Department of Primary Industries

NSW Seasonal Conditions Report - September 2014

Highlights

- Good rainfall occurred across western, northern and coastal NSW, but was low across southern-central areas.
- Drier than normal conditions are likely from September to November across southern and central NSW, and generally warmer conditions. Drier conditions are likely across the west in September.
- ENSO remains neutral, with a 50-65% chance of a late and weak El Niño event developing.
- Pasture growth improved over the coast, north and west, but slowed in southern and central NSW.
- Crops in southern and some central areas have suffered from moisture stress and severe frosts, and yields have been affected. Rainfall is needed in early September.
- Stock water supplies remain variable.
- 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 August was average or above across 76% of NSW, but areas of southern and central NSW received below average rainfall.

Pasture growth slowed across much of southern and south-central NSW during August, but improved along the coast, north and west. Growth across the majority of NSW was average. Biomass remained relatively stable, but improved over areas of the north and north east.

Winter crop growth was affected by a lack of August rainfall across the south and areas of central NSW, with crops now suffering from moisture stress. In the north, crops are also reliant on limited subsoil moisture reserves. Early to mid-September rainfall is essential. Severe frosts in July-August have caused major yield damage to crops across southern and central NSW, particularly early sown crops. Wheat, lupins and canola have been worst affected. Some crops have been grazed out or cut for hay.

Drier than normal conditions are likely between September and October across southern and central NSW and areas of the south east and far west, with generally warmer than normal daytime and overnight temperatures. Over September, drier than normal conditions are likely in the west, with warmer daytime and overnight temperatures in the west and south, and cooler conditions in the north east.

ENSO remains neutral, with a continued 50-65% chance of a late El Niño event in spring. A weak event is considered the most likely. The Bureau of Meteorology El Niño status remains at 'watch' level. Sea surface temperatures are warm along most of the equatorial Pacific. Sub surface warm anomalies are present in the eastern to central Pacific and if westerly winds occur, could trigger an event. Cooler sea surface temperatures have occurred north of Australia, reducing rainfall sources. The IOD is expected to move to neutral.

Rainfall occurred across NSW mid-late month, ranging from 25-100 mm over most of NSW. The coast received 100-400 mm, much of the south less than 10 mm and central areas 10-25 mm. Daytime temperatures were near normal. Overnight temperatures were average in the north but cooler in the south, with severe frosts.

In relative terms, quarterly rainfall was below average over 23% of NSW and average over 58%. Half yearly relative rainfall was average or above over 98% of NSW. Over the quarter, relative rainfall was low across the south and areas of the central tablelands and north west.

Modelled topsoil moisture remained low across the west and north, declined over southern and central NSW but improved along the coast. Subsoil moisture was relatively stable, but was particularly low across the north and north east.

Stock water supplies were variable. Streamflow analysis showed below average run off over areas of the tablelands, north west, south, far west and coast (prior to heavy late August rain).

Relative pasture growth declined in southern and central areas of NSW, but improved across the west, north and coast. Quarterly relative growth remained average or above over 87% of NSW. Relative biomass levels were generally average for the time of year. They declined in the southern and central areas, improved along the coast, but were low over areas of the north west.

The seasonal outlooks presented in this report are obtained from the Australian Bureau of Meteorology & 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 & decision making. Changes in seasonal outlooks may have occurred since this report was released. Outlook information was up to date as at 8 September 2014.

Table of Contents

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 higher 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 August and early September and were up to date as at 5 September 2014.

2.1 Seasonal outlook summary

Table 1: Seasonal (quarterly) outlook summary

	Current Outlook	Previous Outlook
Rainfall (quarter)	Drier (south/central) Near neutral-neutral (northern, far western, north east & far south east NSW)	Drier (south/central) Near neutral-neutral (northern NSW & south to mid-north coast)
Max Temperature (quarter)	Warmer Near neutral (north/north east NSW)	Warmer Near neutral (far north west NSW)
Min Temperature (quarter)	Warmer Near neutral (north/north east NSW)	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 (BoM)

- For the three month period from September to November, drier than normal conditions are likely across most of the southern and central areas of the State. The chances of exceeding median rainfall in these areas are between 25-40%. That is, the chances of receiving below median rainfall are 60-75%. There is a near-equal chance (a 40-45% probability) of above or below median rainfall for most of northern NSW and areas of the far west, as well as the coastal areas from the central to mid-north coast, and the far south coast. For the north east of the State, there is an equal chance of above or below median rainfall (Figure 9).
- This means that for every ten years with similar climate patterns to those at present, across much of southern and central of NSW about three to four September to November periods would be expected to be wetter than normal and six to seven drier than normal.
- The outlook accuracy (confidence or skill) is moderate across most of NSW, ranging from 55-65%, with areas that are high (65-75%) in the north west. However, accuracy is low (less than 55%) across areas of the south (Figure 12).

2.3 Seasonal temperature outlook

- Over the three month period from September to November, warmer than normal daytime temperatures are likely across most of NSW (Figure 10).
- The chance of exceeding median maximum temperatures ranges from 60-80% across most of NSW, with the highest probabilities in the south of the State. The north west and north east of the State have a near-equal probability for warmer or cooler than normal daytime temperatures.
- This means that for every ten years with similar climate patterns to those at present, across most of southern and central NSW about six to eight September to November periods would be expected to have warmer than normal daytime temperatures, and two to four cooler than normal daytime temperatures.
- The outlook accuracy (confidence or skill) is high (65-75%) across most of NSW and moderate (55-65%) across areas of central-southern NSW (Figure 12).
- Warmer than normal overnight temperatures are likely across most of NSW between September to November. The chance of exceeding median minimum temperatures ranges from 60-65% in the north to more than 80% in the far south east. The northern tablelands and areas of the north west slopes have a near-equal chance of above or below normal overnight temperatures (Figure 11).

- The outlook accuracy (confidence or skill) for the minimum temperature outlook is moderate to high (55-75%) across most of NSW, but very high in areas of the far west and low (less than 55%) across the northern tablelands and north coast (Figure 12)

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

	September	October
Rainfall	Drier (west) Near neutral-neutral (east)	Neutral Drier (areas of the south east)
Max Temperature	Warmer (west & south/south west) Cooler (north east) Neutral (remainder)	Neutral Warmer (south east)
Min Temperature	Warmer (south & west) Cooler (north east) Neutral (remainder)	Warmer (south) Neutral (remainder)

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 - September

- Drier than normal conditions are likely across the western half of NSW on the September outlook (Figure 13). The probability of exceeding the median rainfall is 35-40% over this area of the State, decreasing to 30-35% in the north western corner. The exception is the far south western corner of the State, where there is a near-equal chance of wetter or drier than normal conditions. There are near-equal to equal chances of drier or wetter than normal conditions across the remainder of the State (a probability of exceeding median rainfall of 40-55%), with an increased chance of wetter than normal conditions in the far south eastern corner of NSW near Eden. The outlook has a moderate accuracy (skill) over most of the State, but a low accuracy over the coast, areas of the central west, northern tablelands and north west.
- Warmer than normal daytime temperatures are likely (a 60-80% probability) across much of the west, south west and most of the south of NSW during September (Figure 14). The far north east is likely to have cooler than normal daytime temperatures, and the remainder of the State (including most of the coast) has a near-equal to equal probability for warmer or cooler than normal daytime temperatures. This outlook has a moderate accuracy (skill) across most of eastern and central NSW, a high to very high accuracy for areas of the central west and north west, and a low accuracy over areas of the far north west and far west of NSW.
- Warmer than normal overnight temperatures are likely (a 60-80% probability) across the west, south west and much of the south of NSW during September. The north east of the State (including most of the northern tablelands and north coast) is likely to have cooler than normal overnight temperatures, and the remainder of the State has a near-equal to equal probability for warmer or cooler than normal overnight temperatures (Figure 15). This outlook has a low accuracy (skill) across the far north east and most of western and central NSW. It has a moderate accuracy for eastern NSW and areas of the south west and far north west.

September multi-week (as at 7 September)

- Weekly experimental outlook information suggests that during the third and fourth week of September (14-27 September) drier than normal conditions are likely across NSW, with the exception of the north east, areas of the north west and the mid north to north coast. The accuracy (skill) for this outlook is moderate for far north western NSW, but low across the remainder of NSW.
- Daytime temperatures over the third and fourth week of September are likely to be warmer than normal across northern and north eastern NSW, but cooler in the far south west. The remainder of NSW has an equal chance of warmer or cooler than

normal conditions. This outlook has moderate accuracy (skill) over NSW.

- Overnight temperatures over the third and fourth week of September are likely to be warmer than normal across the north east of the State, and cooler than normal across the remainder. Cooler than normal temperatures are most likely in the far south and south east. The accuracy (skill) level for this outlook is moderate for most of NSW, but low in the south.

Month 2 - October

- The experimental outlook for October indicates a near-equal probability for drier or wetter than normal conditions across most of NSW (Figure 17). There is a possibility of drier than normal conditions in areas of the south east. The accuracy (skill) for this outlook is moderate across most of NSW, but low over the central tablelands, areas of the north west, the far west and areas of the north coast and the central-south coast.
- There is a near equal probability of warmer or cooler than normal daytime temperatures across most of NSW during October (Figure 17). Warmer than normal daytime temperatures are likely for areas of the far south east. The skill for this outlook is moderate across most of NSW, but low in areas of the far west and the far north east.
- There is a near equal probability of warmer or cooler than normal overnight temperatures across most of NSW, with warmer than normal temperatures likely across the south (Figure 17). However, the accuracy (skill) for this outlook is low across most of eastern, southern and central NSW, but moderate across the north west and areas of the far west.

2.5 Other climatic models

Bureau of Meteorology statistical model (superseded)

The Bureau of Meteorology statistical model outlooks have been superseded by those from the POAMA model.

With the launch of the new Bureau of Meteorology climate outlook webpage in August 2014, they are no longer available.

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 wetter than normal conditions are likely across most of NSW between September and November, with a 60-80% probability. Some areas in the far north east have a near equal probability for wetter or drier than normal conditions. The skill assessment for this outlook is high across most of eastern and central NSW, but moderate-high for the west. The model indicates that there is a near equal probability of above or below average temperatures across most of NSW, with higher than normal temperatures likely across areas of the coast, and lower than normal temperatures likely across areas of the tablelands and central west. The skill assessment for this outlook is high across most of NSW, but moderate to low across the far west and low to moderate over the far south east.
- For October to December, the UK Meteorology Office's global long range probability modelled output indicates there is an increased chance of wetter than normal conditions across most of NSW (a 60-80% probability of above average precipitation), with a near equal probability of drier or wetter than normal conditions over the far north east. The skill assessment for this outlook is moderate over most of eastern and central NSW, low in the west and south, and high in areas of the north east. For temperature, the outlook indicates that warmer than normal conditions are likely across western, southern and most of eastern NSW with a 60-80% probability of exceeding the average temperature over most of NSW. Northern NSW and areas of north-central NSW have a near-equal probability of above or below average temperatures. The temperature outlook has a low skill over much of NSW, although the skill is moderate to high in the central west and along the mid-north to north coast.

APEC Climate Centre

- The APEC Climate Centre's deterministic multi-model ensemble outlook of rainfall anomalies for September to November indicates that near normal rainfall is likely across most of the State. The temperature anomaly outlook indicates the likelihood of warmer than normal average temperatures, particularly across coastal and southern-central NSW. No skill assessment is available for these outlooks. During September, the APEC Climate Centre's rainfall anomaly outlook indicates a near

normal rainfall is likely across NSW. The temperature anomaly outlook indicates warmer than normal average temperatures are likely during September. No skill assessment is available for these outlooks.

2.6 El Niño-Southern Oscillation (ENSO)

ENSO summary

- ENSO remains neutral, and there is now a reduced chance (about 50-65%) of El Niño conditions developing by spring. If an event does develop, it is most likely to be weak. Some models indicate the likelihood of a borderline El Niño event.
- Sea surface temperatures are warm along the eastern and western equatorial, but with patchy warm anomalies in the central Pacific. Subsurface positive temperature anomalies have increased since late July, and have shifted eastwards.
- The SOI is currently around -11, but needs to sustain these levels to be considered negative. While its behaviour indicates an El Niño-like trend, it is a result of high atmospheric pressure over Darwin rather than a fall in pressure over Tahiti.
- Trade winds have been variable, and are currently near average across the equatorial Pacific. Cloudiness near the International Date Line was below average over most of August.
- The severity of an El Niño event does not necessarily directly relate to the severity of the impact on rainfall. If warm sea surface temperatures remain around Australia, Indonesia and in the eastern Indian Ocean this may assist in mitigating the effects of El Niño conditions.
- The cooling of sea surface temperatures to the north of Australia may influence rainfall through reduced convection.

ENSO outlook and comments

Table 3: ENSO/Climatic Outlook

	Current Outlook (early September)	**Previous Outlook** (early August)
ENSO (overall)	Neutral – El Niño possible/likely	Neutral – El Niño possible/likely
BoM ENSO Tracker Status	El Niño Watch	El Niño Watch
SOI	Neutral – slightly negative	Neutral
Pacific Ocean SST (NINO3.4)	Slightly warm/warm (Neutral – some models)	Slightly warm/warm (Neutral – some models)
Indian Ocean (IOD)	Neutral	Neutral (currently slightly negative)
Southern Annular Mode (SAM/AAO)	Neutral	Neutral

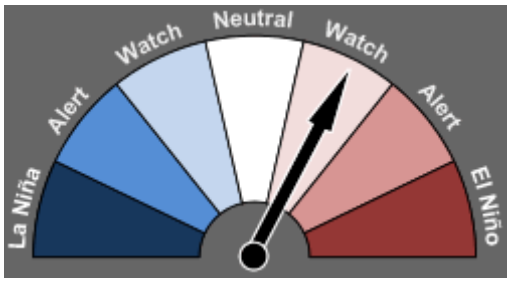
Summary Legend: Grey = Neutral, i.e. neither El Niño nor La Niña or no rainfall trend.
Red = El Niño/reduced rainfall trend.
Blue = La Niña/higher rainfall trend.

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

- Sea surface temperatures are warm across the eastern and western equatorial Pacific ocean, with patchy positive anomalies across the central equatorial Pacific.
- In the key NINO3.4 region, the weekly sea surface temperature anomaly has increased to +0.31 (as at 7 September) from +0.04 late last month, but is still within the neutral range (note that the Bureau of Meteorology uses an anomaly level of +0.8°C as an indicator of an El Niño event). Many global climate models expect NINO3.4 anomalies to peak between +0.5°C and +0.9°C. Above average sea surface temperatures persist in the eastern Pacific. There has been an increase in the NINO 4 region (western equatorial Pacific) over August from +0.34°C to +0.60°C (as at 7 September).
- Tropical rainfall declined across the western tropical Pacific (particularly north of the equator) and near the International Date Line over the last month, as indicated by positive outgoing long-wave radiation (OLR) anomalies. For an El Niño event to occur, rainfall tends to be reduced in this area.
- Other indicators such as the thermocline slope index, and the equatorial Pacific basin upper ocean heat anomalies are currently near zero, and reflect ENSO neutral conditions.

- Sea sub-surface temperatures have warmed across the central and areas of the western equatorial Pacific, and are moving eastwards. Cooler anomalies have decreased in the eastern Pacific.
- 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) remains at El Niño 'Watch' level. In the past, about 50% of the time that this level has been reached, an El Niño event has occurred (compared to 70% at 'Alert' level).

