Department of Primary Industries

NSW Seasonal Conditions Report - August 2014

Highlights

- Rainfall over July was below average over most of NSW. Yearly rainfall was low over areas of the north and coast.
- Drier than normal conditions are likely from August to October across southern and central NSW, and warmer than normal conditions are likely over most of NSW.
- ENSO remains neutral, with a 50-65% chance of an El Niño event developing during spring. A weak event is the most likely to occur.
- Pasture growth deteriorated during July and biomass declined across the north and west. Growth and biomass were also low over the tablelands and coast. Many areas remain in a 'green drought'.
- Crop growth remained good across southern and central areas, but poor over much of the north. Good rainfall is needed over many areas in August and 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 July was below average over 75% of NSW, with near normal rainfall across areas of the central west, central tablelands and limited areas of the far south east, north west and upper Hunter. Yearly rainfall was particularly low over areas of the north, north east and coast.

Pasture growth deteriorated across much of northern and western NSW during July and declined or remained low across areas of the coast, tablelands and slopes. Growth across central and southern NSW remained reasonable to good, but declined along the western margin of the cropping belt. Biomass levels fell over the north, far west, tablelands and coast. Areas of the north and west remain in a 'green drought'.

Winter crop growth remains reasonable to good across southern and central NSW, but poor in the north west, particularly west of the Newell Highway. Good rainfall is essential in August-early September for many areas, particularly for crops in the north and near the western margins.

Drier than normal conditions are likely between August and October across the southern and central areas of NSW, with generally warmer than normal daytime and overnight temperatures. Over August, drier than normal conditions are likely, with warmer daytime and overnight temperatures across most of NSW.

ENSO remains neutral, with about a 50-65% chance of an El Niño event in spring. A weak event is now considered likely. The Bureau of Meteorology has dropped the El Niño status from 'alert' to 'watch' level. Sea surface temperatures in the eastern and western equatorial Pacific remain warm but fell to near average in the central area. Sub surface warm anomalies have decayed and cooled in the eastern equatorial Pacific, but warming has occurred in the west. Westerly wind anomalies have occurred over the western tropical Pacific, but the SOI remains in the neutral range (although negative).

Rainfall over most of NSW ranged from 1-25 mm during July. The southern and central tablelands and areas of the central west and south west slopes received 25-100 mm. Daytime temperatures were above normal over northern, western and eastern NSW. Overnight temperatures were slightly below normal.

In relative terms, quarterly rainfall was below average over 53% of NSW and average over 46%. Half yearly relative rainfall was average or above over 86% of NSW. Over the quarter, relative rainfall was low across the north, north west, north east and areas of the coast.

Modelled topsoil moisture declined markedly, except in areas of central, southern and south eastern NSW. Subsoil moisture was stable.

Stock water supplies remained variable. Yearly streamflow analysis showed below average run off over areas of the tablelands, mid-north to north coast, north west, Riverina and far west.

Relative pasture growth declined across the far west, northern and coastal areas, being below average over 43% of NSW. Quarterly relative growth remained average or above over 81% of NSW. Relative biomass levels were average or above average for the time of year, but low over areas of the north west and the coast.

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 7 August 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 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 June and early July and were up to date as at 7 August 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 NSW & south to mid-north coast)	Drier
Max Temperature (quarter)	Warmer Near neutral (far north west NSW)	Warmer
Min Temperature (quarter)	Warmer	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 August to October, drier than normal conditions are likely across 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 an equal chance of above or below median rainfall for most of northern NSW and areas of the far north west, as well as the coastal areas from the far south to mid-north coast. For the remainder of the State, the chances of exceeding median rainfall are slightly reduced, with a 40-45% probability.
- In the far south eastern corner of the State (south of Bega), the chances of wetter than normal conditions are slightly above normal (Figure 7).
- 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 August to October 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%) near the central west and in the far north west. However, accuracy is low (less than 55%) across the south east (Figure 10).

2.3 Seasonal temperature outlook

- Over the three month period from August to October, warmer than normal daytime temperatures are likely across NSW (Figure 8).
- The chance of exceeding median maximum temperatures ranges from 55% to 75% across most of NSW, with the highest probabilities in the far south east of the State. The lowest probabilities of 55-60% are in the far north west.
- This means that for every ten years with similar climate patterns to those at present, across most of NSW about six to eight August to October 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 moderate (55-65%) across most of NSW, high (65-75% across areas of northern and north eastern NSW but low (less than 55%) across areas of the central to mid-north coast and the south west (Figure 10).
- Warmer than normal overnight temperatures are likely across NSW between August and October. The chance of exceeding median minimum temperatures ranges from 60% to more than 80% across most of NSW, with the highest probabilities in the south east of the State. The lowest probabilities of 60-65% are in the far north west and far south west (Figure 9).

