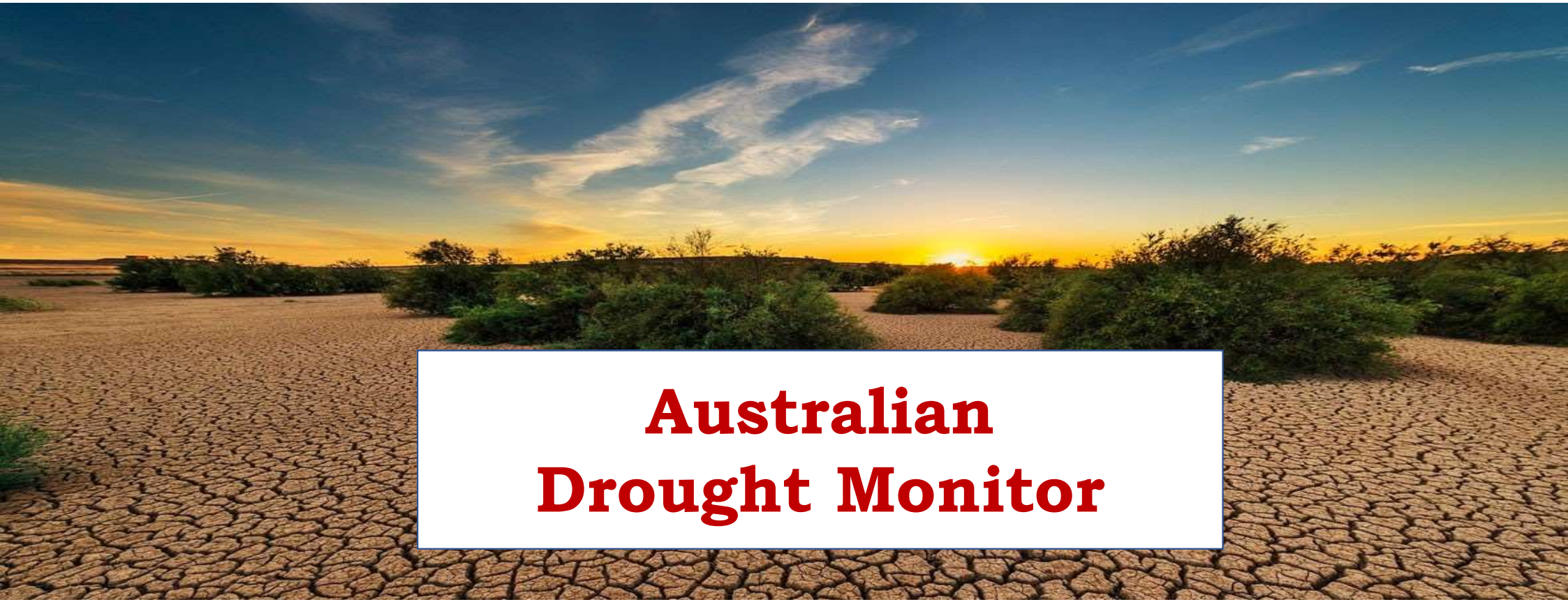


Australian Drought Monitor

Christa Pudmenzky

Centre for Applied Climate Sciences

University of Southern Queensland, Toowoomba, Queensland, Australia

christa.pudmenzky@usq.edu.au

IDMP - Virtual Exchange on Annual Meeting Preparation

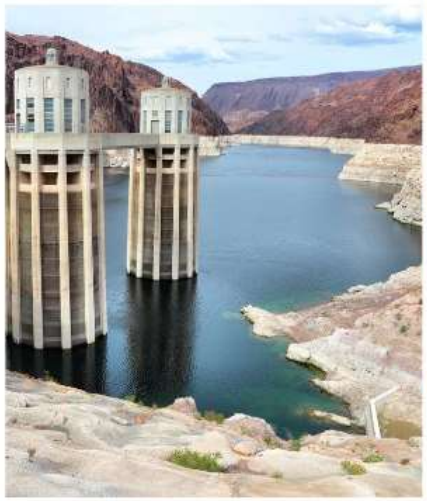
15 September 2021

World Meteorological Organization
Weather • Climate • Water

mla MEAT & LIVESTOCK AUSTRALIA
Queensland Government
UNIVERSITY OF SOUTHERN QUEENSLAND
Northern Australia Climate Program

WHAT ARE THE 5 TYPES OF DROUGHT ?

