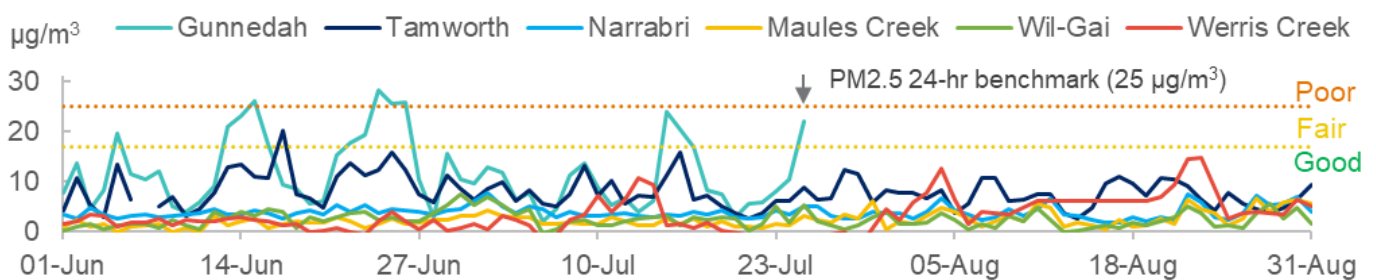


Figure 3 Daily average PM2.5 in winter 2022, showing concentrations below the benchmark.

Air quality: gaseous pollution winter 2022

Figure 4 and Figure 5 show that winter 2022 gaseous trends at Gunnedah station was characterised by broadly stable ozone and nitrogen dioxide concentrations, trailing well below O₃ and NO₂ standards³.

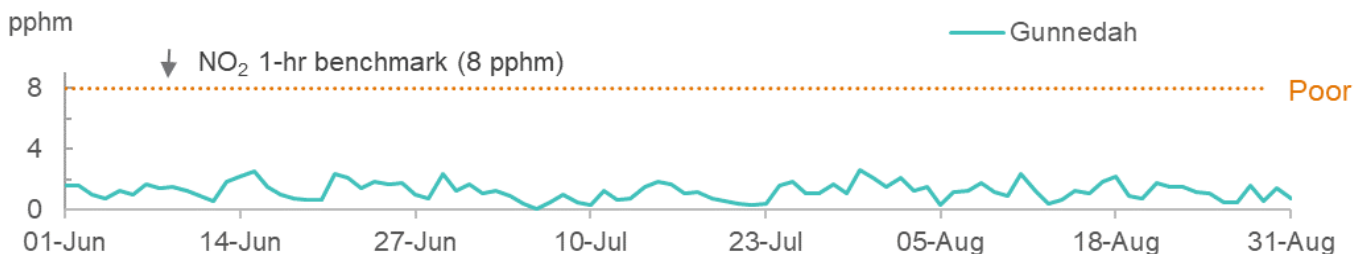


Figure 4 Ozone daily maximum 8-hour average concentrations at Gunnedah during winter 2022, showing levels below the benchmark.

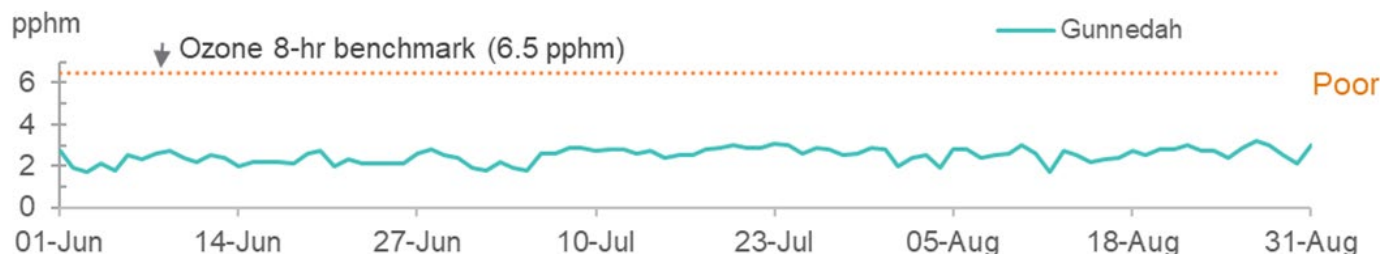


Figure 5 Nitrogen dioxide daily maximum 1-hour average concentrations at Gunnedah during winter 2022, showing levels below the benchmark.