- The outlook accuracy (confidence or skill) for the minimum temperature outlook is low (less than 55%) across all of NSW with the exception of the north west and far north west (Figure 10).

2.4 Monthly rainfall and temperature outlook (BoM, experimental)

The monthly 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 also may differ from the operational seasonal outlooks as they may be based on a different number of scenarios (ensembles). 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

	August	September
Rainfall	Drier	Neutral Drier (south/ south east & far north east)
Max Temperature	Warmer	Warmer (south, central & east) Neutral (west & north west)
Min Temperature	Warmer Neutral (south west)	Warmer Neutral (south & 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.

August

- Drier than normal conditions are likely across NSW on the experimental August outlook (Figure 11). The probability of exceeding the median rainfall is 20-30% over the south west of the State, 0-20% over the southern/central areas and the south east, 30-40% in the north, and 30-40% over the remainder of the State. The outlook has a moderate accuracy (skill) over most of the State.
- Warmer than normal daytime temperatures are likely (a more than 80% probability) across NSW during August (Figure 11). This outlook has a moderate accuracy (skill).
- Warmer than normal overnight temperatures are likely across most of NSW during August, with the highest probabilities in the north and over the mid-north to north coast. There is a near equal probability of above or below median overnight temperatures across the central coast and areas of the south-south west (Figure 11). However, this outlook has a low accuracy (skill) over all of NSW except the far north east.

August multi-week (as at 4 August)

- Weekly experimental outlook information suggests that during the third and fourth week of August (17-30 August) drier than normal conditions are likely across southern/south eastern NSW, with the probability of above median rainfall being 30-40%. For the remainder of the State, there is a near equal probability of above or below median rainfall. The accuracy (skill) for this outlook is moderate for most of NSW, but low for the central and south coast.
- Daytime temperatures over the third and fourth week of August are likely to be warmer than normal across NSW, particularly over the central tablelands, central coast, areas of the central west and the south/south east of the State. This outlook has moderate accuracy (skill) over most of the State.
- Overnight temperatures over the third and fourth week of August are likely to be warmer than normal across eastern and central NSW, as well as areas of northern NSW. The probabilities of higher than normal overnight temperatures are highest along the coast. There are near equal chances for cooler or warmer than normal overnight temperatures across western and south western NSW. The accuracy (skill) level for this outlook is low.

September

- The experimental outlook for September indicates a near-equal probability for drier or wetter than normal conditions across most of NSW (Figure 12). Over areas of the far north east, central coast, south and south east, drier than normal conditions are likely, with a 30-40% probability of exceeding median rainfall. The accuracy (skill) for this outlook is low for south eastern and coastal NSW, but moderate across the remainder.
- Warmer than normal daytime temperatures are likely in September across most of NSW, particularly across the south, south east and central coast. There is a near equal probability of warmer or cooler than normal daytime temperatures across north western- and far western NSW (Figure 12). The skill

for this outlook is moderate across most of NSW, but low across the south east, far south west and areas of the central coast.

- Warmer than normal overnight temperatures are likely across most of NSW in September, particularly over the south eastern and central areas. There is a near equal probability for warmer or cooler than normal overnight temperatures across areas of the south/south west (Figure 12). However, the accuracy (skill) for this outlook is low.

2.5 Other climatic models

Bureau of Meteorology statistical model (superseded)

The Bureau of Meteorology statistical outlook is based on past trends in sea surface temperatures and their relationship to rainfall and temperatures across Australia. These historical relationships and current observations are used to produce the outlook. The statistical model outlooks have been superseded by the outlooks from the POAMA model, and the information is provided for comparative purposes only.

In comparison, the output of the POAMA model takes account of more data and has better skill. Skill assessments for the statistical model are available via this link.

- The Bureau of Meteorology's statistical model indicates drier than normal conditions are likely across western and areas of southern NSW over next three months (a 30-45% probability of exceeding median rainfall). A nearly equal to equal probability for wetter or drier conditions exists over central and eastern NSW (a 45-60% chance of exceeding median rainfall), with the probability of exceeding median rainfall increasing to the north east. The statistical model indicates a very high probability of warmer than normal daytime temperatures across most of NSW (65% to more than 80%), particularly across the north of NSW. The statistical model indicates a high to very high probability of warmer than normal overnight temperatures across the State (a 65-80% probability), particularly across the north and west.

