NSW Seasonal Conditions Report - December 2014

Highlights

- November rainfall was below average across much of northern and central NSW and areas of the coast.
- Drier and warmer than normal conditions are likely across most of NSW from December to February. December has a neutral rainfall outlook.
- ENSO remains neutral, with an increased likelihood of a weak El Niño event in summer.
- The dry spring conditions affected pasture growth and crop yields. Pasture growth was low across the west, north west, and central west and declined in other areas. Low biomass has affected fodder conservation.
- Cereal crop yields were variable, being below average to average in the east, below average in many western areas and poor in the north west. Lack of soil moisture and irrigation water has restricted some summer crops.
- Resources to assist in management for areas suffering poor rainfall and growth are available at www.dpi.nsw.gov.au/agriculture/emergency/drought/managing

1. Summary

Rainfall during November was below average across 46% of NSW, with recordings generally being less than 60% of normal.

Pasture growth remained low across western, north western and central western NSW and declined across areas of the coast, tablelands and the Hunter valley. Biomass levels declined across northern and central western NSW. Low biomass has affected fodder conservation.

Cereal crop yields were variable. Yields were somewhat below average to average in the east, but were poor in the north west and the northern central west. They were below average in areas of the south west and the southern central west.

Lack of soil moisture, low allocations and irrigation water costs have restricted the area sown to many summer crops.

Between December to February, drier than normal conditions are likely across most of NSW. Warmer than normal daytime and overnight temperatures are likely across most of the State. During December, there is a near equal chance for drier or wetter than normal conditions over most of NSW. Drier conditions are likely in the south east. Warmer daytime temperatures are likely in the east, north and west and warmer overnight temperatures. However, an updated experimental outlook suggests wetter conditions and cooler daytime temperatures are possible across eastern and central NSW in December.

ENSO remains neutral, with an increased likelihood of a weak El Niño event commencing in summer and lasting into autumn. The Bureau of Meteorology's El Niño status has increased to 'alert' level. Equatorial sea surface and sub-surface temperatures have increased and the SOI remains low. Marginal El Niño conditions affected winter and spring rainfall. Cooler sea surface temperatures to the north of Australia are reducing potential rainfall sources.

Rainfall across most of NSW was between 5-25 mm during November. The north east, south and coast received 25-100 mm with isolated areas receiving more. The far north west received 0-10 mm. Daytime and overnight temperatures were above average, with two heatwave events. In relative terms, quarterly rainfall was below average over 76% of the State, including most of northern, central and eastern NSW and the northern tablelands. Half yearly relative rainfall was below average across 65% of NSW.

Modelled topsoil moisture was low across NSW. Relative to historical records, it was average in areas of the south and far west. Subsoil moisture levels declined across western and central NSW and were below average across the north west, northern tablelands, mid-north to north coast, central tablelands and Riverina. Streamflow analysis indicated below average run off over areas of the north west, tablelands, central west, Riverina, far west and central to north coast.

November relative pasture growth was below average across much of NSW. Quarterly relative growth was low over the south west, north west, tablelands, Riverina and central areas. Relative biomass levels declined across the north west, northern tablelands, central west, central tablelands and Riverina.

The seasonal outlooks presented in this report are obtained from the Australian Bureau of Meteorology and other sources. These outlooks are general statements about the likelihood (chance) of (for example) exceeding the median rainfall or minimum or maximum temperatures. Such probability outlooks should not be used as categorical or definitive forecasts, but should be regarded as tools to assist in risk management and decision making. Changes in seasonal outlooks may have occurred since this report was released. Outlook information was up to date as at 8 December 2014.

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2. Seasonal outlook

Seasonal outlook and ENSO information are sourced from the Australian Bureau of Meteorology (BoM) and international sources. The BoM's official outlooks are based on modelled output from the Predictive Ocean Atmosphere Model for Australia (POAMA), which is a dynamical (physics-based) climate model developed by the BoM and CSIRO Marine and Atmospheric Research. Further information on POAMA outlooks can be obtained here and at http://poama.bom.gov.au/.

Outlooks should be treated with caution when skill is low and strong climate drivers are lacking. In these situations, secondary influences (such as sea surface temperatures around the continent) may have a greater impact.

Changes in seasonal outlooks may have occurred since this report was released, and can be determined by clicking on the links provided.

Seasonal outlook and ENSO information were collated in late October and early November and were up to date as at 8 December 2014.

2.1 Seasonal outlook summary

Table 1: Seasonal outlook summary (BoM)

	Current Outlook	Previous Outlook
Rainfall (quarter)	Drier (majority of NSW) Near neutral (far south west and north east)	Drier (majority of NSW) Near neutral (limited areas of far south east and central to mid-north coast)
Max Temperature (quarter)	Warmer	Warmer
Min Temperature (quarter)	Warmer Near neutral (far south west)	Warmer

Outlook Legend: Grey = Neutral, i.e. equal chance of drier/wetter or warmer/cooler.
Red = Drier or warmer.
Blue = Wetter or cooler.

Source: Derived from information provided by the Australian Bureau of Meteorology.

2.2 Seasonal rainfall outlook

- For the three month period from December to February, drier than normal conditions are likely across most of the State. The chances of exceeding median rainfall across most of NSW are between 25-40%. That is, the chances of receiving below median rainfall across most of NSW are 60-75%. There is a near-equal chance (a 40-45% probability) of above or below median rainfall for areas of the north east and far south west of NSW (Figure 9).
- This means that for every ten years with similar climate patterns to those at present, across most of NSW about three to four December to February periods would be expected to be wetter than normal and six to seven drier than normal.
- The past outlook accuracy (confidence or skill) is low across most of NSW, with areas that are moderate across the north west, north east, Hunter valley and south east (Figure 12).
- About 45% of other global climate models surveyed also suggest drier than normal conditions are likely during the December to February period across much of NSW.

2.3 Seasonal temperature outlook

- Over the three month period from December to February, warmer than normal daytime temperatures are likely across NSW (Figure 10).
- The chance of exceeding median maximum temperatures ranges from 60-80% across the State, with the highest probabilities across the far north west, the central coast and the south east of the State.
- This means that for every ten years with similar climate patterns to those at present, across NSW about six to eight December to February periods would be expected to have warmer than normal daytime temperatures, and two to four cooler than normal daytime temperatures.
- The past outlook accuracy (confidence or skill) for the maximum temperature outlook is moderate across central and most of southern NSW. It is high in the north east of NSW and along most of the coast, but low in the far north west and a small area in the south around Deniliquin (Figure 12).
- Over the three month period from December to February, warmer than normal overnight temperatures are also likely across most of NSW. The chance of exceeding median minimum temperatures ranges from 55-80% across most of NSW. There is a near-equal chance of warmer or cooler than normal overnight temperatures in the far south west (a 55-60% chance of warmer than normal conditions) (Figure 11).
- The past outlook accuracy (confidence or skill) for the minimum temperature outlook is

moderate across the majority of NSW (Figure 12).

- Some 73% of global climate models surveyed suggested that warmer than normal conditions are likely across NSW between December and February.

2.4 Monthly rainfall and temperature outlook

Monthly outlook information is sourced from the Australian Bureau of Meteorology (BoM).

The multi-week and month 2 experimental climate outlooks from the POAMA model are provided with thanks to, and by special agreement with, the Bureau of Meteorology. However, they are experimental only, do not currently form part of the BoM's standard services and are not yet fully calibrated. They should therefore be used with some caution.

Feedback on the experimental outlooks can be provided to climate.helpdesk@bom.gov.au.

Monthly outlook summary

Table 2: Monthly outlook summary (BoM)

	December	January
Rainfall	Near neutral - neutral (most of NSW) Drier (areas of the south east and north east)	Drier
Max Temperature	Warmer (eastern, northern, north/central and far western NSW) Near neutral (southern and south/central NSW)	Warmer Near neutral (far south west)
Min Temperature	Warmer Near neutral (areas of the south east, far north coast and south/central coast)	Warmer Near neutral-neutral (areas of the far west, far south west, and south west)

Outlook Legend: Grey = Neutral, i.e. equal chance of drier/wetter or warmer/cooler.
Red = Drier or warmer.
Blue = Wetter or cooler.

Source: Derived from information provided by the Australian Bureau of Meteorology.

Month 1 - December

- For the majority of NSW, there is a near-equal to equal chance of wetter or drier than normal conditions during December. Drier than normal conditions are likely in an area of the south east between Lithgow, Canberra, Bega and Jervis Bay, which has a 35-40% chance of exceeding median rainfall. Drier than normal conditions are also likely between Armidale and Kempsey, and near Boggabri and Mungindi (Figure 13).
- The December rainfall outlook has a moderate past accuracy (skill) over most of the State, but has a low accuracy over areas of the south west, north west, northern tablelands, Hunter valley and mid-north to north coast.
- Recent updates to the experimental December rainfall outlook indicate the possibility of wetter than normal conditions across much of NSW.
- Warmer than normal daytime temperatures are likely across most of eastern, northern and far western NSW during December (a 60-70% probability). However, much of the south of the State and southern/central areas have a near equal chance of warmer or cooler than normal conditions (Figure 14).
- The December daytime temperature outlook has a moderate to high past accuracy (skill) across most of NSW, but is low in the north east of the State and areas of the far south west and far north west.
- Recent updates to the experimental December maximum temperature outlook indicate cooler than normal daytime temperatures across the central and some coastal areas of NSW, but warmer than normal conditions in the south west.
- Warmer than normal overnight temperatures are likely (a 60-75% probability) across NSW during December. The central and south coast areas have a near equal chance of warmer or cooler than normal temperatures (a 55-60% chance of exceeding median minimum temperatures) (Figure 15).
- The December overnight temperature outlook has a moderate to high past accuracy (skill) across most of NSW, with the exception of areas of the north east, south and far west.
- Recent updates to the experimental December minimum temperature outlook indicate a near equal chance of warmer or cooler than normal overnight temperatures across much of central, eastern and northern

NSW, but warmer than normal temperatures in the south, south west and west.

December multi-week (as at 4 December)

- Weekly experimental outlook information suggests that during mid to late December (18-31 December) wetter than normal conditions are likely across most of NSW, with near-equal probabilities for wetter or drier than normal conditions across the far south west. The past accuracy (skill) for this outlook is low.
- Daytime temperatures during mid to late December are likely to be cooler than normal over eastern and central NSW, with the highest probabilities for cooler than normal conditions across the east and north east. Warmer than normal conditions are likely across the far west. This outlook has a moderate accuracy (skill) over most of NSW, but is low across the south and south west.
- Overnight temperatures during mid to late December are likely to be cooler than normal across the east, some central areas and some northern areas of the State, with the highest probabilities for cooler than normal conditions in the north east. Warmer than normal overnight temperatures are likely across south western and western NSW. The past accuracy (skill) level for this outlook is low for most of NSW, but moderate across areas of the north west.

Month 2 - January

- The outlook for January indicates that drier than normal conditions are likely across NSW, with the chances of exceeding median rainfall being between 25-40% (Figure 17).
- The January rainfall outlook has a low past accuracy across most of NSW, but a moderate past accuracy across most of northern NSW, and areas of the far west, central west and far south east.
- Warmer than normal daytime temperatures are likely across most of NSW during January (Figure 17) with a 60% to more than 80% probability. In the far south west, there is a near-equal chance of warmer or cooler than normal overnight temperatures.
- The past accuracy (skill) for the January daytime temperature outlook is low across the south and west of NSW and areas of the central west. The past accuracy is very low in the far north west and in areas of the Riverina. The past accuracy is moderate for most of northern and coastal NSW, except for areas of the south coast.
- Warmer than normal overnight temperatures are likely across the northern, central and eastern areas of NSW during January, with the probability of exceeding the median minimum temperatures ranging from 60% to more than 80%, and generally increasing towards the north east. There is a near equal to equal probability of warmer or cooler than normal overnight temperatures across the far west and areas of south western NSW (Figure 17).
- The past accuracy (skill) for the January overnight temperature outlook is moderate across most of NSW, but low in areas of the far north east and south.

2.5 Other climatic models

UK Meteorology Office

The output from this model is provided for the use of international meteorological centres, and not as general seasonal outlooks. It should therefore be used with caution.

- The UK Meteorology Office's global long range probability modelled output indicates a near-equal probability for wetter or drier conditions across NSW between December and February, with a 40-60% probability of above average rainfall. The past skill for this outlook is low across most of the State, but is low to moderate across the far north west and the central to south coast.
- The model indicates that there is a 60-80% probability of above average temperatures across most of NSW between December and February. There is a more than 80% probability of above average temperatures areas of the south west slopes and southern tablelands and the far south east. The past skill for this outlook is moderate to high across north eastern NSW, low to moderate across the south to mid-north coast and low for the remainder of NSW.
- For January to March, the UK Meteorology Office's global long range probability modelled output indicates there is near equal chance of wetter or drier than normal conditions across most of NSW (a 40-60% probability of above average precipitation), with drier than normal conditions likely across the coast and areas of the south east and north west. The past skill for this outlook is low over most of NSW, low to moderate in the south and high in the far north east.
- For temperature over the January to March period, the outlook indicates that warmer than normal conditions are likely across

NSW, with a 60-80% probability of exceeding the average temperature. An area in the north west has a more than 80% probability of above average temperatures. The temperature outlook has a low past skill over much of western and southern NSW, although the skill is moderate to high across areas of north eastern, north western and coastal NSW.

APEC Climate Centre

- The APEC Climate Centre's deterministic multi-model ensemble outlook of rainfall anomalies for December to February indicates that near normal rainfall is likely across most of the State, with drier than normal conditions in the north east. The temperature anomaly outlook indicates the likelihood of warmer than average temperatures, except for areas of the far south west. No skill assessment is available for these outlooks.
- During December, the APEC Climate Centre's rainfall anomaly outlook indicates that slightly lower than normal rainfall is likely across areas of the north east and the Riverina. The temperature anomaly outlook indicates warmer than average temperatures, particularly across eastern and central NSW. No skill assessment is available for these outlooks.

2.6 El Niño-Southern Oscillation (ENSO)

ENSO summary

- ENSO remains neutral, although a number of indicators have reached El Niño thresholds. The equatorial Pacific continues to be warm and the SOI remains moderately negative. Most climate models continue to indicate the likelihood of a weak El Niño event occurring over summer and extending into autumn 2015. Some models are suggesting a borderline event instead.
- While a number of indicators are currently characteristic of an El Niño event, including sea surface and sub-surface temperatures and the SOI, overall atmospheric circulation has yet to show clear coupling.
- El Niño events usually have little influence on summer rainfall over NSW (Figure 18 and Figure 19), however such assessments have been based on events that commence earlier in the year (in autumn/winter). An El Niño event developing in summer is extremely unusual. The Bureau of Meteorology's outlook suggests that such an event will result in lower than normal rainfall and higher than normal temperatures. Even borderline El Niño conditions can have a major impact on rainfall and temperatures, as experienced during winter and spring this year.
- Sea surface temperatures increased over November and are warm across most of the equatorial Pacific, decreasing slightly in the east but increasing in the west. Positive subsurface temperature anomalies cover much of the central and eastern equatorial Pacific.
- The SOI has been at negative levels (below -7) since mid-August, apart from a few weeks in October.
- Trade winds are currently near average across the equatorial Pacific.
- Cloudiness has been generally below average at the equator near the International Date Line over the last month. During an El Niño event, cloudiness and rainfall tends to increase in this area. Tropical rainfall declined to the west of the junction of the equator and the International Date Line, as indicated by positive outgoing long-wave radiation (OLR) anomalies. Reduced rainfall occurred over areas of Indonesia in the last month, which can be an El Niño-like indicator.
- Other indicators such as the thermocline slope index, and the equatorial Pacific basin upper ocean heat anomalies are currently near zero, and continue to reflect ENSO neutral conditions.
- The cooling of sea surface temperatures to the north of Australia in the Maritime Continent area may influence rainfall through reduced convection. However, sea surface temperatures have increased to the north west of the continent.

ENSO outlook and comments

Table 3: ENSO/Climatic Outlook

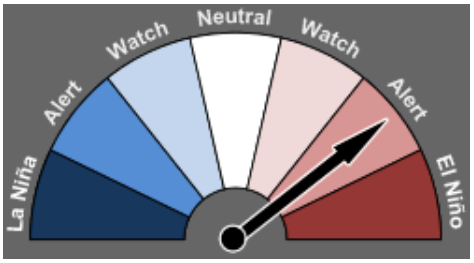
	Current Outlook (early December)	Previous Outlook (early November)
ENSO (overall)	Neutral – El Niño likely	Neutral – El Niño possible/likely
BoM ENSO Tracker Status	El Niño Alert	El Niño Watch
SOI	Moderately negative	Moderately negative
Pacific Ocean SST (NINO3.4)	Warm (Neutral – some models)	Slightly warm/warm (Neutral – some models)
Indian Ocean (IOD)	Neutral	Neutral
Southern Annular Mode (SAM/AAO)	Weakly – moderately positive	Weakly negative - neutral

Summary Legend: Grey = Neutral, i.e. neither El Niño nor La Niña or no rainfall trend.
Red = El Niño/reduced rainfall trend.
Blue = La Niña/higher rainfall trend.

Source: Derived from information provided by the Australian Bureau of Meteorology and the US National Oceanic and Atmospheric Administration.