METEOROLOGICAL
drought refers to an extended period of dry weather patterns.



HYDROLOGICAL
drought refers to low water supply in our rivers, lakes, aquifers, and other reservoirs that often follows meteorological drought.

AGRICULTURAL
drought occurs when a water shortage significantly damages or destroys agricultural crops.

ECOLOGICAL
drought is the most recently defined type of drought and refers to widespread ecological damage caused by the lack of soil moisture.

SOCIOECONOMIC
drought refers to when a water shortage affects the supply and demand of drought commodities, such as water, food grains, and fish.

Nevada Division of Water Resources

Brief overview of the Australian Drought Monitor

Visit to NDMC, Oct 2018

- The Drought Monitor is modelled on the *U.S. Drought Monitor (USDM)* at the National Drought Mitigation Center at the University of Nebraska-Lincoln in the late 1990s.
- The *Combined Drought Indicator (CDI) is a scaled down version* which was also developed at NDMC.
- The CDI concept is widely used in Europe, Africa, Asia and other countries.
- A*dvantage* of the CDI: only a *few variables are required* to calculate a CDI that monitors agricultural-related drought conditions.
- The *Australian Drought Monitor* is **completely objective** and does not include any human adjustments from ground observations prior to publication.

Development of the Australian Drought Monitor

The CDI is based on the combination of four different indices:

- Standard Precipitation Index (SPI)
- Evapotranspiration (ET)
- Soil Moisture (SM 0 – 1.0 m)
- Normalized Difference Vegetation Index (NDVI)

- The CDI calculation methodology combines the four data sets as given in the equation below:
  CDI= a x SPI + b x SM + c x ET + d x NDVI
  where a, b, c and d are respective weights assigned to each of the input data.

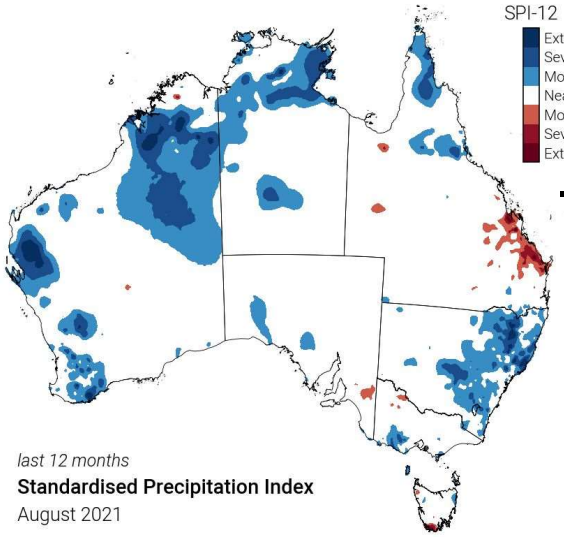
- The indices are calculated on a monthly basis for each grid cell (5 km x 5 km) over Australia.

Using the Australian Combined Drought Indicator (CDI)

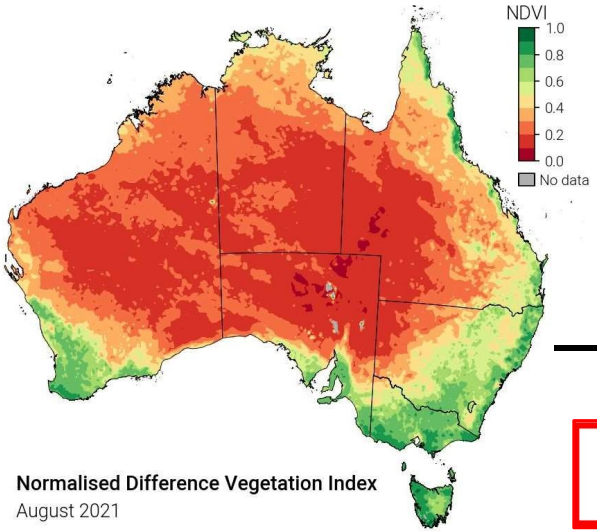
- The CDI is calculated as a percentile value, which is then converted into eleven categories:

Category	Percentile	Approximate frequency of drought
Exceptional Wet	98% to 100%	
Extreme Wet	95% to 98%	
Severe Wet	90% to 95%	
Moderate Wet	80% to 90%	
Slightly Wet	70% to 80%	
Near Normal	30% to 70%	
Slightly Dry	20% to 30%	1 in 3 years
Moderate Drought	10% to 20%	1 in 5 years
Severe Drought	5% to 10%	1 in 10 years
Extreme Drought	2% to 5%	1 in 20 years
Exceptional Drought	0% to 2%	1 in 50 years

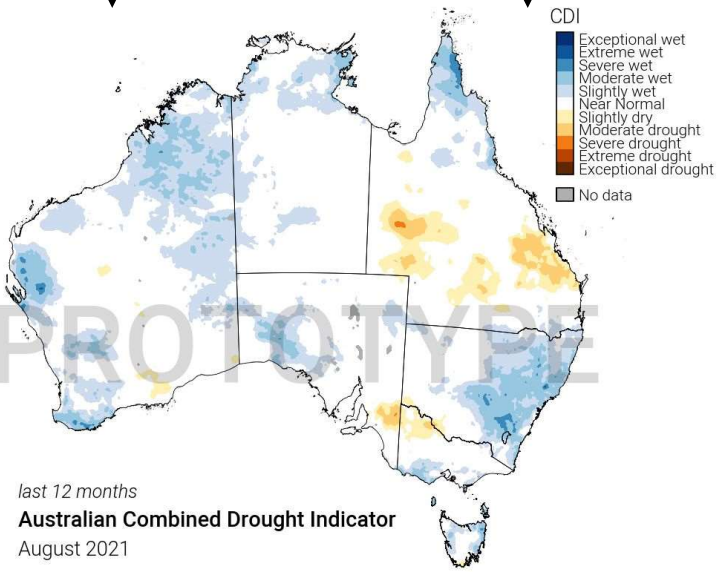
August 2021 CDI Map – 12 months



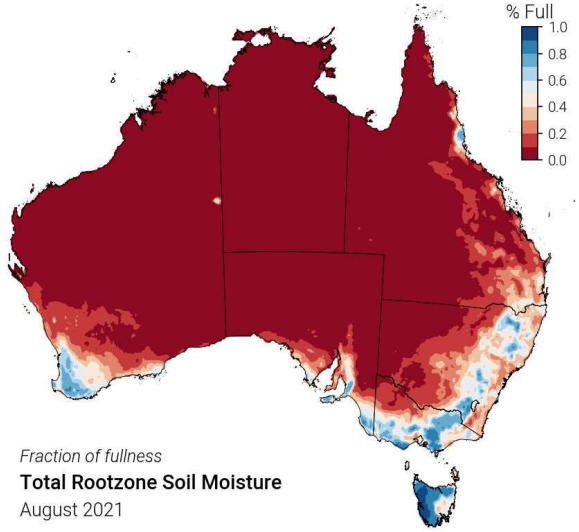
last 12 months
Standardised Precipitation Index
August 2021



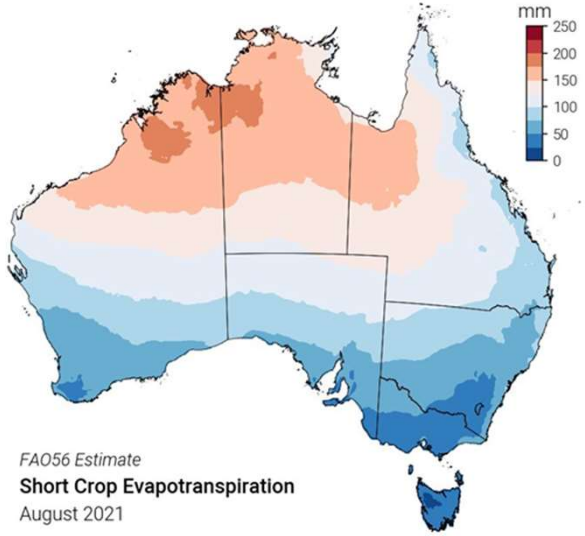
Normalised Difference Vegetation Index
August 2021