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 roughly equal probability (40-60%) for wetter or drier than normal conditions across most of NSW between August and October. Some areas in the far north east have an elevated probability of exceeding average rainfall (60-80%). The skill assessment for this outlook is high across most of NSW, but low for the far north west and the Hunter valley. The model indicates that above average temperatures (a 60-80% probability) are likely for the period across NSW, particularly along the far south coast (a more than 80% probability). The skill assessment for this outlook is high across most of NSW, but moderate to low along the coast.
- For September to November, the UK Meteorology Office's global long range probability modelled output indicates a near-equal probability for wetter or drier than normal conditions across NSW. There is an increased chance of wetter than normal conditions in the far north western corner of the State (a 60-80% probability of above average precipitation). The skill assessment for this outlook is moderate to high over most of NSW, but moderate in the north east and far west. 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 most 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 August to October indicates that near normal rainfall is likely across most of the State, with potentially drier conditions in the far north east. The temperature anomaly outlook indicates the likelihood of near normal temperatures over the north west, increasing to warmer than normal temperatures over the southern, central and coastal areas. No skill assessment is available for these outlooks. During August, the APEC Climate Centre's rainfall anomaly outlook indicates a likelihood lower than normal rainfall over the southern and southern-central areas of NSW. The temperature anomaly outlook indicates cooler than normal temperatures are likely across the north of the State, with near normal temperatures across the far south

and the coast. 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.
- Sea surface temperatures have declined in the central and eastern-central equatorial Pacific, as a result of the lack of coupling between the ocean and atmosphere, but above average sea surface temperatures remain in the eastern and western equatorial Pacific. Sub surface temperatures have declined in the central and western equatorial Pacific, but increased in the east. Sea surface temperatures will need to increase again if an El Niño event is to occur.
- 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.

ENSO outlook and comments

Table 3: ENSO/Climatic Outlook

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

Summary Legend: Grey = Neutral, i.e. neither El Niño nor La Niña.
Red = El Niño/reduced rainfall trend.
Blue = La Niña/higher rainfall trend.

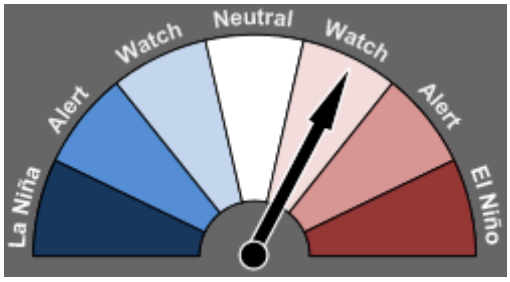
Source: Derived from information provided by the Australian Bureau of Meteorology and the US National Oceanic and Atmospheric Administration.

- Sea surface temperatures remain warm over the eastern and western Pacific Ocean along the equator, although they have cooled) over the central Pacific.
- In the key NINO3.4 region, the weekly sea surface temperature anomaly has declined from weak El Niño to neutral levels (+0.20°C) (note that the Bureau of Meteorology uses an anomaly level of +0.8°C as an indicator of an El Niño event). Above average sea surface temperatures persist in the eastern Pacific. There has been a recent increase in the NINO 4 region (western equatorial Pacific) to above normal levels.
- Tropical rainfall has remained slightly enhanced over Indonesia and the western tropical Pacific, as indicated by negative outgoing long-wave radiation (OLR) anomalies over the last month. Recently, however, positive anomalies have occurred over this region. For an El Niño event to occur, rainfall tends to be reduced in this area. Positive OLR anomalies occurred south of the equator near the International Date Line, and negative anomalies north of the equator.
- Other indicators such as the thermocline slope index, and the equatorial Pacific basin upper ocean heat anomalies have declined to near zero, and reflect ENSO neutral conditions.
- Sea sub-surface temperatures have cooled in the eastern Pacific, remaining warm to less than 50 m. Warm anomalies are present to 300 m in the western Pacific. Cooler anomalies are now occurring to 150 m across the central and eastern Pacific.
- A continued decrease in the intensity of the sea sub-surface anomalies indicates a reduced risk of a moderate or strong El Niño event developing. At present, the Climate Prediction Centre (CPC) considers that a weak event is likely.
- 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 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 Madden-Julian Oscillation (MJO) is currently in the western Pacific and appears to have caused a burst of low level westerly

winds, which may have contributed to the recent increase in sea surface temperatures in the NINO 3.4 and 4 regions.

