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|------------------------|---|
| Dust activity | Less than last month, below average for this time of year |
| Wind strength | Less than last month, average for this time of the year |
| Groundcover | Decreasing but still very good for this time of the year |
| Rainfall | Below average for NSW and VIC, wettest December in SA |
| Land management | Some fallowing in wheat belt, summer crops establishing |

Dust activity

There was very little dust activity across the network in December 2016 (Figure 1). The ongoing good groundcover is protecting most of the grazing country from wind erosion. Groundcover reduction (Figure 3) is predominantly occurring in grazing areas. Summer crop establishment has been good in the north of New South Wales and harvest of winter crops proceeded through the wheat belt (DPI seasonal report December 2016 - http://www.dpi.nsw.gov.au/data/assets/pdf_file/0010/691534/NSW-Seasonal-Conditions-Report-December-2016.pdf). Small areas of bare fallow can explain the dust we have registered in the Victorian Mallee (red circle in Figure 2).

Walpeup recorded a moderate dust storm with visibility below 1km on 8 December 2016. Wind speeds exceeded 45km/h on that day. Dust also registered in Deniliquin, Narrandera and Temora that day.

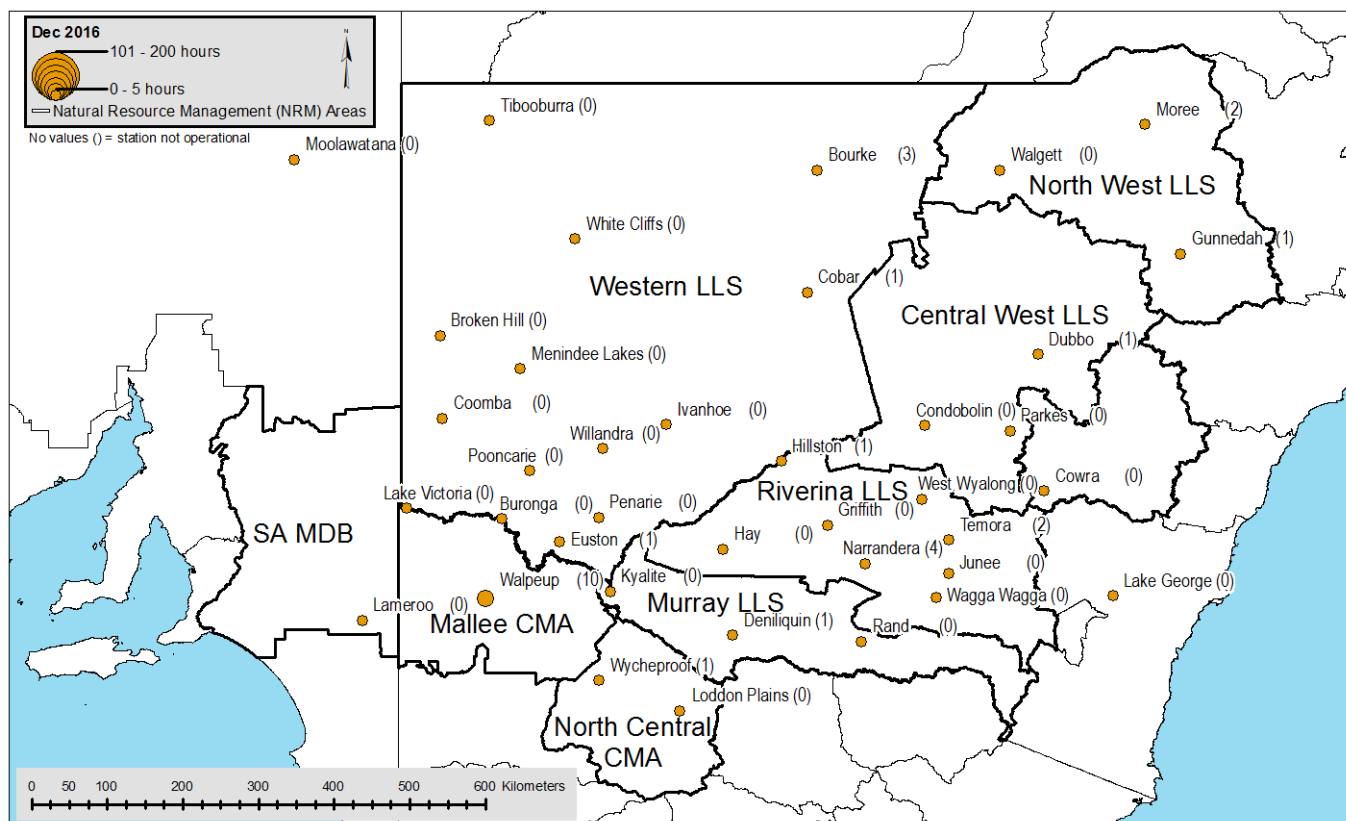


Figure 1: Hours of dust activity (number in brackets) at each DustWatch site in December 2016

Groundcover

The area with greater than 50% groundcover has remained stable for most of the NRM areas (Table 1) although groundcover has decreased substantially across the south east of Australia (Figure 3). The areas with greater than 50% groundcover decreased slightly in the Mallee Catchment Management Area, the South Australian Murray Darling Basin area and the Local Land Services - Western Region (green colours in Figure 2 and Table 1) leaving large areas below the cover target in the semi-arid regions.

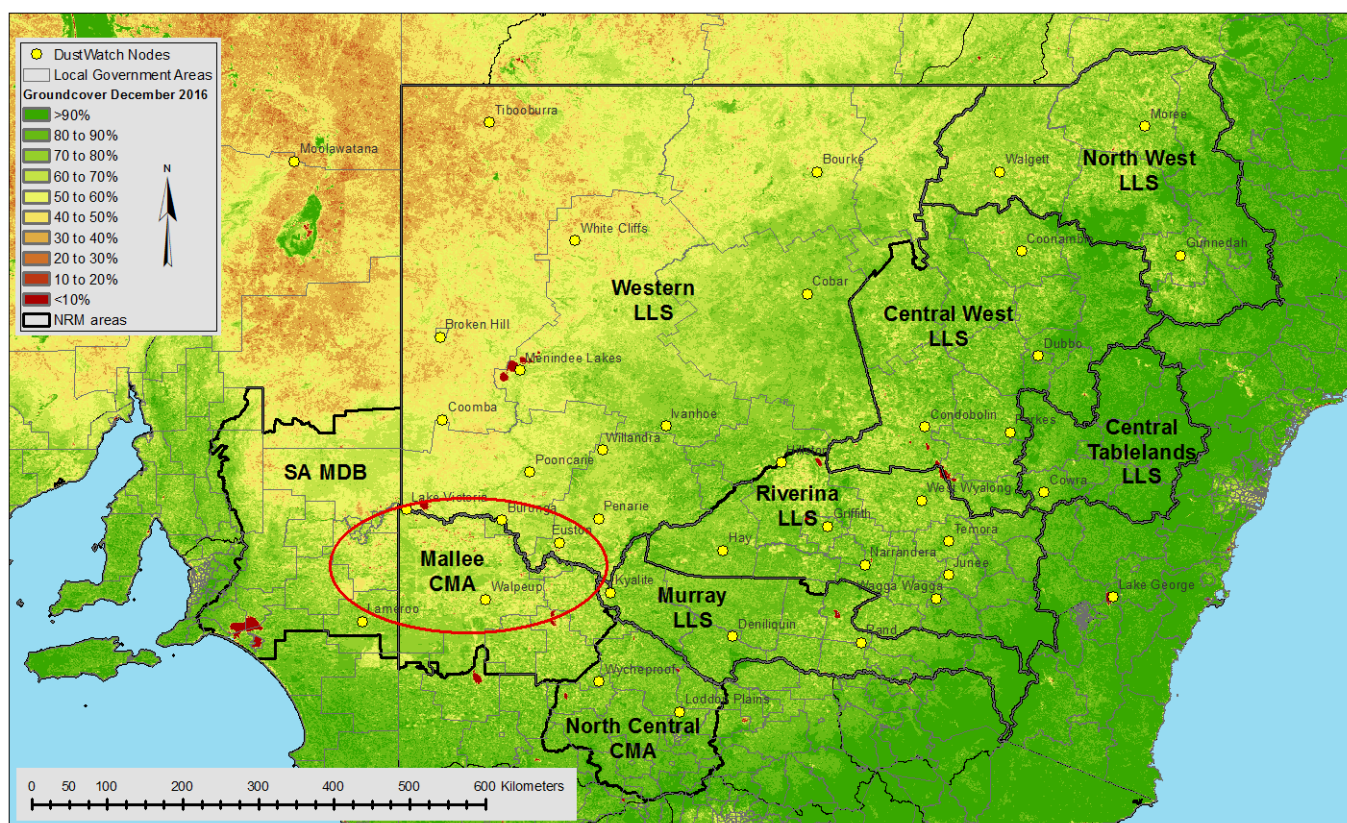


Figure 2: Groundcover for December 2016 as determined from MODIS.