³ Air quality categories based on the updated national gaseous standards (or benchmarks) are not yet established. Hence these plots only show an air quality category for 'poor', defined by the gaseous benchmarks.

Seasonal weather and climate

In June 2022, many parts of the state recorded rainfall totals 20% below their monthly averages⁴. During July and August, drier-than-average conditions persisted for the west and inland south, but for the central parts of the coast, dry conditions in June were followed by the wettest July on record and a very wet August⁵. Mean winter maximum and minimum temperatures were close to average, except over the south-eastern quarter of the state, where minimum temperatures were above average, likely due to increased cloud cover.

Drought conditions and dust activity

The NSW DPI Combined Drought Indicator (CDI) showed 100% of the state in the Non-Drought category at the end of August 2022 (Figure 6)⁶. DustWatch⁷ reported very little dust activity in the North West NSW region during winter 2022, and Gunnedah observed no dust activity in terms of hours of dust activity. These were the result of good ground cover, wetter than average conditions, and below average wind strength.

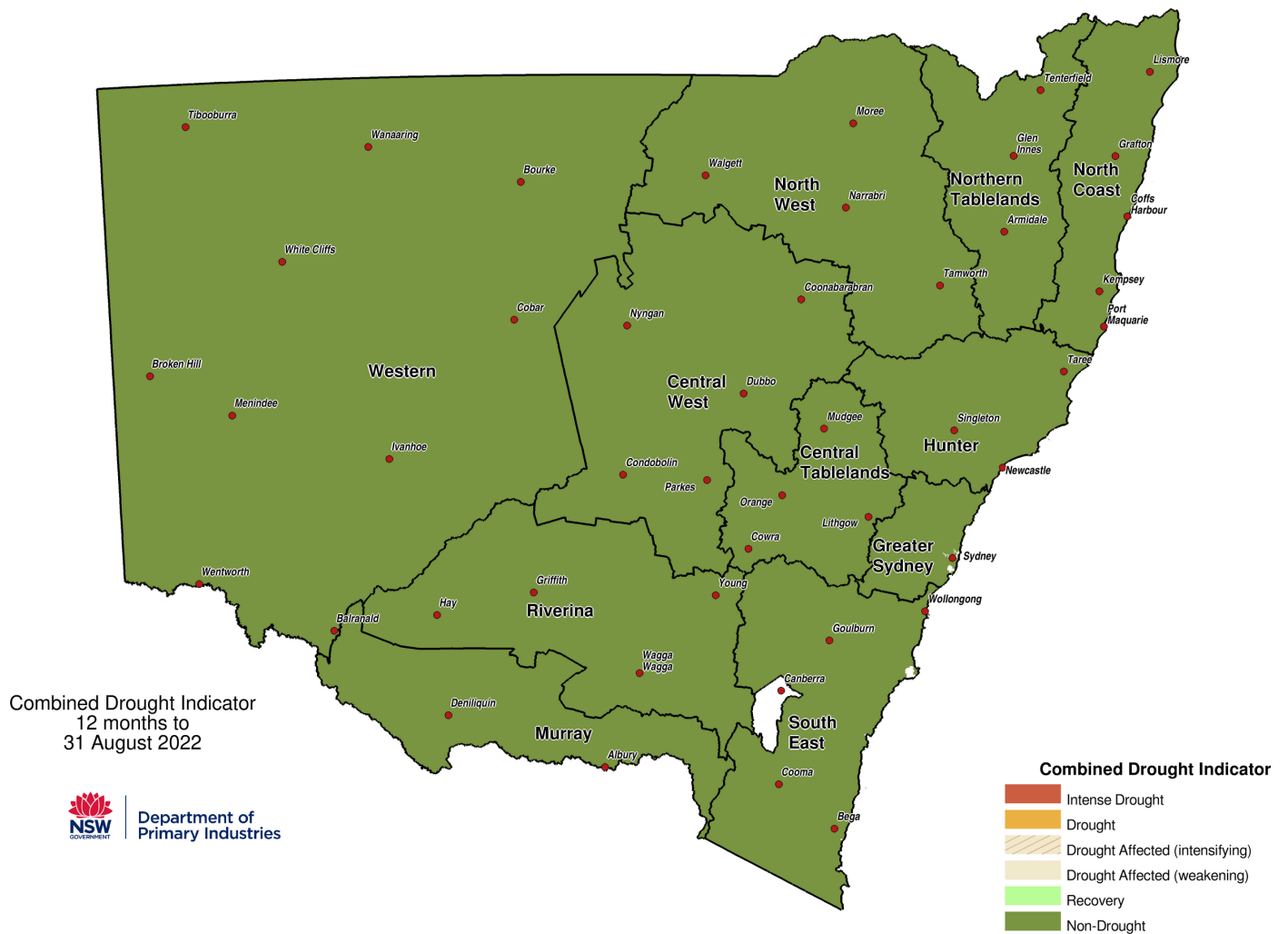


Figure 6 NSW Combined Drought Indicator – 12 months to 31 August 2022, showing non-drought conditions across the Namoi/North West region and generally across the state.

⁴ Seasonal Climate Summary for New South Wales in winter 2022, Bureau of Meteorology, accessed March 2023.

⁵ Decile maps for three months to 31 August 2022 for NSW: rainfall (June 2022, July 2022, and August 2022) and temperature (maximum and minimum), Bureau of Meteorology, accessed March 2023.