- The Bureau of Meteorology's ENSO tracker (Figure 1) has been shifted from El Niño 'Alert' to 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).

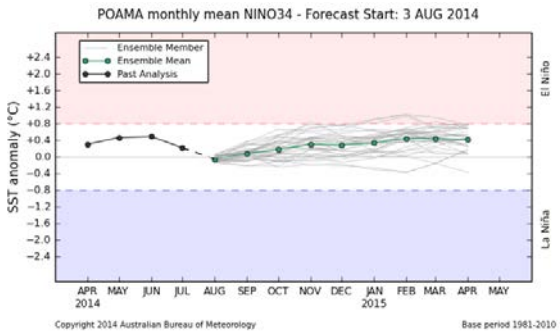
Figure 1: Bureau of Meteorology ENSO tracker status



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 outlook from all global climate models.
- Five to six of the eight global climate models surveyed by the Bureau of Meteorology still indicate that sea surface temperatures are likely to be at or near El Niño levels by October to December.

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 are 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 7 August) indicates the likelihood of a weak El Niño event developing during August to October, peaking in late spring and early summer and continuing into 2015. The model forecast probabilities for an El Niño event have decreased since last month, and CPC/IRI now rate the chances of an El Niño event occurring as 65-66% during the late spring and summer (Table 4).

Table 4: Current consensus ENSO forecast probabilities (as at 7 August)

Season	La Niña	Neutral	El Niño
Jul-Sep	1%	53%	46%
Aug-Oct	1%	44%	55%
Sep-Nov	1%	39%	60%
Oct-Dec	1%	34%	65%
Nov-Jan	2%	32%	66%
Dec-Feb	2%	34%	64%
Jan-Mar	3%	38%	59%
Feb-Apr	3%	44%	53%
Mar-May	4%	48%	48%

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

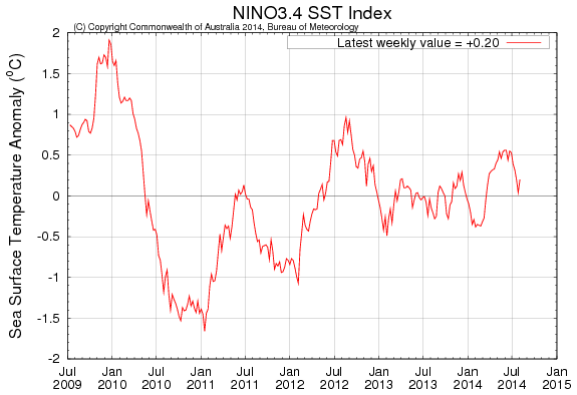
- Note that the CPC/IRI classifies values of the NINO3.4 index between -0.5°C and +0.5°C as indicating neutral conditions, rather than the -0.8°C to +0.8°C range used by the Bureau of Meteorology. This will result in differences when various meteorological organisations report that El Niño or La Niña 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 eastern and western equatorial Pacific remain warmer than normal, with temperatures near average in the central equatorial Pacific near the International Date Line.
- The most recent monthly temperature anomaly value in the key NINO3.4 region is +0.18°C for July, a decrease from the value of +0.46°C for May and June.
- Weekly sea surface temperatures have continued to decline in the NINO 3 region, with the temperature anomaly now at +0.35°C as at 3 August. The decline in the temperature anomalies in the NINO 3.4 (Figure 3) and 4 regions continued till 27 July with levels at +0.04°C and +0.34°C respectively, but as at 3 August the temperature anomalies increased again to +0.20°C and +0.59°C respectively.

Temperatures in the NINO 1 and 2 regions remain high, but have also declined.