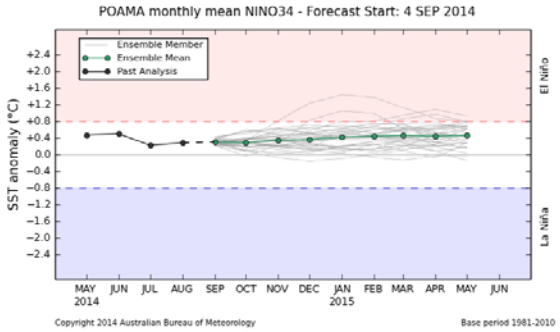
Figure 1: Bureau of Meteorology ENSO tracker status



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 decline to neutral levels (Figure 2). However, it is important to consider the outlooks from available global climate models.
- Five of the eight global climate models surveyed by the Bureau of Meteorology still indicate that sea surface temperatures in the NINO3.4 Pacific Ocean region are likely to be at or near El Niño levels by November. Six of the eight indicate that sea surface temperatures will be at this level by January.

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 September) indicates the likelihood of a weak El Niño event developing during September to November, peaking during summer and continuing into the first few months 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 and +0.9°C. The model forecast probabilities for an El Niño event have decreased slightly since last month, and CPC/IRI now rate the chances of an El Niño event occurring as 60-65% or less during the late spring and summer (Table 4).

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

Season	La Niña	Neutral	El Niño
Aug-Oct	0%	57%	43%
Sep-Nov	0%	45%	55%
Oct-Dec	1%	38%	61%
Nov-Jan	1%	34%	65%
Dec-Feb	2%	34%	64%
Jan-Mar	3%	36%	61%
Feb-Apr	3%	41%	56%
Mar-May	4%	48%	48%
Apr-Jun	5%	53%	42%

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

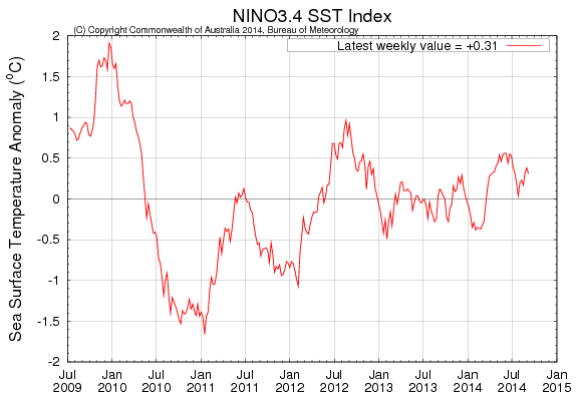
- Note that the CPC/IRI classifies values of the NINO3.4 index between -0.5°C and +0.5°C as indicating neutral conditions, rather than the -0.8°C to +0.8°C range used by the Bureau of Meteorology. This will result in differences when various meteorological

organisations report that El Niño or La Niña conditions are developing.

Sea temperatures

- Monthly sea surface temperatures from the Bureau of Meteorology and the US National Oceanic and Atmospheric Administration (NOAA) indicate that the western equatorial Pacific (west of the International Date Line) was warmer than normal, as was the eastern Pacific. Temperatures were near average across much of the central equatorial Pacific.
- Sea surface temperatures have cooled around the north of Australia, which may influence rainfall through reduced convection.
- The most recent monthly temperature anomaly value in the key NINO3.4 region is +0.20°C for August, a slight increase from +0.18°C for July, but a decrease from the value of +0.46°C for May and June.
- Weekly sea surface temperatures remain neutral-slightly warm in the NINO 3 region. The temperature anomaly increased from +0.35°C as at 3 August to +0.46°C by 24 August, but fell slightly to +0.38°C by 7 September. In the NINO 3.4 region (Figure 3) the temperature anomaly has increased from +0.04°C late last month to +0.31°C as at 7 September, but remains in the neutral range.
- The temperature anomaly in the NINO 4 region has increased from +0.34°C in late July to +0.60°C as at 7 September. Temperature anomalies in the NINO 1 region are +0.72°C and in the NINO 2 region are +0.46°C as at 7 September.

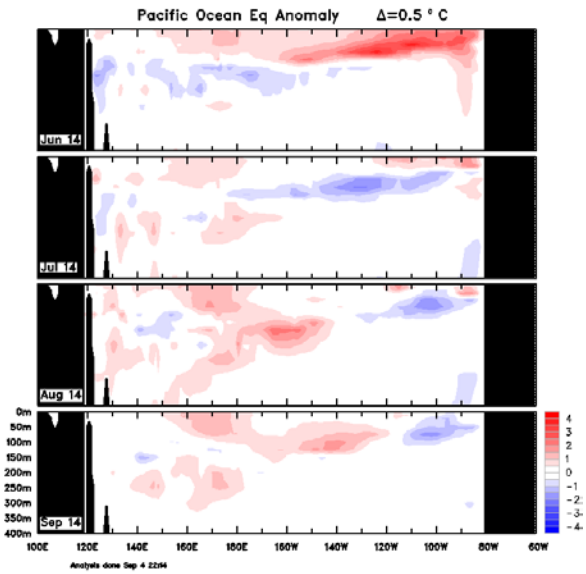
Figure 3: NINO3.4 Sea Surface Temperature Index



Source: Australian Bureau of Meteorology

- The sub surface sea temperatures in the equatorial Pacific show a decline in the cool anomalies in the eastern Pacific. This has been as a result of the formation of another downwelling Kelvin wave in the western equatorial Pacific in July, triggered by low level westerly wind anomalies, and its movement into the east-central region (Figure 4). In comparison to the Kelvin wave earlier in the year, this is a much weaker event.
- Positive subsurface anomalies now extend across most of the central Pacific. This is reflected in the increase in the sea surface temperatures in the NINO 3.4 and 4 regions since late July.

Figure 4: Monthly sea sub-surface temperatures



Source: Australian Bureau of Meteorology

Southern oscillation index (SOI)

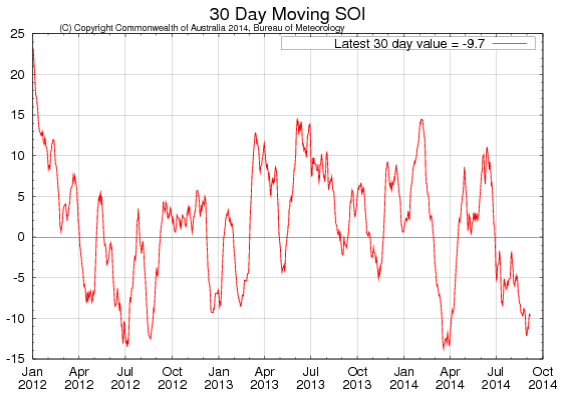
- The monthly value of the Southern Oscillation Index is currently negative at -9.7 (as at 7 September), although this is not yet regarded as a negative SOI event.
- The low SOI has been a result of high atmospheric pressure over Darwin during the month (and extending across most of the continent) rather than a decrease in pressure at Tahiti.
- From a level of +11.0 in mid-June, the SOI declined to -5.3 in late July, and after increasing slightly, fell to between approximately -11 to -12 between late August to early September (Figure 5, Table 5).

Table 5: Values of the Southern Oscillation Index

	Current monthly value (8 September)	Previous monthly value (5 August)
SOI (30 day)	-9.7	-5.7

Source: Australian Bureau of Meteorology.

Figure 5: 30 day moving SOI



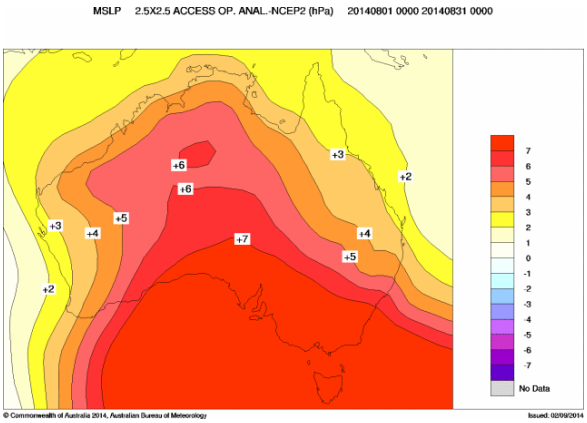
Source: Australian Bureau of Meteorology

- 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 stronger and further south than normal over early August, favouring dry conditions until mid-month. On average, it has been about level with Melbourne during the last month, as indicated on NOAA and Bureau of Meteorology mean sea level pressure charts.
- Atmospheric pressure was higher than normal over most of the continent during August, increasing towards the south. It was extremely high over most of NSW for the month, as shown in Figure 6. This contributed to the dry conditions in early-mid August. The high pressure systems also contributed to the severe frosts early in the month over central and southern NSW (Figure 8), by promoting very cold air flow and clear conditions.

Figure 6: Anomalous mean sea level pressure, August 2014



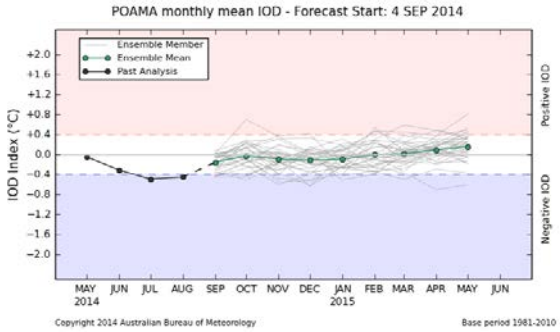
Source: Australian Bureau of Meteorology.

- The sub-tropical ridge is a zone of high pressure which between November and April is normally located south of Australia at about 40°S, and tends to suppress cold front activity. During winter, it generally moves northwards to around 30°S, allowing cold fronts to extend further into southern Australia.

Indian Ocean dipole (IOD)

- The Indian Ocean dipole has been negative since mid-June, and 2014 has now been declared a negative IOD year.
- The latest IOD index value for the week ending 7 September is -0.65°C. The outlooks suggest that it will return to neutral levels this month. While the sea surface temperatures in the Arabian Sea are still cooler than normal, and near Indonesia are warmer than normal, cool anomalies have begun to form to the north of Australia on the edge of the eastern area (pole) used in the calculation of the IOD.
- The Bureau of Meteorology's POAMA model and all climate models surveyed by the Bureau of Meteorology favour the return to a neutral IOD between September and November (Figure 7), and for it to remain neutral through to January. The POAMA sea surface temperature outlook indicates that cooling of the eastern Indian Ocean will occur in September.
- The chances for a positive IOD event will increase if an El Niño event occurs. The IOD is consistent with El Niño or La Niña conditions in the Pacific about 70% of the time. A positive IOD in conjunction with an El Niño event can cause further reductions in rainfall.

Figure 7: 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.
- 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 along the equator. Westerly anomalies present in early August across the eastern and central equatorial Pacific weakened late in the month, reducing the risk of increased sea surface temperatures. However, they were sufficient to trigger a Kelvin wave (see above).
- 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.
- Cloud conditions at the equator near the International Date Line have been below average since late July. Convection and precipitation was suppressed over the International Date Line and across the western Pacific to the north of the equator.
- Cloud conditions were generally above average between late February and late April, decreased between late April and early May, were generally slightly above average from mid-May to late June, and oscillated around average during July. During early-mid August, they were below average.
- Cloudiness in this area 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 negative to near neutral, after falling from weakly positive in early August to moderately-weakly negative in late August.
- The SAM index value from POAMA (as at 4 September) was weakly negative at -0.5 and the AAO index value from NOAA (as at 5 September) was near neutral.
- The outlook from POAMA indicates the SAM index will remain weakly negative to near neutral into the third week of September. The NOAA outlook is similar.
- 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 NSW during August, but slightly higher than normal in the north/north east, and slightly lower than normal in the south/south east.

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 (Figure 18). However, this is not always the case.
- Lower than normal rainfall is more likely if a positive IOD event occurs in conjunction with an El Niño event (Figure 19).
- 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 current rainfall 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 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.

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%	23%	20%	56%
Quarter	0%	24%	58%	18%
Half year	0%	2%	58%	40%
Year	0%	35%	63%	2%

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

August

- Relative to historical records, rainfall for August was above average across 56% of the State, extending across the northern and central areas of Western LLS district, areas of North West and Northern Tablelands LLS districts and along the coastal LLS districts. In the west and along the coast, relative rainfall was generally extremely high.
- Below average relative rainfall occurred over 23% of NSW (that is, rainfall in the 3rd decile or below), particularly across the south and some central areas of the State. It extended across most of Murray, Riverina and Central Tablelands LLS districts, and across the eastern quarter of Central West LLS district.
- Average relative rainfall (that is, rainfall of between the 4th and 7th deciles) fell across 20% of NSW (Figure 20, Table 6), extending across the areas of Western, Central West and North West LLS districts.
- Over August, the north of the State generally had rainfall of 10-50 mm above normal, while rainfall along the coast was generally 50-200 mm above normal.
- Across the south of the State the rainfall was generally 25-100 mm below normal for the month. This area had rainfall of less than 60% of normal, with the far south receiving less than 20% of normal.

June to August (3 months)

- Over the 3 month period from June to August, relative rainfall was average or above over 76% the State (Figure 21, Table 6).
- Below average relative rainfall occurred across 24% of the State, extending primarily across the south and south west. This included the southern area of Western LLS district (comprising 21% of its area), the

majority of Murray (83%) and the southern half of Riverina (65%) LLS districts. Areas of the Central Tablelands (58%), North West (18%) and Northern Tablelands (9%) LLS districts also received below average relative rainfall for the period. Most of these areas received 40-80% of their normal rainfall.

- The northern area of the Western LLS district between Wanaaring, Enngonia, Bourke and Cobar, and between Wanaaring and Broken Hill received above average relative rainfall for the period.
- An area in the Central West LLS district between Warren, Quambone, Nyngan and Hermidale received well above average to extremely high rainfall over the period.
- Areas of the North Coast LLS district north of Dorrigo and northern and southern coastal areas of South East LLS district also received above average relative rainfall over the quarter.
- The remainder of the State (58%) received average relative rainfall for the quarterly period (that is, rainfall of between the 4th and 7th deciles).

March to August (6 months)

- Over the six months to August, relative rainfall was average across 58% of NSW, below average across just 2% and above average across 40% (Figure 22, Table 6).
- Only isolated areas received below average relative rainfall for the period. This included areas to the north of Walgett, around Moree and Hay, around Taree, Port Macquarie and north of Kempsey, and other areas in the Hunter and Greater Sydney LLS districts.
- Much of the Western (58%), Central West (63%) and South East (60%) LLS districts received above average relative rainfall for the period. Areas between Nyngan and Cobar, west of Cooma and around Broken Hill received extremely high relative rainfall for the period. These areas received 125-200% of their normal half yearly rainfall.

December to August (9 months, BoM)

- Over the 9 month period from December to August relative rainfall across the State was below average across most of the North West, Northern Tablelands, North Coast, Hunter and Greater Sydney LLS districts.
- The majority of the Northern Tablelands and North Coast LLS districts experienced very much below average rainfall, as did areas from Walgett to the north, to the east of Moree and near Taree.
- A small area of below average relative rainfall also occurred near Hay in the Riverina LLS district (Figure 23).
- Most of these areas received between 40-80% of their normal rainfall, with an area between Walgett, Collarenebri and Lightning Ridge receiving 40-60% of normal rainfall. Most of the North Coast LLS district received between 40-60% of normal rainfall.
- An area of above average relative rainfall occurred in the Central West LLS district between Forbes, Parkes, Dubbo, Nyngan and Cobar. Above average relative rainfall also occurred across the west and south of the Western LLS district, and in the Murray LLS district along the Murray River between Balranald and Moama.
- The remainder of the State had generally average relative rainfall over the period.

September to August (12 months)

- Over the twelve months to August, below average relative rainfall extended across almost all of the North West, Northern Tablelands, Central Tablelands and North Coast LLS districts.
- All other LLS districts had areas of below average relative rainfall for the period, particularly Hunter (54%), Riverina (50%), Greater Sydney (51%) and Central West (24%) (Figure 24, Table 6).
- Most of the North West and Northern Tablelands LLS districts, and areas of the North Coast, Hunter and Central West LLS districts received well below average to extremely low relative rainfall during the period.
- Most of these areas received between 60-80% of their normal rainfall for the period, with areas in the north west and around Hay receiving less than 60%.
- For the year, below average relative rainfall occurred across 35% of NSW.
- Above average relative rainfall was restricted to areas of the far south coast near Bega, parts of the alpine areas, and an area between Hermidale and Nyngan.