Table 1: Percentage NRM area with groundcover >50% for June to December 2016 as determined from MODIS.

| Date | Central West | Mallee | Murray | North Central | North West | Riverina | SA MDB | Western | Central Tablelands |
|----------|--------------|--------|--------|---------------|------------|----------|--------|---------|--------------------|
| Jun 2016 | 100 | 99 | 100 | 100 | 98 | 100 | 98 | 96 | 100 |
| Jul 2016 | 100 | 100 | 100 | 100 | 99 | 100 | 99 | 97 | 100 |
| Aug 2016 | 100 | 100 | 100 | 100 | 99 | 100 | 98 | 94 | 100 |
| Sep 2016 | 100 | 100 | 100 | 100 | 99 | 100 | 98 | 96 | 100 |
| Oct 2016 | 100 | 99 | 100 | 100 | 99 | 100 | 96 | 88 | 100 |
| Nov 2016 | 99 | 97 | 99 | 100 | 99 | 99 | 93 | 83 | 100 |
| Dec 2016 | 99 | 95 | 100 | 100 | 99 | 99 | 89 | 74 | 100 |

Groundcover change

Over the last three months (September 2016 to December 2016) groundcover has declined across south-east Australia. Most visible reductions are in the Local Land Services – Riverina and Western region and across the border in the Victorian Mallee and South Australian Murray Darling Basin (Figure 3). The time series in Figure 4 shows the repeated pattern of decline of cover at this time of year for the Local Land Services Western region.