- A strong west to east gradient in sea surface temperatures, which would indicate El Niño-like oceanic and atmospheric coupling, has not yet occurred. Under these circumstances, it is possible that the growth of an El Niño event will be slower or reduced. The stronger such a gradient, and the stronger the westerly winds blowing across the equatorial Pacific, the more likely it is that coupling may occur. Alternatively, stronger winds can lead to stronger sea surface temperature gradients developing.
- The Bureau of Meteorology's ENSO tracker (Figure 1) has moved to El Niño 'Alert' level. In the past, about 70% of the time that this level has been reached, an El Niño event has occurred (compared to 50% at 'Watch' level).

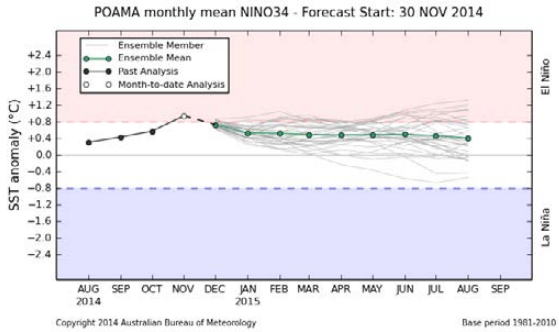
Figure 1: Bureau of Meteorology ENSO tracker status



Source: Australian Bureau of Meteorology

- The Bureau of Meteorology's POAMA model's latest long range outlook indicates that the sea surface temperature anomalies in the NINO3.4 Pacific Ocean region may increase to above the El Niño threshold in November-December (which has already occurred) and then decline to warm but neutral levels (Figure 2). However, about half of the model ensembles (grey lines) indicate temperatures may remain above the Bureau's threshold El Niño level of +0.8°C during autumn. Two of the eight global climate models surveyed by the Bureau of Meteorology indicate that sea surface temperatures in the NINO3.4 Pacific Ocean region are likely to remain at El Niño levels through late summer and autumn. The others indicate temperatures that are warm, but below the threshold level of +0.8°C.

Figure 2: Current Bureau of Meteorology POAMA NINO3.4 Forecast



Source: Australian Bureau of Meteorology

- The CPC/IRI ENSO Alert System Status remains on 'El Niño watch'. This indicates conditions remain favourable for the development of an El Niño event within the next six months.
- The CPC/IRI consensus ENSO forecast of the NINO3.4 index (as at 4 December) indicates the likelihood of a weak El Niño event developing during summer and continuing well into the autumn of 2015. The majority of forecasts indicate NINO 3.4 sea surface temperature anomalies are expected to be in the range of +0.5°C to +1.0°C.
- The CPC/IRI model forecast probabilities for an El Niño event occurring have increased since last month, with 65% of global climate models now expecting an El Niño event during summer (Figure 3, Table 4).

Figure 3: CPC/IRI Consensus ENSO Forecast

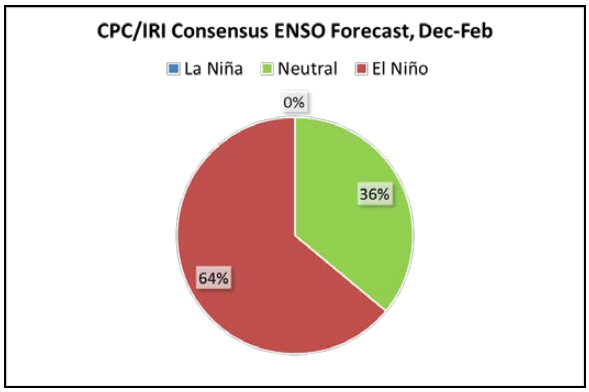


Table 4: Current consensus ENSO forecast probabilities (as at 4 December)

Season	La Niña	Neutral	El Niño
Dec-Feb	0%	36%	64%
Jan-Mar	1%	39%	60%
Feb-Apr	1%	41%	58%
Mar-May	2%	44%	54%
Apr-Jun	3%	45%	52%
May-Jul	5%	49%	46%
Jun-Aug	7%	49%	44%
Jul-Sep	9%	49%	42%

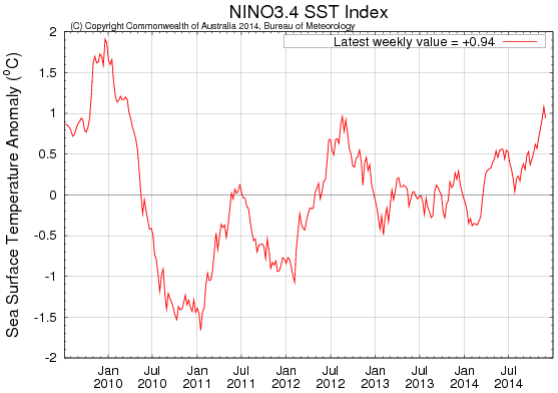
Source: Climate Prediction Centre/International Research Institute for Climate and Society.

- Note that the CPC/IRI classifies values of the NINO3.4 index between -0.5°C and +0.5°C as indicating neutral conditions, rather than the -0.8°C to +0.8°C range used by the Bureau of Meteorology. This will result in differences when various meteorological organisations report that El Niño or La Niña conditions are developing.

Sea temperatures

- Monthly sea surface temperature information from the Bureau of Meteorology and the US National Oceanic and Atmospheric Administration (NOAA) indicate the equatorial Pacific has continued to warm, particularly in the eastern and central areas. Temperatures were above average across most of the equatorial Pacific.
- Sea surface temperatures were cool to the north of Australia in the Maritime Continent region during the month, although warm to the north west of Australia. Cool sea surface temperatures to the north of the continent may influence rainfall through reduced convection.
- The most recent monthly temperature anomaly value in the key NINO3.4 region is +0.85°C for November, above the Bureau of Meteorology's El Niño level of +0.8°C.
- Weekly sea surface temperatures to 30 November were warm in the NINO 3.4 region (Figure 4), with the current temperature at +0.94°C (above the Bureau of Meteorology's El Niño threshold level of +0.8°C). The sea surface temperature anomaly during the last month was +0.84°C in the NINO 3 region, and +0.94°C in the NINO 4 region. Temperature anomalies in the NINO 1 region are +0.21°C and in the NINO 2 region are +0.58°C as at 30 November.

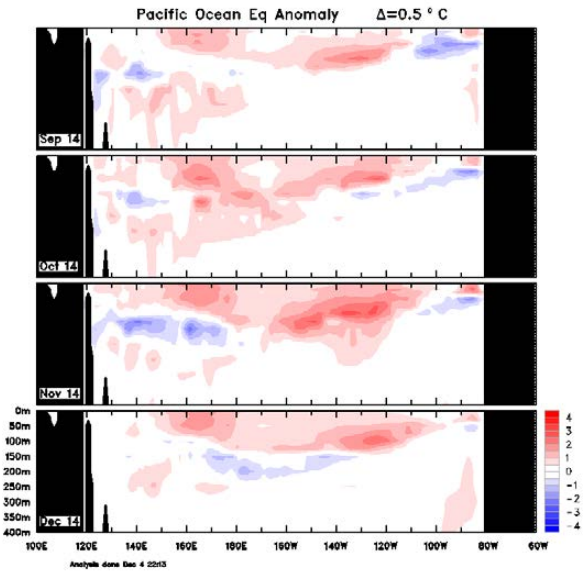
Figure 4: NINO3.4 Sea Surface Temperature Index



Source: Australian Bureau of Meteorology

- The sub surface sea temperatures show warm anomalies across most of the equatorial Pacific, and have done so since September. The positive anomalies in the central equatorial Pacific have moved eastwards (Figure 5). Some weak negative anomalies remain in the far east and at depth in the central Pacific.

Figure 5: Monthly sea sub-surface temperatures



Source: Australian Bureau of Meteorology

Southern oscillation index (SOI)

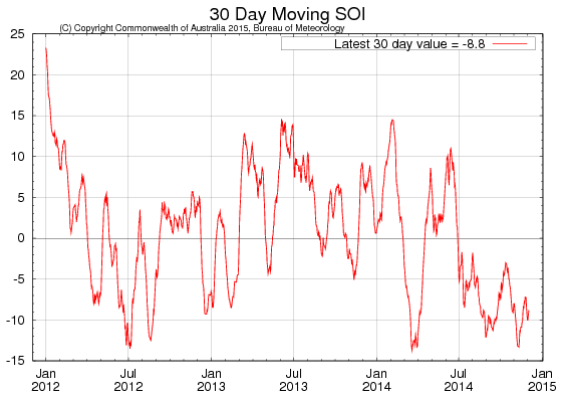
- The monthly value of the Southern Oscillation Index is currently moderately negative at -8.8 (as at 3 December), falling from -7.4 in late October (Figure 6, Table 5) and generally sustaining levels of below -7 since mid-August. The sustained low values over the last few months indicate some degree of atmospheric coupling with the ocean, but other indicators have not yet reached El Niño levels.

Table 5: Values of the Southern Oscillation Index

	Current monthly value (3 December)	Previous monthly value (7 November)
SOI (30 day)	-8.8	-12.5

Source: Australian Bureau of Meteorology.

Figure 6: 30 day moving SOI



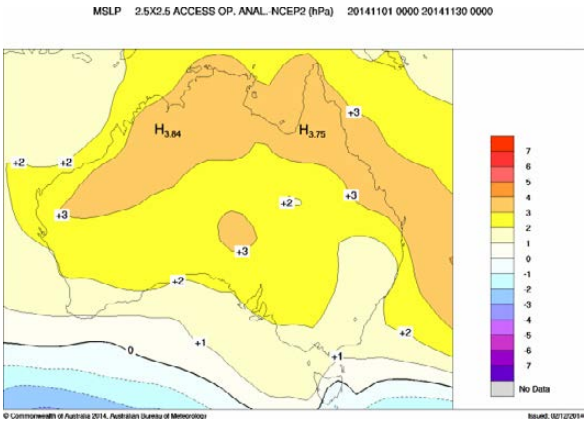
Source: Australian Bureau of Meteorology

- The Southern Oscillation Index is one factor indicating the development and intensity of El Niño and La Niña events in the Pacific Ocean. It is calculated from variations in surface atmospheric pressure between Darwin and Tahiti. Values of the SOI between -8 and +8 indicate neutral conditions, sustained values above +8 may indicate a La Niña event, and sustained values below -8 may indicate an El Niño event.

Sub-tropical ridge (STR)/atmospheric pressure

- The sub-tropical ridge was slightly further south than normal during November. There was high atmospheric pressure over most of the continent during November, particularly over the north (affecting the SOI) (Figure 7), as indicated on NOAA and Bureau of Meteorology mean sea level pressure charts. Increased pressure contributes to the blocking of the passage of fronts through NSW.
- During November, the sub-tropical ridge is normally around a pressure of 1015 hPa and is centred at around a latitude of 33°S to 35°S.

Figure 7: Monthly mean sea level pressure anomaly



Source: Australian Bureau of Meteorology.

- The sub-tropical ridge is a zone of high pressure which between January and March is normally located south of Australia at about 38°S to 39°S, and tends to suppress cold front activity. During June to September, it generally moves northwards to around 30°S to 32°S, allowing cold fronts to extend further into southern Australia.

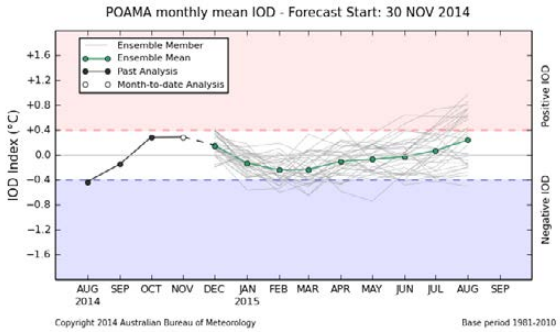
Indian Ocean dipole (IOD)

- The Indian Ocean dipole remains neutral.
- The latest IOD index value for the week ending 30 November is +0.15. The outlooks

indicate that it will remain neutral into early 2015.

- The Bureau of Meteorology's POAMA model and all climate models surveyed by the Bureau of Meteorology favour a neutral IOD between December and April (Figure 8). The POAMA sea surface temperature outlook indicates generally near neutral conditions in the eastern and western Indian Ocean areas used for the calculation of the IOD, extending through to March.

Figure 8: Current Bureau of Meteorology POAMA Indian Ocean Dipole Forecast



Source: Australian Bureau of Meteorology.

- The IOD has little effect on Australian climate until late autumn or winter. An IOD event usually starts between May and June, peaks in August to October and rapidly decays afterwards. It tends to have little influence from December to April, during the monsoon season.
- A negative IOD period (a sustained IOD index value of -0.4°C or less) is caused by warmer than normal water in the tropical eastern Indian Ocean and cooler than normal water in the tropical western Indian Ocean. A negative IOD period increases the chances of above normal rainfall during winter and spring across southern and much of western and central NSW, as shown in this link. A negative IOD can also contribute to below-average mean sea level pressure over Darwin, which may cause an increase in the SOI.
- A positive IOD period (a sustained IOD index value of +0.4°C or more) is the result of cooler than normal water in the tropical eastern Indian Ocean and warmer than normal water in the tropical western Indian Ocean. Positive IOD periods have been associated with a decrease in rainfall during winter and spring across southern, western and central NSW.

Trade winds and Pacific cloud conditions

- Trade winds are currently near normal across the equatorial Pacific (as at 30 November).
- Easterly trade winds strengthen across the tropical Pacific during La Niña events and weaken or reverse during El Niño events. Weakening of the trade winds allows warmer than normal water to move into the central and eastern tropical Pacific Ocean. The Madden-Julian Oscillation is moving across the Maritime Continent into the eastern Pacific.
- Cloud conditions at the equator near the International Date Line were generally below normal over the last month, but fluctuated around normal over the last two weeks of November. Convection and precipitation were suppressed to west of the junction of the International Date Line and equator, as indicated by positive outgoing long-wave radiation (OLR) anomalies. Reduced rainfall occurred over areas of Indonesia in the last month, which can be an El Niño-like indicator.
- Cloudiness at the equator near the International Date Line decreases during La Niña events and increases during El Niño events.

2.7 Other climatic indicators

Southern annular mode (SAM)

- The experimental Southern Annular Mode or Antarctic Oscillation (AAO) index is currently weakly positive (as at 4 December), after being weakly positive in early November then weakly negative for the remainder of the month.
- The SAM index value from POAMA (as at 4 December) was weakly positive at about +1.25, and the AAO index value from NOAA (as at 4 December) was weakly-moderately positive at just under +2.
- The outlook from POAMA indicates the SAM index will be weakly positive at about +1 through to mid-late December. The NOAA outlook suggests the index will be moderately positive at around +2 through to about mid-December.
- SAM outlooks tend to be extremely variable, particularly at lead times of two weeks or more, and the skill level for outlooks of 10-21 days tends to be low.
- A negative SAM event indicates an expansion of the belt of strong westerly

winds towards the equator, resulting in more or stronger low pressure systems across southern Australia and potentially increased rainfall.

- A positive SAM event indicates the contraction of the belt of strong westerly winds towards Antarctica and higher pressures over southern Australia. During autumn and winter, a positive SAM event can potentially mean a decrease in rainfall across southern Australia. However, a strongly positive SAM in spring and summer can mean southern Australia is influenced by the northern half of high pressure systems, leading to a slightly higher likelihood of increased rainfall over south eastern and central NSW.

NSW cloud conditions

- Cloud conditions were near normal across most of NSW during November, but lower than normal in the north east and areas of the north west.

2.8 Possible effects of El Niño events

- El Niño conditions are often associated with below normal rainfall and above normal daytime temperatures across much of NSW in the second half of the year, and an increased risk of frost. However, this is not always the case.
- Between December and February, the greatest effect of strong El Niño events in the past has been slightly reduced (decile 4) rainfall across areas of the far south east of the State (Figure 18). El Niño events (in general) do not strongly affect rainfall in NSW during summer (Figure 18 and Figure 19). However, such assessments have been based on events that commence earlier in the year (in autumn/winter). An El Niño event developing in summer is extremely unusual. The Bureau of Meteorology's outlook suggests that such an event will result in lower than normal rainfall and higher than normal temperatures during December to February.

  The severity of an El Niño event does not necessarily directly relate to the severity of the impact on rainfall. In some cases, severe El Niño events have had a limited effect on rainfall, while mild-moderate El Niño events have had a major effect.

3. Rainfall

3.1 Relative rainfall

Relative rainfall information is sourced from the AussieGRASS project of the Queensland Department of Science, Information Technology, Innovation and the Arts and from the Bureau of Meteorology.

Relative rainfall is calculated by comparing and ranking the rainfall for the current period against that for the same period over every year since 1889 (percentile ranks).

This means that if the current period has a rank of between 30 and 70 against all other years, it is regarded as being "average" and the conditions experienced will occur over about 4 out of every 10 years.

Summary

Table 6: Rainfall relative to historical records – percentage area of NSW in each class

Period	Missing data	Below Average (0-30%)	Average (31-70%)	Above Average (71-100%)
Month	1%	46%	52%	1%
Quarter	0%	76%	23%	1%
Half year	0%	65%	34%	1%
Year	0%	41%	57%	2%

Source: Derived from information supplied by the Queensland Department of Science, Information Technology, Innovation and the Arts.