⁶ Drought conditions - NSW State Seasonal Updates: June 2022, July 2022 and August 2022, Department of Primary Industries, accessed March 2023.

⁷ DustWatch Reports: June 2022, July 2022 and August 2022, Department of Planning and Environment, accessed March 2023.

Rainfall

The Bureau of Meteorology’s (BOM) seasonal rainfall summary at Figure 7⁸ shows that winter 2022 rainfall levels were ‘average’ for most of the Namoi/North West Slopes region. Seasonal totals for the region as a whole ranged between 100–200 millimetres (mm)⁸. When compared against recent trends, winter totals for the region were higher in 2022 relative to the past 3 years (2019, 2020, 2021)⁸.

Seasonal rainfall totals at individual BOM stations, Tamworth AWS (141 mm)⁹ and Gunnedah AWS (142 mm)¹⁰, were slightly above their long-term winter totals (106–134 mm)^{11,12}. The department’s Gunnedah air quality monitoring station (Gunnedah AQM) recorded 160 mm of rainfall (Figure 8)¹³, also trending above these long-term totals.

Figure 8 shows the rainfall pattern at Gunnedah AQM during the winter 2022 season (green bars). Winter 2022 recorded a higher frequency of rainfall days (22 days) when compared to the Bureau’s long-term observations at Gunnedah AWS (13 days)¹³. Viewing monthly rainfall data, June rainfall total was the lowest and below average relative to long-term average data from Gunnedah AWS. Later in the season, an East Coast Low in June and a vigorous cold front in August resulted in the wettest July on record and above-average rainfall in August. Gunnedah AWS recorded its highest-ever monthly rainfall total (102 mm) in August 2022¹¹, while the monthly total at Gunnedah AQM was 117 mm according to the department’s records.