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.

August

- Overall, NSW received a State-wide average rainfall of about 50 mm, 33% above the historical average and making it the wettest August since 2003. The exception was in the south west of NSW and across areas of the Riverina, where rainfall was below average.
- Most of the State received rainfall of 125% above average or more, while the central tablelands, Riverina and south west received rainfall of less than 60% of average, down to less than 20% of average in some areas.
- The first half of the month was dry, with high pressure dominant across the continent and the sub-tropical ridge being stronger and further south than normal for the time of year.
- A surface trough between 15-19 August caused rainfall across most of inland NSW, particularly across northern and central NSW. This developed into an east coast low, bringing rainfall to the Sydney basin, Illawarra and south coast between 18-19 August. Strong onshore easterlies and series of coastal troughs with embedded lows produced heavy rainfall late in the month, particularly along the north coast.
- Rainfall during August was generally between 125-300% of normal (based on historical records between 1961 and 1990) across northern and coastal NSW. Some areas of the coast and far west received over 300% of their normal rainfall during the month. The south, south west and areas of the central west received generally 40-80% of normal rainfall. The far south received less than 20% of normal rainfall for the month.
- Some 20% of the State received average rainfall during the month, that is, rainfall of between the 4th and 7th decile, 22% received below average rainfall and 56% received above average rainfall (Table 6).
- Total rainfall over the State ranged from 0-400 mm, with the majority of the State receiving 25-100 mm.
- The majority of the coast and some adjacent eastern fall areas received 100-300 mm. Heavier falls of 300-400 mm occurred over some areas of the south and north coast, resulting in flooding.
- Areas of the south-south west, extending from Wagga and Corowa to Griffith, Hay and Balranald received less than 10 mm. The remainder of the south west and areas of the central west and the western areas of the central tablelands received 10-25 mm. The tablelands generally received between 25-100 mm, with the eastern edges receiving 100-200 mm (Figure 25).

June to August (3 months)

- Total rainfall over the three months to August ranged from 50-200 mm over most of the State, with areas of the far west receiving 25-50 mm.
- The west and north west of NSW received 25-100 mm, the central areas generally 100-200 mm and the coast and alpine areas received 200-300 mm during the period (Figure 26). Some areas of the coast received 300-400 mm.
- Rainfall during this period was between 100-150% of normal across the coast and areas of the west and far west. Most of the central areas of the State received rainfall of between 80-100% of normal. Southern and areas of north western NSW received 40-80% of normal rainfall.

March to August (6 months)

- Rainfall across the State during the March to August period ranged from 50-800 mm (Figure 27), with most areas receiving between 100-400 mm.
- Some of the lowest rainfall over the period (50-100 mm) fell in the far north west of Western LLS district around Tibooburra.
- The western areas of the plains and the north west generally received between 100-200 mm. The eastern areas of the plains generally received 200-300 mm, with some areas of the central west receiving 300-400 mm. The central areas of the State, including the slopes and much of the tablelands, received 300-400 mm during the period, with some areas receiving 400-600 mm. The northern tablelands and northern slopes generally received 200-400 mm.
- The coastal LLS districts generally received 300-600 mm. Some areas of the coast received up to 600-800 mm and the alpine and adjacent areas received 400-800 mm.

4. Temperature anomalies

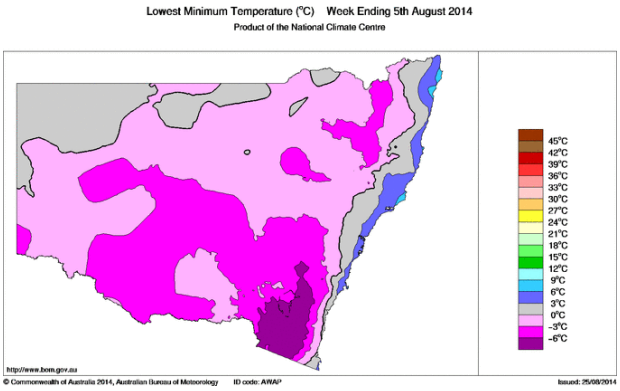
Temperature information is sourced from the Bureau of Meteorology.

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.

- The average monthly daytime temperature was 0.8°C warmer than normal across NSW.
- Daytime temperatures across August were 1°C warmer than normal across southern, south western and central western NSW. Across areas of the south to mid-north coast, far north east and far north west, daytime temperatures were 0 to 1°C below normal and 0 to 1°C above normal across the remainder of the State.
- Overnight temperatures were near average for the north of the State, although very cool conditions (5°C cooler than normal) were experienced across the southern inland, particularly between the 2-9 August.
- Severe frosts were recorded in mid-late July and the first week of August, particularly across the southern cropping areas and the southern half of the central cropping areas. Some were associated with light rainfall on the previous day, increasing the risk of damage to crops. This was in part the effect of the dominant high pressure systems (Figure 6), bringing a flow of very cold air and in promoting clear conditions. The most severely affected areas are shown in Figure 8 below in the darker purple colours. Note that temperatures at ground level are around 2°C lower than those shown.

Figure 8: Lowest minimum temperature for the week to 5 August 2014.



Source: Australian Bureau of Meteorology.

- Overnight temperatures during August were between -3 to -2°C below normal across areas of south western, southern and central NSW. Most of the south had overnight temperatures of -1°C or more below normal. Overnight temperatures were 1 to 2°C above normal along the central to north coast and in the north east. For the remainder of the State, they were 0 to 1°C above normal.

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	76%	23%	1%
Subsoil	44%	48%	8%

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

5.2 Topsoil

- Despite the high rainfall in mid to late August, average modelled topsoil moisture remained low across much of southern, western and central NSW (Figure 31). The reason for this was that topsoil moisture levels had fallen to very low levels prior to the mid-August rainfall.
- An end of the month topsoil moisture assessment shows even more severe drying in the south of the Central West, and across the western and central areas of the Murray and Riverina LLS districts, the south of Western LLS district and the north west of the North West LLS district. It also shows the effects of the heavy rainfall along the coast, with topsoil moisture levels in the high range, and the good rainfall over much of the Northern Tablelands LLS district and the east of the North West LLS district.
- Overall, only 23% of NSW had moderate topsoil moisture (averaged over the month), 1% high topsoil moisture and 76% low topsoil moisture (Figure 31, Table 7), similar to July.

- Most of the improvement in modelled topsoil moisture since July was across the coastal LLS districts, as a result of the heavy rainfall in these areas in late August. Levels also improved in the south east of North West LLS district.
- Modelled topsoil moisture levels were maintained or declined slightly across the upper south west slopes and areas of the central and southern tablelands. Declines in topsoil moisture occurred on the western margin of the tablelands.
- The low August rainfall in the southern and southern-central areas of NSW saw a decline in soil moisture levels across these areas, including the western and central areas of the Murray and Riverina LLS districts.
- Across the northern and central areas of Western LLS district, soil moisture levels improved somewhat.
- On a percentile rank basis (Figure 33), topsoil moisture levels were below average across most of the south and the southern-central areas of the State. This was particularly the cast across the Murray and Riverina LLS districts, as well as the south of the Central West and the west of the Southern Tablelands LLS districts. Low relative topsoil moisture was also evident across the south west and south of the Western LLS district and in areas of the North West and Northern Tablelands. Relative topsoil moisture was high in the far north west, in the Nyngan area and over the far north coast. Elsewhere, it was average.
- Weekly percentile rank topsoil moisture to 31 August indicates extremely high levels along the coastal LLS districts, areas of the Northern Tablelands, the south east of North West and the northern third of the Western LLS districts.
- Total soil moisture levels were in the range of 10-40 mm across most of the western and central areas of the State. Over the east of the State, levels were generally between 40-80 mm, increasing to 80-150 mm in the alpine areas.

5.3 Subsoil

- Modelled subsoil moisture levels remained relatively stable over the State between July and August (Figure 32, Table 7).
- There was an improvement in modelled subsoil moisture across areas of the South East LLS district, but subsoil moisture levels to the end of August are not yet showing the influence of the heavy coastal rainfall late in the month.
- The North West LLS district had the lowest overall relative subsoil moisture during the month, with 80% of its area in the low category. This was followed by 57% of Western, 51% of Northern Tablelands, 40% of Central West, 34% of Murray and 30% of Riverina LLS districts. All LLS districts apart from North West, Northern Tablelands and Western had more than 50% of their area in the moderate-high category.
- Total modelled subsoil moisture for the month was generally 100-200 mm across most of the State, less than 100 mm in the west of North West LLS district and across much of Northern Tablelands LLS district. It was less than 50 mm near Walgett and Armidale, and ranged from 100-400 mm across most of the coast. Levels were higher in the alpine areas.
- On a percentile rank basis (Figure 34), modelled subsoil moisture was below average across the north west between Brewarrina, Walgett, Collarenebri and Coonabarabran, and north of Moree. It was also below average across most of the Northern Tablelands, North Coast and Greater Sydney LLS districts and the south of the Central Tablelands and the north-north east of the Hunter LLS districts.
- Subsoil moisture levels were also well below average around Hay.
- The western and southern to south eastern areas of Central West LLS district, and the southern and western areas of South East and areas of Western LLS districts had above average subsoil moisture for August.

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 tablelands and coast. The pasture growth model is not as well calibrated for these areas as for the rangelands, plains and 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 outlook for pasture growth over September to November suggests slightly below average growth is likely across much of central, south western and far south eastern NSW. The outlook for the central, mid-north and north coast and the east of the northern tablelands is for near average to somewhat above average growth, with above average growth likely across the central and northern areas of the far west.
- Very limited growth is suggested for areas across the eastern and southern areas of the Western LLS district and areas across the western half of the Central West, Riverina and Murray LLS districts.
- Skill levels for this outlook are moderate to high for the east of the State and areas of the north west, but low for the remainder of the State.

6.2 Modelled pasture growth

- Modelled pasture growth improved across much of western, northern and coastal NSW between July and August, but declined in areas of the south and south east (Figure 35).
- Lack of rainfall in August across the southern areas of the State and the south of the central west contributed to a decrease in pasture growth in these areas, particularly in the west of the Riverina and Murray LLS districts, and the south east of the Western LLS district.
- Alternative pasture growth models show very low growth for temperate pasture species over the southern and central tablelands, Monaro, and the south west slopes and plains. Growth improved across the central to north coast, and also improved across the north of the northern tablelands and the north west slopes.
- The best pasture growth during the month occurred across the slopes, the central to north coast and the Hunter valley. Growth in these areas was generally between 200-1,000 kg of dry matter (DM)/ha.
- Modelled pasture growth across most of Western LLS district (particularly the west and north) and the west of the North West LLS district increased from 10-20 kg DM/ha to 50-200 kg DM/ha. There was a slight improvement in growth across the Central Tablelands LLS district, and the northern and areas and coastal strip of the South East LLS district. As a result of the August rainfall, pasture growth in the eastern and central areas of the Central West, Riverina and Murray LLS districts declined somewhat to 100-500 kg DM/ha.
- Growth declined over the Monaro and alpine areas of the South East LLS district, as well as the west of the Riverina and Murray LLS districts.

6.2 Modelled biomass

- Modelled total standing dry matter (biomass) levels were similar in most districts to July.
- Biomass levels improved in the east and south of the North West LLS district, and over areas of the Northern Tablelands, North Coast, Hunter and Greater Sydney LLS districts. There was a decline in biomass levels in the west of the Riverina and Murray LLS districts.
- Biomass levels were low across the far western and northern areas of the Western LLS district, the western half of North West, the southern and central areas of Northern Tablelands, the south to south east of Central Tablelands, the east of Murray and Riverina and the majority of the South East LLS districts (Figure 36). Biomass levels in these areas were generally less than 500 kg/ha of dry matter (DM)/ha.

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	7%	17%	42%	33%	1%
Quarter	3%	9%	58%	29%	1%
Half Year	1%	6%	32%	60%	1%
Year	0%	23%	59%	17%	1%
Biomass					
Month	0%	12%	54%	34%	1%

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

August

- Relative to historical records, 75% of NSW had average or above average pasture growth during August (Table 8, Figure 37).
- The area of the State with above average growth increased from 18% in July to 33% in August, as a result of the rainfall across much of northern, western and coastal NSW.
- The area showing below average growth fell from 43% in July to 17% in August.
- The major declines in monthly relative pasture growth occurred across the south eastern area of Western LLS district, the southern area of Central West and the western and central areas of the Riverina and Murray LLS districts. Low relative pasture growth also occurred in areas of the North West LLS around Walgett and Moree and in the south east of the Central Tablelands LLS district. In these areas, relative pasture growth generally ranged from below average to extremely low, although they were interspersed with areas of average relative growth.
- In the Western LLS district, the south east of North West LLS district and the Northern Tablelands, North Coast, Hunter, Greater Sydney and South East LLS districts, relative growth generally improved to range between average to above average. Relative growth was also average to above average across the northern half of Central West LLS district, and the east of the Murray and Riverina LLS districts.
- Areas of missing data accounted for 7% of the area of NSW, primarily across far west, the south east and the north east.

June to August (3 months)

- Over the three months to August, relative pasture growth was average or better across most of the State.
- Some 29% of the area of NSW had above average relative growth and 58% had average growth, compared to 43% and 38% for the three months to July (Table 8, Figure 38).
- The area of the State with below average relative growth over the three month period included an area of the mid-north coast spanning the Hunter and North Coast LLS districts, the northern and western area of the North West LLS district, and isolated areas of Western, Central West, Murray and Riverina LLS districts.
- Areas of highest relative pasture growth for the period occurred across the south of the Western and the areas of the Central West LLS districts, and across areas of the tablelands and Monaro.

March to August (6 months)

- Over the six month period from March to August relative pasture growth was similar to the previous six month period, but improved along the coast. Relative growth was above average across much of southern, central and western NSW, and over areas of the north.
- Most of the Northern Tablelands, Central Tablelands, Central West, Riverina and Murray LLS districts had well above average to extremely high relative growth over the period.
- Relative pasture growth improved across the coastal areas over the period, with the exception of areas of the far south coast and mid-north coast.
- The northern areas of the State also had generally average relative growth, except for an area between Walgett, Collarenebri, Carinda, Lightning Ridge and Goodooga and to the north of Moree.

- The area of below average relative growth for the period fell from 47% over February to July to 16% over March to August across the North Coast LLS district. It also fell and from 39% to 6% across the Greater Sydney LLS districts. Below average relative growth over the North West LLS district increased slightly from 27% to 30%
- Relative growth over the period was average or above over 92% of the State (Table 8, Figure 39), and above average over 60% of the State.

September to August (12 months)

- Relative pasture growth over the last 12 months remained similar to the period to July, although with a decrease in the area of below average growth and an increase in the area of average growth.
- Relative growth was average or above across 68% of the State (Table 8, Figure 40).
- The best relative growth extended across the central tablelands and upper Hunter valley, and over areas of south western and western NSW, covering 17% of the State.
- Below average relative growth covered 23% of the area of the State. It extended across the north west and the north eastern corner of NSW, covering the majority of the North West LLS district and large areas of the Northern Tablelands, North Coast and Greater Sydney LLS districts. Areas of the Western, Hunter and South East LLS districts also showed below average growth, as did the east of the Murray and Riverina LLS districts, and an area between Griffith and Hay.

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 average relative total standing dry matter (biomass) increased between July and August (Table 8, Figure 41). Levels of below average relative biomass declined slightly, and levels of above average relative biomass fell from 43% to 34%.
- Relative to historical records, biomass remained high across the Northern Tablelands and Central Tablelands LLS districts. It was also high across the west of the Hunter and South East LLS districts.
- There was an improvement in biomass levels across the coastal LLS districts, but a decline in the northern area of the North West LLS district. The central-southern areas of NSW generally declined from above average to average relative biomass levels.

7. Crop production

Crop production information is sourced from the NSW DPI grains report. An updated 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 5 September 2014.