November

- Relative to historical records, rainfall for October was below average (that is, rainfall in the 3rd decile or below) across 46% of the State.
- Below average rainfall occurred across areas of the North West, Northern Tablelands, Hunter, Greater Sydney, Central Tablelands, Central West, Western and South East LLS districts. These areas received rainfall that was generally below average (3rd decile) to well below average (2nd decile) relative to historical records.
- These areas generally received rainfall of less than 40% of normal for the month.
- Average relative rainfall (that is, rainfall of between the 4th and 7th deciles) fell across 52% of NSW (Figure 20, Table 6), extending across much of the south, west and north east of the State. Most of the Riverina, Murray, and North Coast LLS districts received average relative rainfall, as did the

south and far west of the Western LLS district.

- Areas in the Murray LLS district between Deniliquin and Albury received above average relative rainfall during the month.
- Rainfall in this area was between 100-150% of normal for the month.

September to November (3 months)

- Over the 3 month period from September to November, relative rainfall was average or above over 24% the State (Figure 21, Table 6).
- Below average relative rainfall occurred across 76% of the State, extending primarily across much of northern, central and eastern NSW. Below average relative rainfall occurred across more than 60% of the area of all LLS districts except Murray and South East.
- Extremely low relative rainfall (in the lowest 10% of years) occurred over most of North West, Northern Tablelands and Central West LLS districts, the western third of Hunter LLS district and areas in the east of Western LLS district. These areas generally received less than 40% of their normal rainfall for the period. The remainder of the State generally received less than 80% of normal rainfall for the period, with most areas receiving less than 60%.
- About 24% of the State received average relative rainfall for the quarterly period (that is, rainfall of between the 4th and 7th deciles). Areas receiving average relative rainfall for the 3 month period included the far west of Western LLS district, most of Murray LLS district and the southern and coastal areas of South East LLS district.

June to November (6 months)

- Over the six months to November, relative rainfall was average across 34% of NSW, but below average across 65% (Figure 22, Table 6). Above average rainfall for the period occurred over less than 1% of the State.
- Below average relative rainfall for the period occurred across most of the central and southern areas of the State. This included more than half of the Western LLS district and more than 65% of the Central West, Hunter and Murray LLS districts. It included more than 85% of the Central Tablelands, North West, Northern Tablelands and Riverina LLS districts.
- Most of the State received between 60-80% of normal rainfall for the period, with the north west, and areas of the south west and central west receiving less than 60% of normal. Areas of the far south east received rainfall of between 100-125% of normal for the period.
- Above average relative rainfall was confined to a small area along the coast in the South East LLS district.
- The north western and central areas of Western LLS district, the north west of Central West district, most of Greater Sydney LLS district, the coast and the Monaro received generally average rainfall for the period (that is, rainfall of between the 4th and 7th deciles).

March to November (9 months, BoM)

- Over the 9 month period from March to November, relative rainfall across the State was below average across much of the North West, Northern Tablelands, and North Coast LLS districts, the north of the Hunter LLS district and between Hay and Wentworth (Figure 23).
- Most of these areas received 60-80% of their normal rainfall for the period, with areas in north of Walgett, around Hay and to the south west of Coffs Harbour receiving 40-60% of normal rainfall for the period.
- An area near Tweed Heads received very much below average relative rainfall for the period.
- Scattered areas of above average relative rainfall occurred across the central west and the far south of the State. Larger areas occurred across the far south east, between Broken Hill and Wilcannia and between Cobar and Nyngan. Rainfall in these areas was generally between 100-125% of normal for the period.
- The remainder of the State had generally average relative rainfall over the period.

December to November (12 months)

- Over the twelve months to November, below average relative rainfall extended across 41% of NSW and occurred across almost all of the North West, Northern Tablelands, North Coast, Hunter and Greater Sydney LLS districts.
- Large areas of the Central Tablelands (67%), Riverina (39%) and Central West (31%) LLS districts also experienced below average relative rainfall for the period (Figure 24,

Table 6), as well as areas in Western and South East LLS districts.

- Large areas of the North West, Northern Tablelands, North Coast and LLS districts received relative rainfall that was well below average to extremely low during the period.
- Most of the areas receiving below average relative rainfall received between 60-80% of their normal rainfall for the period, with a large proportion receiving less than 60%.
- Above average relative rainfall was restricted to scattered areas around Broken Hill, Wentworth, Deniliquin and the alpine areas.
- The majority of the State (57%) received average rainfall for the period, covering most of the Western, Murray and South East LLS districts, the central areas of Riverina and the southern half of Central West LLS districts.

3.2 Total rainfall

Total rainfall information is sourced from the AussieGRASS project of the Queensland Department of Science, Information Technology, Innovation and the Arts and from the Bureau of Meteorology.

November

- Overall, NSW received a State-wide rainfall of 54% of normal during November.
- Only areas of the far south and south west of the State received above average rainfall. A large area of the State received rainfall of less than 20-40% of average.
- Conditions were dry for most of the month. The majority of the rainfall occurred as a result of thunderstorm activity. Most of the rainfall occurred on the 1st, 6th, 16-17th and 24-26th of the month.
- Total rainfall over the State during November ranged from 0-200 mm, with the majority of the State receiving 5-25 mm.
- Areas in the south and north east received 25-100 mm, with the coast generally receiving 25-100 mm. The far north west and areas of the central west received 0-10 mm. Isolated areas of the north coast and part of the alpine areas received 100-200 mm (Figure 25).

September to November (3 months)

- Total rainfall over the three months to November ranged from 10-300 mm over NSW, with most of the State receiving between 25-100 mm.
- The west received between 10-50 mm for the period, and the central areas of the State between 25-100 mm (Figure 26). The tablelands, south west slopes, Riverina and Monaro generally received 50-200 mm. Most of the coastal strip received 100-200 mm, with limited areas in the south east and the alpine areas receiving 200-300 mm.

June to November (6 months)

- Rainfall across the State during the June to November period ranged from 50-600 mm (Figure 27), with most areas receiving between 100-300 mm.
- Some of the lowest rainfall over the period (50-100 mm) fell across the far west, west of Bourke, Cobar, Ivanhoe and Hay and mostly within the Western LLS district.
- The central areas of the State, including the plains and slopes, generally received 100-200 mm during the period. The tablelands and upper slopes generally received 200-300 mm, with some areas in the central and southern tablelands receiving 300-400 mm. The northern tablelands generally received 100-200 mm.
- The alpine areas and areas along the coast from received 300-600 mm for the period.

4. Temperature anomalies

Temperature information is sourced from the Bureau of Meteorology.

The data used to create the temperature anomaly maps in Figure 29 and Figure 30 are slightly different from that used to create the anomaly maps on the Bureau of Meteorology website. The comments below reflect the website maps, which are more accurate, rather than those included in this report. The maps in Figure 29 and Figure 30 are provided for a general assessment only.

- High temperatures occurred across NSW and the ACT during November, with the month being the fourth warmest on record.
- Daytime temperatures for the month were 4.06°C above average.
- The majority of the State had daytime temperatures of up to 3-5°C above average for the month, with the coast and eastern edge of the tablelands being up to 2-3°C above average. An area covering most of the central tablelands, north west and the west of the northern tablelands had daytime temperature anomalies of 5-6°C above average.

- November had two major heatwave events, between the 14-15th and 20-24th. Daytime temperatures for large areas of NSW were more than 12°C above average on the 14th and 23rd November.
- Overnight temperatures were 2.14°C above average during November.
- The majority of the State had minimum temperatures of 1-3°C above average for the month, with areas of the north west being 3-4°C above average.
- Areas of the south west and far south east had had minimum temperatures of 0-1°C above average.

5. Relative soil moisture

Soil moisture information is sourced from the joint CSIRO and Bureau of Meteorology Australian Water Availability Project (AWAP).

The soil moisture maps presented in Figure 31 and Figure 32 show the average monthly soil moisture content for the topsoil and subsoil, as a proportion of its saturated capacity.

Monthly soil moisture levels relative to historical records (percentile ranks) are shown in Figure 33 and Figure 34. These percentile rank products use a relatively short comparative period of 1961-1990, which may result in large fluctuations in values from month to month.

5.1 Summary

Table 7: Average monthly relative soil moisture (fraction) – percentage area of NSW in each class

Layer	Low (0-0.3)	Moderate (0.3-0.7)	High (0.7-1.0)
Topsoil	99%	1%	0%
Subsoil	60%	36%	4%

Source: Derived from information supplied by CSIRO and the Australian Bureau of Meteorology.

5.2 Topsoil

- Modelled topsoil moisture continued to decline during November, due to limited rainfall and warm temperatures (Figure 31). Levels across 99% of the State were in the lowest 30% of values, relative to a saturated profile. Most of Western, Central West and North West LLS districts had modelled topsoil moisture levels in the lowest 10% of values.
- Overall, only 1% of NSW had moderate topsoil moisture (averaged over the month), (Figure 31, Table 7).
- On a percentile rank basis (Figure 33), topsoil moisture levels were below average across most North West, Northern Tablelands, North Coast, Hunter, Central West, Central Tablelands and South East LLS districts. In addition, topsoil moisture levels were below average over the eastern and central areas of Western LLS district and the north of Riverina LLS district. Areas of extremely low topsoil moisture occurred across much of the North West, Northern Tablelands, Hunter and Central West LLS districts. They also occurred over the central areas of the North Coast, the east and north of the Central Tablelands, the central areas of the South East and the east of the Western LLS districts.
- Average percentile rank topsoil moisture extended across the far west of the Western LLS district, the central areas of Murray LLS district, the southern half of Riverina LLS district and an area in the far south of the South East LLS district.
- Total topsoil moisture levels dropped by about 50% from the previous month. They were generally less than 10 mm across most of western and central NSW. Over the tablelands and south west slopes, levels were generally between 10-20 mm, although the eastern areas of the Northern Tablelands LLS district had levels of less than 20-40 mm. Over the east of the State, levels were generally between 10-40 mm.

5.3 Subsoil

- Modelled subsoil moisture levels declined over the State between October and November (Figure 32, Table 7), with 60% of the State in the lowest 30% of values relative to a saturated profile. This was an increase from 53% in the previous month.
- The lowest modelled subsoil moisture levels were in the north east, east and south of the Western LLS district, the North West LLS district, the north of the Central West and the west of Riverina and Murray LLS districts.
- Moderate levels of modelled subsoil moisture occurred over most of the North Coast, Greater Sydney, Central Tablelands and South East LLS districts. Moderate levels also occurred in the west of Western LLS district, the south of Central West and the east of Murray and Riverina LLS districts.

- On a percentile rank basis (Figure 34), areas of below average subsoil moisture occurred across the North West and Northern Tablelands LLS districts. They also extended across most of North Coast, Central Tablelands and Riverina LLS districts, the north of Hunter and Central West LLS districts and the east of Murray LLS district.
- Areas of above average percentile ranked subsoil moisture occurred around Nyngan, in areas of the Western LLS district and in the south of South East LLS district.
- Total modelled subsoil moisture for the month was generally 50-200 mm across the western and central areas of the State. A band with 100 mm or less extended from the west of North West LLS district, through the east and to the south of Western LLS district. It also extended through the Central West LLS district and across the west of Murray and Riverina LLS district through Hay to Griffith, Wagga and to Deniliquin. The central and northern areas of the Northern Tablelands LLS district also had modelled subsoil moisture levels of less than 100 mm.
- Modelled subsoil moisture was less than 50 mm near Walgett, Lightning Ridge, Collarenebri, Hay and Armidale and between Balranald and Wentworth.
- Apart from the alpine areas, the south and central coast and southern areas of the South East LLS district had the greatest levels of total modelled subsoil moisture, in the range of 200-400 mm.

6. Pasture growth and biomass

Pasture growth and biomass information is sourced from the AussieGRASS project of the Queensland Department of Science, Information Technology, Innovation and the Arts.

The modelled total pasture growth and biomass levels should be used with some caution in the higher rainfall areas of NSW such as across the upper slopes, tablelands and coast. The pasture growth model is not as well calibrated for these areas as for the rangelands, plains and lower slopes.

6.1 Pasture growth outlook

Growth outlooks are based on modelled pasture and soil moisture conditions, modelled soil nitrogen levels and the phase of the Southern Oscillation Index (SOI) over the last one to two months.

The SOI phase is used to determine the likelihood of rainfall over the next three months, and is often different to the outlook from the Bureau of Meteorology POAMA model.

Growth outlooks are based on the probability of pasture growth over the next three months exceeding the long term (post 1957) median value.

The growth outlooks have varying levels of skill across NSW. As a result, they should be used with some caution. Skill levels are particularly low in autumn.

- The growth outlook was based on a consistently negative SOI phase during October to November. The SOI phase assessment of rainfall for December to February is for below average rainfall for the State, similar to the Bureau of Meteorology's outlook.
- The outlook for pasture growth over December to February suggests that slightly below average to below average growth is likely across much of central and western NSW and areas of the north west.
- Above average growth is suggested for areas of the tablelands, north coast and the northern Hunter valley. The outlook for the southern half of the coast is mixed, but is generally below average.
- Past skill levels for this outlook are high for the east of the State (coast and eastern areas of the tablelands), but are low to very low for most of the western half of the tablelands, and the central and western areas of the State. The outlook should be treated with some caution in the latter areas.

6.2 Modelled pasture growth

- Modelled pasture growth remained low across the majority of the western, central and north west of the State. Growth in these areas was less than 10 kg dry matter (DM)/ha.
- Growth declined across the eastern areas of the Central West LLS district, much of the Hunter and the northern area of the Central Tablelands LLS districts. Growth appeared to decline in across the Greater Sydney LLS district and the eastern areas of the South East LLS district, but improved over the North Coast LLS district (Figure 35).
- Reasonable growth occurred during the month across all except the north of the Central Tablelands LLS district, across areas of the Northern Tablelands LLS district and

the Monaro and tablelands areas of the South East LLS district. Reasonable levels of growth also occurred across the upper slopes areas of the Riverina and Murray LLS districts. However, even in these areas growth generally declined from that of October and was in the range of about 50-200 kg of dry matter (DM)/ha for the month.

- Modelled pasture growth across most of Western LLS district, most of the North West LLS district, most of the Central West LLS district, the western half of Riverina and Murray and the western and southern areas of the Hunter LLS districts was less than 10 kg DM/ha for the month.
- Note that the AussieGRASS modelled pasture growth output is not as well calibrated for upper slopes, tablelands and coastal areas as for the rangelands, plains and lower slopes.
- The output from alternative pasture growth models are more appropriate for the upper slopes, tablelands and coast than the AussieGRASS pasture growth model. However, there have been some calibration issues. Output from these models indicates that growth is low across most of NSW. However, there was a slight improvement across the eastern areas of the Murray and Riverina LLS districts, the north of the Hunter LLS district, the far south west of the Western LLS district and the Northern Tablelands and North Coast LLS districts.
- Relative to historical records, growth estimates from alternative models (relative to historical records) indicate below average growth across most of northern NSW, the tablelands, the central and south coast and the Hunter valley, as well as areas of the north coast. Areas of average growth occurred across most of southern NSW and the southern half of Western LLS district.
- Accumulated growth for the year across most areas of the South East LLS district is well above median, although growth slowed over the past month in many locations. Growth over the Central Tablelands LLS district also slowed over the last month, but accumulated growth is still above median in the central areas. In the north and south of the Central Tablelands LLS, growth has been poor during spring and accumulated growth for the year has fallen from well above median to near median or below. Growth across the Northern Tablelands LLS district remains low to moderate, and cumulative growth is below median. Cumulative growth across the North Coast LLS district has declined in the last month and is near median in the south, but below median in the north. Growth in this district over the last month has been near median in the south, but below median in areas of the north. Some coastal areas in the North Coast LLS district have shown an improvement in growth, although other areas are still below median. Growth across areas of the Hunter LLS district declined over the last month, and cumulative growth for the year has declined to median or somewhat above median levels.

6.2 Modelled biomass

- Modelled total standing dry matter (biomass) levels declined across areas of western, central and northern NSW. Declines also occurred in the north of the Central Tablelands and the west of the Hunter LLS districts. Biomass remained relatively stable elsewhere.
- Modelled biomass levels across the far western and northern areas of the Western LLS district and the North West LLS district (Figure 36) were generally less than 500 kg of dry matter (DM)/ha, and in many areas were less than 250 kg DM/ha. Across the remainder of the Western LLS district, biomass levels were generally 250-1,000 kg DM/ha.
- Modelled biomass levels across the Central West LLS district generally declined to less than 500 kg DM/ha. Levels of modelled biomass also declined across the Northern Tablelands LLS district, the north of Central Tablelands, the central and western areas of the Riverina and areas of the North Coast LLS districts.
- Note that the AussieGRASS modelled biomass output is not as well calibrated for upper slopes, tablelands and coastal areas as for the rangelands, plains and lower slopes.

6.4 Relative pasture growth

Relative pasture growth and biomass are calculated by comparing and ranking the current modelled growth and biomass against that for the same period over every year since 1957 (percentile ranks).

This means that if the current period has a rank of between 30 to 70 against all other years, it is regarded as being “average” and the conditions experienced will occur over about 4 out of every 10 years.