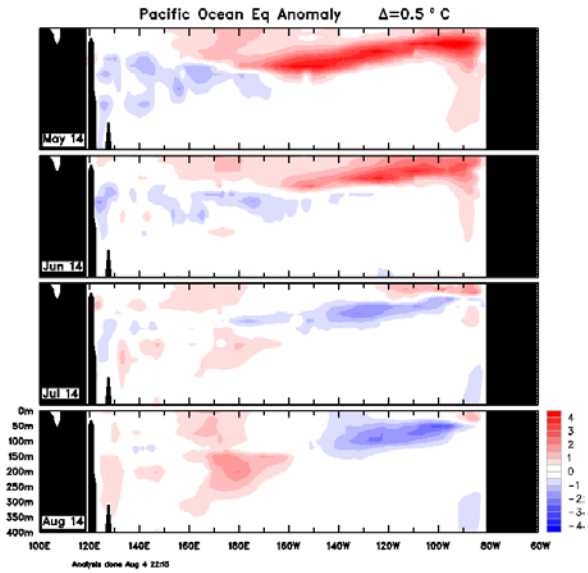
Figure 3: NINO3.4 Sea Surface Temperature Index



Source: Australian Bureau of Meteorology

- The sub surface sea temperatures in the equatorial Pacific show the gradual cooling of the strong warm anomaly in the central and western equatorial Pacific over the last four months (Figure 4).
- Sub surface temperatures in the eastern equatorial Pacific have cooled, and the warm anomaly has decayed greatly and is now less than 50 m in depth. Cool anomalies are present to a depth of 150 m in the central and areas of the eastern Pacific. A warm anomaly has developed in the western equatorial Pacific at and west of the International Date Line, to a depth of 300 m. This is reflected in the recent increase in the sea surface temperatures in the NINO 3.4 and 4 regions, and the presence of low level westerly wind anomalies in this area.
- This continued weakening in temperature anomalies represents the upwelling phase of the Kelvin wave that caused the warming to occur. Downwelling and warming occurs in the leading edge of a Kelvin wave, and upwelling and cooling in the trailing edge.

Figure 4: Monthly sea sub-surface temperatures



Source: Australian Bureau of Meteorology

Southern oscillation index (SOI)

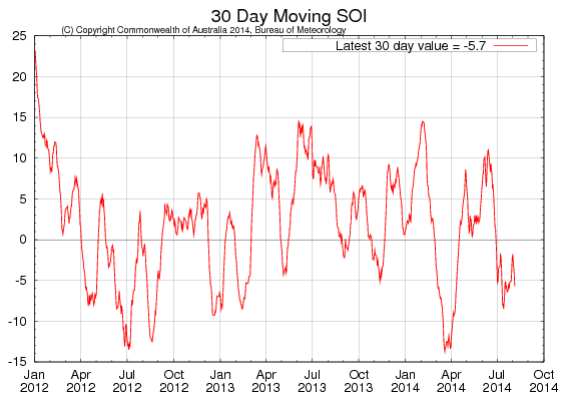
- The monthly value of the Southern Oscillation Index is currently in the neutral range.
- From a level of +11.0 in mid-June, the SOI underwent a rapid decline to -5.3 in early July. After fluctuating between -1.7 to -8.5 in early to mid-July, it has since returned to a level of -5.7 (Figure 5, Table 5).

Table 5: Values of the Southern Oscillation Index

	Current monthly value (5 August)	Previous monthly value (9 July)
SOI (30 day)	-5.7	-3.2

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.

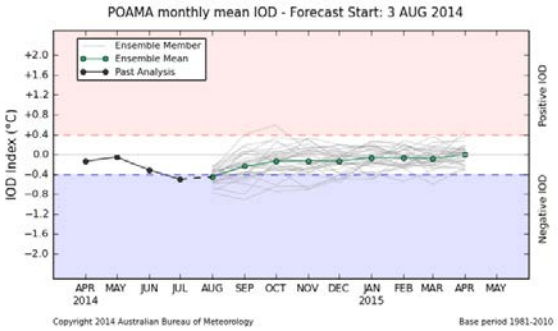
Sub-tropical ridge (STR)/atmospheric pressure

- The sub-tropical ridge is close to its normal winter position, as indicated on NOAA and Bureau of Meteorology mean sea level pressure charts.
- During June, cold fronts were allowed through into NSW but during July, atmospheric pressure was above normal across the State, particularly in the north and northern-central areas of NSW. The higher than normal pressure further south tended to push frontal activity to the south as well.
- 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 at negative levels for the last seven weeks. The latest IOD index value for the week ending 3 August is -0.69°C. The outlook is that it will return to neutral levels in spring.
- This is due to below average sea surface temperatures in the tropical western Indian Ocean and warmer than average temperatures in the eastern Indian Ocean (to the north west of Australia).
- However, the IOD will need to remain below -0.4°C into August to be considered a negative IOD event.
- The Bureau of Meteorology's POAMA model and all climate models surveyed by the Bureau of Meteorology favour a neutral IOD over October to December (Figure 6). 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 6: 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 near normal along the equator near the central to eastern tropical Pacific. Westerly anomalies have occurred in the western tropical Pacific, possibly as a result of the passage of the Madden-Julian Oscillation.
- If these westerly anomalies continue, they could cause further warming of the sea surface in the central Pacific. Continued westerly anomalies are an indicator of an El Niño event.