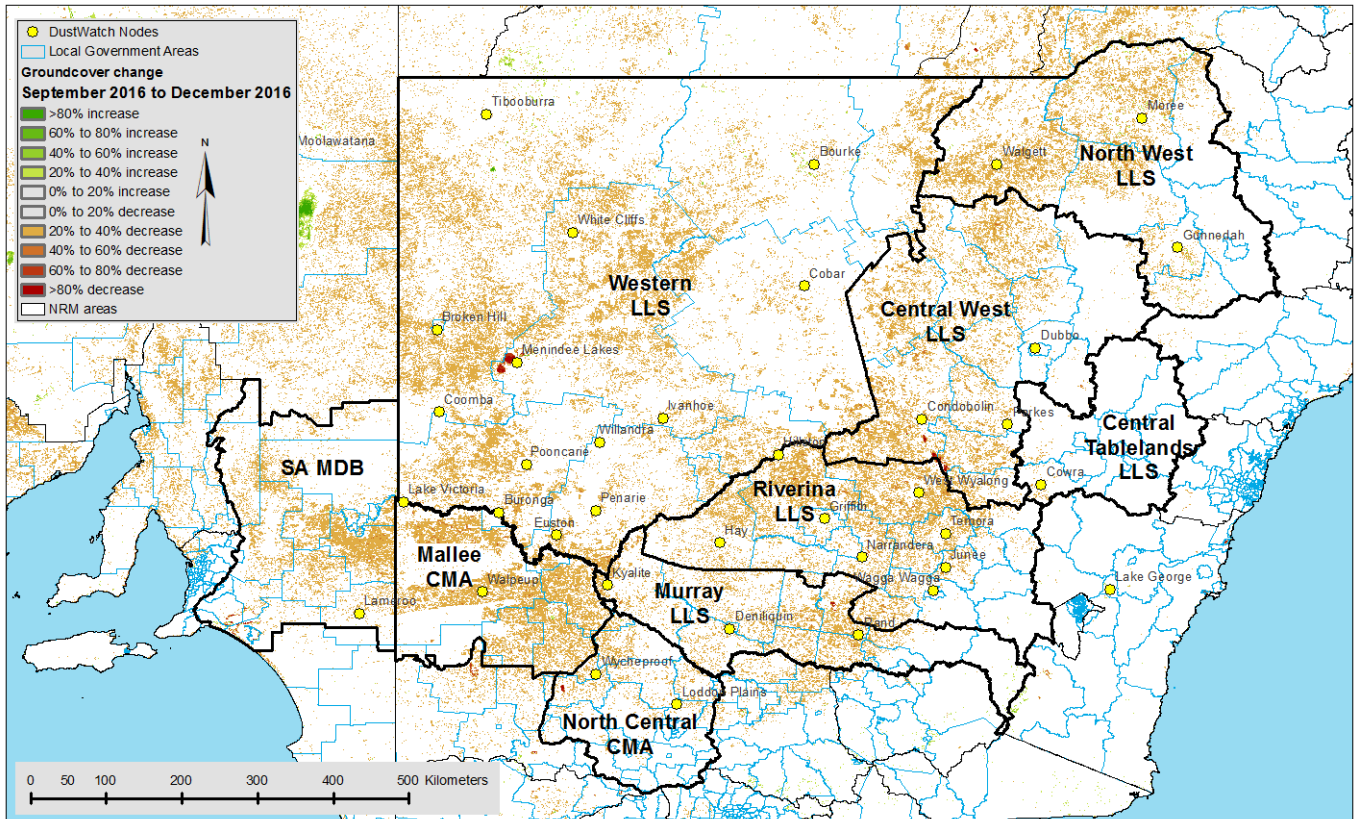


Figure 3: Groundcover change between September 2016 and December 2016 as determined from MODIS.

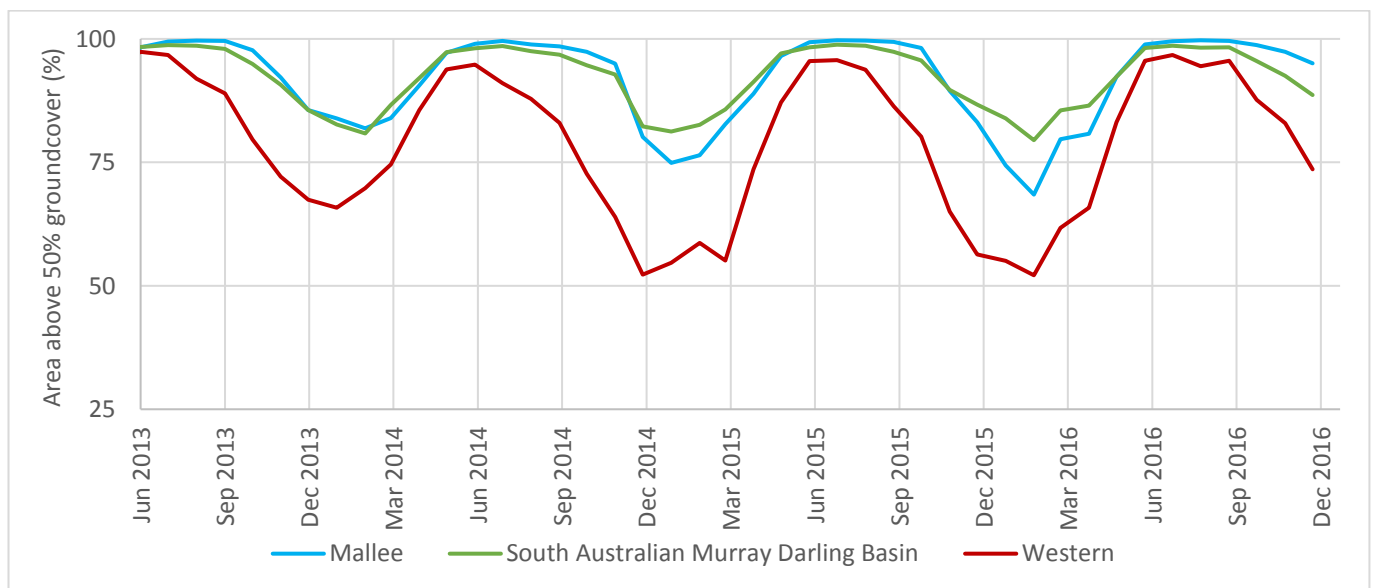


Figure 4: Area above 50% cover for the Western LLS and Mallee and SA-MDB CMA as determined from MODIS.