Relative monthly pasture growth should be compared to modelled pasture growth for interpretation. 'Average' levels of relative growth may correlate with modelled levels (in kg/ha) that are quite low or high at certain times of year.

Summary

Table 8: Pasture growth and biomass relative to historical records – percentage area of NSW in each class

Period	No Data	Below Average (0-30%)	Average (31-70%)	Above Average (71-100%)	Other
Growth					
Month	27%	58%	14%	1%	0%
Quarter	2%	53%	39%	5%	1%
Half Year	1%	35%	58%	5%	1%
Year	0%	19%	67%	13%	1%
Biomass					
Month	0%	45%	45%	9%	1%

Source: Derived from information supplied by the Queensland Department of Science, Information Technology, Innovation and the Arts.

November

- Relative to historical records, 58% of NSW had below average pasture growth during November (Table 8, Figure 37), although there were large areas of missing data across the west of the State.
- The area of the State with above average growth was just 1%.
- Average growth was restricted to areas of the north coast, the south and the far west.
- All LLS districts had below average growth across 60% or more of their area, with the exception of Western and Murray LLS districts. However, these LLS districts had large areas of missing data.
- The greatest declines in monthly relative pasture growth occurred across the South East, Hunter, Greater Sydney LLS districts and areas of the Central Tablelands LLS district.
- Well below average to extremely low monthly relative growth occurred across large areas of the North West, Northern Tablelands, Hunter, Central West, Central Tablelands and the Greater Sydney LLS districts, and the northern half of the South East LLS district.

September to November (3 months)

- Over the three months to November, relative pasture growth declined from the previous quarterly period. Areas of below average growth expanded, and areas of above average growth declined.
- The major declines in growth occurred across the northern tablelands and the north western, central and south western areas of the State.
- Over the Western LLS district, quarterly relative growth was low across the east, north and south, but average or better across the north west.
- Relative growth was average or better over 44% of the State. Only 5% of the area of NSW had above average relative growth and 39% had average growth (Table 8, Figure 38). Most of the coastal areas had average relative growth, as well as areas of the far north west.
- Some 53% of the area of the State had below average relative growth over the three month period. This included around 75% or more of the North West, Northern Tablelands, Central West, and Central Tablelands LLS districts, and over half of the Hunter, Murray and Riverina LLS districts.

June to November (6 months)

- Over the six month period from June to November, relative pasture growth declined from the previous period, particularly across northern and central areas of the State. Relative growth remained average across the far west and coastal areas of NSW.
- Much of the North West, Northern Tablelands and Central Tablelands LLS districts had below average growth for the period, as did the eastern and western areas of Central West, much of Riverina, the west of Hunter and the east and south of Western LLS districts. Below average growth extended across 35% of the State, an increase from 20% in the previous period.
- Relative growth over the period was average or above over 63% of the State (Table 8, Figure 39), and above average over just 6% of the State.

December to November (12 months)

- Yearly relative growth was average or above across 80% of the State (Table 8, Figure 40), with 67% of the State having average relative growth.
- Below average relative growth for the period covered 19% of the area of the State. It extended across 74% of the North West LLS district. Between Walgett, Lightning Ridge and Goodooga and around Moree, relative

growth was extremely low (relative growth in the lowest 10% of years).

- Patches of below average relative growth occurred across the north east of Western LLS district, the west of the Riverina LLS district around Hay, the north west of the Northern Tablelands LLS districts, and the east of Riverina and Murray LLS districts. Growth around Hay, Tenterfield and Tweed Heads was also extremely low.
- Patches of above average growth occurred in the far south west and west of Western LLS district, the north west of Central West LLS district near Nyngan and over areas of the coast.

6.5 Relative biomass

Relative monthly biomass should be compared to modelled biomass for interpretation. "Average" levels of relative biomass may correlate with modelled levels (in kg/ha) that are quite low or high at certain times of year.

- The area of below average relative total standing dry matter (biomass) increased between October and November from 34% to 45% (Table 8, Figure 41). Levels of average relative biomass fell from 52% to 46% and above average relative biomass from 13% to 9%.
- Relative to historical records, biomass remained average across most of the coastal LLS districts, most of Western LLS district and across the south east of NSW. However, patches of below average relative biomass occurred in the north and west of the Hunter LLS district and the northern and central areas of the North Coast LLS district. Areas of below average relative biomass also occurred in the north east and east of Western LLS district. Relative biomass levels remained high across areas of the far west of the Western LLS district, and some of the central areas of Murray LLS district.
- Relative biomass levels across most of the North West and the Northern Tablelands LLS districts were well below average to extremely low. Relative biomass was also low across the majority of Central Tablelands LLS district, the east of Central West and the majority of Riverina LLS district.
- Relative biomass levels were extremely low across the west and north of North West LLS district, the central Northern Tablelands, the north east of Western, the north of North Coast and in the west of Riverina LLS district around Hay.

7. Crop production

An updated copy of the NSW DPI grains report was not available at the time of publication.

8. Water storage and irrigation allocations

8.1 Storage levels

Storage levels are given as at 4 December 2014.

- Levels in water storages are low-moderate, with the average capacity being 47%.
- Changes in storage levels during the last month were generally minor, with the largest increase at Lake Cargelligo (8%). Most storages had minor decreases of between 1-5%, with the largest decrease at Blowering Dam (-14%), Lostock Dam (-8%), Hume Dam (-7%) and Burrinjuck Dam and Lake Pamamaroo (-5%).

Table 9: Capacity of storages

Storage	Current Volume (GL)	Effective Capacity (%)	Monthly Change (%)
Toonumbar	-	-	-
Malpas	7	60	-5
Glenbawn	643	86	-1
Glennies	231	82	-2
Lostock	18	87	-8
Brogo	9	100	0
Cochrane	-	-	-
Dartmouth	3374	87	-4
Hume	1926	64	-7
Blowering	679	41	-14
Burrinjuck	741	72	-5
Brewster	-	-	-
Carcoar	10	27	-4
Cargelligo	33	87	8
Wyangala	593	49	-4
Glenlyon	70	-	-
Pindari	38	12	-1
Copeton	364	26	-2
Chaffey	22	34	-2
Keepit	48	10	-4
Split Rock	70	17	-2
Burrendong	259	19	-3
Oberon	28	62	-2
Windamere	173	47	-1
Lake Cawndilla	73	0	0
Lake Menindee	-	0	0
Lake Pamamaroo	98	33	-5
Wetherell	58	28	-2
Total	**9565**		
Average		**47**	

8.2 Irrigation allocations

Allocations are given as at 4 December 2014.

- General security allocations remained unchanged from early September, except for a small increase in the allocations for the Bega-Brogo River Valley from 48% to 52%, and for the Murray River Valley from 39% to 45%.

Table 10: Irrigation allocations

River valley	Allocation	Licence category
NSW Border Rivers*	28.2%	General security A Class
	0%	General security B Class
	100%	High security
Richmond	100%	General security
	100%	High security
Gwydir*	0%	General security
	100%	High security
Hunter	100%	General security
	100%	High security
Paterson	100%	General security
	100%	High security
Lachlan*	0%	General security
	100%	High security
Belubula*	0%	General security
	100%	High security
Lower Darling*	100%	General security
	100%	High security
Macquarie and Cudgegong*	2%	General security
	100%	High security
Murray*	45%	General security
	97%	High security
Murrumbidgee*	40%	General security
	95%	High security
Lower Namoi*	0%	General security
	100%	High security
Upper Namoi*	100%	General security
	100%	High security
Peel	0%	General security
	50%	High security
Bega Brogo	52%	General security
	100%	High security
*Carry over water may be available		

9. Appendix

Maps and data used in the production of this report.

Seasonal rainfall and temperature outlook

Figure 9: Quarterly rainfall outlook

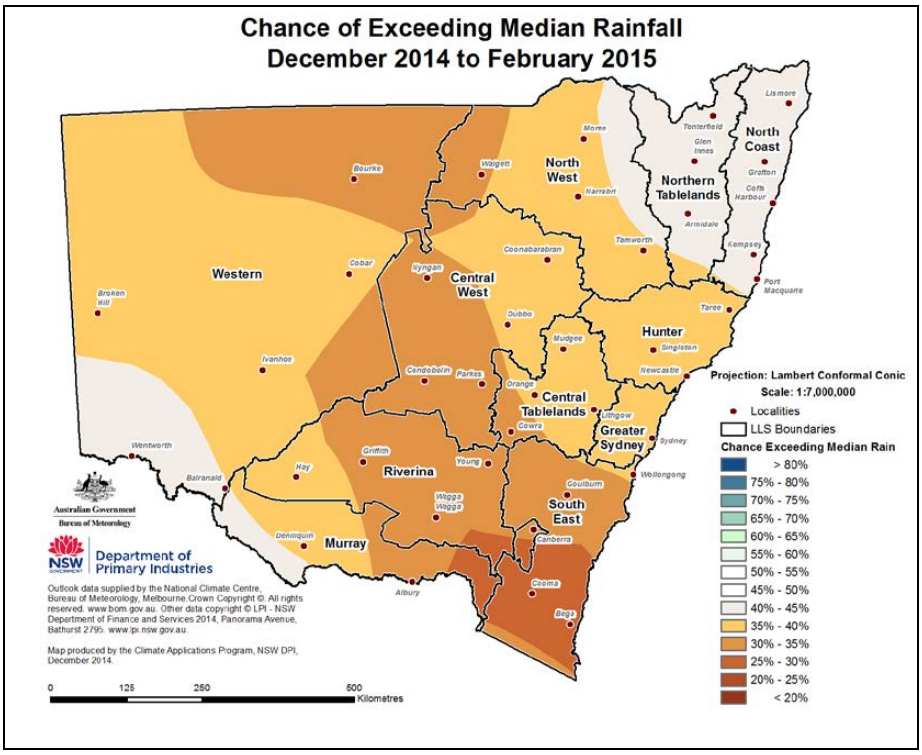


Figure 10: Quarterly maximum temperature outlook

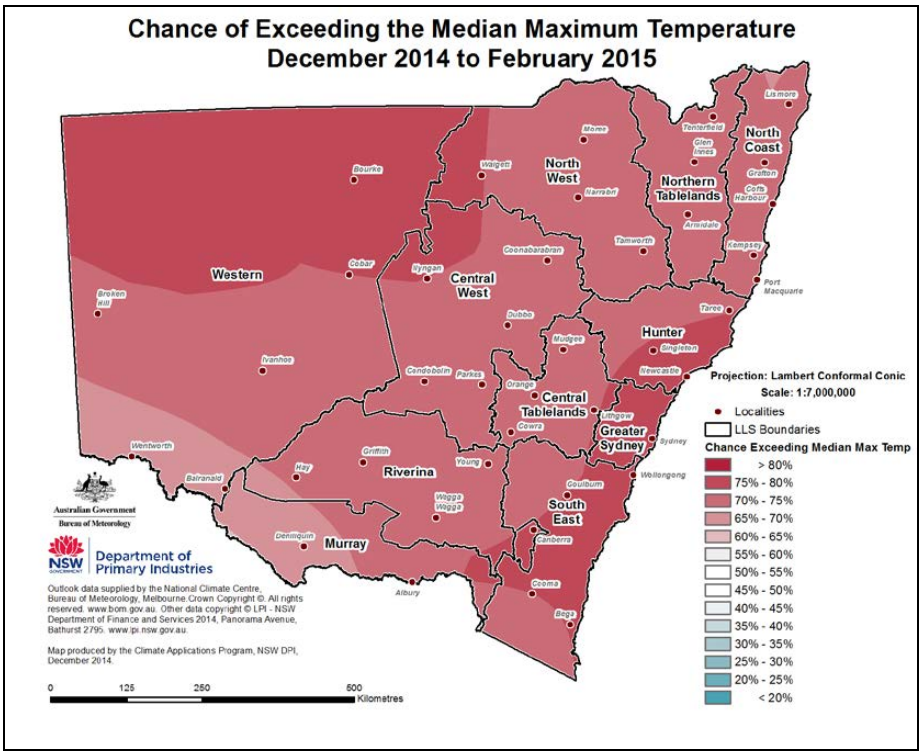


Figure 11: Quarterly minimum temperature outlook

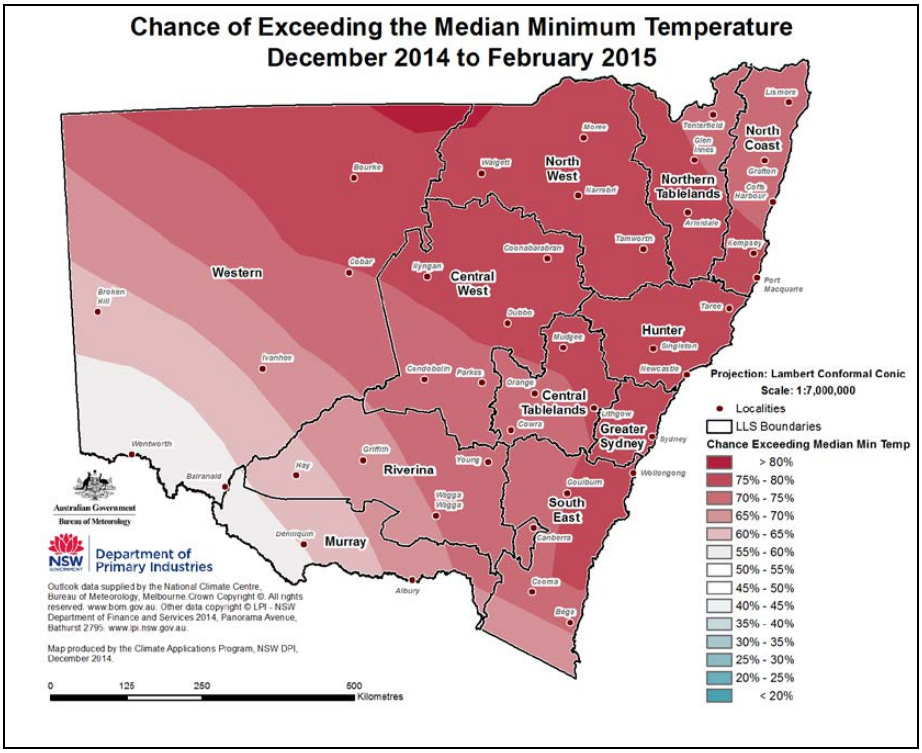
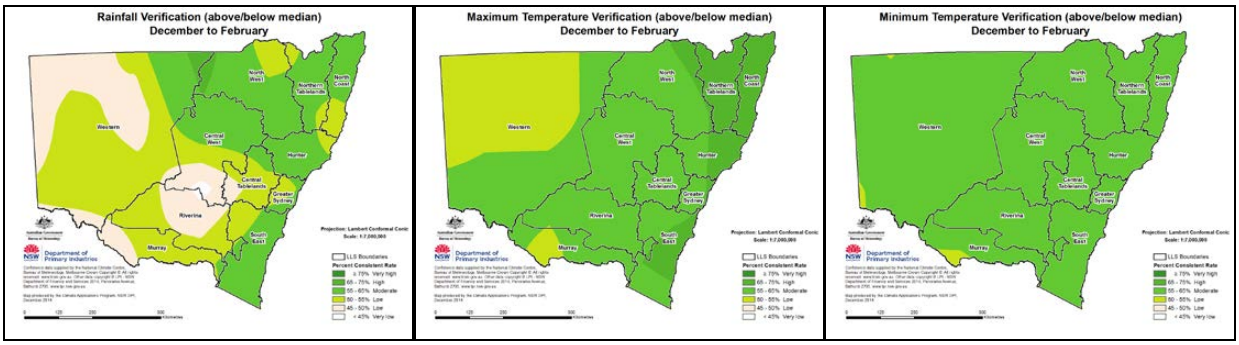