last 12 months
Australian Combined Drought Indicator
August 2021



Fraction of fullness
Total Rootzone Soil Moisture
August 2021



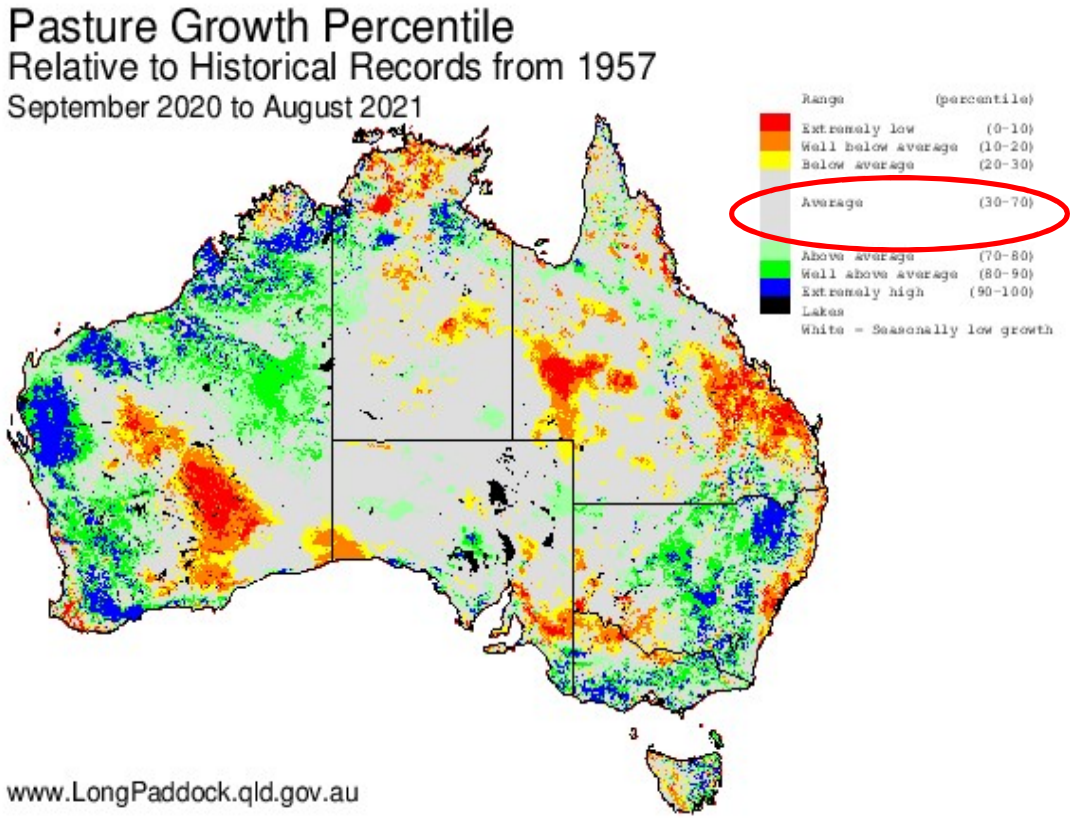
FAO56 Estimate
Short Crop Evapotranspiration
August 2021