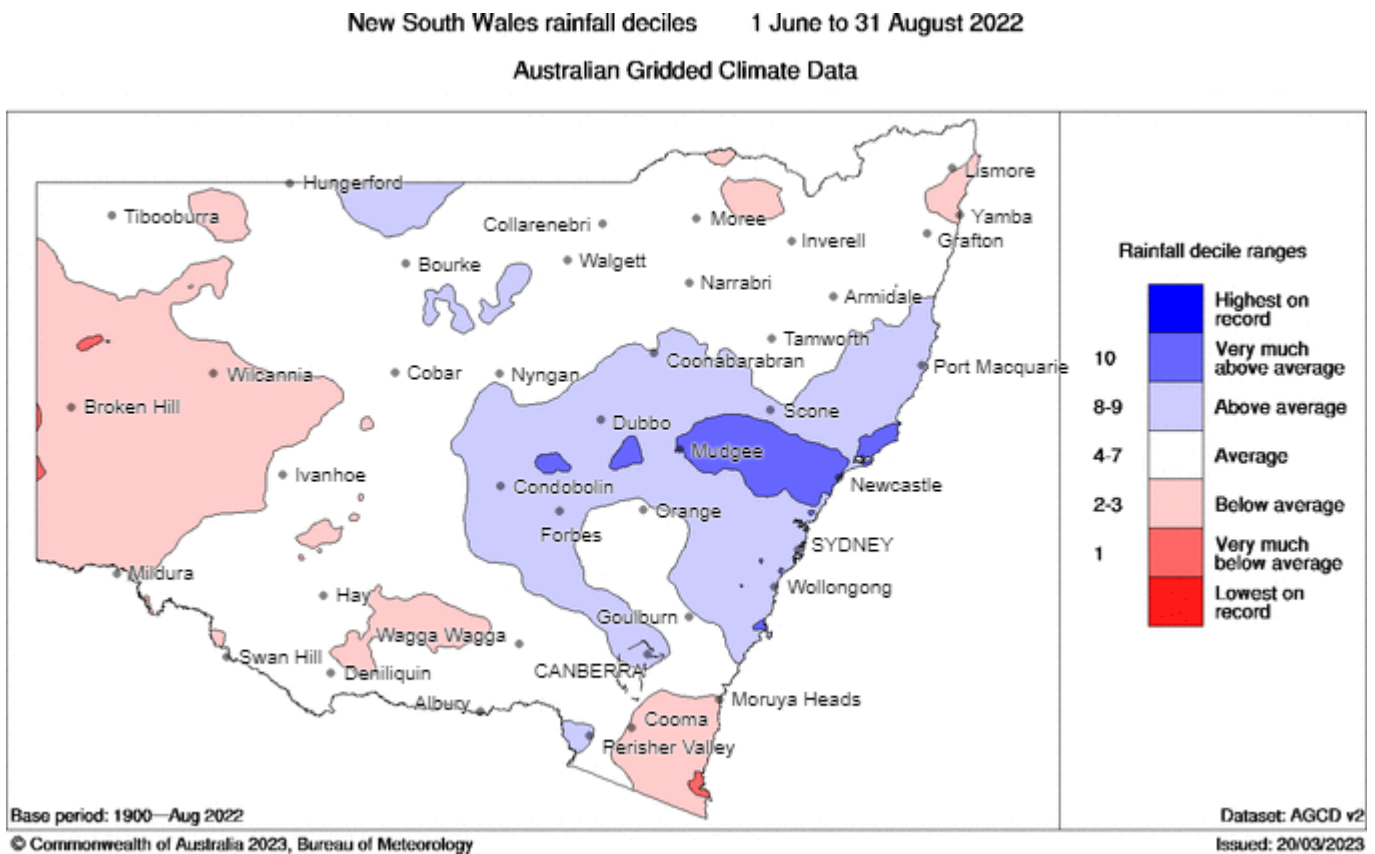


Figure 7 NSW rainfall deciles for winter, 1 June to 31 August 2022, showing average rainfall in the Namoi/North West Slopes region.

⁸ Regional winter 2022 rainfall totals and 1-year to 3-year differences, Bureau of Meteorology, accessed March 2023.

⁹ Tamworth Airport Automatic Weather Station (AWS), NSW - Daily Weather Observations (bom.gov.au), accessed March 2023.

¹⁰ Gunnedah Airport AWS, NSW - Daily Weather Observations (bom.gov.au), accessed March 2023.