Figure 12: Outlook skill maps



Month 1 rainfall & temperature outlook

Figure 13: Month 1 rainfall outlook

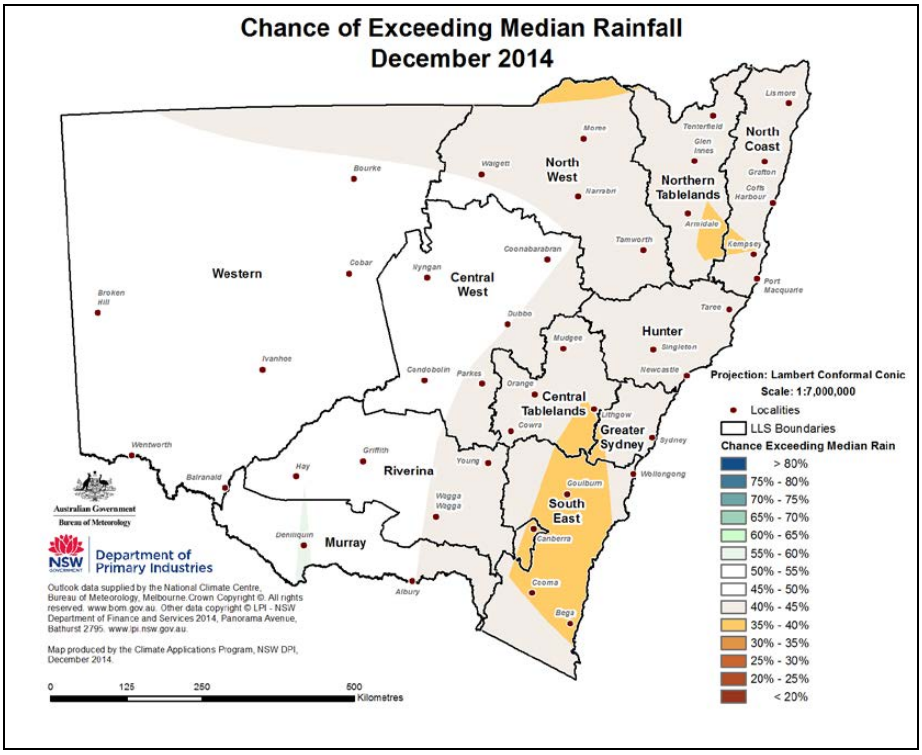


Figure 14: Month 1 maximum temperature outlook

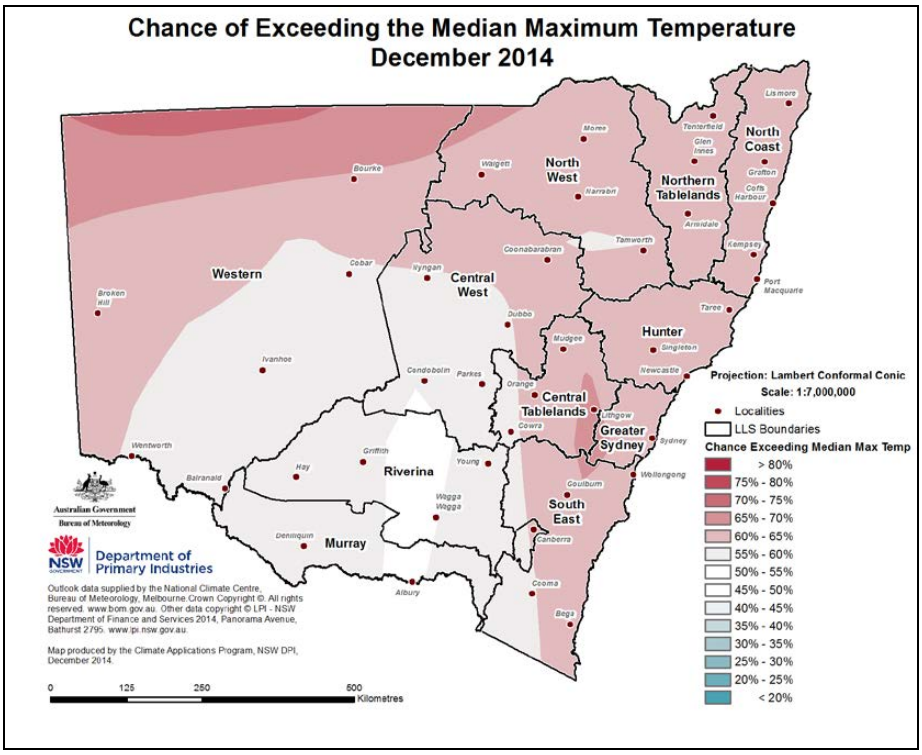


Figure 15: Month 1 minimum temperature outlook

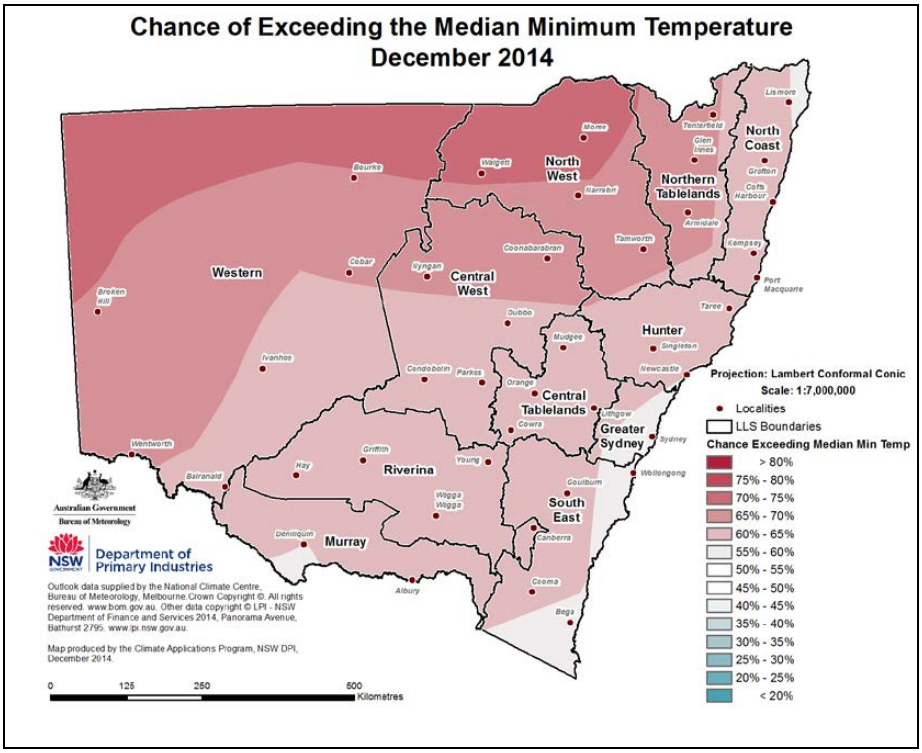
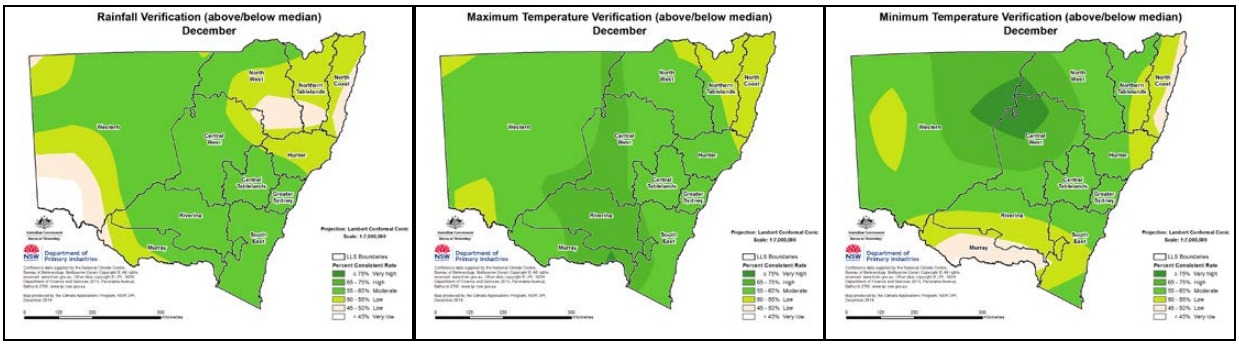


Figure 16: Month 1 outlook skill maps

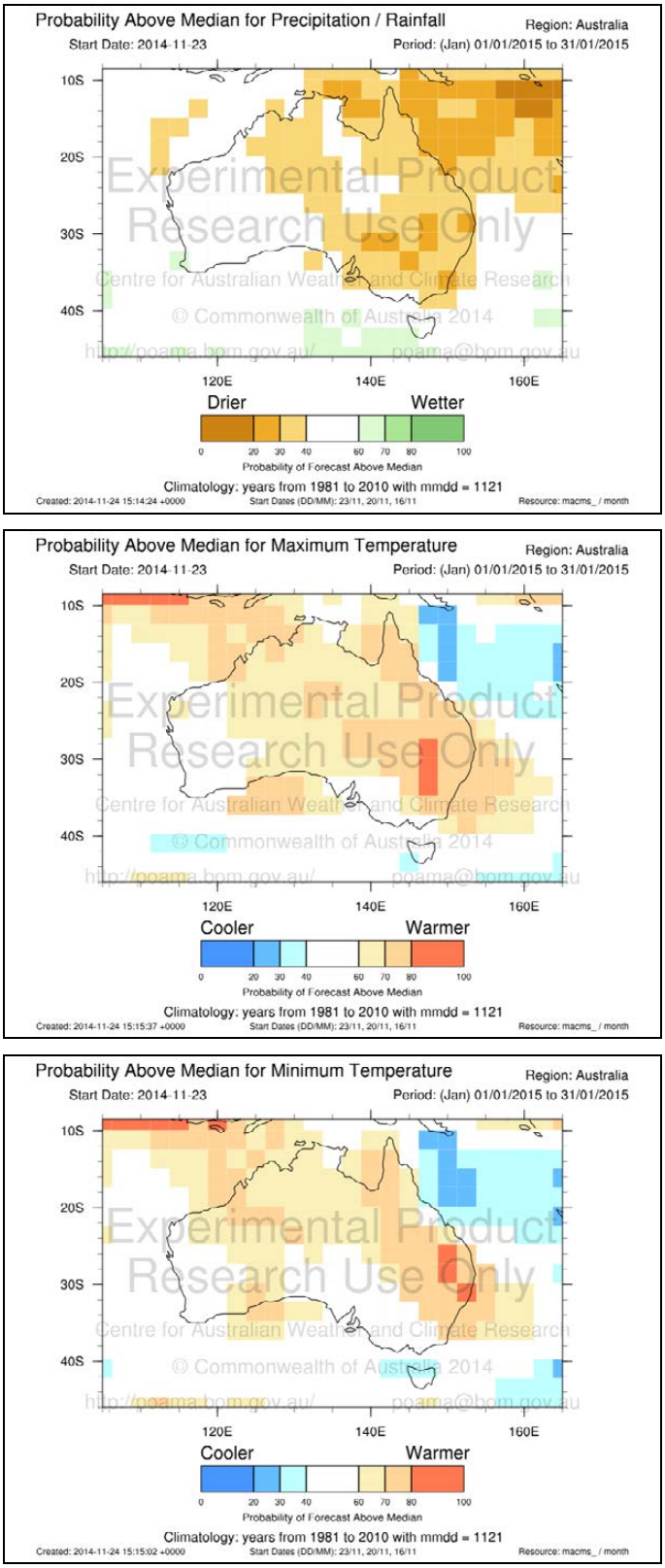


Month 2 rainfall & temperature outlook

(Bureau of Meteorology, POAMA - experimental)

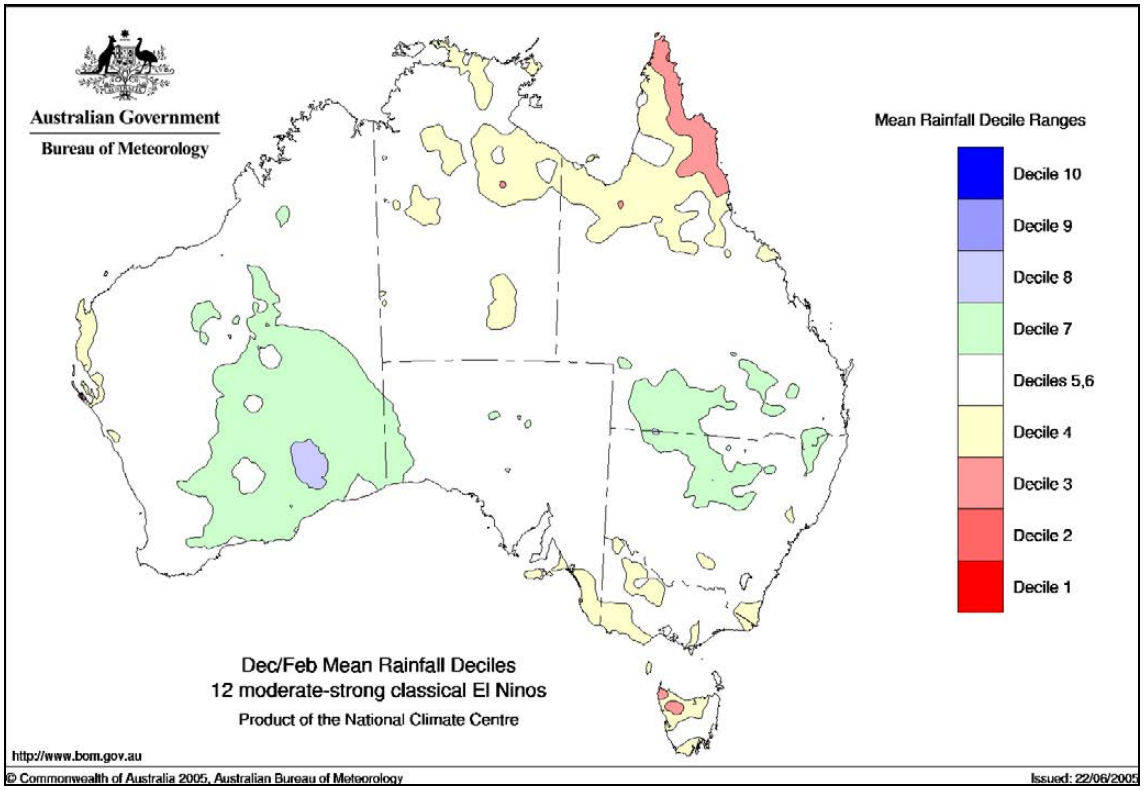
Note – Operational Bureau of Meteorology month 2 outlook maps will be available in the near future.

Figure 17: Experimental month 2 rainfall and temperature outlooks



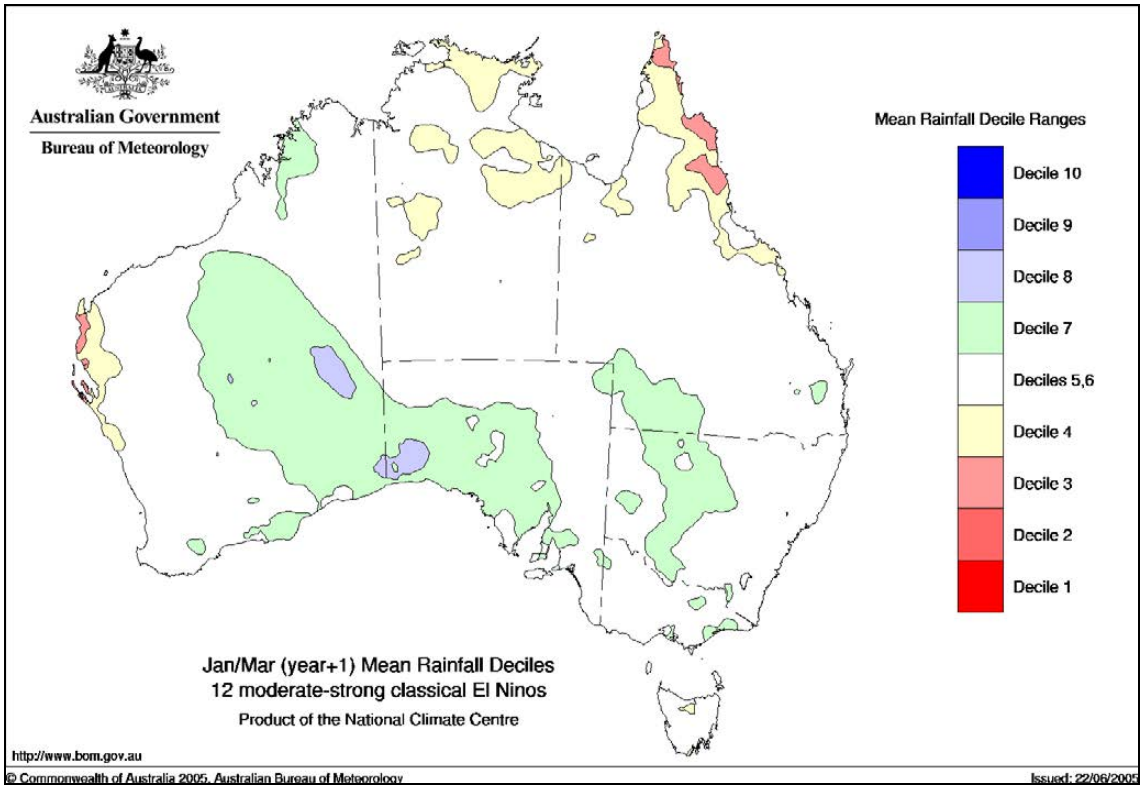
Possible effects of an El Nino event

Figure 18: Australian Dec-Feb mean rainfall deciles for twelve moderate to strong El Nino events



Source: Australian Bureau of Meteorology

Figure 19: Australian Jan-Mar mean rainfall deciles for twelve moderate to strong El Nino events