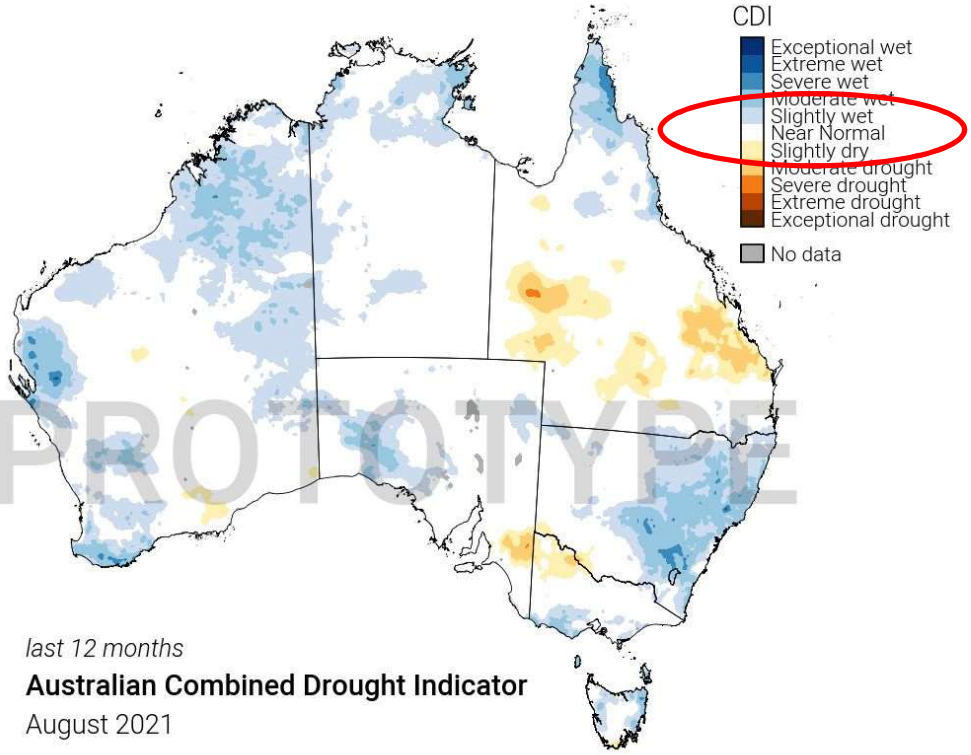
each 5 km x 5 km grid cell has a different weight

Northern Australia Climate Program

- The CDI has been calculated back to April 1998 when the Copernicus Global Land Service (Sentinel-3 satellite) vegetation data became available. This is a hindcast of more than 23 years.
- **Droughts** originate from a deficiency of precipitation leading to water shortages. The impacts are dependent on location, soil and vegetation types, intended use of water, storage capacity, time of year, duration and severity of the water deficit.
- To determine if a region is either going into drought, continues to be in drought or is coming out of drought it is recommended to view the CDI drought maps using different time scales (1, 3, 6, 9, 12, 24 or 36 months).
- Possible impacts of the different lengths of drought periods are available on the NACP website: **https://nacp.org.au/drought_monitor**