Rainfall

New South Wales recorded good rainfall in December 2016 (Figure 5). The north and north west of New South Wales in particular recorded substantial falls between 50 and 100mm. In contrast the south west received very little rain, especially along the New South Wales - Victorian border and across the border into north western Victoria. South Australia had good falls of up to 200mm in the south eastern parts.

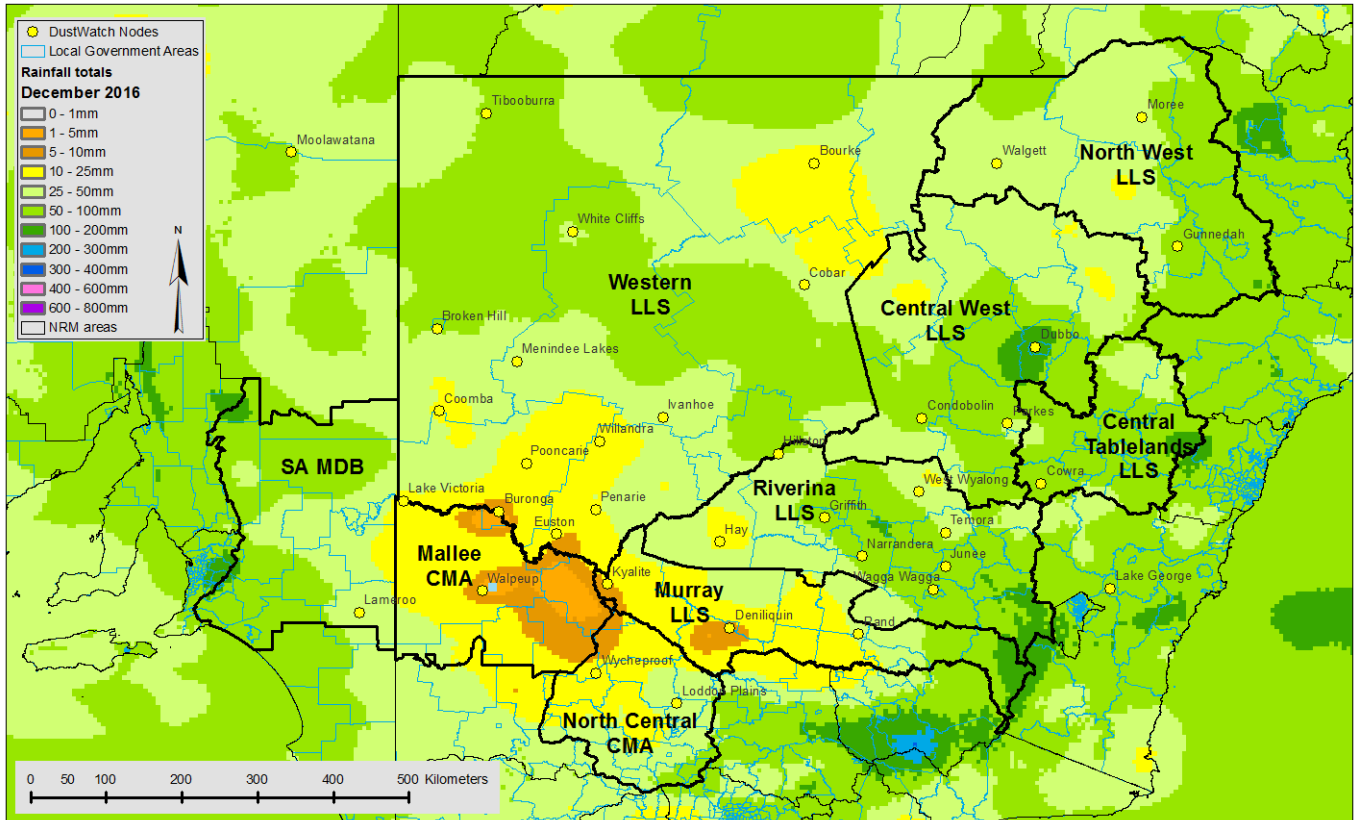


Figure 5: Rainfall totals for December 2016

Rainfall across the DustWatch network in December 2016 was around or below average in central New South Wales for December 2016 (white and red colours in Figure 6a). North western New South Wales received above average rainfall (blue colours in Figure 6a). Due to the substantially above average rainfall in September and October the three monthly rainfall deciles remained predominantly in the average (white) to above average records (blue colours in Figure 6b).