Source: Australian Bureau of Meteorology

Rainfall

Figure 20: Relative rainfall – monthly

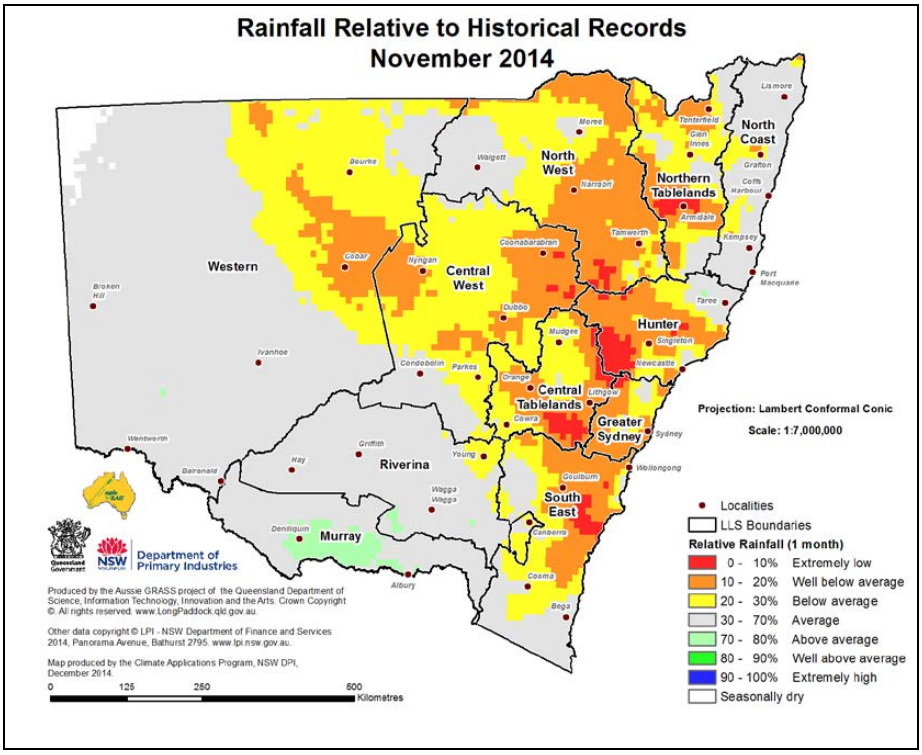


Figure 21: Relative rainfall – quarterly

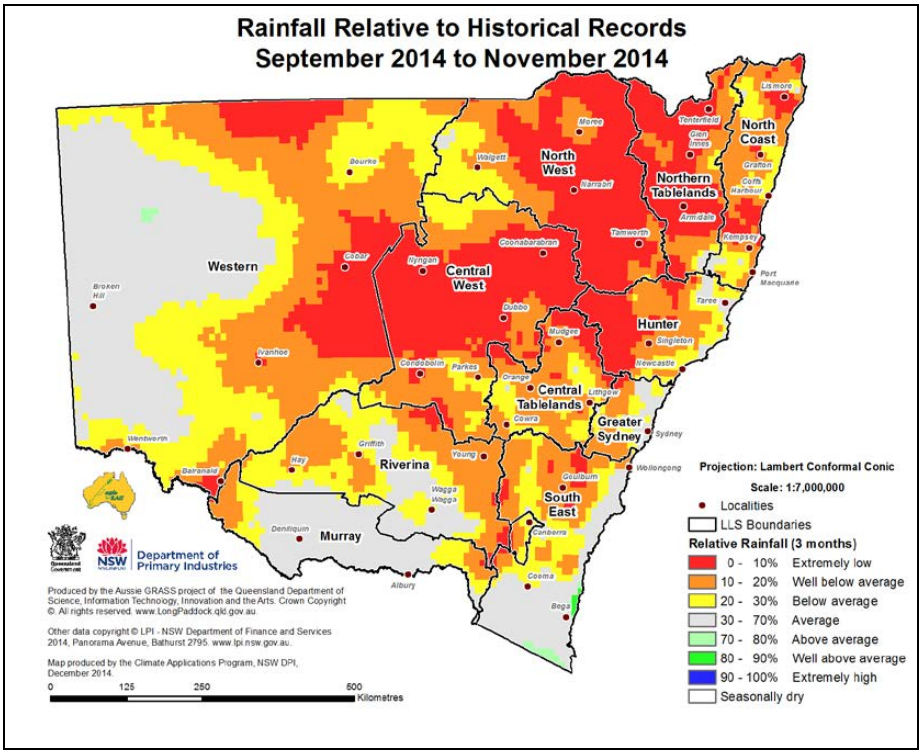


Figure 22: Relative rainfall – half yearly

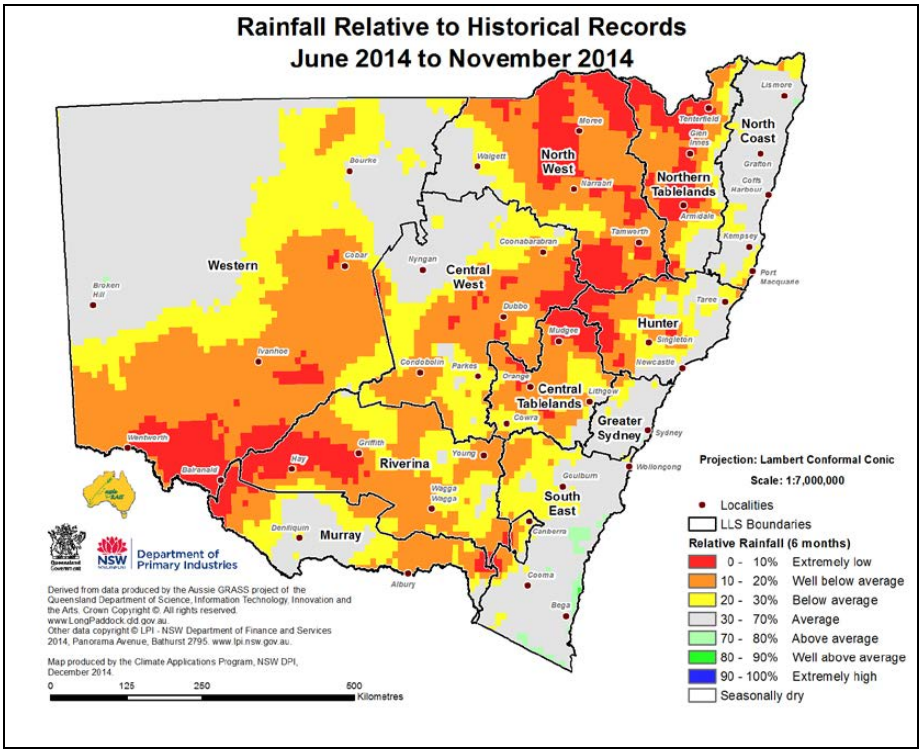


Figure 23: Relative rainfall – nine monthly

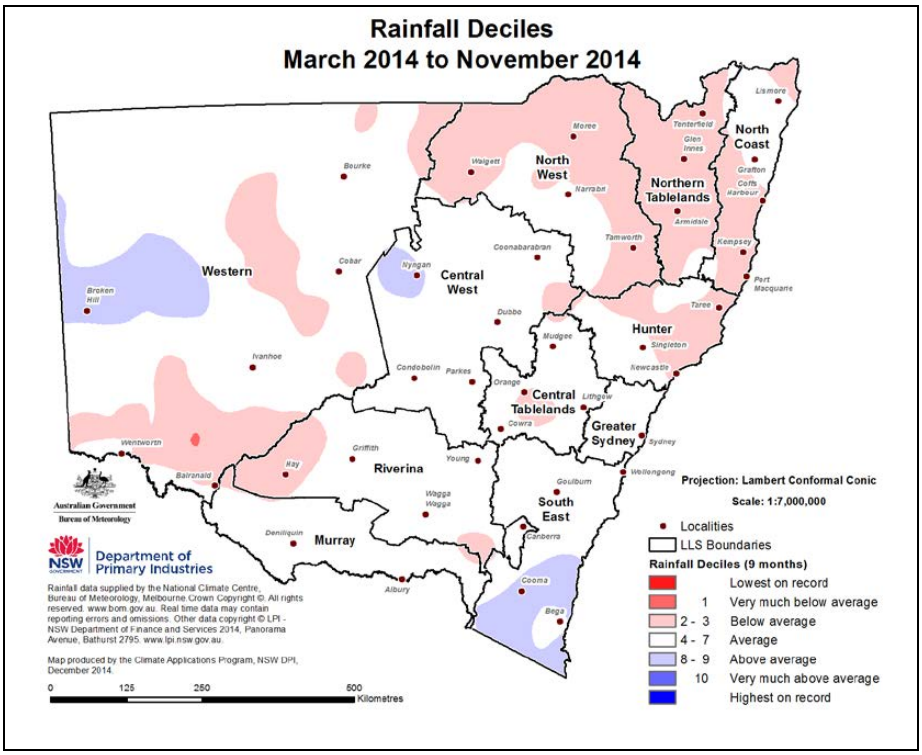


Figure 24: Relative rainfall – yearly

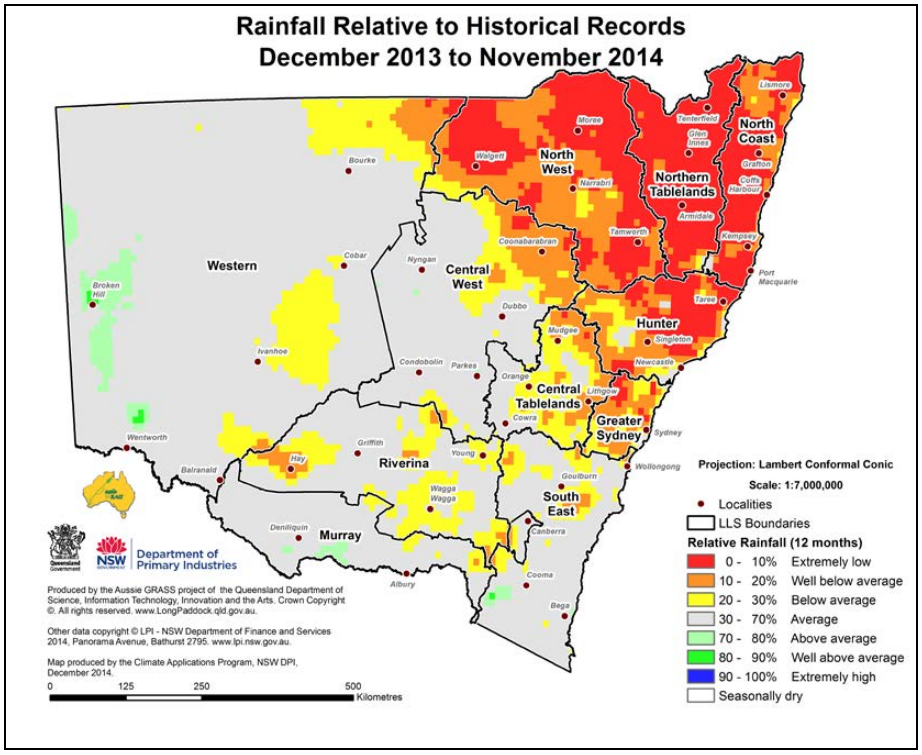


Figure 25: Total rainfall – monthly

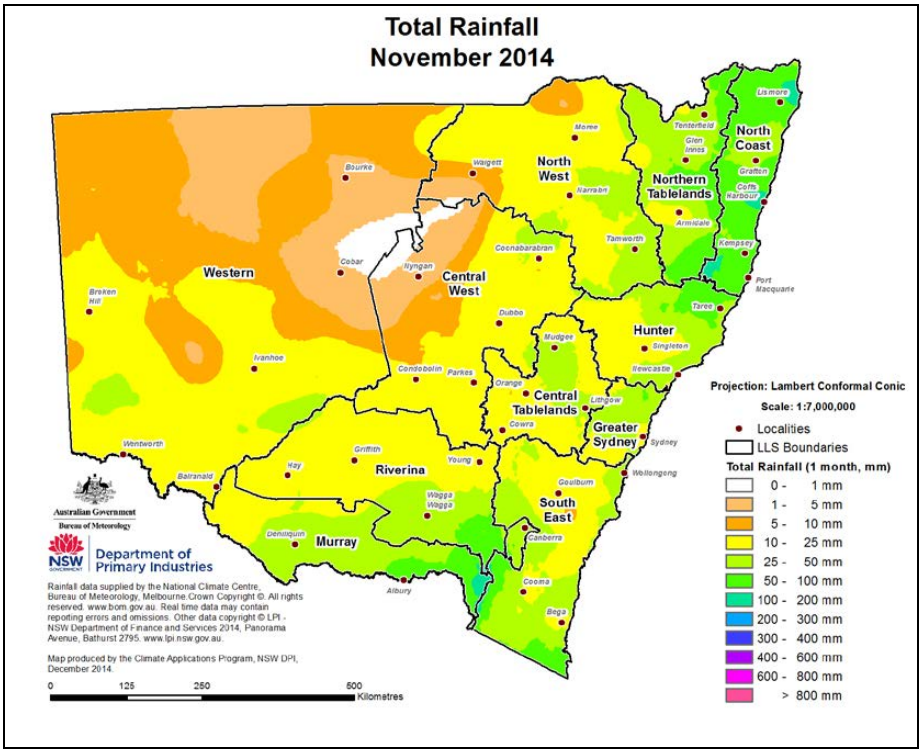


Figure 26: Total rainfall – quarterly

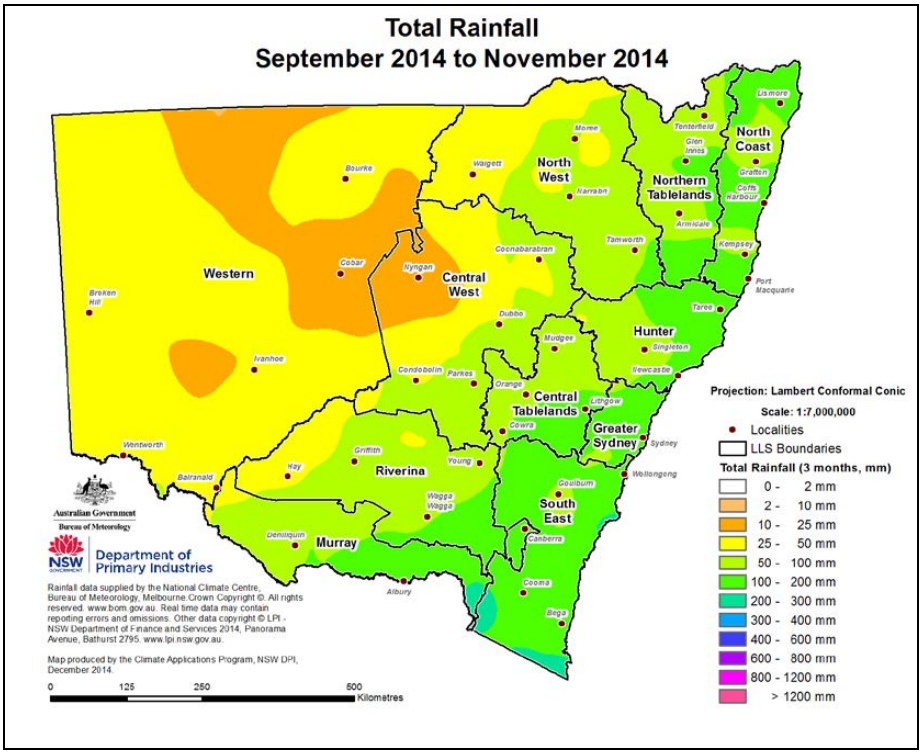


Figure 27: Total rainfall – half yearly

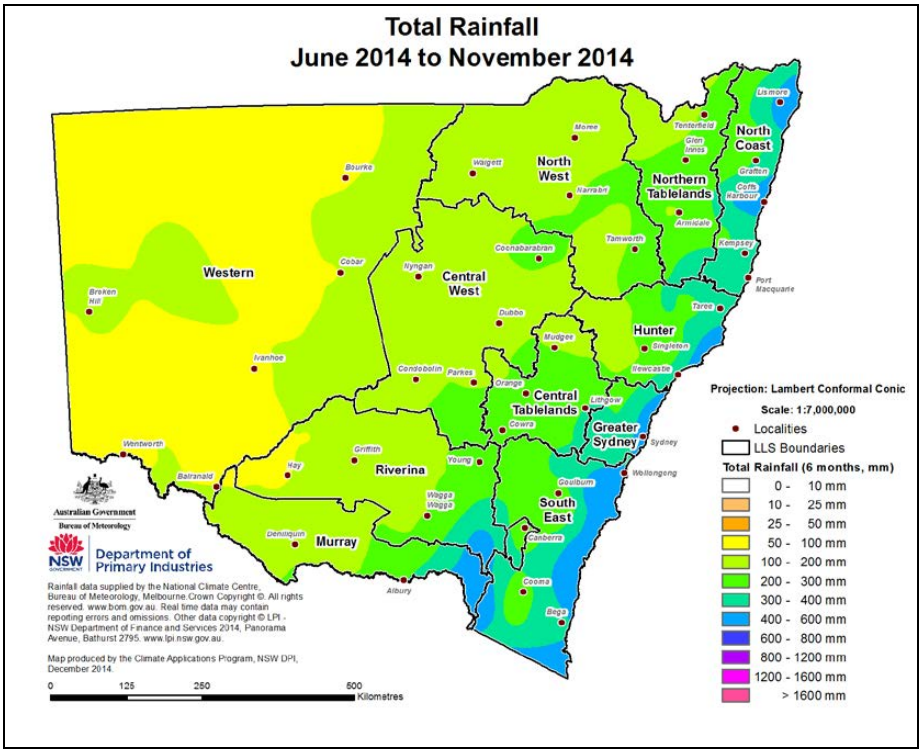
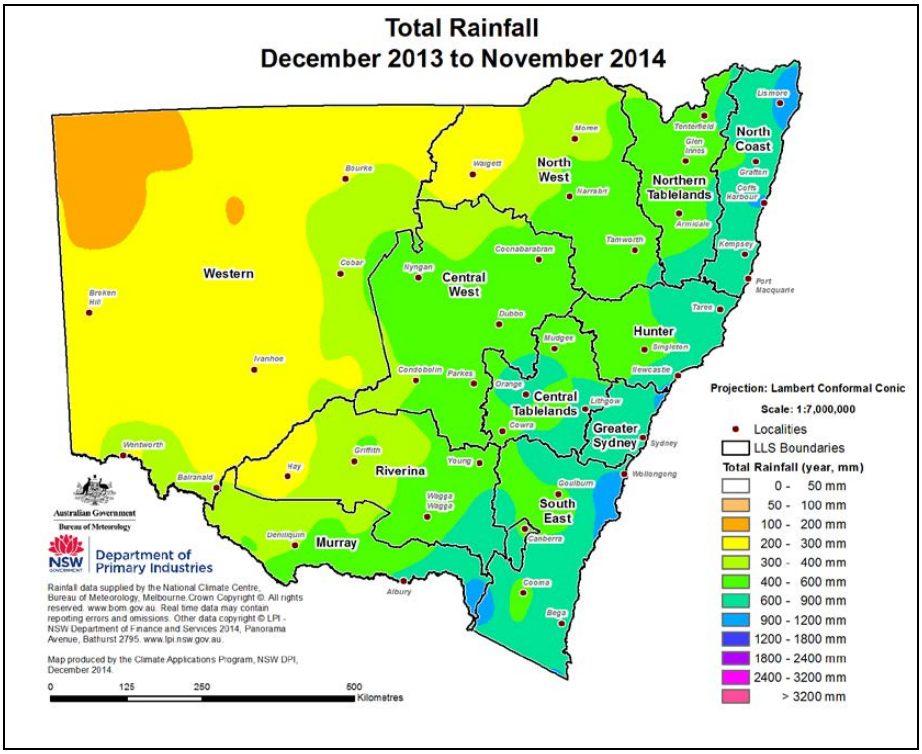


Figure 28: Total rainfall – yearly



Temperature

Note - The data used to create the temperature anomaly maps in Figure 29 and Figure 30 are slightly different from that used to create the anomaly maps on the Bureau of Meteorology website. The website maps are more accurate and should be used in preference.