- 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 are fluctuating around the long term average. As at late July they were about average. Convection was enhanced near and just west of the International Date Line and over portions of Indonesia.
- 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.
- 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 neutral. It was moderately positive over most of July, but declined to be strongly negative in mid-July and returned neutral in late July.
- The rainfall events in early and mid-June corresponded with the SAM being moderately negative and neutral respectively.
- In early to mid-July, the SAM remained moderately positive and with higher than normal pressure further south, cold fronts were also shifted towards the south.
- The SAM index value from POAMA (as at 3 August) was near neutral at +0.5 and the AAO index value from NOAA (as at 4 August) was weakly positive at +1.
- The outlook from POAMA indicates the SAM index to increase slightly in early August then remain near neutral through until mid-late August. The NOAA outlook suggests the index will increase to be weakly to moderately positive (+1 to +2) in early-August, then decline to be weakly negative (-1) by mid-August.
- 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 over most of NSW during July were near normal, but lower than normal along the coast.

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 13). 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 14).
- 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 1890 (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%	74%	25%	0%
Quarter	0%	53%	46%	1%
Half year	0%	14%	51%	35%
Year	0%	52%	47%	1%

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

July

- Relative to historical records, rainfall for July was below average over 74% of NSW (that is, rainfall in the 3rd decile or below).
- Average rainfall (that is, rainfall of between the 4th and 7th deciles) fell across 25% of NSW (Figure 15, Table 6), extending across the central west and areas of the central tablelands, far south east, the north west and upper Hunter.
- Most areas of the State had rainfall of 10-50 mm below normal, with areas of the coast having rainfall deficits of 100 mm.
- The most severe rainfall deficits occurred in the South East LLS district, with much of the coastal and eastern tablelands areas and Monaro having extremely low relative rainfall. Areas of the Western LLS district to the south and west of Cobar and near White Cliffs also had extremely low relative rainfall.
- The majority of Central West and Central Tablelands LLS districts, and the western half of Hunter LLS district received average to near average relative rainfall, as did the north eastern corner of the Western LLS district.
- Most of the Western, Riverina, Murray, South East, Greater Sydney, Hunter, North Coast, Northern Tablelands and North West LLS districts received below average relative rainfall for July. These areas generally received less than 60% of their normal rainfall. Areas of the Western, North West, North Coast, Greater Sydney and South East LLS districts receiving less than 20% of their normal rainfall.

May to July (3 months)

- Over the 3 month period from May to July, relative rainfall was average or above over 47% the State (Figure 16, Table 6).
- Below average relative rainfall occurred across 53% of the State, extending across all of Greater Sydney and North Coast LLS districts, and over the majority of Hunter, North West and Northern Tablelands LLS districts. Below average relative rainfall also extended across the north and south west the Western LLS district, and the north eastern and central areas of the South East LLS district.
- Most of these areas had below to well below average rainfall, and received 20-60% of normal levels.
- The central and southern areas of the State generally received average relative rainfall for the period. Some 61% of the Central Tablelands, 91% of Central West, 97% of Riverina and 98% of Murray LLS districts received average or better rainfall.
- Small areas along the Murray River, the alpine areas and near Nyngan received above average relative rainfall, receiving up to 125-150% of normal rainfall.

February to July (6 months)

- Over the six months to July, relative rainfall was average across 51% of NSW, below average across 14% and above average across 35% (Figure 17, Table 6).
- Much of the Northern Tablelands (59%), North Coast (99%), Hunter (45%) and Greater Sydney (76%) LLS districts received below average relative rainfall over the period, as did areas of the North West (25%) and South East (12%) LLS districts.
- Areas of the North Coast and the north east of Hunter LLS districts received extremely low relative rainfall during the period, that is, rainfall in the lowest 10% of years. These areas had a 200-800mm rainfall deficit over the last six months.
- Much of the central and southern areas of the State received above average rainfall, as did the far south west. These areas received up to 125-200% of normal rainfall.