¹¹ Gunnedah Airport AWS summary climate statistics, Bureau of Meteorology, accessed March 2023.

¹² Tamworth Airport AWS summary climate statistics, Bureau of Meteorology, accessed March 2023.

¹³ DPE observations at Gunnedah air quality monitoring (AQM) station. These data are not NATA accredited.

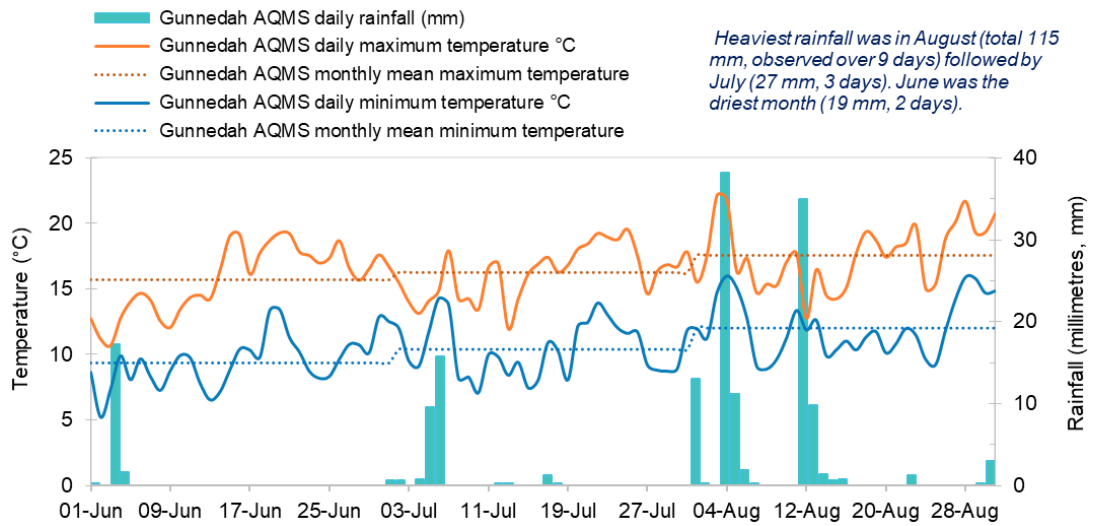


Figure 8 Gunnedah AQM station meteorology conditions, showing rainfall days and seasonal maximum and minimum temperatures during winter, 1 June to 31 August 2022.

Temperature

Maximum (daytime) temperatures across the Namoi/North West Slopes region were generally average to below average according to the Bureau’s winter 2022 seasonal summary (Figure 9)⁶. The department’s Gunnedah AQM station recorded cooler-than-average days (maximum temperatures) compared to long-term data from Gunnedah AWS, while overnight (minimum) temperatures were above average. Winter maximum temperatures at Gunnedah AQM station ranged from 10.7–22.2°C (orange line at Figure 8), with an average of 16.5°C, about 2°C lower compared to the long-term average winter maximum at Gunnedah AWS (18.2°C)¹³. Minimum temperatures at Gunnedah AQM station from ranged 5.2–16°C (blue line), with an average of 10.6°C, about 8°C higher than the Gunnedah AWS¹³ long-term average winter minimum (2.7°C). High cloud cover and rainfall during July and August across the region likely led to the cooler-than-average days and average to warmer-than-average nights.

Maximum Temperature Deciles 1 June to 31 August 2022
Distribution Based on Gridded Data
Australian Bureau of Meteorology