- Levels in water storages are low-moderate, with the average capacity being 55%.
- Changes in storage levels during the last month were generally minor, with the largest increase at Burrinjuck Dam (7%).

Table 9: Capacity of storages

Storage	Current Volume (GL)	Effective Capacity (%)	Monthly Change (%)
Toonumbar	11	100	5
Malpas	9	71	-
Glenbawn	660	88	1
Glennies	244	86	0
Lostock	20	100	4
Brogo	9	100	0
Cochrane	2	-	-
Dartmouth	3655	95	1
Hume	2206	73	3
Blowering	1172	71	2
Burrinjuck	836	81	7
Brewster	-	-	-
Carcoar	11	31	1
Cargelligo	27	68	4
Wyangala	689	57	5
Glenlyon	95	-	-
Pindari	52	17	0
Copeton	459	33	0
Chaffey	26	39	3
Keepit	87	19	1
Split Rock	83	20	0
Burrendong	312	24	1
Oberon	29	65	1
Windamere	182	49	0
Lake Cawndilla	125	7	-1
Lake Menindee	-	0	0
Lake Pamamaroo	143	49	-2
Wetherell	72	35	0
Total	**11216**		
Average		**55**	

8.2 Irrigation allocations

Allocations are given as at 5 September 2014.

- General security allocations remained unchanged from early August, except for a small allocation for the Macquarie and Cudgegong (2%) and an increase in the allocations for the Murrumbidgee River Valley from 24% to 30% and the Murray River Valley from 12% to 20%.

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*	20%	General security
	97%	High security
Murrumbidgee*	30%	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	40%	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

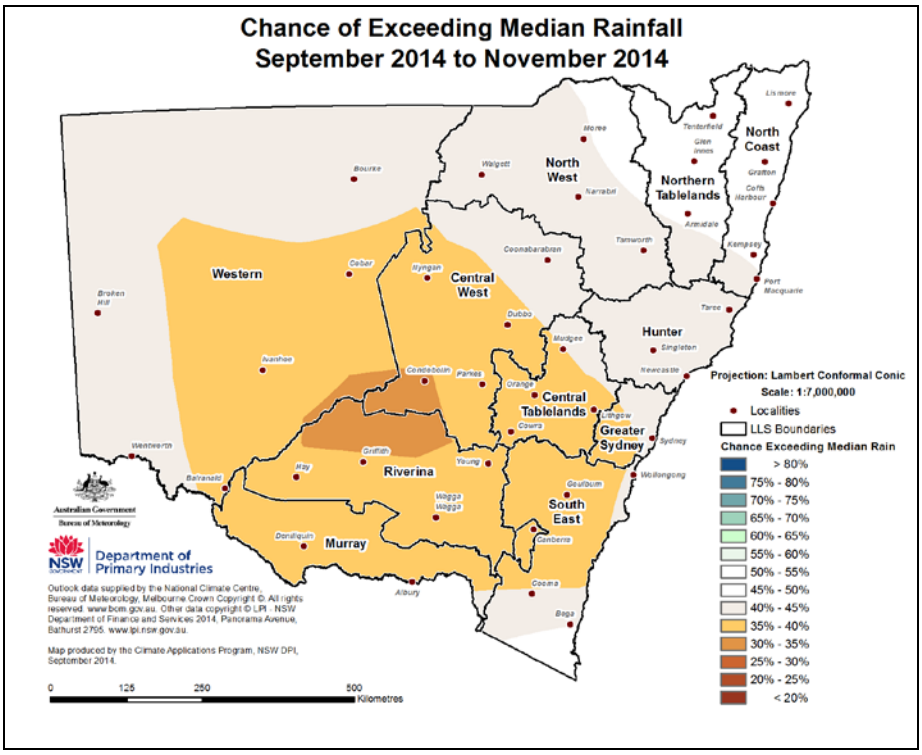


Figure 10: Quarterly maximum temperature outlook

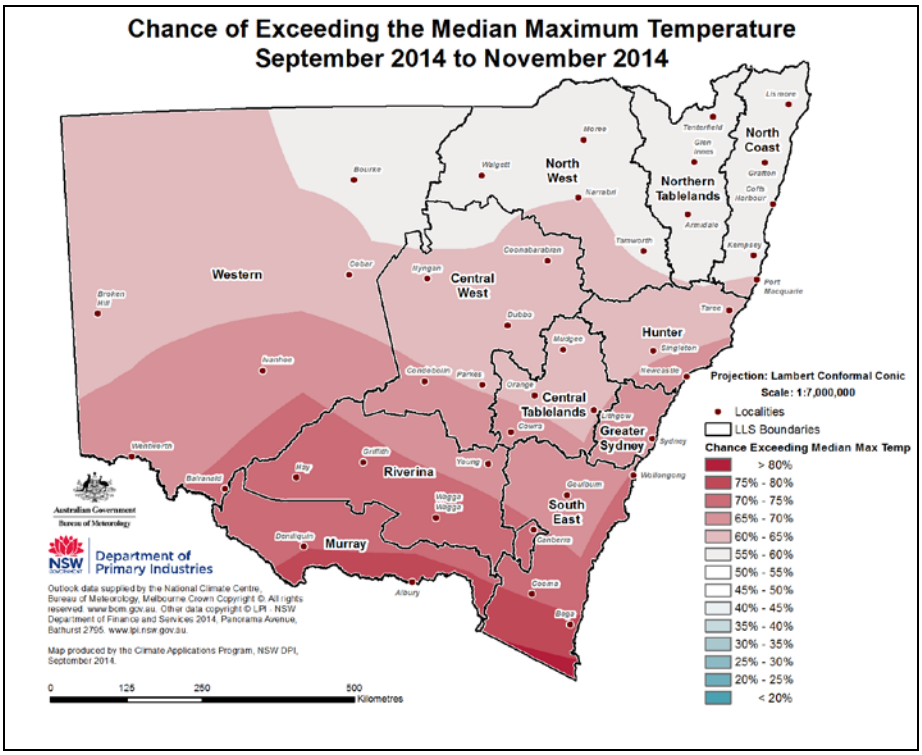


Figure 11: Quarterly minimum temperature outlook

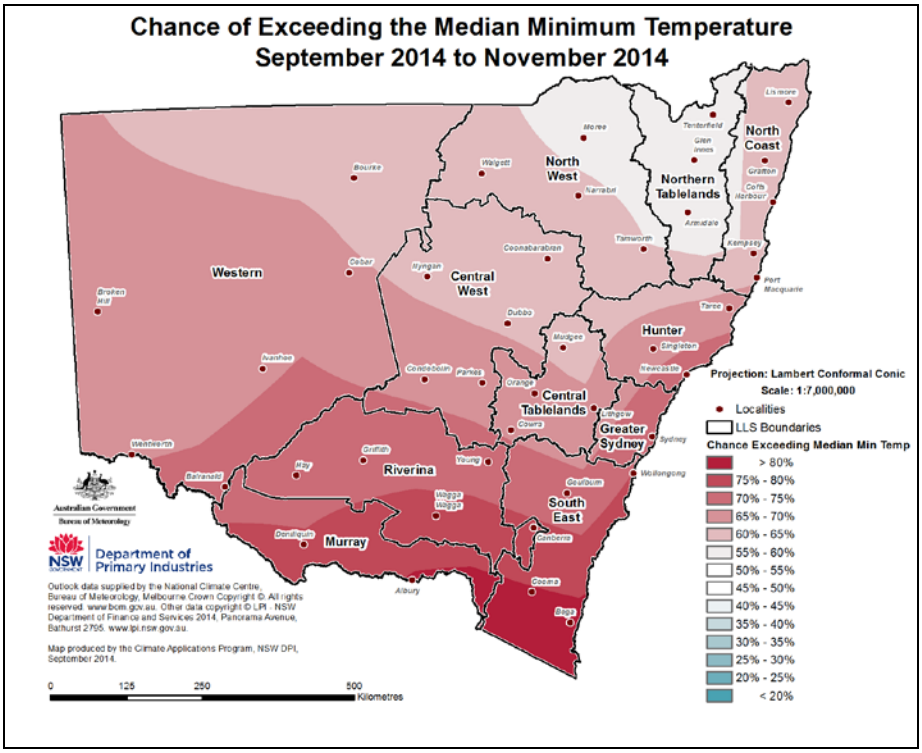
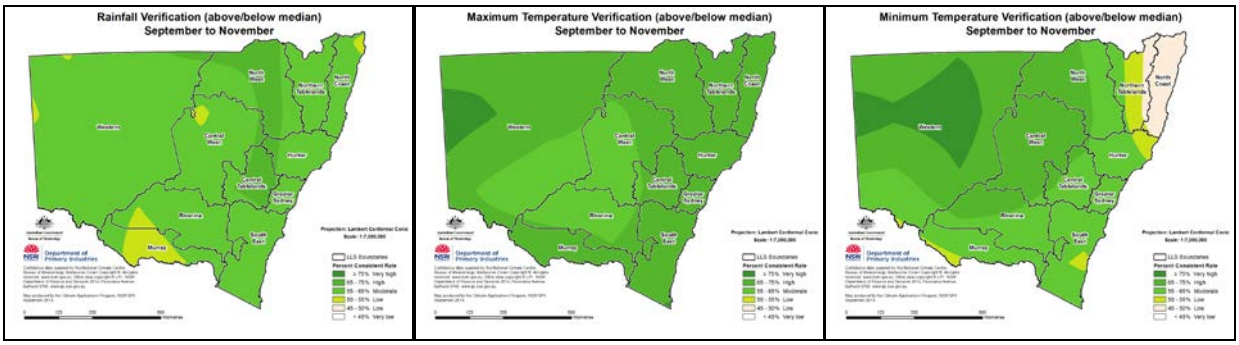


Figure 12: Outlook skill maps



Note – The outlook skill maps this month are from earlier modelling than those on the Bureau of Meteorology website. The website skill maps include more recent information, and should be referred to in preference to those above.

Month 1 rainfall & temperature outlook

Figure 13: Month 1 rainfall outlook

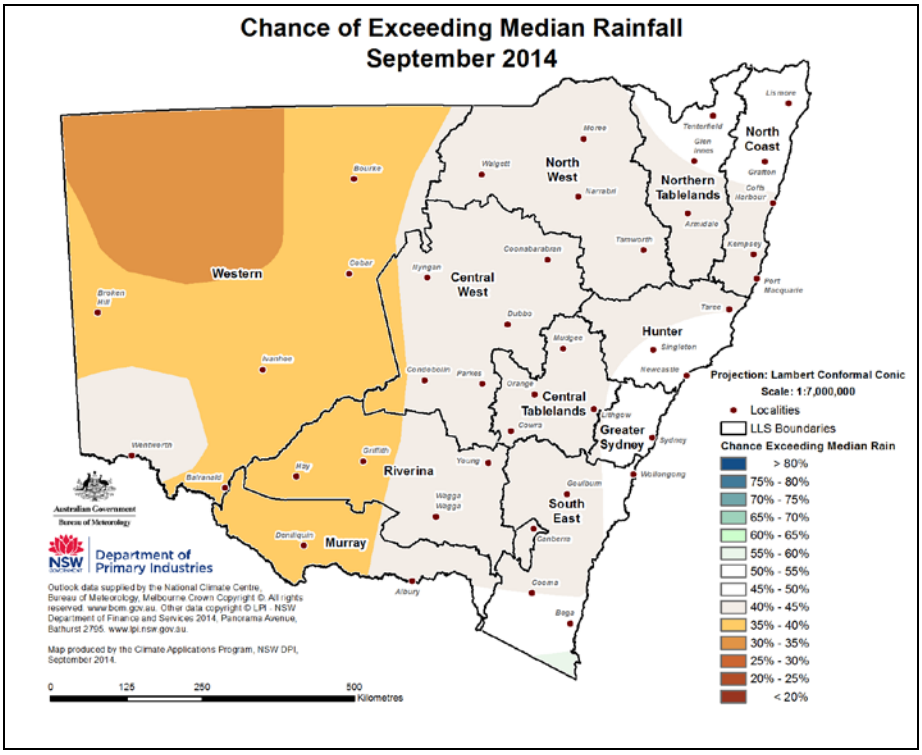


Figure 14: Month 1 maximum temperature outlook

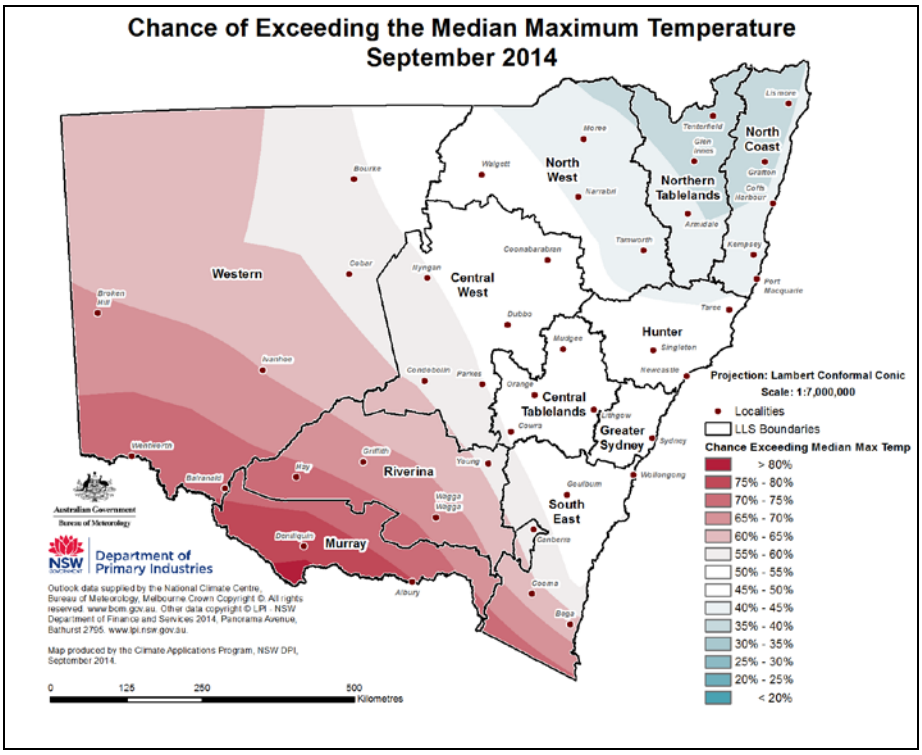


Figure 15: Month 1 minimum temperature outlook

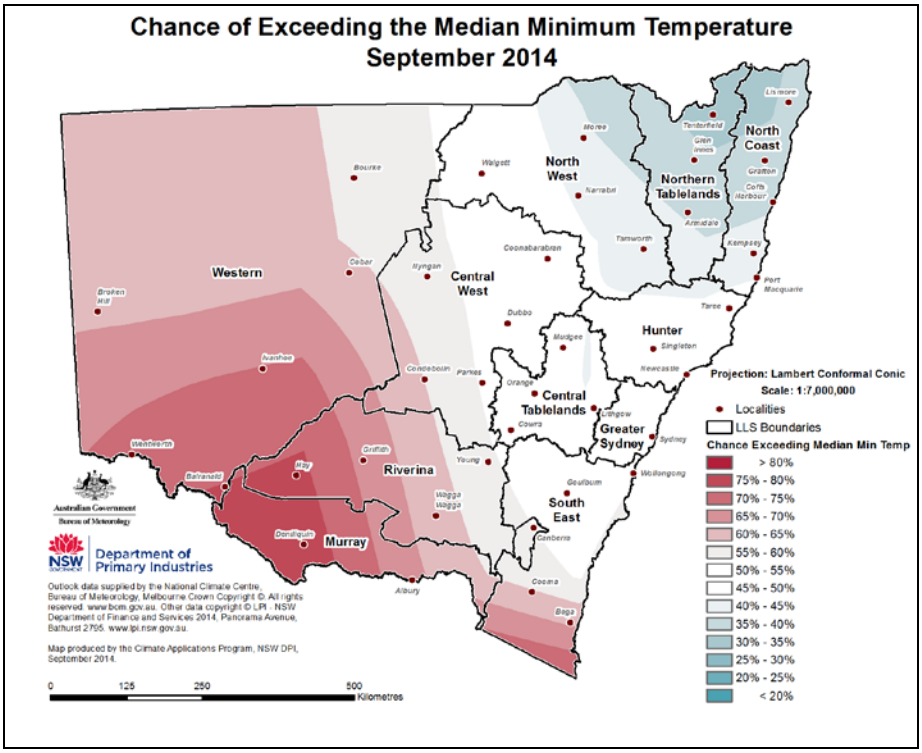
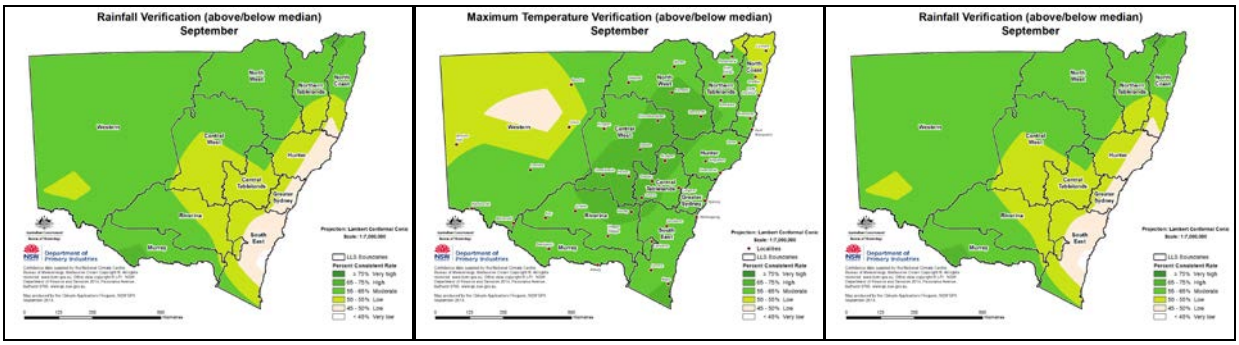


