

Estimated evapotranspiration for the Victorian Water Accounts 2024-25

Introduction

Evapotranspiration is the sum of transpiration by plants plus evaporation from soil, open water surfaces and the wet surfaces of plants soon after rainfall. This appendix presents modelled estimates of evapotranspiration for 2024-25.

The evapotranspiration and rainfall estimates reported in this appendix have been calculated by the Bureau of Meteorology using the [Australian Landscape Water Balance model](#) (AWRA-L)¹.

The AWRA-L evapotranspiration output used is “E_{tot}” — the modelled landscape actual evapotranspiration, or the total evapotranspiration from vegetation, soil and groundwater.

The adoption of AWRA-L outputs to report on evapotranspiration and rainfall for 2024-25 follows the method used since the 2019-20 Victorian Water Accounts. Prior to 2019-20, previous editions of the Victorian Water Accounts used evapotranspiration estimates based on results from the SoilFlux model, a one-dimensional water balance model. The 2019-20 Victorian Water Accounts documented a comparison of the new and old methods and reported that there was no obvious negative or positive bias when comparing the data.

The AWRA-L approach was adopted due to the availability and ease of use of AWRA-L model outputs, as well as the quality of the documentation that the Bureau of Meteorology provides to support the Australian Landscape Water Balance model.

More information on AWRA-L is available at <https://awo.bom.gov.au/about/overview>

Evapotranspiration in 2024-25

Evapotranspiration amounts vary considerably across Victoria depending on a range of factors including rainfall conditions and land cover. Averaged across Victoria as a whole, evapotranspiration in 2024-25 was estimated to be 483 mm, which was lower than the long-term average calculated based on a post-1975 historic climate reference period. The evapotranspiration in 2024-25 was 17% lower than that reported for 2023-24.

Modelled estimates of basin evapotranspiration are presented in Figure A-1. Evapotranspiration is presented in terms of millimetres per unit area, to allow for direct comparison between basins of different sizes.

Figure A-1 shows that conditions across the western and central regions of the state were below the long-term average while the far eastern region generally experienced annual evapotranspiration conditions close to the long-term average.

The Wimmera-Avon Rivers basin in north-western Victoria had the lowest evapotranspiration relative to the long-term average conditions, with 2024-25 conditions approximately 33% below average. All other basins in the north-west and south-west regions experienced annual evapotranspiration at least 13% below the long-term average. Below average evapotranspiration across the western regions is a result of the relatively low rainfall, where the 2024-25 annual rainfall was between 14 and 37% below the long-term average rainfall.

The East Gippsland basin in the south-east experienced the highest annual evapotranspiration in 2024-25 relative to the long-term average, with the annual evapotranspiration 7% above average. Other basins in the south-east region that experienced higher than average annual evapotranspiration were the most easterly basins. Basins in the south-east region located closer to Melbourne experienced annual evapotranspiration between 9 to 13% below average.

Annual evapotranspiration in river basins in the north-east of the state was below or close to average conditions, ranging between 85% to 100% of the long-term average.

Figure A-2 shows the annual rainfall for Victoria's river basins. Averaged across Victoria, the annual rainfall was 19% below the long-term average, and 7% less than 2023-24. At the river basin scale, rainfall was below the

¹ Frost, A. J., and Shokri, A., (2021) The Australian Landscape Water Balance model (AWRA-L v7). Technical Description of the Australian Water Resources Assessment Landscape model version 7. Bureau of Meteorology Technical Report. https://awo.bom.gov.au/assets/notes/publications/AWRA-Lv7_Model_Description_Report.pdf

long-term average conditions in many river basins during 2024-25 with some exceptions. The 2024-25 rainfall conditions in the Tambo, Snowy and East Gippsland basins in the south-east were above the long-term average. Rainfall in the Thomson and Mitchell River basins was close to the long-term average. Below average rainfall conditions were more widespread, with all other river basins experiencing rainfall at least 12% below the long-term average. The driest river basins were found in the north-west of Victoria, with the Wimmera-Avon Rivers basin receiving only 63% of the long-term average.