Figure 29: Maximum monthly temperature anomaly

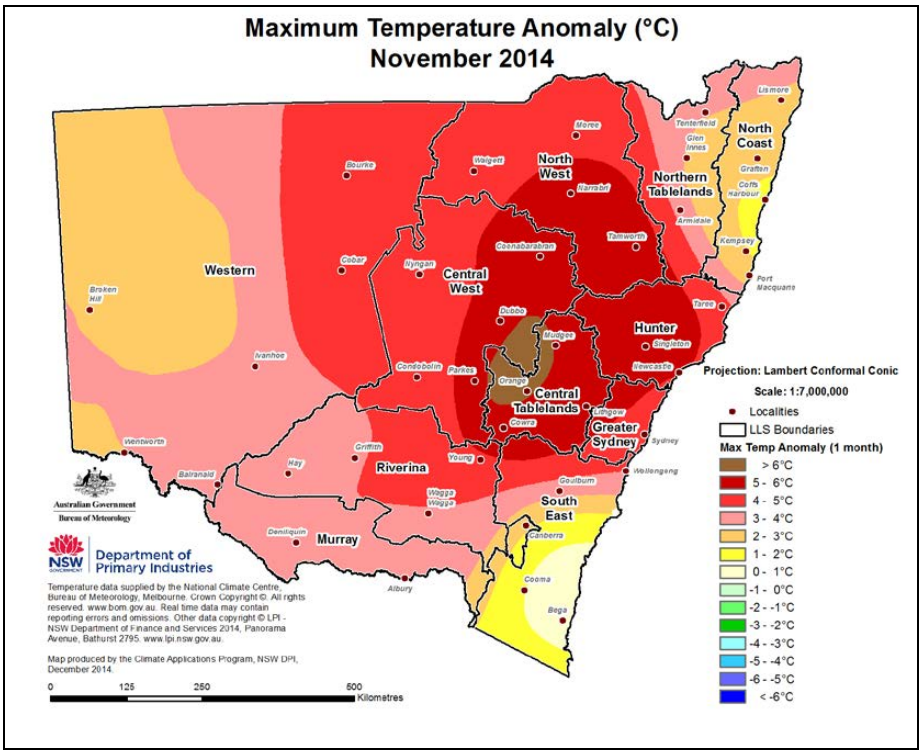
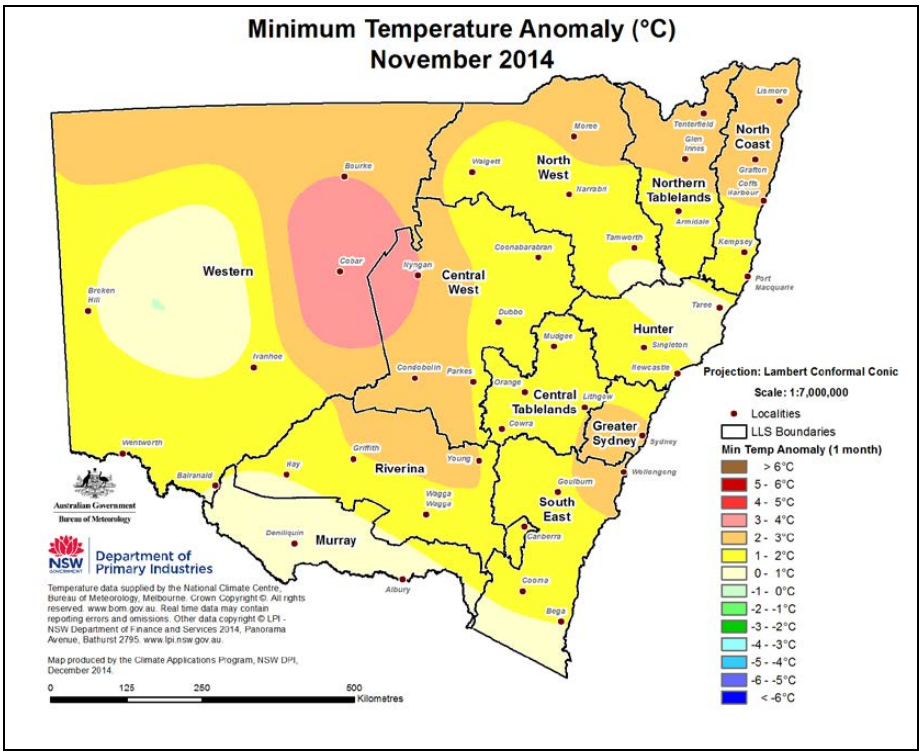


Figure 30: Minimum monthly temperature anomaly



Soil moisture

Figure 31: Relative monthly topsoil moisture (fraction of a saturated profile)

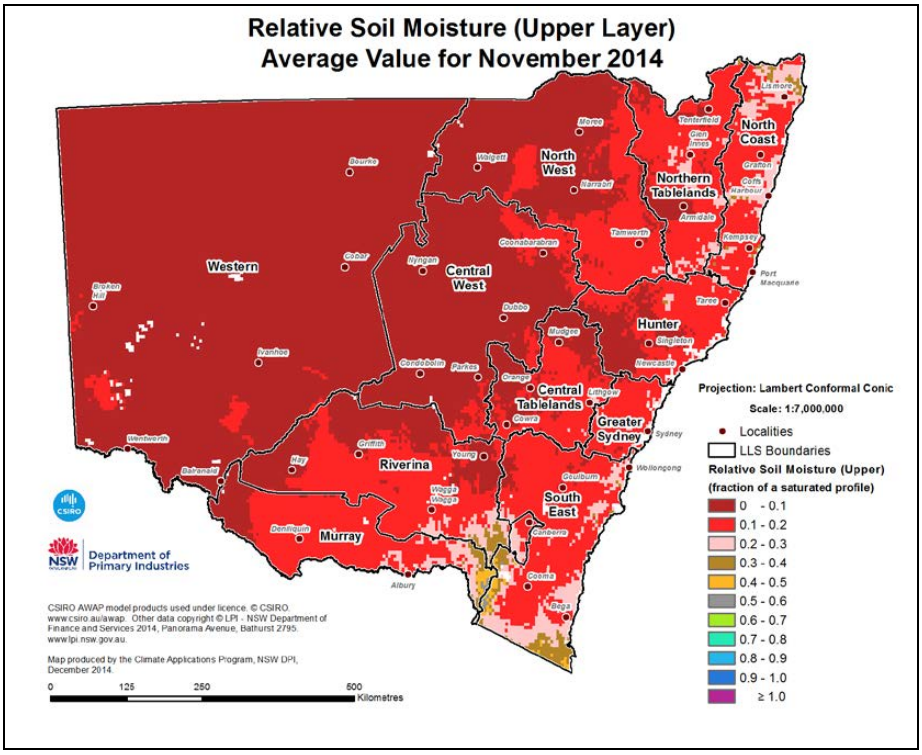


Figure 32: Relative monthly subsoil moisture (fraction of a saturated profile)

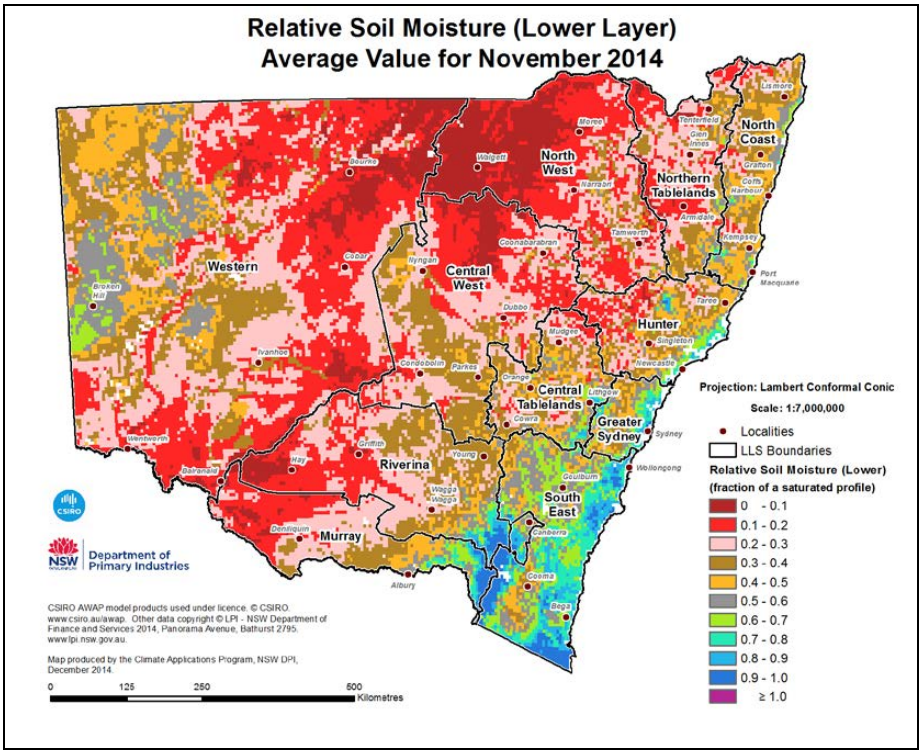


Figure 33: Relative monthly topsoil moisture (percent rank)

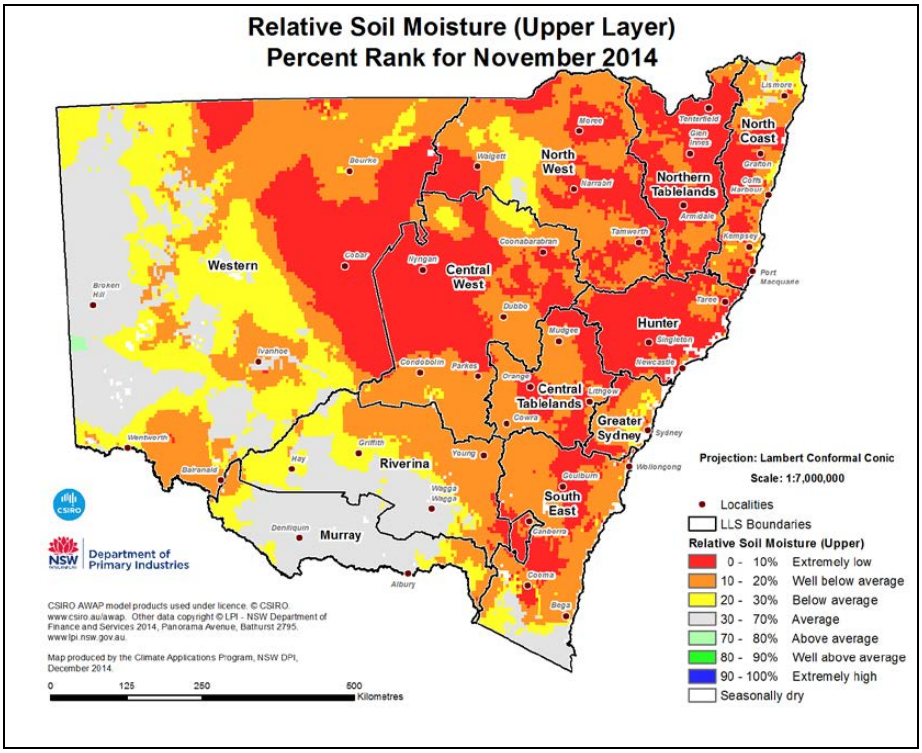
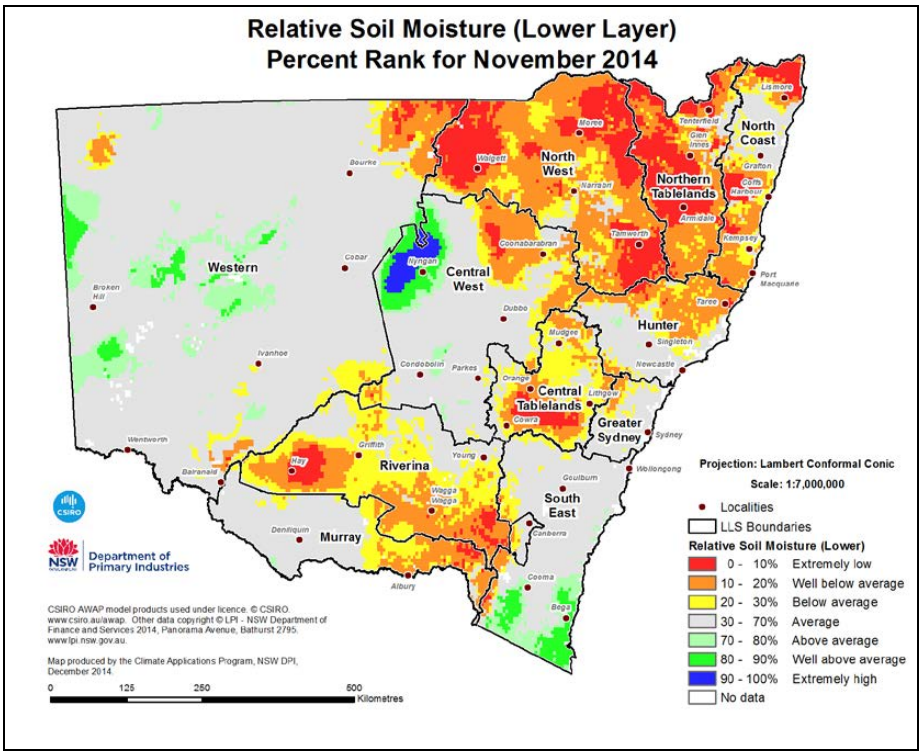


Figure 34: Relative monthly subsoil moisture (percent rank)