Figure 16: Month 1 outlook skill maps



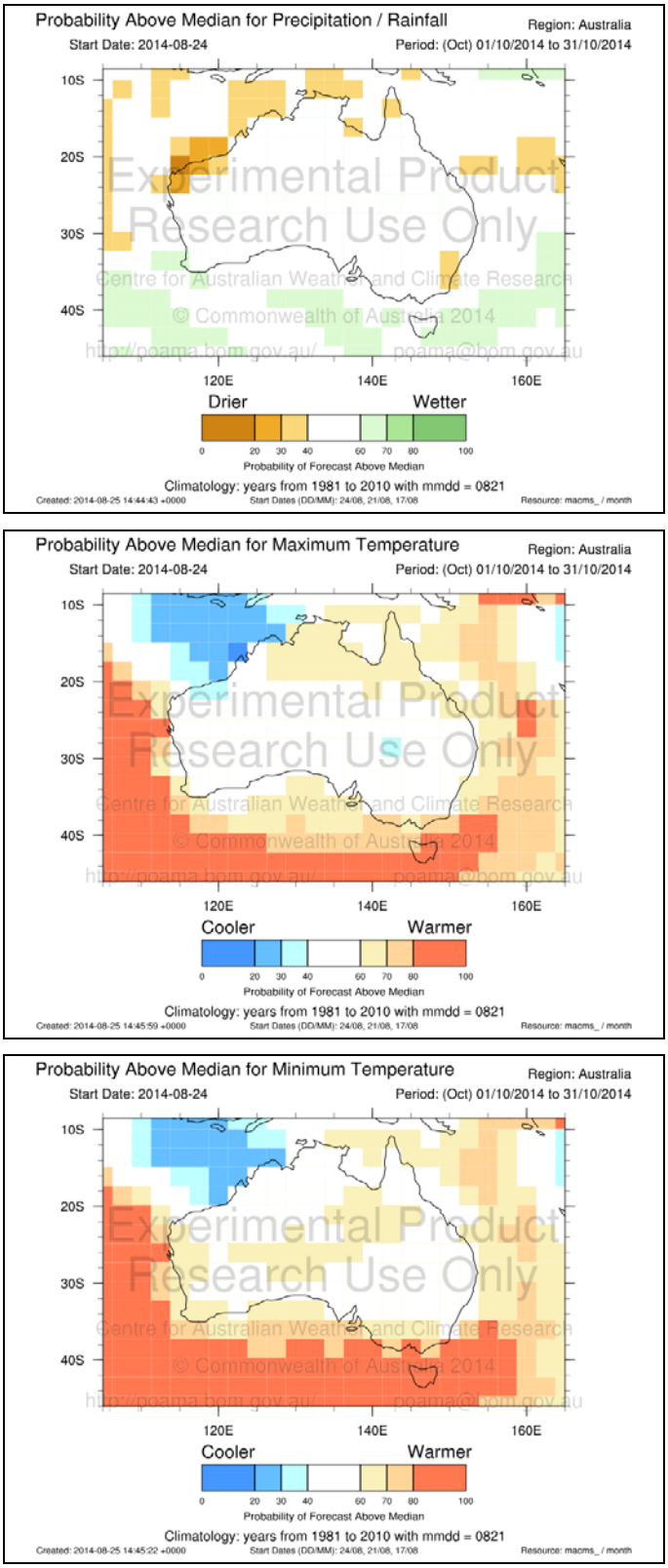
Note – The outlook skill maps this month are from earlier modelling than those on the Bureau of Meteorology website. The website skill maps include more recent information, and should be referred to in preference to those above.

Month 2 rainfall & temperature outlook

(Bureau of Meteorology, POAMA - experimental)

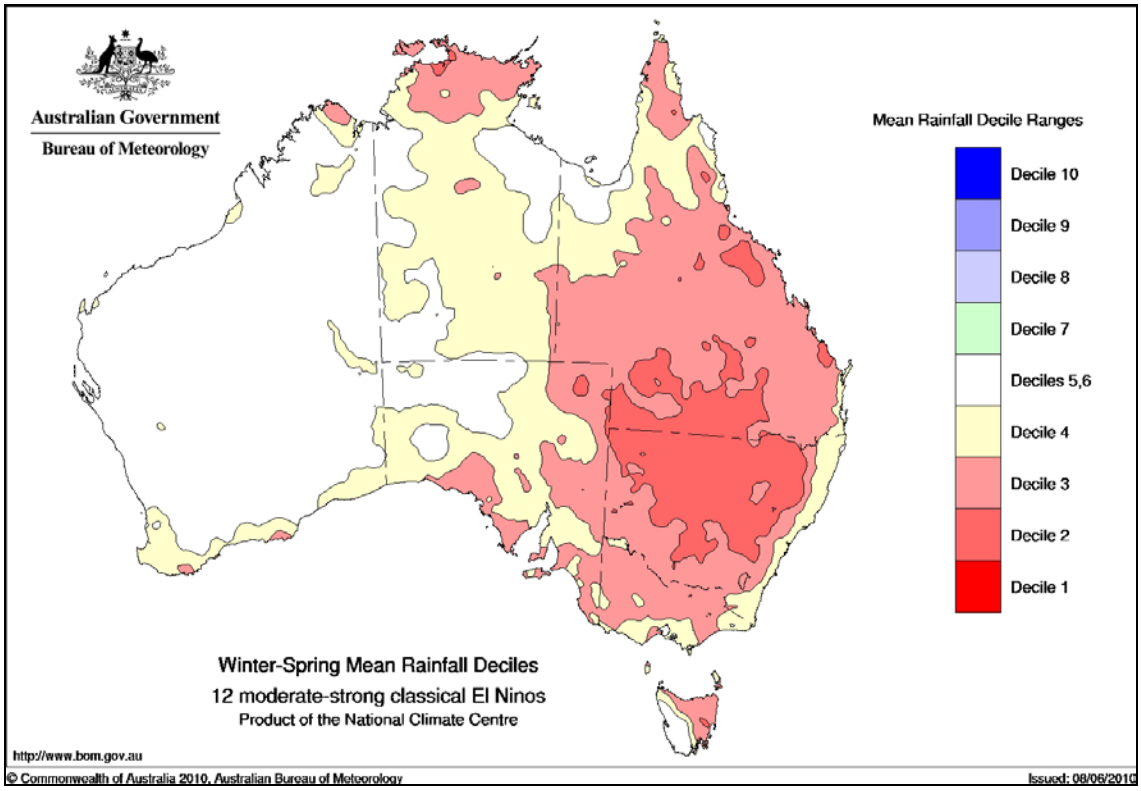
Note – Operational Bureau of Meteorology month 2 outlook maps will be available in the near future.

Figure 17: Experimental October rainfall and temperature outlooks



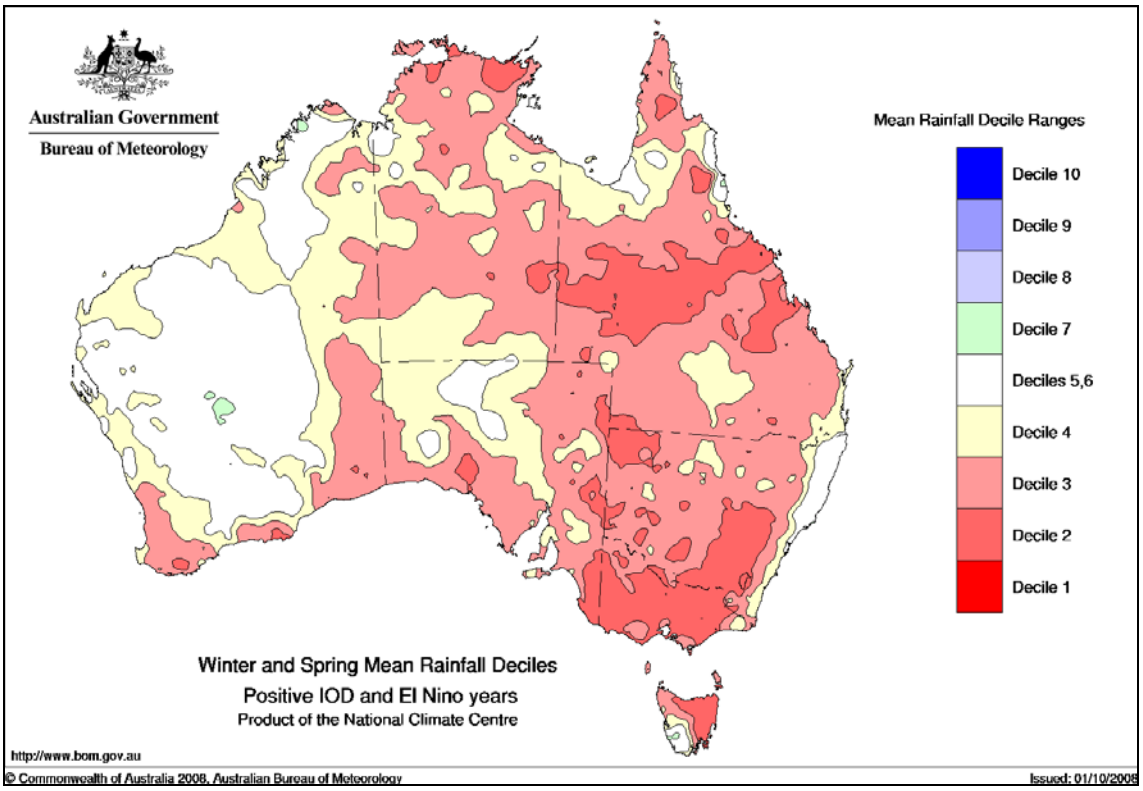
Possible effects of an El Nino event

Figure 18: Australian winter-spring mean rainfall deciles for twelve El Nino events



Source: Australian Bureau of Meteorology

Figure 19: Australian winter-spring mean rainfall deciles for seven positive IOD events coinciding with El Nino events