Figure A-3 shows evapotranspiration as a proportion of rainfall in Victoria's basins. Averaged across the state in 2024-25, the proportion of evapotranspiration to rainfall was higher than the long-term average. This is consistent with below-average rainfall across large areas of Victoria during 2024-25.

Figure A-1 Modelled evapotranspiration per unit area

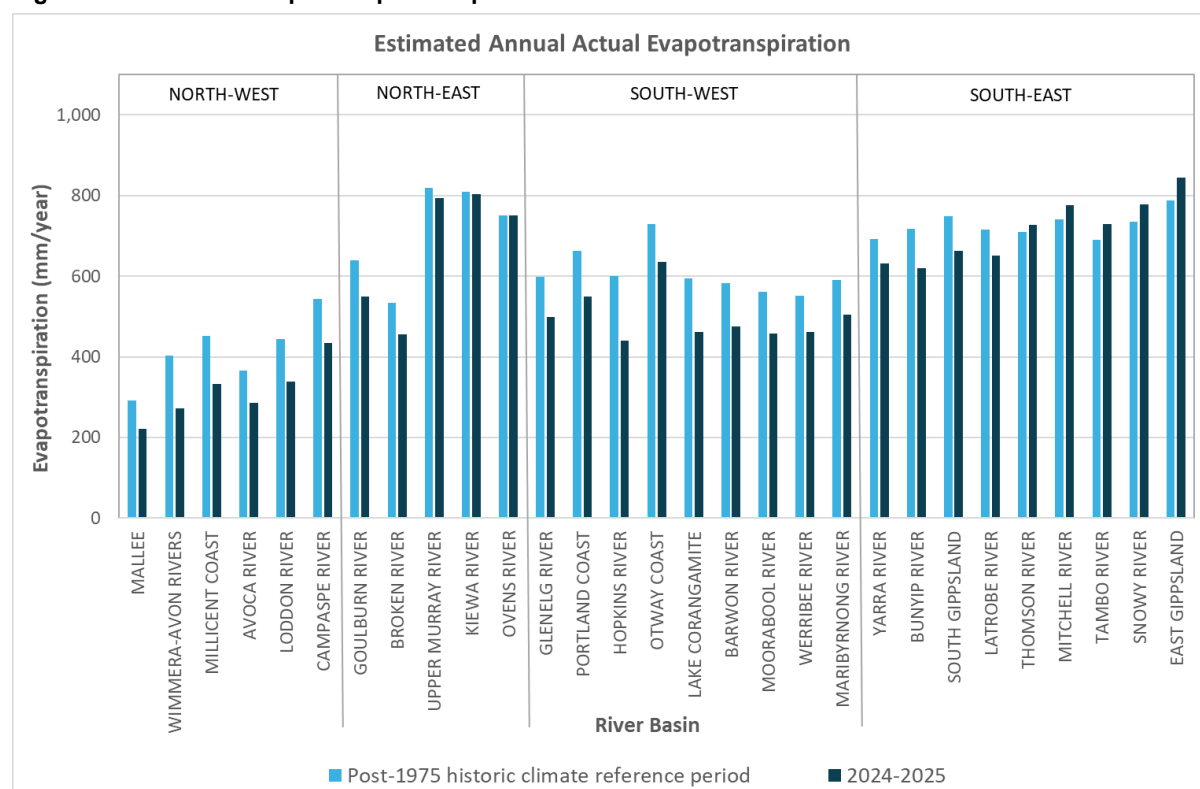


Figure A-2 Annual rainfall

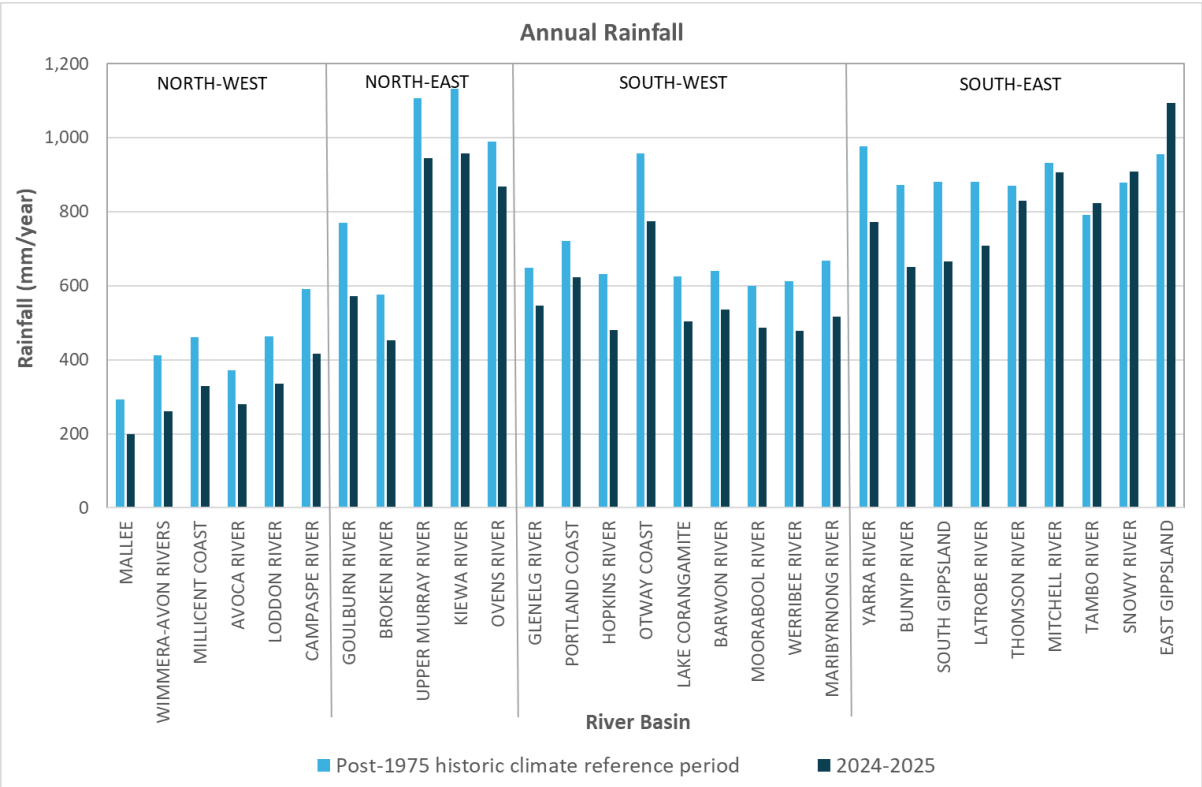
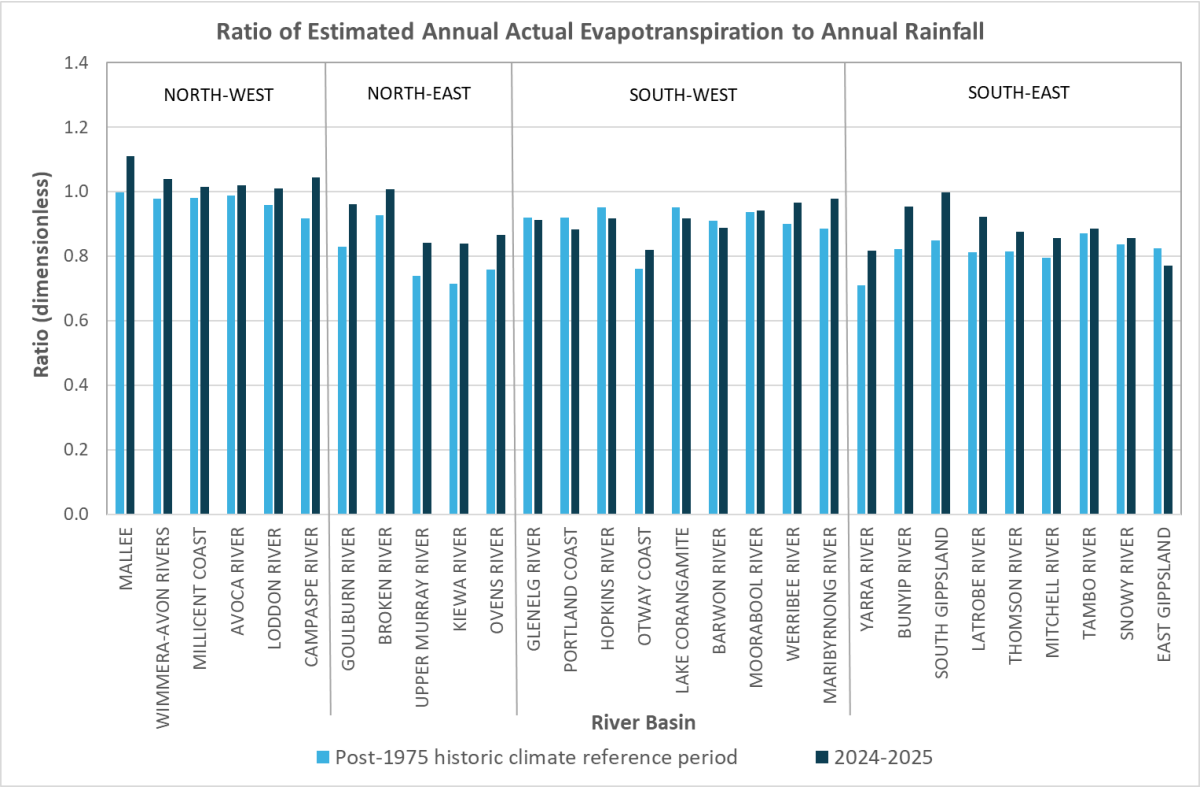


