

# How multi-criteria analysis climate modelling could be used to influence Chardonnay wine grape production in NSW

Fahey D, Holzapfel B, Dunne K, Kelley J, Ellis B and Lawson J  
Department of Primary Industries, NSW

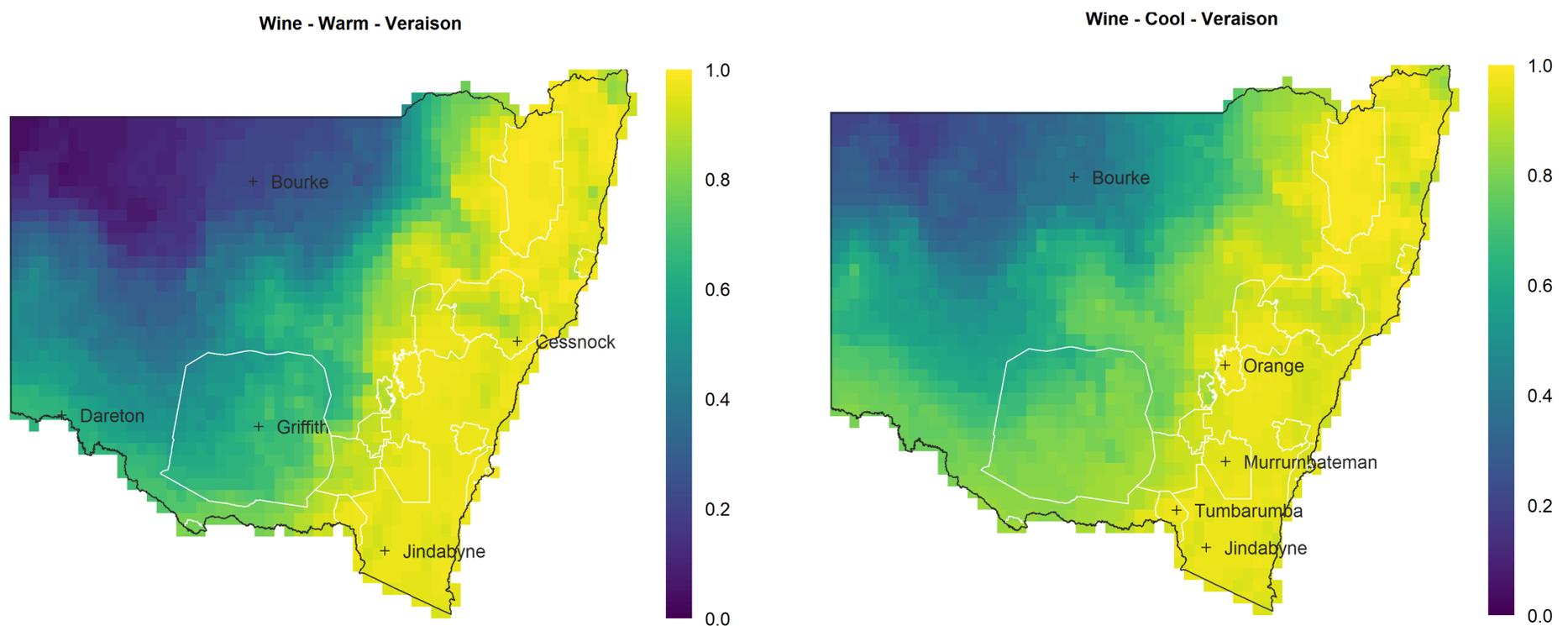
**BACKGROUND:** Wine grape production is constantly under stress from variability in climatic conditions. Understanding how climate changes will affect production in each NSW wine region will assist with future decisions regarding Chardonnay management, including identifying priority adaptation and mitigation strategies. The cultivar Chardonnay was chosen to model as it accounts for approximately 70% of NSW total white varietal crush.

## METHODS

- Data for key climatic variables (e.g. chill portions, temperature and rain) for each phenological phase (e.g. dormancy, budburst, shoot growth, flowering, berry growth, véraison, harvest and post-harvest) were gathered and used to create an MCA hierarchical structure that underpins the climate suitability model.
- The MCA climate suitability model captures the extent to which the climate conditions satisfy the requirements for each phenophase, but does not consider other factors like management decisions, soil, and topography.
- Using data from 1970 to 2019 (50 years), the climate suitability for each phenophase is determined and then mapped for the state. Phenophase outputs are combined based on the 'importance' of each phenophase to production. The 'importance' values were determined by a panel of NSW viticulturists. Figure 1 shows the annual climate suitability for Chardonnay during véraison.

## GROWING DEGREE DAYS (GGD) VS FIXED DATE MODEL

- Unable to develop a 'state-wide' GDD model for Chardonnay due to a lack of regional phenology data to validate the calendar dates produced by the model.
- Instead, two MCA models were developed to investigate production in warm and cool climate wine-growing regions of NSW. The models use fixed date ranges for phenology, which were based off reference sites in each region.



**Figure 1.** Average (1970–2019) climate suitability score during véraison, the range in suitability is from 0 to 1, with 0 representing very low suitability and 1 representing highly suitable climate conditions. The areas labelled on the map indicate the locations used for temperature comparison, and the white polygons represent the wine regions in NSW.

## RESULTS

- The spatial maps indicate where there are areas of high and low climate suitability for Chardonnay production.
- The outputs from the Chardonnay MCA show the potential benefits of the process by identifying the areas in NSW with high climate suitability as well as the key climate risks for vineyard plantings, production and quality.
- It also showed some gaps in our understanding of the optimal to sub-optimal climate conditions for Chardonnay growing in NSW.

## FUTURE WORK

- NSW DPI will run the models on future projections data (2050) to investigate how climate change may affect production in NSW.
- Concurrently models have also been developed for Chardonnay quality, water demand and key biosecurity risks for viticulture. These results will be integrated with the Chardonnay model to provide further insight into the climate vulnerabilities for production in NSW.
- Industry, government and community will be able to access and use the findings strategically to enhance Chardonnay production in NSW and direct future investment to targeted locations.

Reports will be available at <https://www.dpi.nsw.gov.au/dpi/climate/climate-change-and-primary-industries/explore-by-industry/horticulture>

This work has been completed as part of the DPI Climate Change Research Strategy funded by the NSW Climate Change Fund. We would like to acknowledge the viticulturists and growers that provided the data to help generate the models.