Source: Australian Bureau of Meteorology

Rainfall

Figure 20: Relative rainfall – monthly

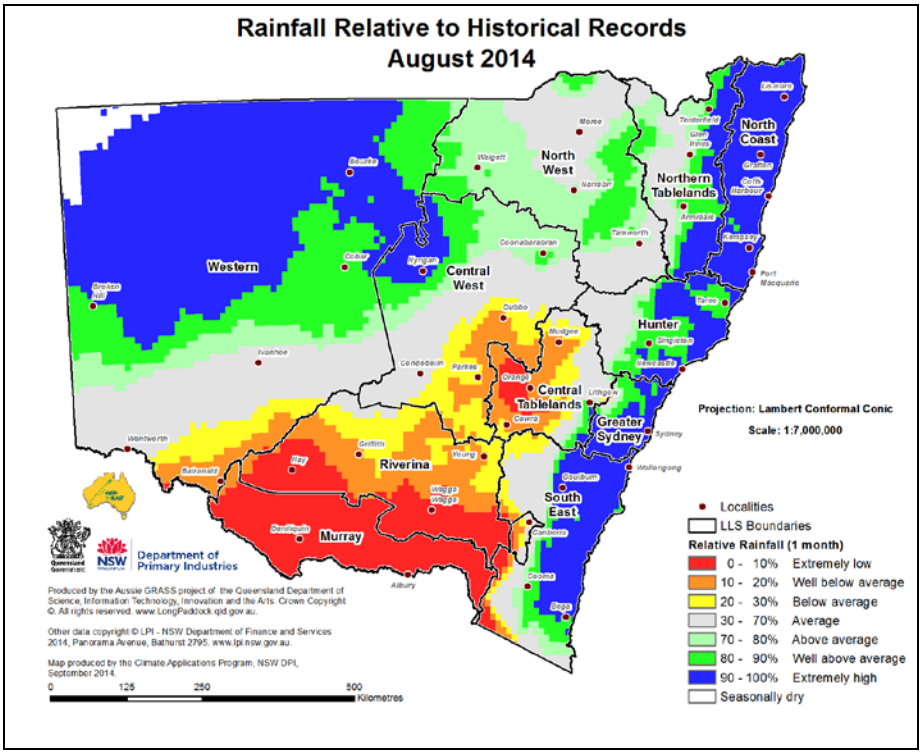


Figure 21: Relative rainfall – quarterly

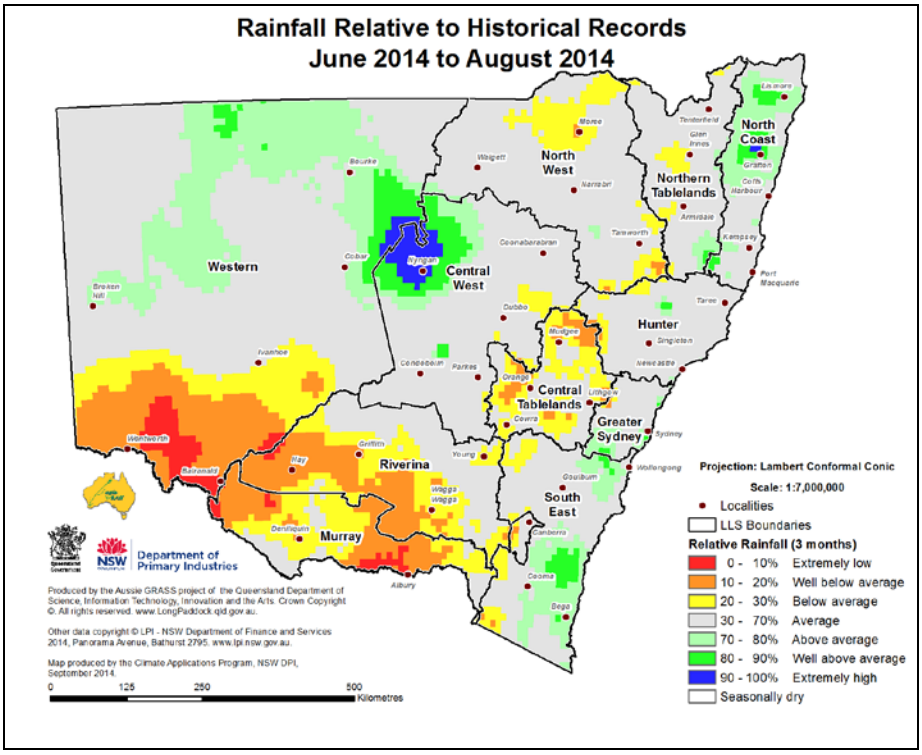


Figure 22: Relative rainfall – half yearly

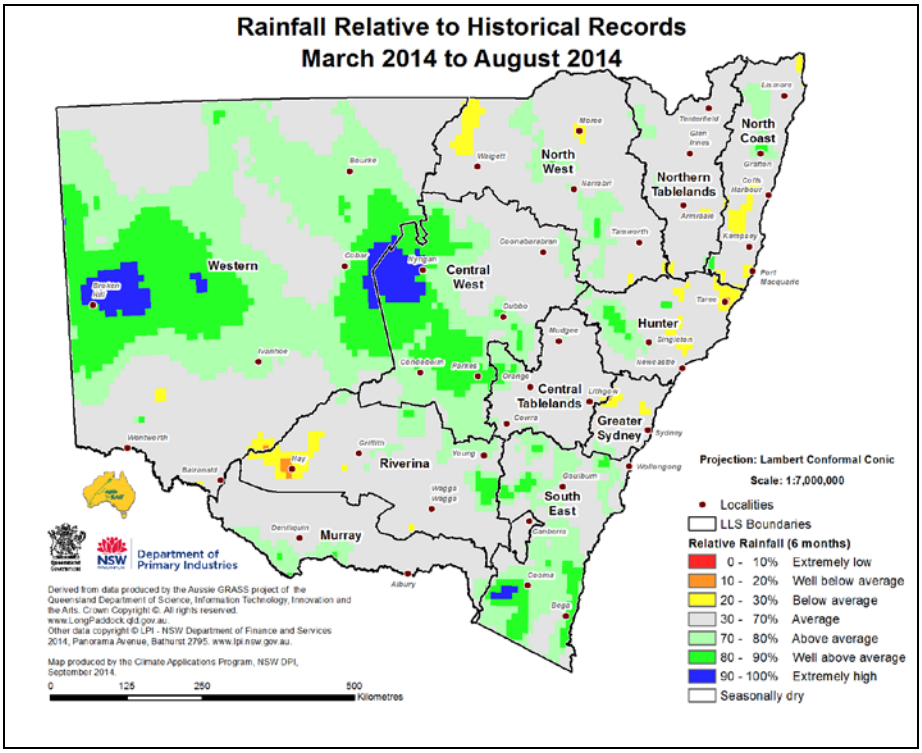


Figure 23: Relative rainfall – nine monthly

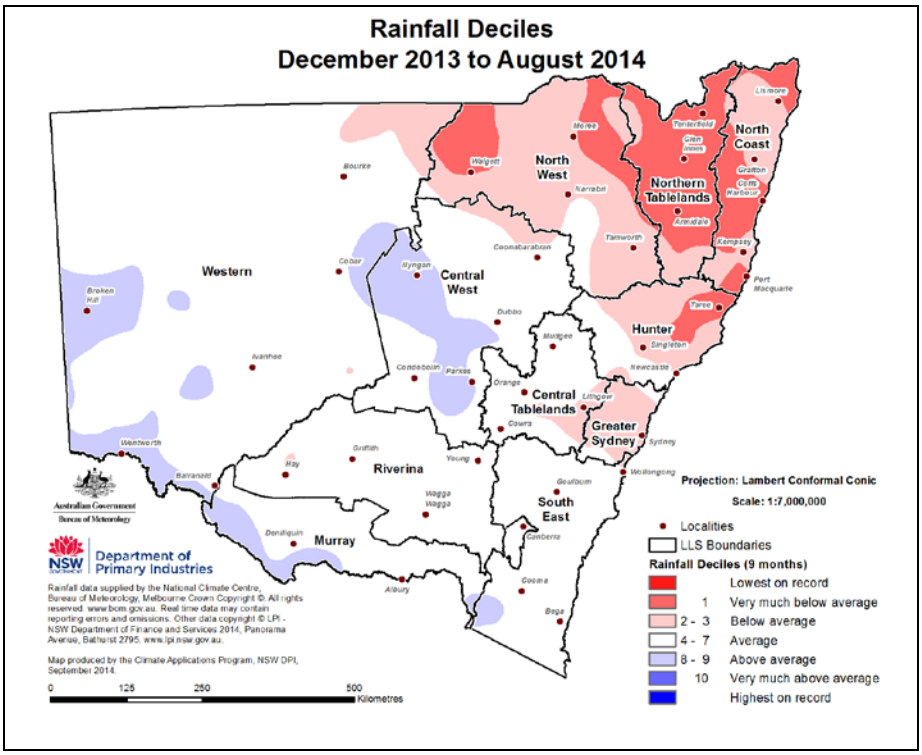


Figure 24: Relative rainfall – yearly

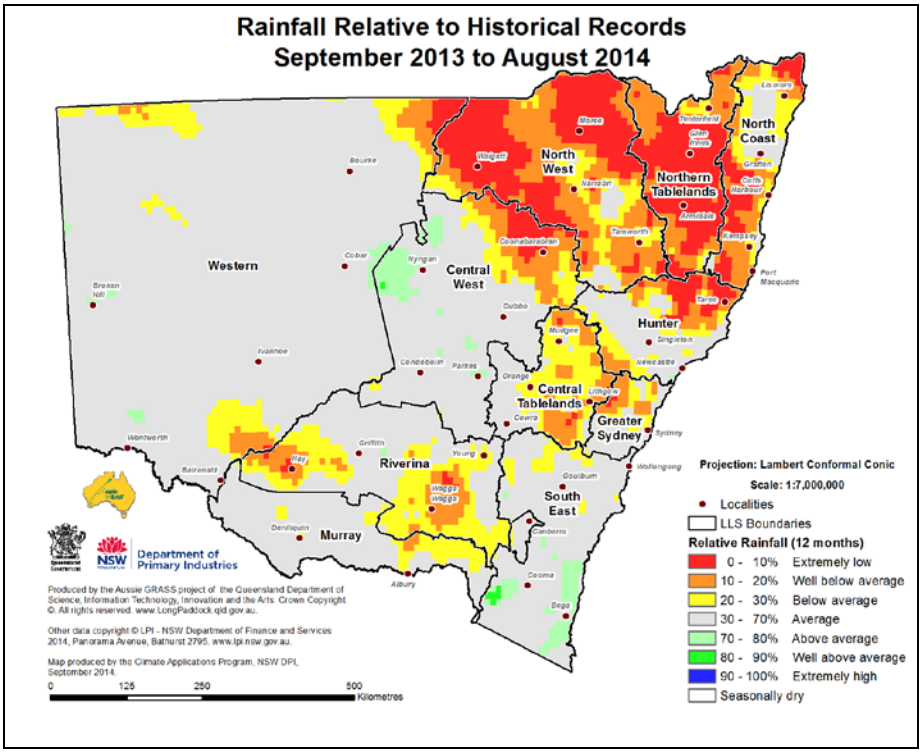


Figure 25: Total rainfall – monthly

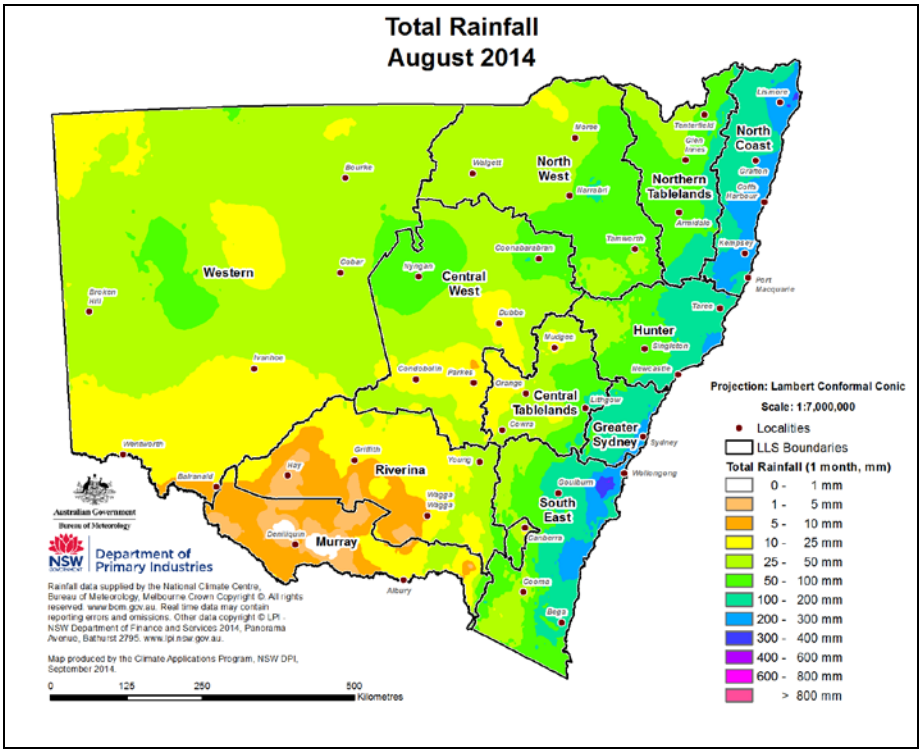


Figure 26: Total rainfall – quarterly

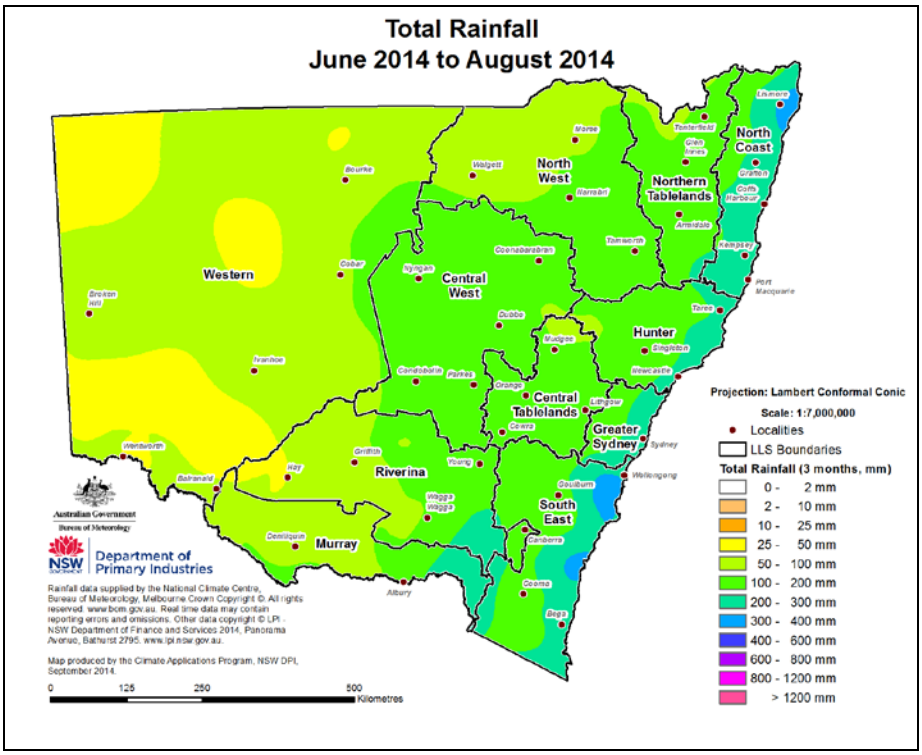


Figure 27: Total rainfall – half yearly

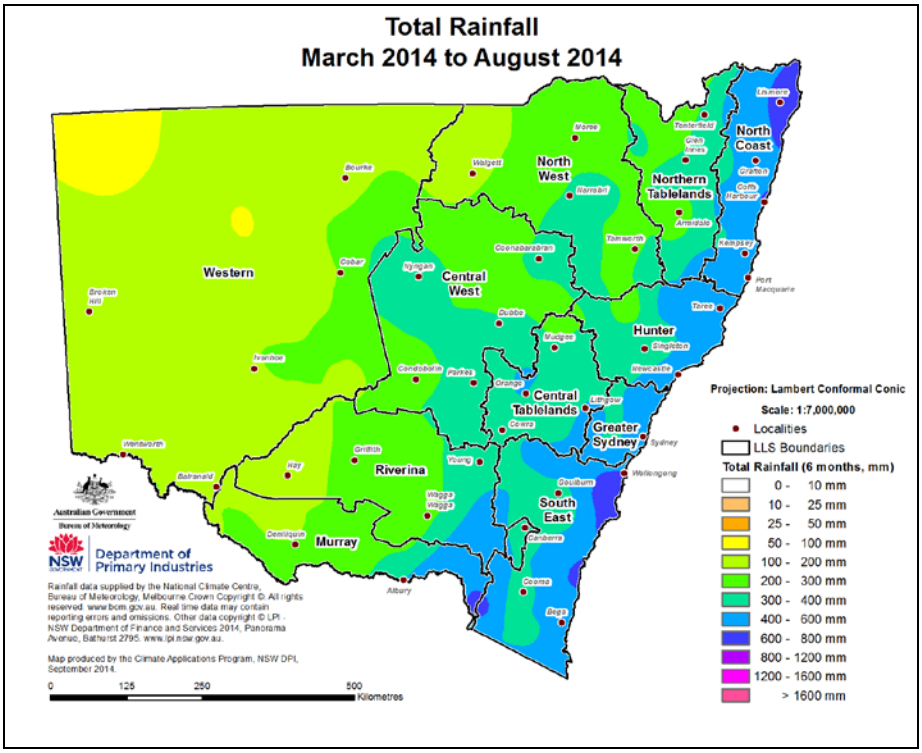
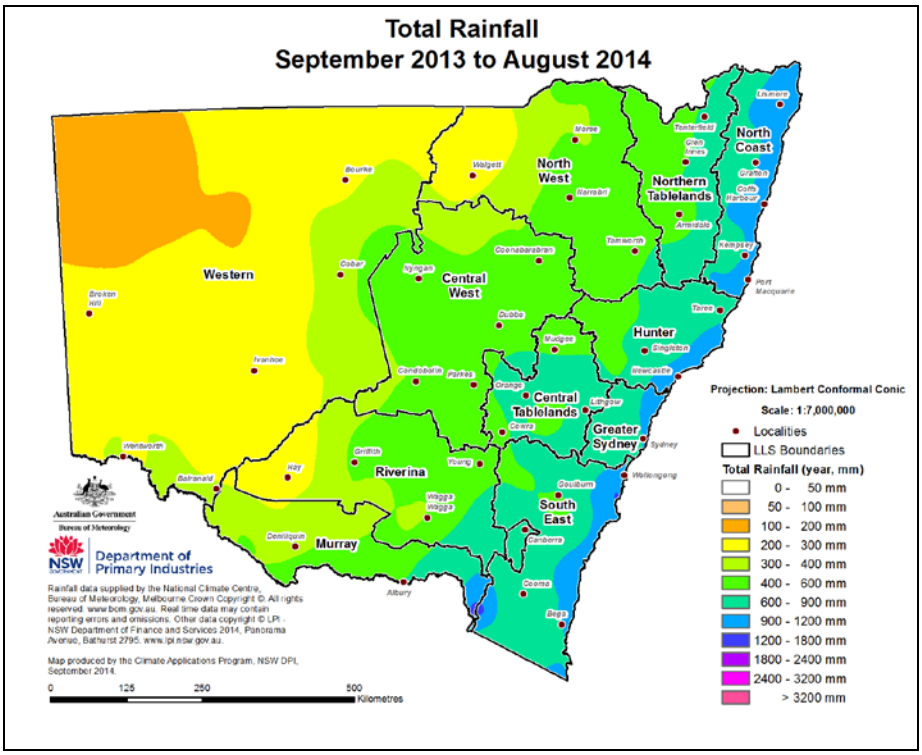