Figure A-3 Modelled evapotranspiration as a percentage of rainfall



North-east Victoria (Goulburn to Upper Murray basins)

All basins in the north-east of Victoria experienced below average rainfall conditions in 2024-25, with annual rainfall ranging from 12% to 26% below long-term average conditions (Figure A-2). The estimates of evapotranspiration were close to or below average for all north-eastern basins (0-15% below long-term average evapotranspiration), compared to above average conditions in 2023-24. The estimated evapotranspiration ranged from 456 mm in the Broken basin to 804 mm in the Kiewa basin (Figure A-1). A decrease in evapotranspiration was exhibited in all north-eastern basins in 2024-25 compared to the previous reporting period of 2023-24.

In 2024-25 evapotranspiration as a proportion of rainfall in the north-eastern basins was above the long-term average (Figure A-3) but decreased compared to 2023-24 conditions. The Broken basin was estimated to have the north-east's highest evapotranspiration as a proportion of rainfall — 101%, compared to the long-term average of 93% — and the lowest was in the Kiewa and Upper Murray basins: 84%, compared to the long-term average of 71% and 74%, respectively.

South-eastern Victoria (East Gippsland to Yarra basins)

There were mixed rainfall conditions across south-eastern Victoria in 2024-25, ranging from 25% below average to 15% above average (Figure A-2). The East Gippsland basin received the most rainfall relative to the long-term average, with annual rainfall relative to the long-term average tending to increase for more easterly basins. This reporting period was generally drier than the conditions experienced in 2023-24, with exception of the more easterly basins. Similarly, the estimated evapotranspiration rates in 2024-25 were higher than average in the most easterly basins, but below average closer to central Victoria. The evapotranspiration in East Gippsland basin was 7% above the long-term average, but 13% below the long-term average in the Bunyip basin. (Figure A-1). The estimated evapotranspiration ranged from 621 mm in the Bunyip basin to 844 mm in the East Gippsland basin. The modelled evapotranspiration decreased in most south-eastern basins compared to the 2023-24 reporting period. The East Gippsland basin was the exception to this trend, where there was a small increase in the estimated evapotranspiration compared to 2023-24.