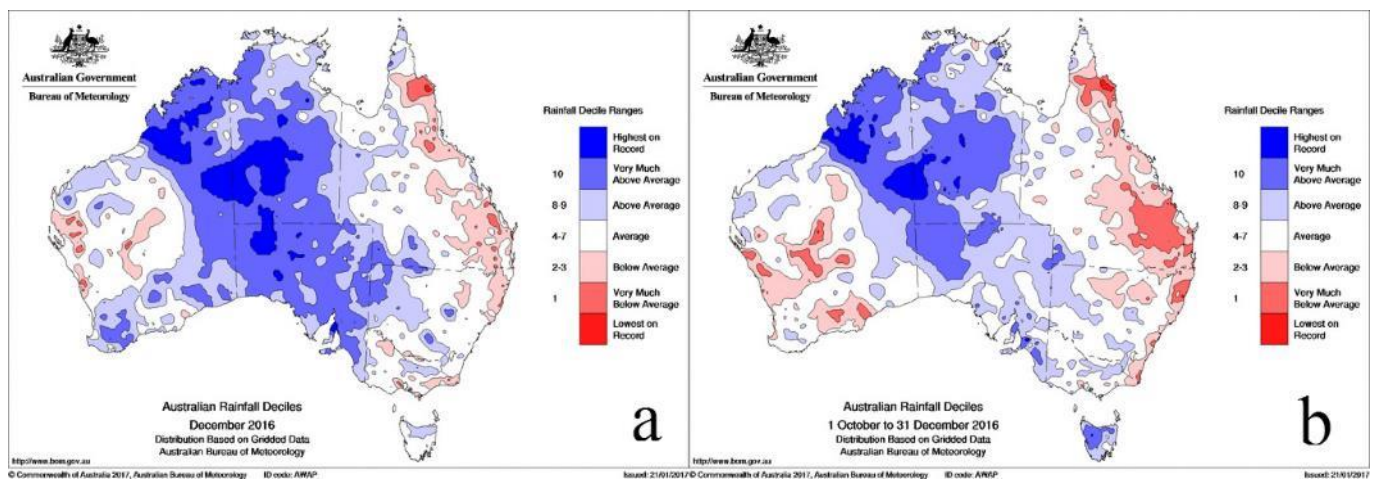


Figure 6: Rainfall deciles for December 2016 (a) and 1 October 2016 to 31 December 2016 (b)

MODIS satellite

Fire numbers in December 2016 were very similar to last month with not many fires detected across the DustWatch network (Figure 7). The dust activity on 8 December 2016 was hidden under cloud.