Pasture growth and biomass

Figure 35: Modelled pasture growth

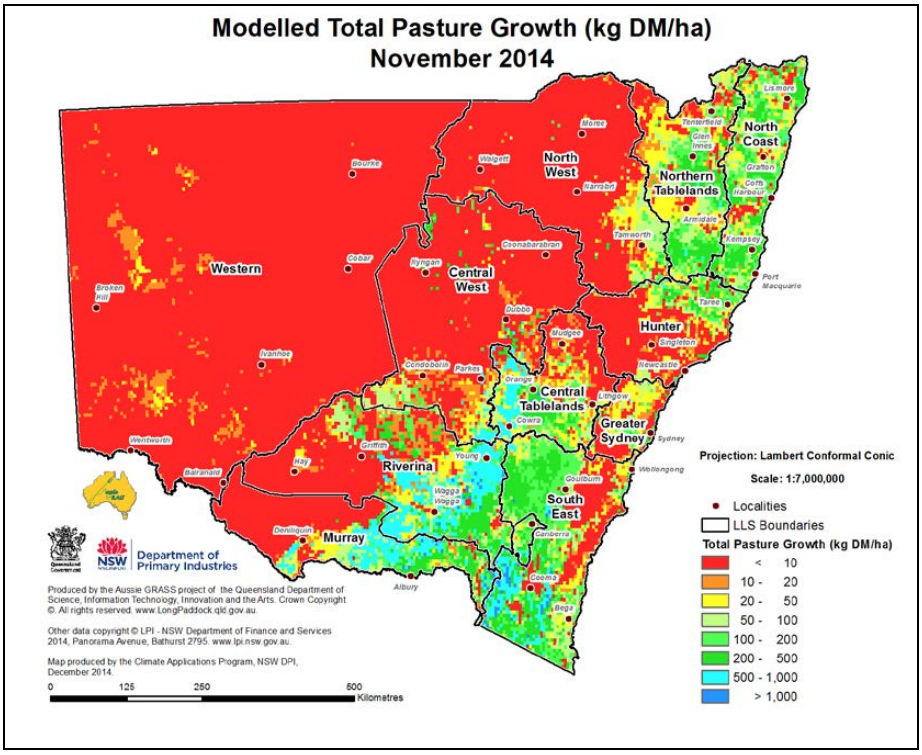


Figure 36: Modelled biomass

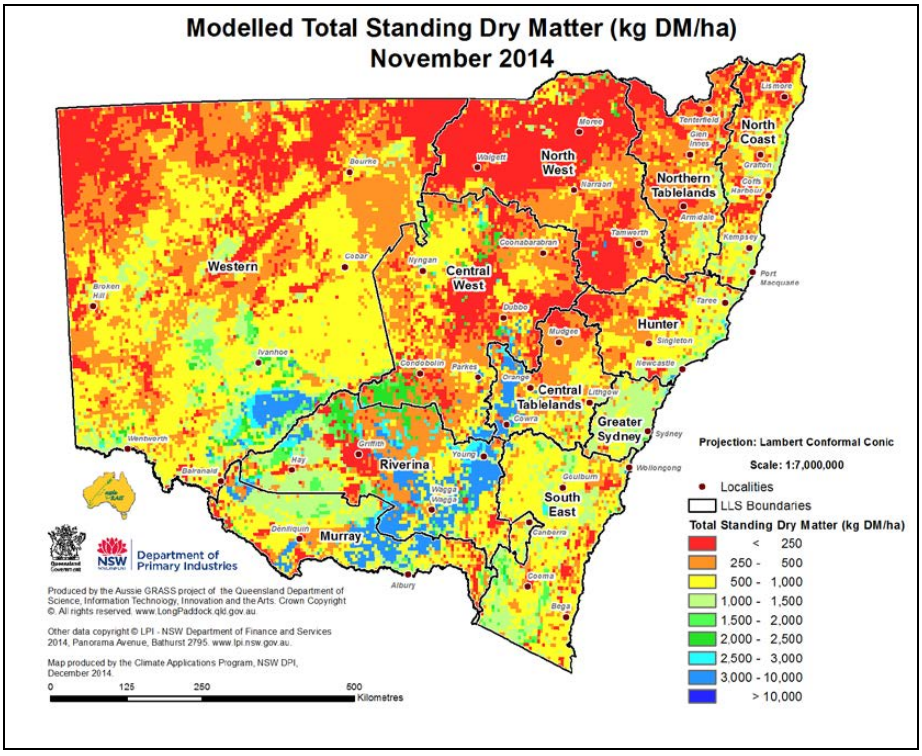


Figure 37: Relative pasture growth – monthly

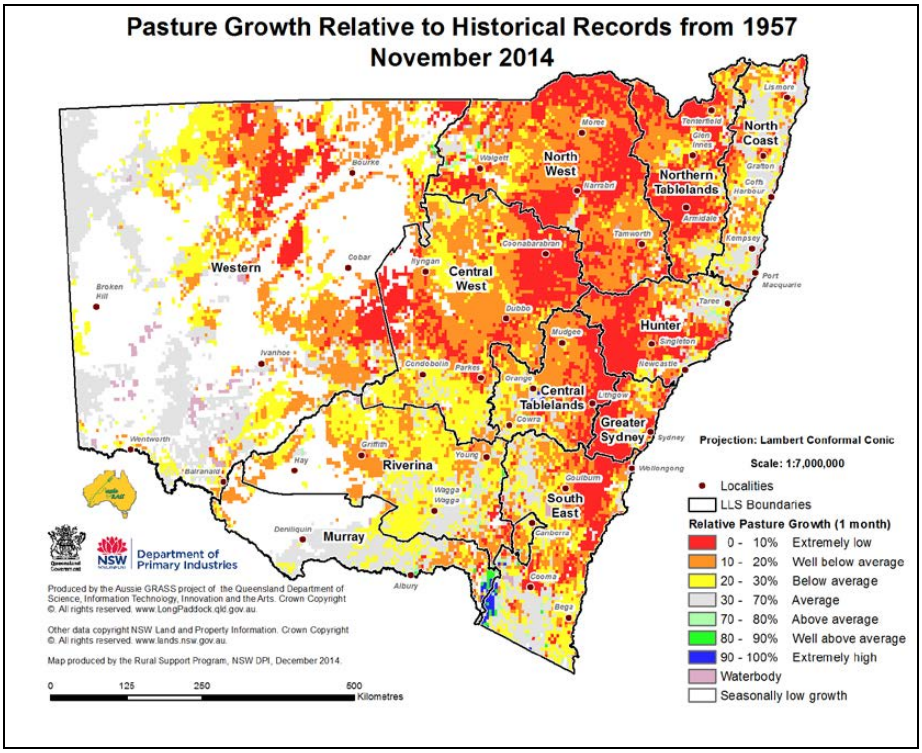


Figure 38: Relative pasture growth – quarterly

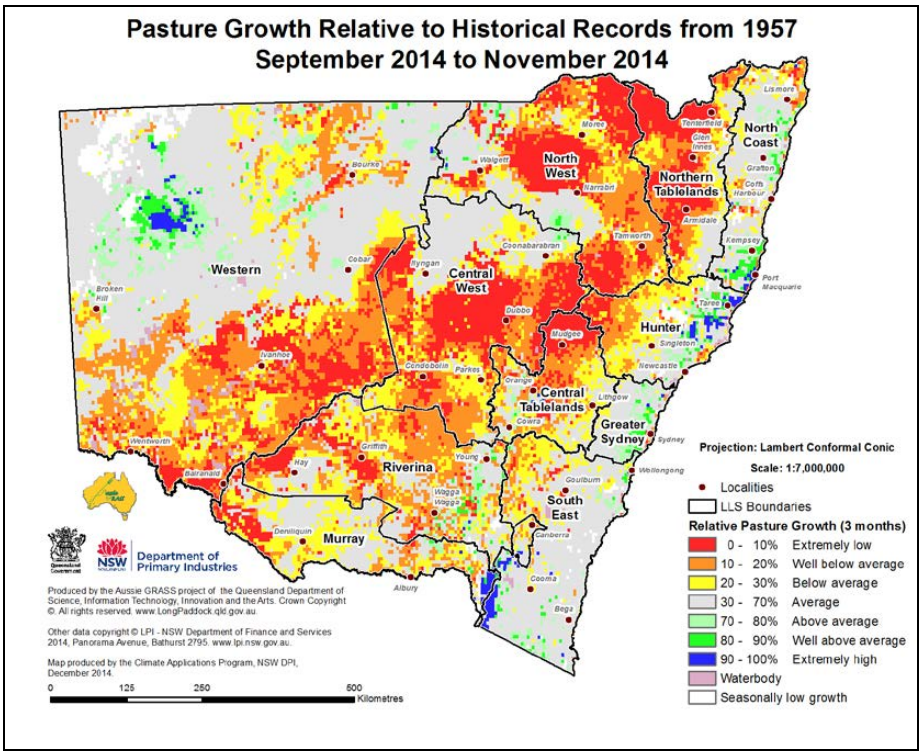


Figure 39: Relative pasture growth – half yearly

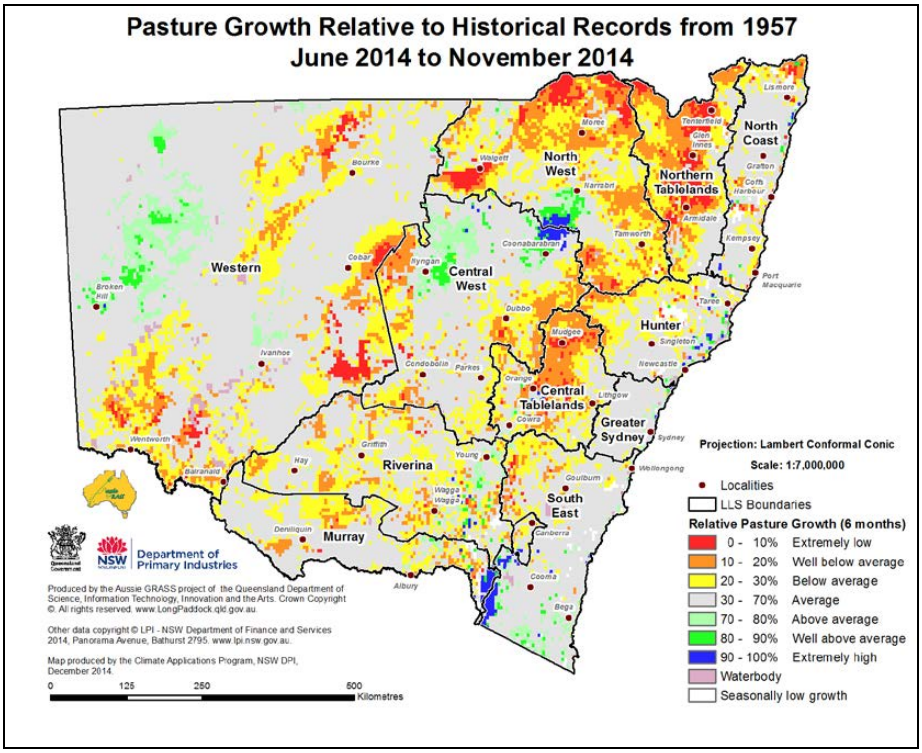


Figure 40: Relative pasture growth – yearly

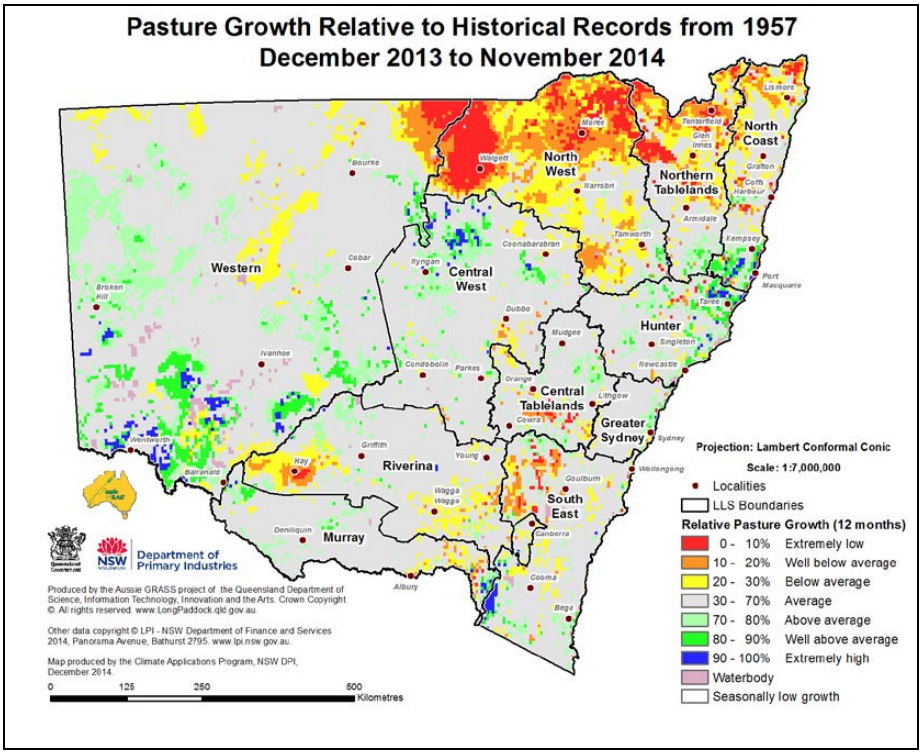


Figure 41: Relative biomass – monthly

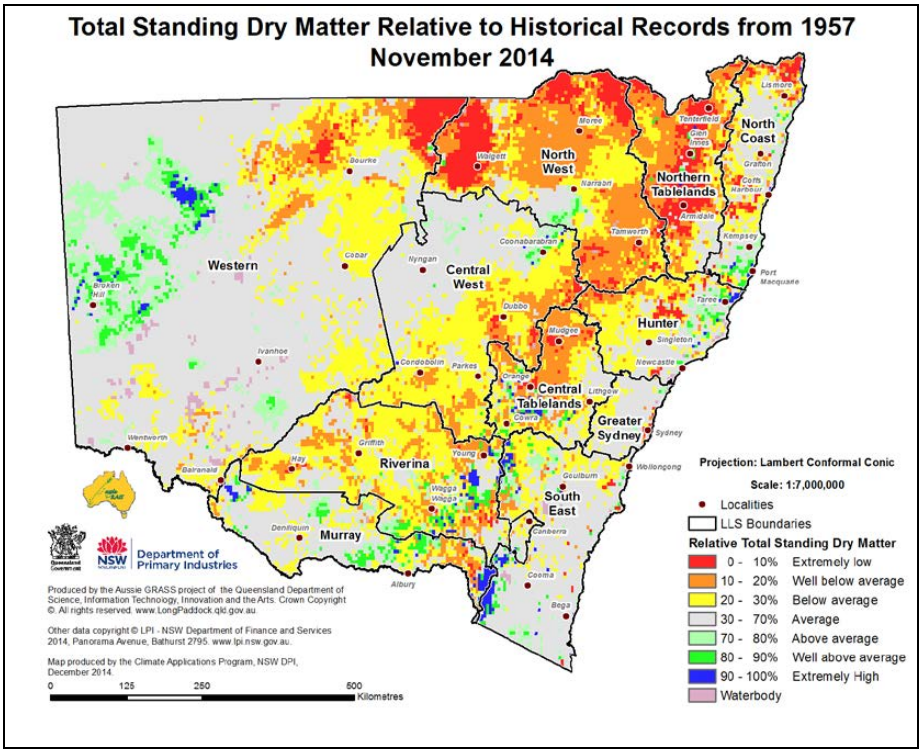
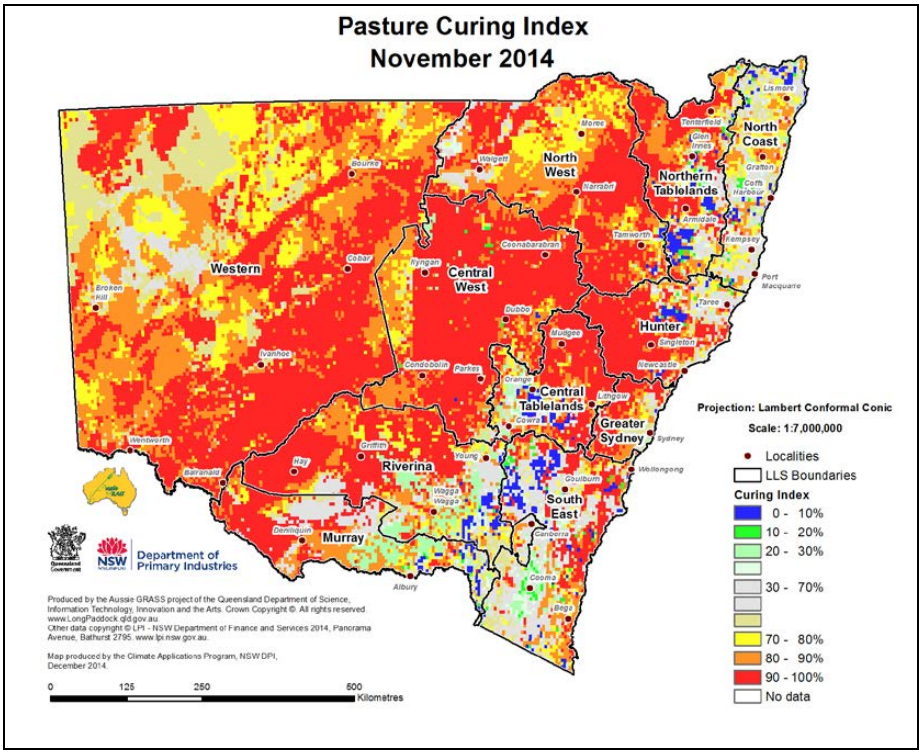


Figure 42: Pasture curing index



More information

For more information, contact the NSW Department of Primary Industries on 02 6391 3100 or Local Land Services on 1300 795 299.

The Seasonal Conditions Summary, a shortened version of this document, is available at http://www.dpi.nsw.gov.au/agriculture/emergency/seasonal-conditions/regional-seasonal-conditions-reports. A link to join the Seasonal Conditions mailing list is also available at that site.

A four-page simplified summary of the seasonal outlook and the current conditions is provided in the NSW Climate Summary, available at www.dpi.nsw.gov.au/agriculture/emergency/seasonal-conditions/summary.

Acknowledgments

Information used in this report was sourced from the Australian Bureau of Meteorology, CSIRO, Queensland Department of Science, Information Technology, Innovation and the Arts, NSW Local Land Services, the US National Oceanic and Atmospheric Administration, the International Research Institute for Climate and Society (Columbia University), the UK Meteorological Office, the APEC Climate Centre and NSW Department of Primary Industries.

Warning

Published by the Department of Primary Industries.

ISSN 2202-1795 (Online)

PUB14/311

Volume 2/Number 12

Jobtrack 12948