Figure 28: Total rainfall – yearly



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

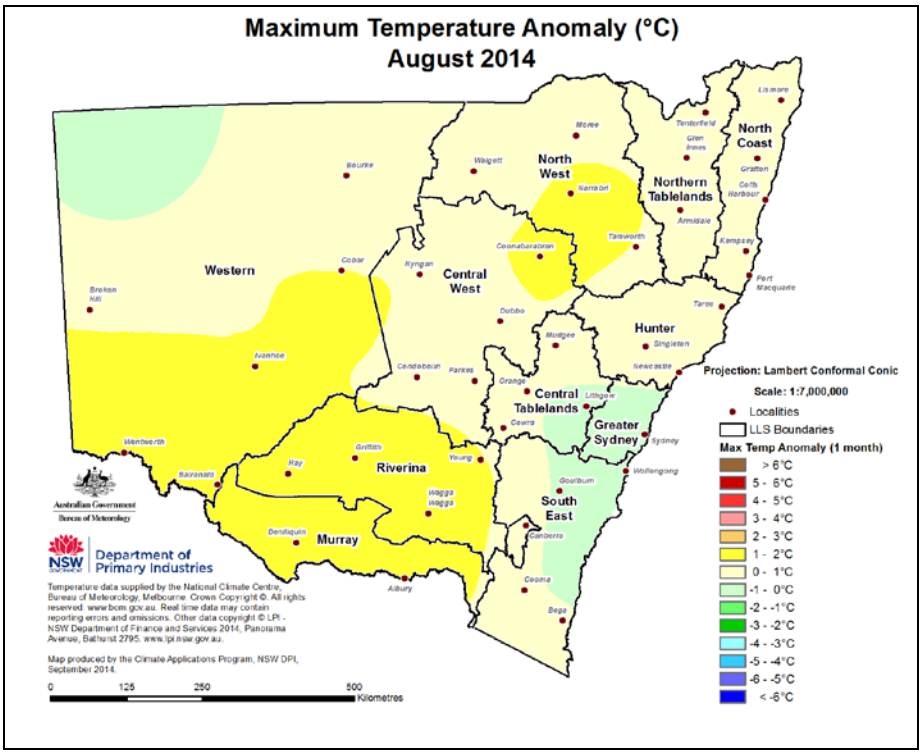
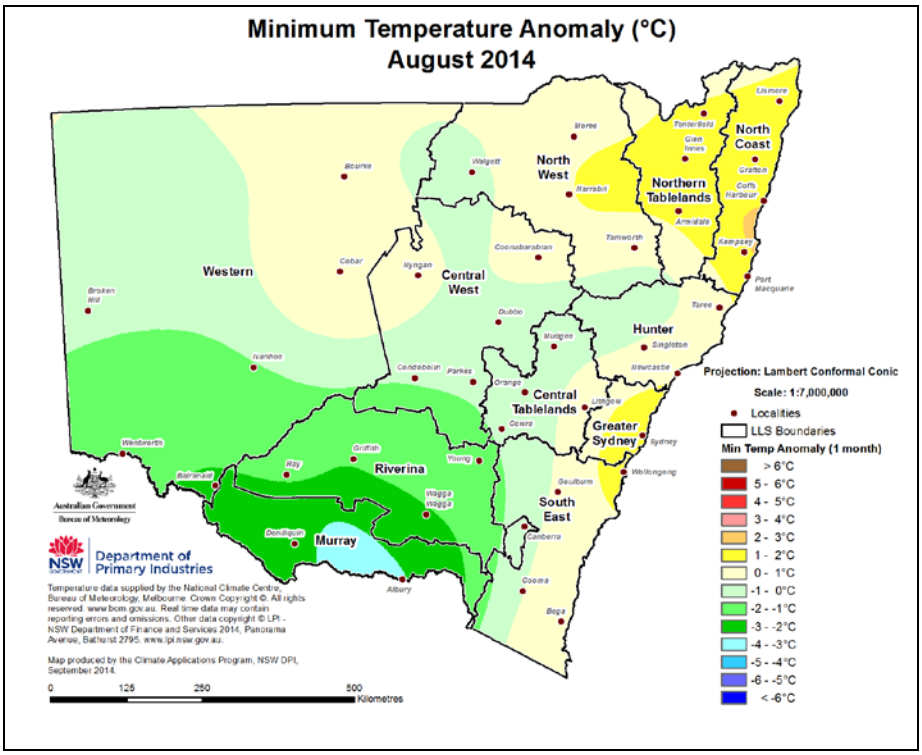


Figure 30: Minimum monthly temperature anomaly



Soil moisture

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

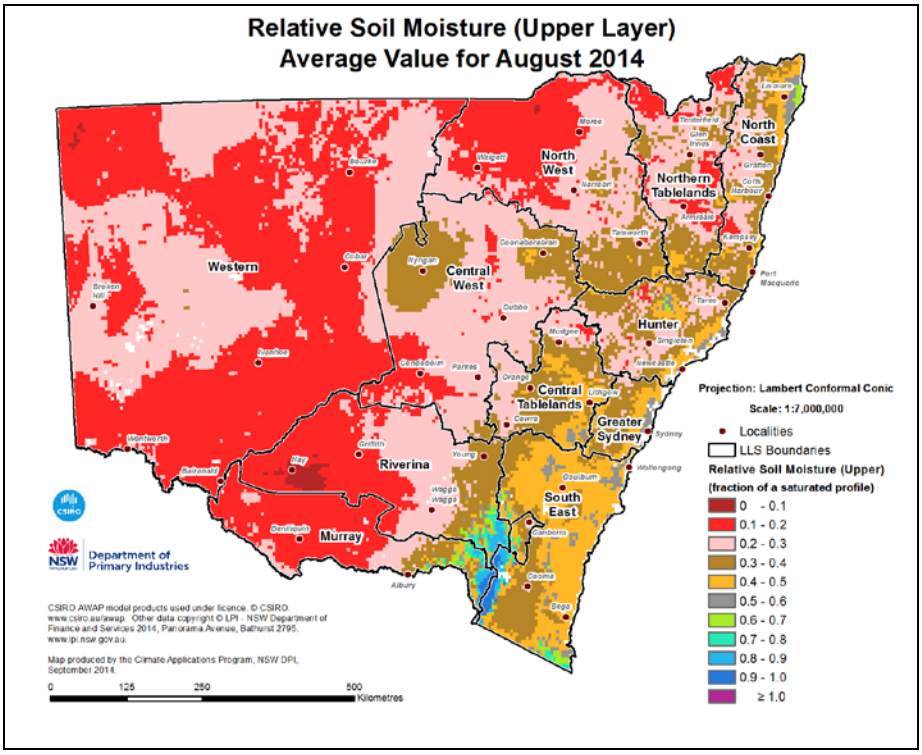


Figure 32: Relative monthly subsoil moisture (fraction of a saturated profile)

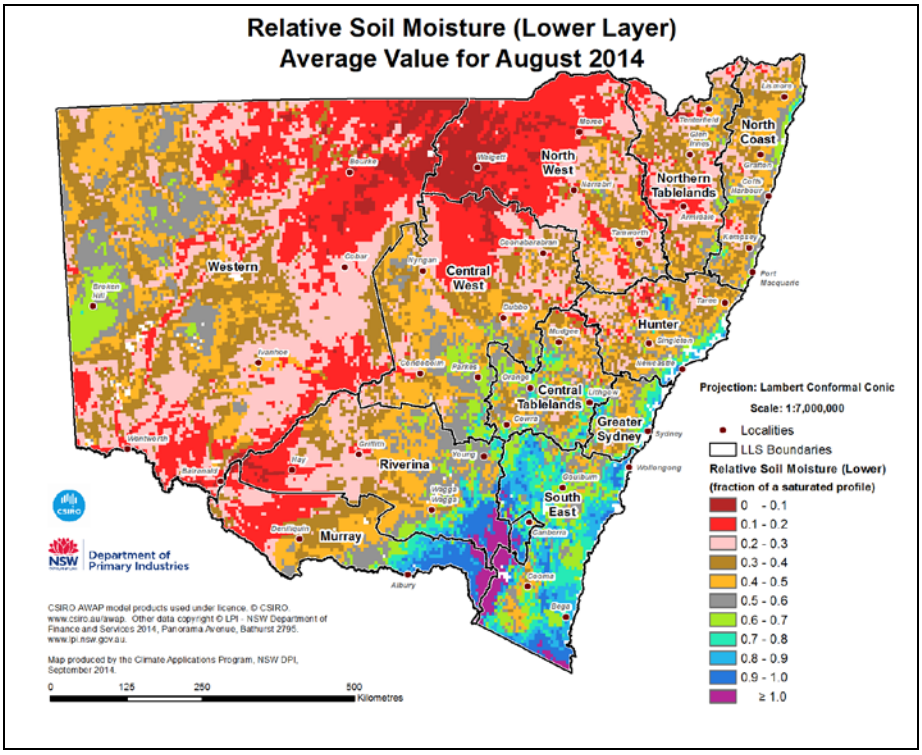


Figure 33: Relative monthly topsoil moisture (percent rank)

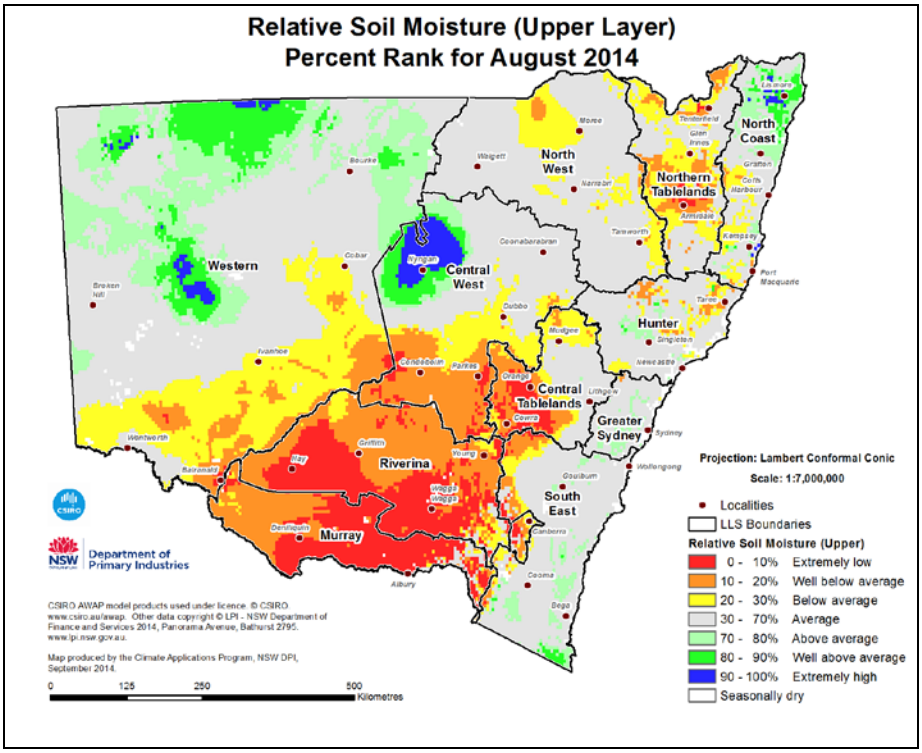
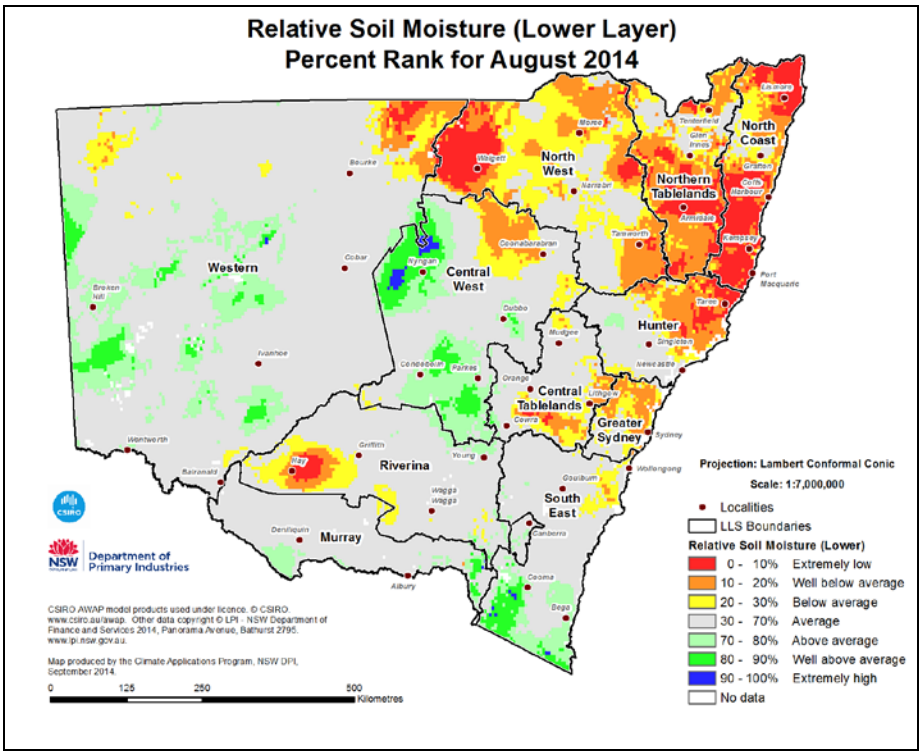


Figure 34: Relative monthly subsoil moisture (percent rank)