Validation of the Combined Drought Indicator
August 2021 – 12 months

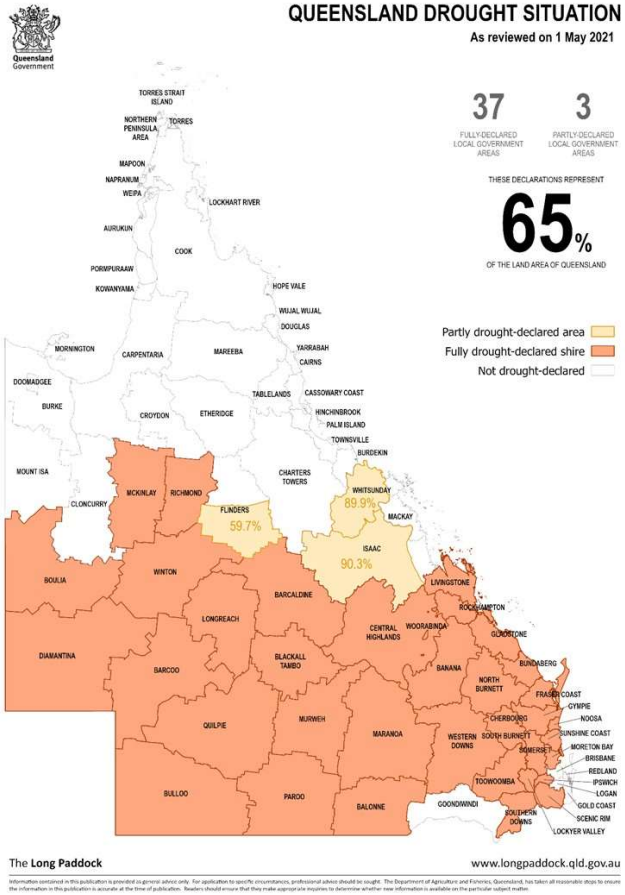




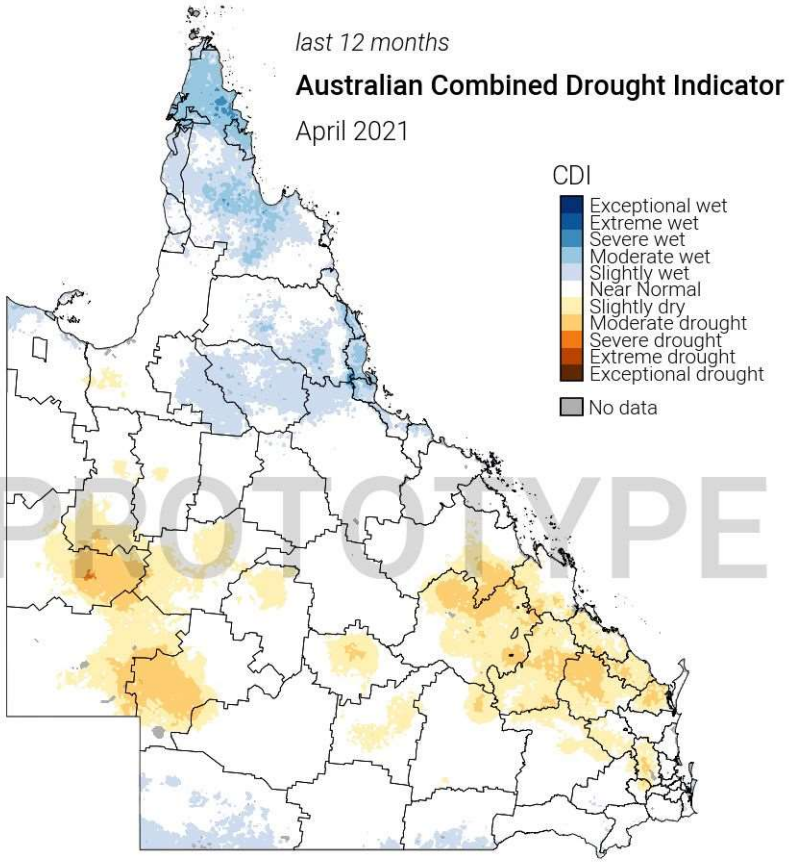
The Australian Drought Monitor reached a major milestone