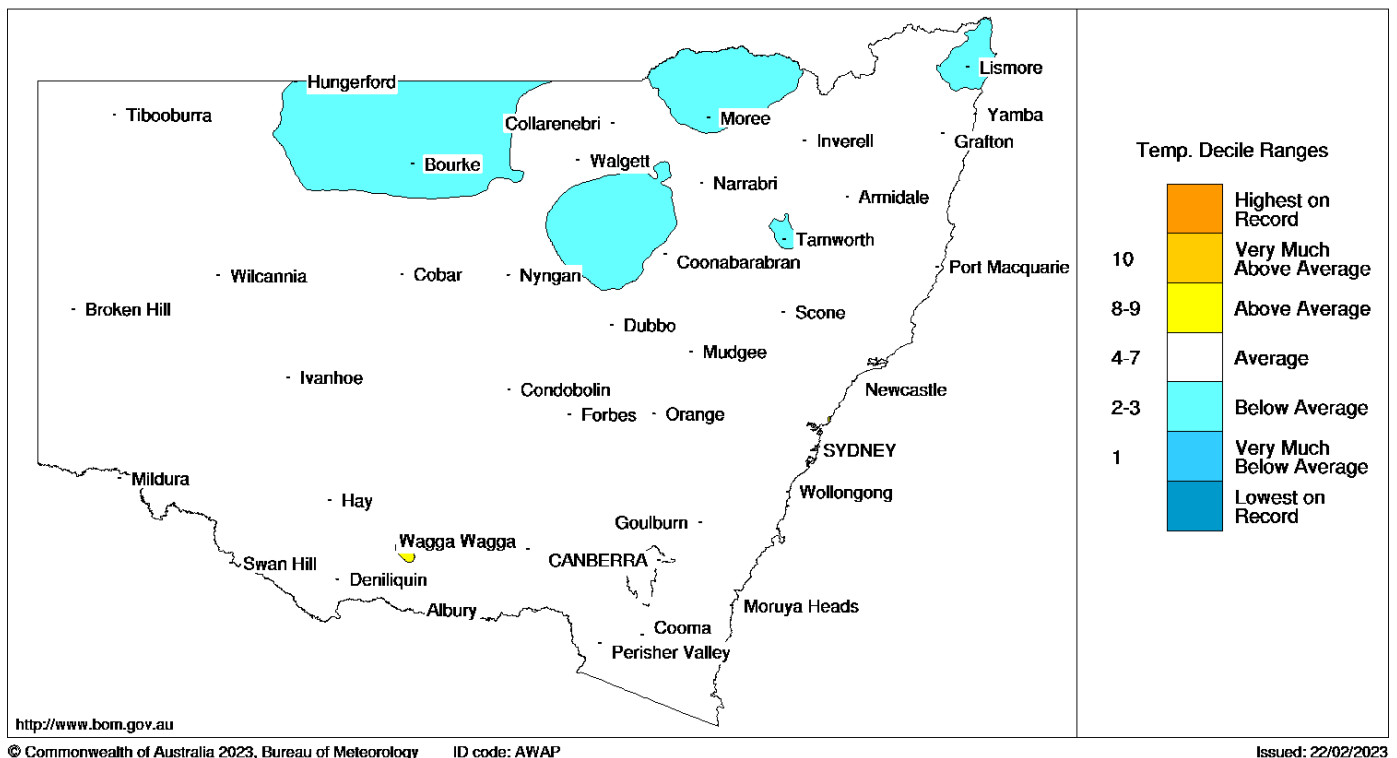


Figure 9 NSW maximum temperature deciles, showing near average maximum temperatures in the North West Slopes region during winter, 1 June to 31 August 2022.

Wind

The topography of the North West Slopes region is characterised by highlands in the east and south, and to the west lies a broad floodplain, with Namoi River flowing north-west through Gunnedah and Narrabri, and Peel River flowing north-west through Tamworth. Prevailing winds across the region generally align with direction of the Namoi and Peel River valleys, that is, along the south-east to north-west sector.

The wind rose map at Figure 10 shows wind direction and speed in the region, with the length of the bars showing the percentage of time wind blows from each direction, and colours along the bars indicating wind speed categories.

As is typical for the Namoi region during winter months, prevailing winds in winter 2022 were generally light to moderate south-easterlies. At Tamworth and Gunnedah some influence from other sectors was observed, while at Narrabri the south-easterlies dominated, and winds were stronger than at other locations.