Pasture growth and biomass

Figure 35: Modelled pasture growth

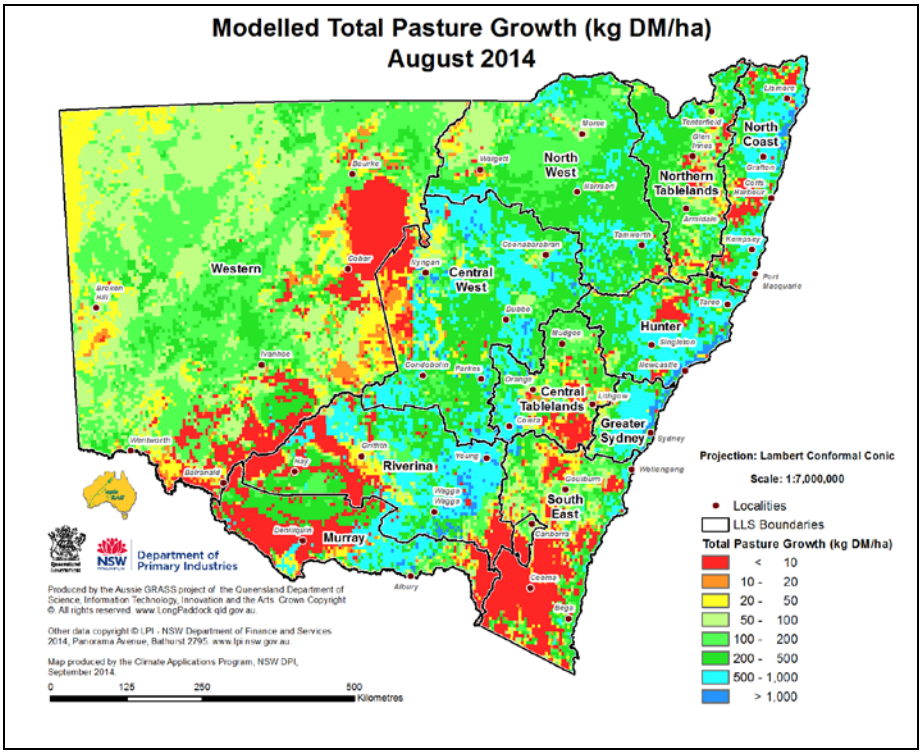


Figure 36: Modelled biomass

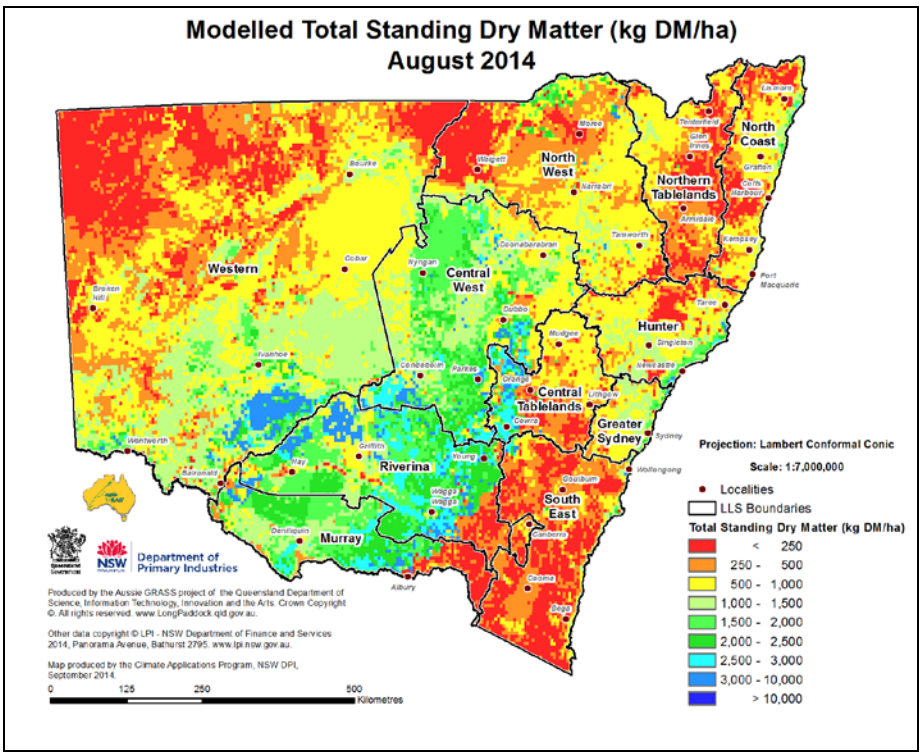


Figure 37: Relative pasture growth – monthly

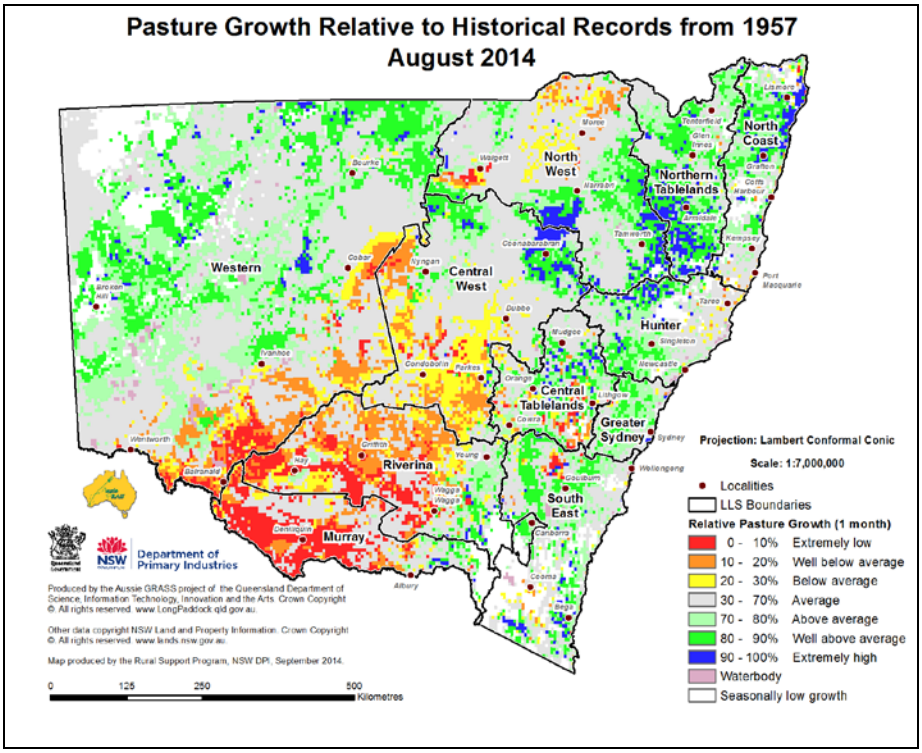


Figure 38: Relative pasture growth – quarterly

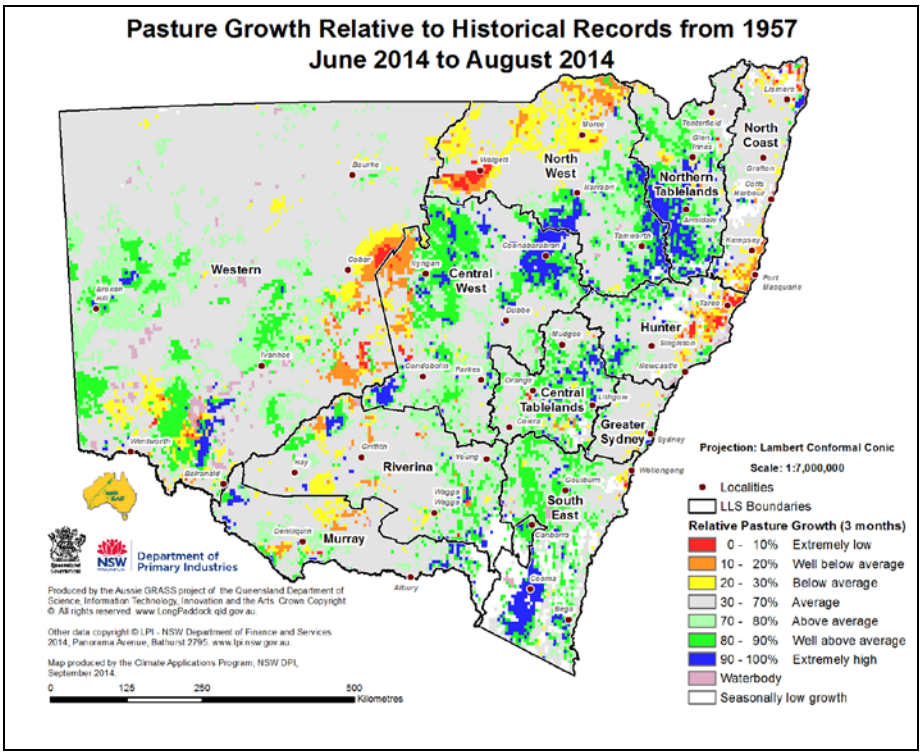


Figure 39: Relative pasture growth – half yearly

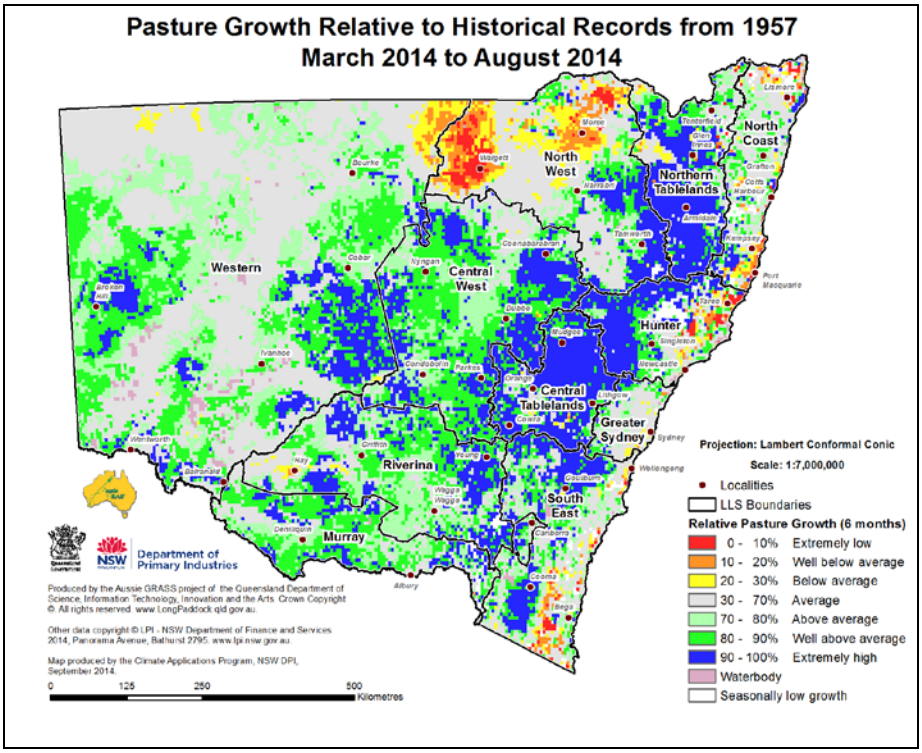


Figure 40: Relative pasture growth – yearly

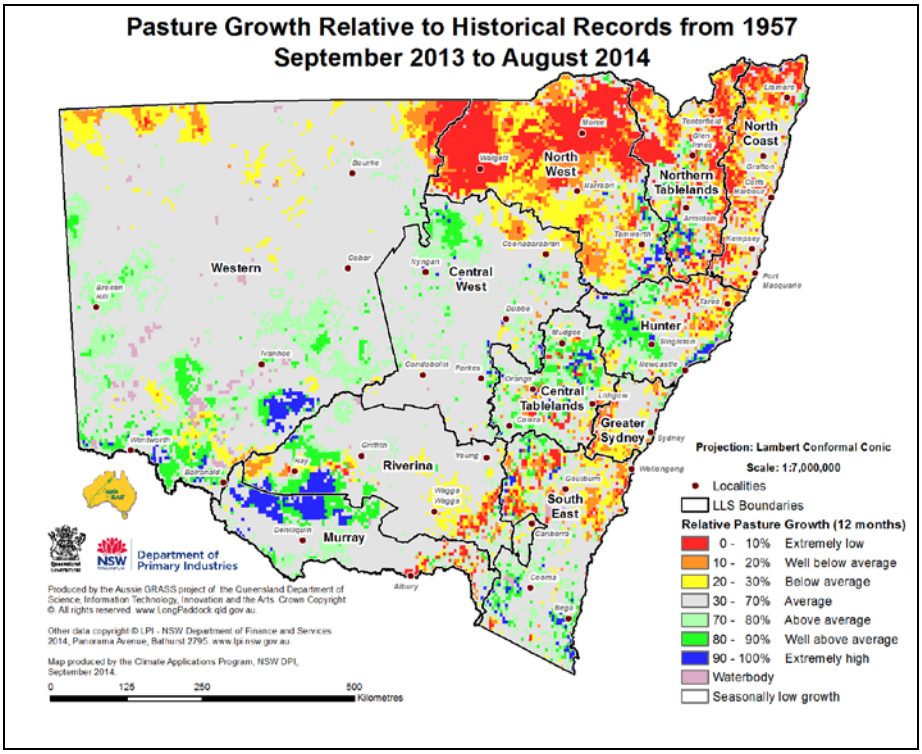


Figure 41: Relative biomass – monthly

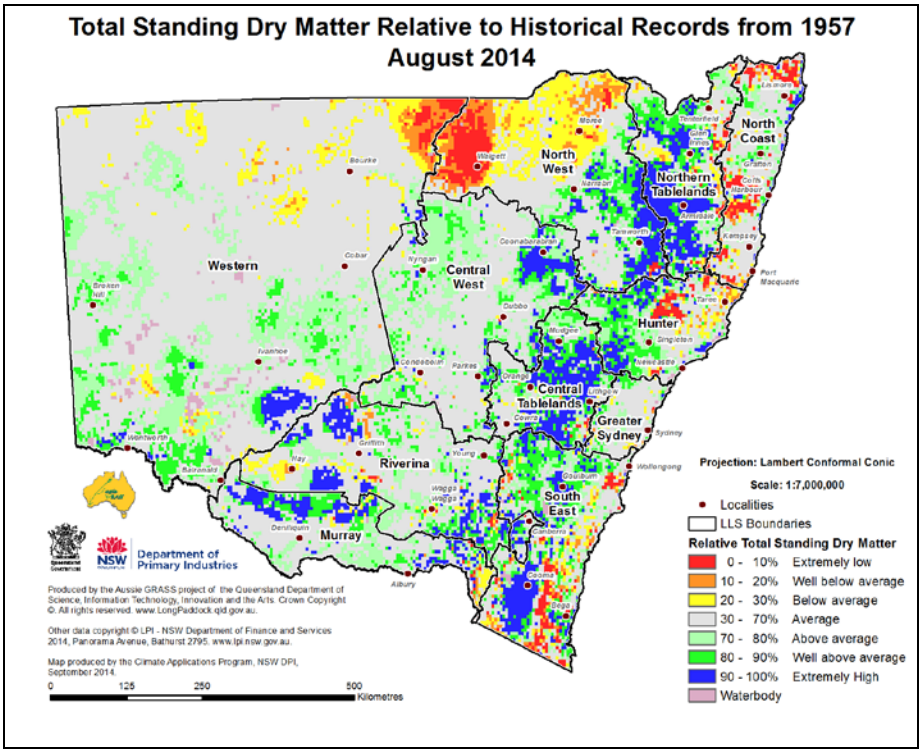
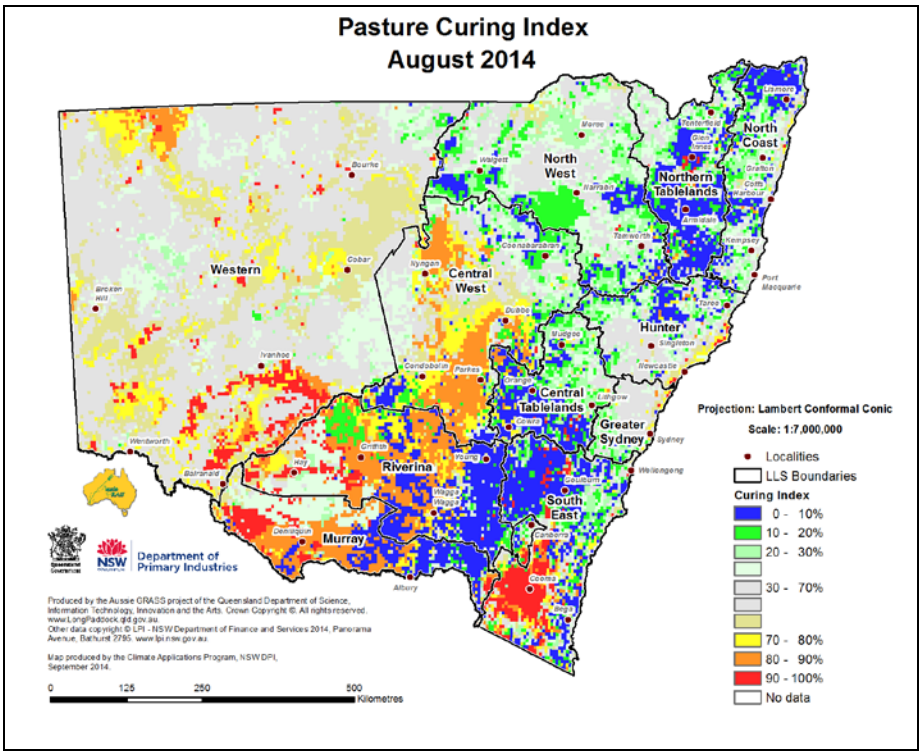


Figure 42: Pasture curing index



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 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

Recognising that some of the information in this document is provided by third parties, the State of New South Wales, the author and the publisher take no responsibility for the accuracy, currency, reliability and correctness of any information included in the document provided by third parties.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (September 2014). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.

Published by the Department of Primary Industries.

ISSN 2202-1795 (Online)

PUB14/170

Volume 2/Number 9

Jobtrack 13184