- **Minister for Agricultural Industry Development and Fisheries - Mark Furner**

Press Release Saturday, 29 May 2021



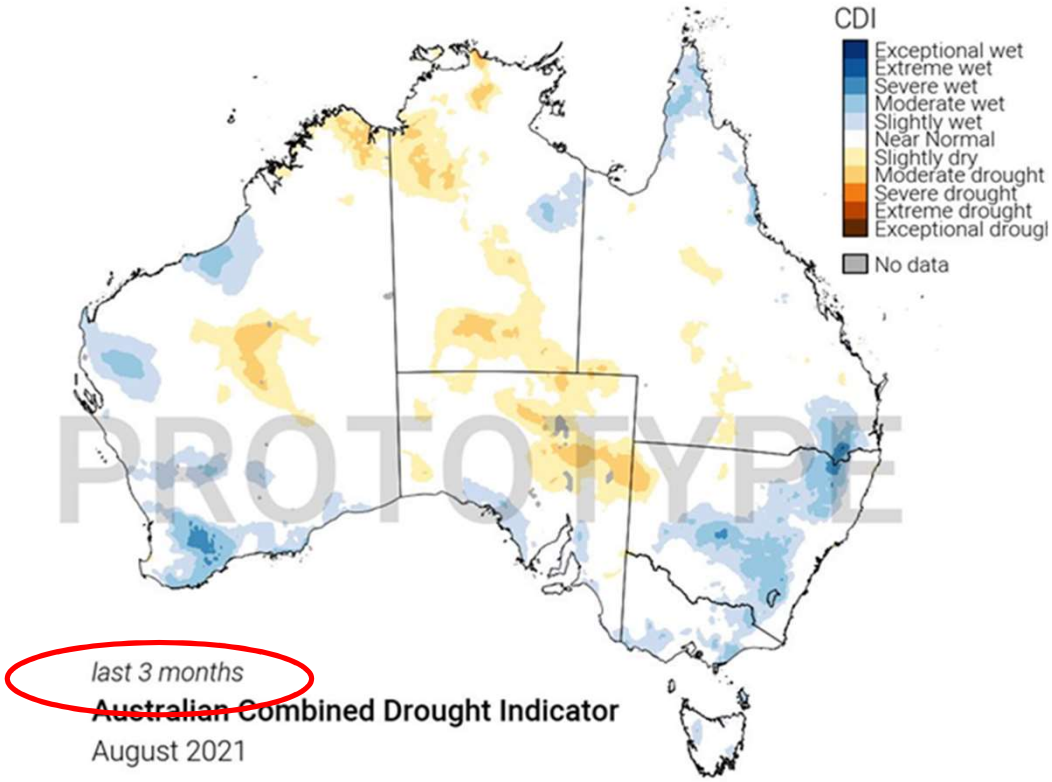
Direct Application:
Local Drought Committees (LDCs) uses the 12, 24 and 36 month CDI in the assessment of the drought status Queensland.

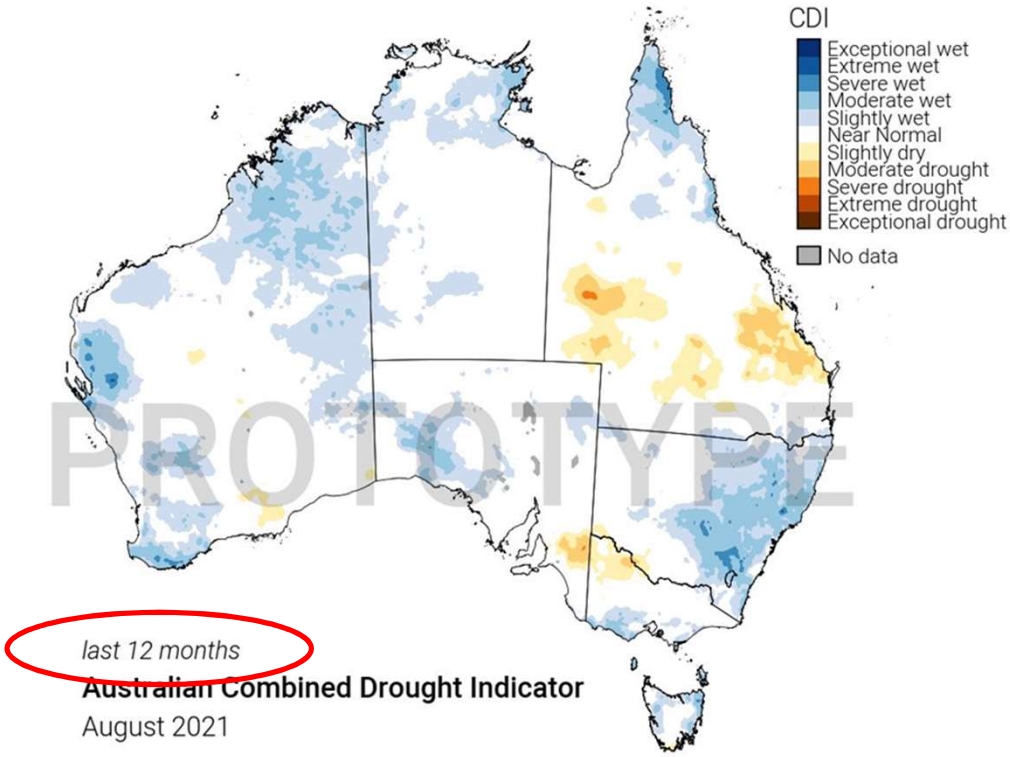


Validation of the CDI

- The Drought Monitor relies on field observations from extension officers, Climate Mates and other local experts to provide feedback to validate observational data and corresponding indices.
- **SurveyMonkey** is being used to collect drought-related condition and impact information from 'people on the ground' to produce a **Drought Condition & Impact Report.**
- If you would like to be part of the validation process please contact me on: christa.Pudmenzky@usq.edu.au

How dry or wet is it in your area?