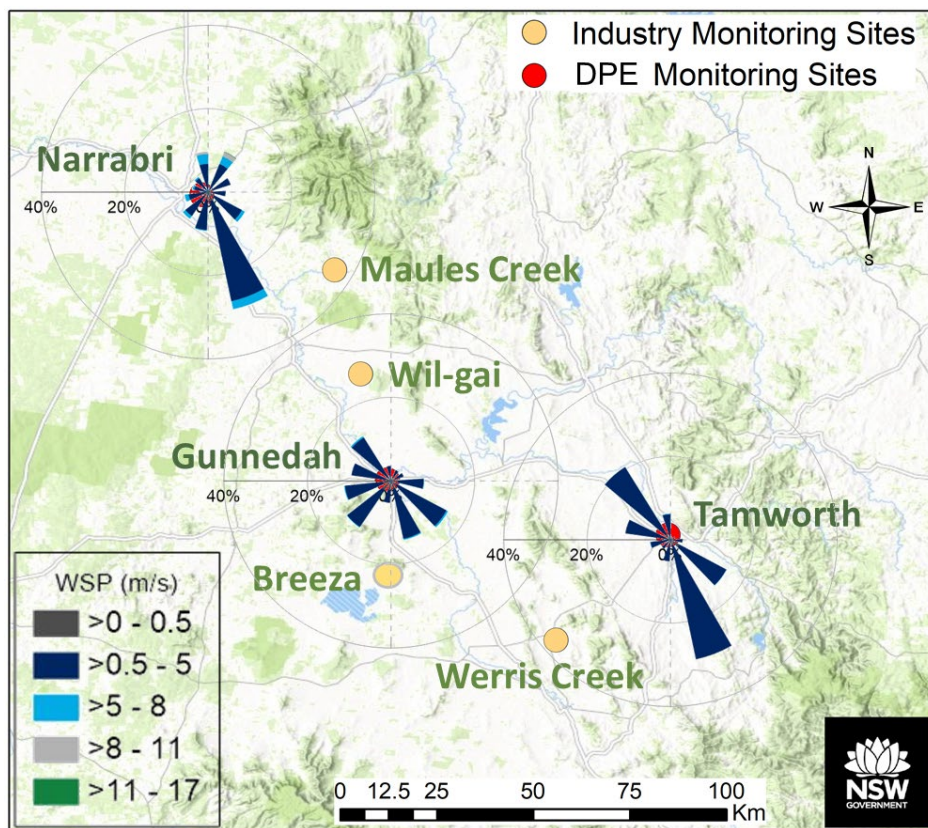


Figure 10 Wind rose map for the Namoi/North West Slopes during winter 2022.

Pollution roses from hourly particle data

Pollution roses show the wind direction and particle levels at a location, with the length of each bar around the circle showing the percentage of time wind blows from each direction. The colours along the bars indicate the concentration of particle levels. Figure 11 shows the winter 2022 pollution roses for the 3 regional centres (Narrabri, Gunnedah, and Tamworth).

High levels of hourly PM10 and PM2.5 were predominantly associated with south easterly winds at all stations, but at Gunnedah the most elevated particle levels were associated with southwesterlies. Elevated particle levels at Tamworth and Gunnedah were occasionally observed under north westerlies.

Gunnedah AQM station¹⁴ is located within the region’s population centre, as is Tamworth AQM station¹⁵. Both stations are surrounded by high population densities, while Narrabri AQM station¹⁶ is located at Narrabri Airport, outside of the regional population centre located to the west. There are no major population centres influencing Narrabri under predominant south-easterlies observed during winter.