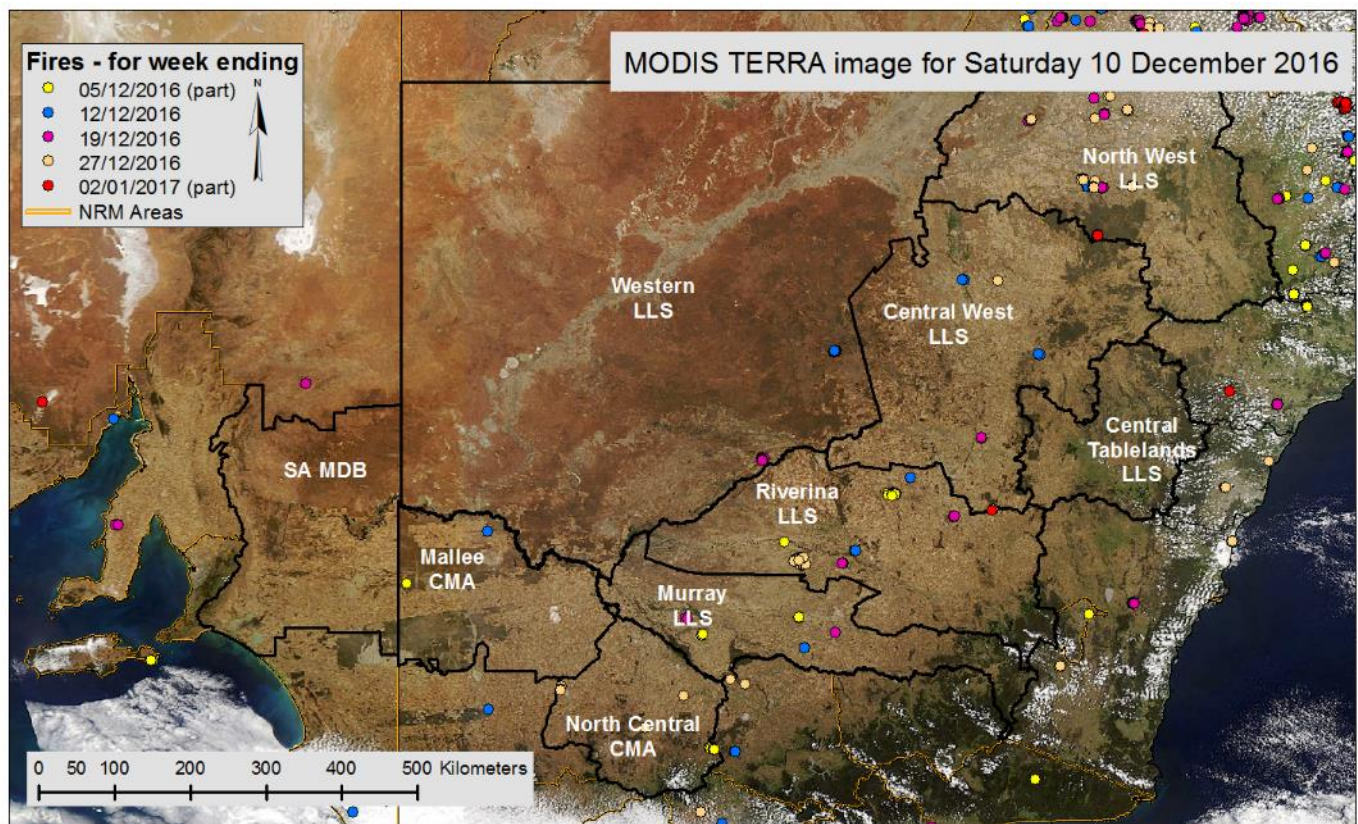


Figure 7: Active burning fires in December 2016 as determined from MODIS satellite.

Social media

The great photo below was posted on Instagram by Jenet Stewart from IMAJENIT design. It shows a great willy-willy (or dust devil) approaching cotton bales near Trangie in December 2016. Willy-willies contribute about 10% to Australia's dust budget of 59 million tonnes per year (Klose and Shao, 2016). So they do not contribute much to the overall transport of dust across the landscape but can look quite spectacular.

The term ...” is thought to derive from *Yindjibarndi* or a neighbouring language.^[2] In Aboriginal myths, willy-willies represent spirit forms. They are often quite scary spirits, and parents may warn their children that if they misbehave, a spirit will emerge from the spinning vortex of dirt and chastise them. There is a story of the origin of the *brologa* in which a bad spirit descends from the sky and captures the young being and abducts her by taking the form of a willy-willy...” (Wikipedia – Dust Devil, Jan 2017)



Photo 1: Willy-willy near Trangie in western NSW (IMAJENIT - Jenet Stewart).

Reference

Klose, M, and Shao, Y, (2016) A numerical study on dust devils with implications to global dust budget estimates. *Aeolian Research* 22:47-58.

DOI: 10.1016/j.aeolia.2016.05.003

The DustWatch team

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The MODIS image is courtesy of MODIS Rapid Response Project at NASA/GSFC; the fire data is courtesy of the Fire Information for Resource Management System (FIRMS) and the rainfall maps are from the Australian Bureau of Meteorology. This project would not be possible without funding from: the National Landcare Programme, Riverina, Western, Central West, Central Tablelands and Murray Local Land Services (LLS) in NSW; the NSW EPA, the Mallee and North Central CMAs in Victoria and Murray Darling Basin NRM in South Australia and in-kind contributions from Griffith University in Queensland, CSIRO, TERN and the Australian National University. We particularly thank our many DustWatch volunteers who provide observations and help maintain the instruments.

ISSN - 2206-3161

OEH 2016/0804



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