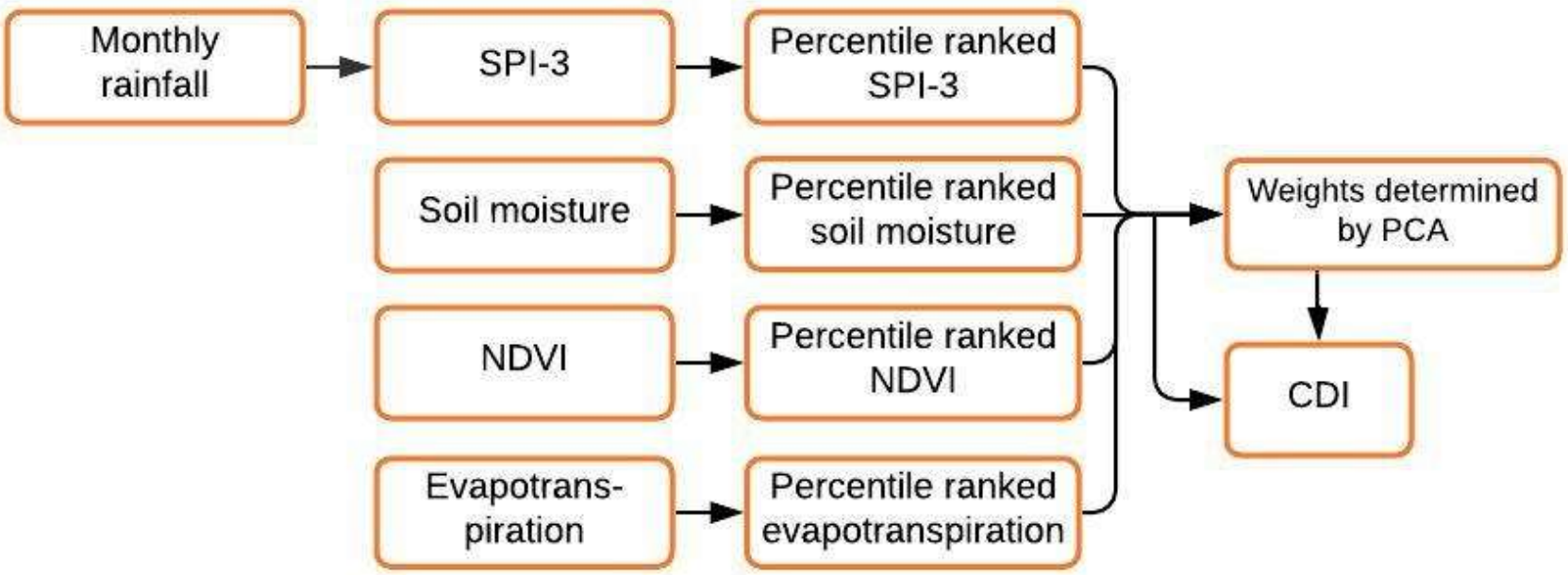


In Summary

- The development of the Australian Drought Monitor provides producers and growers with the ability to manage the effects of climate and weather variability and incorporate the information into their decision making, planning and reporting.
- The Australian Drought Monitor is a web-based tool that provides users with access to spatial information on the current status of drought.


Thank you

Overview of the Steps involved to produce the Australian CDI



- Each dataset is percentile ranked over a baseline period and the results combined using a weighted average.
- Principal Component Analysis (PCA) is used to determine the optimal weighting for the CDI for each grid cell for every month over Australia.