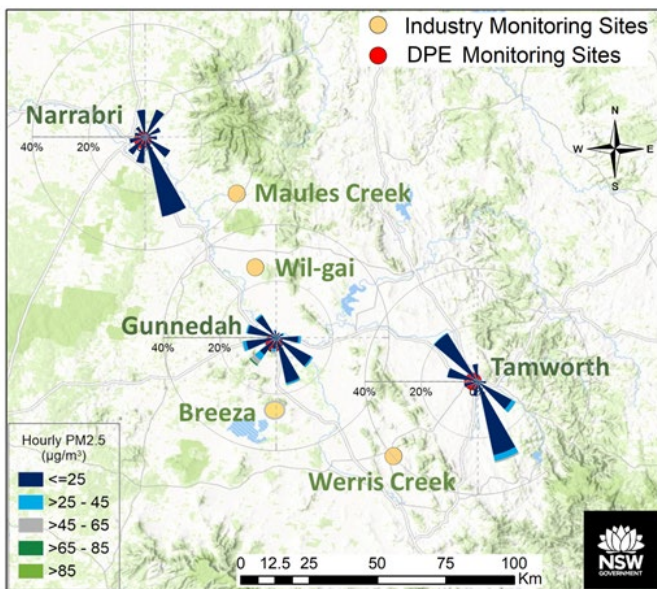
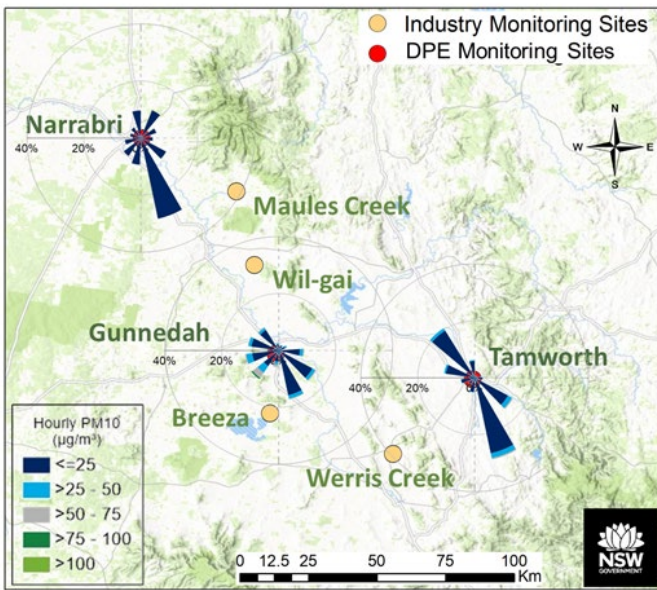


Figure 11 Pollution roses for hourly PM10 (top) and hourly PM2.5 (bottom) in winter 2022.

¹⁴ [About the DPE Gunnedah Air Quality Monitoring station.](#)

¹⁵ [About the DPE Tamworth Air Quality Monitoring station.](#)

¹⁶ [About the DPE Narrabri Air Quality Monitoring station.](#)

Online performance of monitoring stations

The target performance for air quality monitoring at the Department of Planning and Environment stations is at least 95% data availability for all criteria pollutants and meteorological parameters. The maximum online time attainable for gases, NO₂ and O₃, is 96% due to daily calibrations.

Table 2 presents online performance of monitoring stations at Gunnedah, Narrabri and Tamworth during winter 2022:

- Narrabri and Tamworth met online target for PM10 and PM2.5 monitoring
- Gunnedah did not meet online targets for PM10 and PM2.5
- all stations met online targets for monitoring of meteorology.

Table 2 Online performance (%) from 1 June to 31 August 2022

Station	Particles PM10 daily	Particles PM2.5 daily	Gases NO ₂ hourly	Gases O ₃ hourly	Meteorology wind hourly
Gunnedah	59.8	59.8	93.8	95.5	100.0
Narrabri	100.0	100.0	-	-	99.9
Tamworth	100.0	98.9	*	*	99.8

'-' not monitored

Reduced online times were due to:

- Gunnedah PM10 and PM2.5: intermittent data loss occurred from 14 April to 20 October 2022 due to ongoing instrumentation problems. Data for the period 1 June to 20 July was validated upon internal review, while data from 29 July to 31 August was deemed invalid, leading to data loss during winter 2022.
- Tamworth NO₂ and O₃: monitors were decommissioned on 13 May 2022, marking the end of a summer monitoring campaign spanning 2 seasons (November 2020 to March 2022).

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