In 2024-25 evapotranspiration as a proportion of rainfall was close to or above the long-term average in all basins (Figure A-3). The South Gippsland basin was estimated to have the south-east's highest evapotranspiration as a proportion of rainfall — 100%, compared to the long-term average of 85% — and the lowest was in the East Gippsland basin: 77%, compared to the long-term average of 82%.

South-western Victoria (Maribyrnong to Glenelg basins)

Rainfall over south-western Victoria in 2024-25 was below the long-term average, with basins receiving between 76%-86% of the average (Figure A-2). The estimated evapotranspiration was also below the long-term average for all basins, with the regional evapotranspiration rates between 73% and 87% of the long-term conditions (Figure A-1). The 2024-25 estimated evapotranspiration values ranged from 440 mm in the Hopkins basin to 635 mm in the Otway Coast basin. All basins experienced a decrease in evapotranspiration from the last reporting period.

In 2024-25, evapotranspiration as a proportion of rainfall across south-western basins was close to but varied around the long-term average (Figure A-3). The Maribyrnong basin had the highest ratio of evapotranspiration as a proportion of rainfall in the south-west at 98%, compared to the long-term average of 89%. The lowest ratio of evapotranspiration as a proportion of rainfall was the Otway Coast basin with 82%, compared to the long-term average of 76%.

North-western Victoria (Mallee to Campaspe basins)

Rainfall conditions in 2024-25 were below average across the north-west, with the annual totals ranging from 25-37% below average (Figure A-2). During this year, evapotranspiration was also below the long-term average for the north-west basins, ranging from 20% to 33% below average conditions (Figure A-1). The estimated evapotranspiration ranged from 222 mm in the Mallee basin to 435 mm in the Campaspe basin, which reflects a decrease in all basins compared to 2023-24.

In 2024-25, evapotranspiration as a proportion of rainfall for the north-western basins was close to or greater than the long-term average, with the greatest difference being 14% in the Campaspe basin (Figure A-3). The highest ratio of evapotranspiration to rainfall was in the Campaspe and Wimmera-Avon Rivers basins at 104% in 2024-25, compared to the long-term average of 92% and 98%, respectively. The lowest ratio of evapotranspiration to rainfall occurred for the Loddon and Millicent Coast basins, where the 2024-25 ratio in both basins was 101%, compared to the long-term average of 96% and 98%, respectively.

Key assumptions and data limitations

The estimates of evapotranspiration presented in this appendix are based on results from the Bureau of Meteorology's Australian Landscape Water Balance model (AWRA-L)².

² Information about the assumptions of the AWRA-L model can be found in Frost, A. J., and Shokri, A., (2021): https://awo.bom.gov.au/assets/notes/publications/AWRA-Lv7_Model_Description_Report.pdf

Modelling evapotranspiration requires many approximations and assumptions that qualify the accuracy of the estimates. Major assumptions and limitations of the method used to derive the above estimates of evapotranspiration include:

- representing the landscape as only 3 land use types: shallow and deep-rooted vegetation, and impervious surfaces (urban areas and rocky outcrops). The latter landscape type was added in AWRA version 7
- not explicitly accounting for actual evapotranspiration in irrigated areas or over reservoirs and lakes.

This modelling approach and associated uncertainties mean that the estimated evapotranspiration reported here may differ from the water balance estimates reported for each basin in other sections of the Victorian Water Accounts. Additionally, version updates made by the Bureau of Meteorology to the AWRA model may make it difficult to directly compare evapotranspiration estimates reported in the Victorian Water Accounts from year to year. Readers should interpret the data with care.

The basin areas used to report evapotranspiration estimates are slightly different to those used for reporting in the Victorian Water Accounts' surface water local reports. In the surface water local reports, the Murray basin captures information about Murray River irrigation districts in the Mallee, Avoca, Loddon, Campaspe, Goulburn and Broken basins. For evapotranspiration reporting, these irrigation districts are included within their host river basin (for example, the Mildura Irrigation District is in the Mallee basin). However, as noted above, the evapotranspiration estimates do not account for water applied by irrigation.