November to July (9 months, BoM)

- Over the 9 month period from November to July relative rainfall across the State was below average across the North West,

Northern Tablelands, North Coast and Greater Sydney LLS districts. Rainfall was also below average across the north and of the Hunter LLS district, across the north of the South East LLS district and areas of the Central Tablelands, Central West and Western LLS districts.

- A small area of below average relative rainfall also occurred near Hay in the Riverina LLS district (Figure 18).
- Most of these areas received between 40-80% of their normal rainfall, with an area between Walgett, Collarenebri and Lightning Ridge receiving 20-40% of normal rainfall. The north coast and mid-north coast received between 40-60% of normal rainfall, as did areas of the north west and the far north west.
- Areas of above average rainfall occurred in an area of the central west between Molong, Parkes and Forbes, in the alpine and adjacent areas, and near Broken Hill. Another area of above average rainfall occurred in areas along the Murray River between Wentworth and Corowa, extending north to Deniliquin and Balranald.
- The remainder of the State had generally average relative rainfall over the period.

August to July (12 months)

- Over the twelve months to July, below average relative rainfall extended across almost all of the North West, Northern Tablelands North Coast and Greater Sydney LLS districts, as well as over areas of the Western (45%), Central West (31%), Hunter (77%), South East (33%) and Central Tablelands (65%) LLS districts (Figure 19, Table 6). For the year, below average relative rainfall occurred across 52% of NSW.
- Most of North West, Northern Tablelands, North Coast and Greater Sydney LLS districts received extremely low rainfall over the period, as did areas of Central West, Hunter and South East LLS districts. These areas generally received from 40-60% of their normal yearly rainfall, with an area between Walgett, Collarenebri, Lightning Ridge and Goodooga receiving between 20-40% of normal yearly rainfall.
- Some 47% of the State, including most of the south east, southern, central and part of the western areas had average relative rainfall for the period. Only isolated areas (including the alpine areas) received above average relative rainfall during the period.

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.

July

- Overall, NSW received a State-wide average rainfall of 14 mm, well below the historical average of 39 mm, and making it the driest July since 2002.
- Most of the rainfall fell on the tablelands and over southern NSW, as a result of a cold front between 16 and 18 July.
- Rainfall during July was between 0-60% of average (based on historical records between 1961 and 1990) across most of NSW. Along the tablelands and some central areas, rainfall was between 60-100% of normal. Over much of the far west, areas of the north west, the north coast, and the south to central coast, rainfall was less than 20% of normal.
- Some 25% of the State received average rainfall during the month, that is, rainfall of between the 4th and 7th decile, and 74% received below average rainfall (Table 6).
- Total rainfall over the State ranged from 0-200 mm, with the majority of the State receiving 1-25 mm. The southern and central tablelands, areas of the south west slopes and the central west received 25-100 mm. The alpine areas received 100-200 mm.
- Much of western NSW received only up to 10 mm, as did areas of the north west, the north coast, the central to south coast and the Monaro (Figure 20).

May to July (3 months)

- Total rainfall over the three months to July ranged from 25-200 mm over most of the State, with areas of the far west receiving 2-50 mm. The alpine areas received 200-400 mm during the period (Figure 21).
- Areas around Tibooburra in the Western LLS district received less than 25 mm. Much of the rainfall in this area was between 20-40% of normal.
- Most of the central and southern areas of the State and the south east received 100-200 mm. The north and north east generally received 50-100 mm.
- The central and southern areas of the State had generally near normal rainfall (80-125%). The remainder of the State had less

than 40-80% of normal rainfall. Much of the coast and the far north west received less than 40% of normal rainfall for the period.

February to July (6 months)

- Rainfall across the State during the February to July period generally ranged from 100-600 mm (Figure 22), 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 300-600 mm during the period. 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 800 mm and the alpine areas received 600-1,200 mm.

4. Temperature anomalies

Temperature information is sourced from the Bureau of Meteorology.

The data used to create the temperature anomaly maps in Figure 24 and Figure 25 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 24 and Figure 25 are provided for a general assessment only.

- Daytime temperatures across the State during the month averaged 1.2°C above normal.
- Average monthly daytime temperatures were 1-2 °C warmer along the south to lower north coast, the far north coast and the Hunter valley. The north west and west of the State had also had 1-2 °C warmer than average monthly daytime temperatures.
- The central and the southern areas of the State had generally near normal maximum temperatures, with a range of 0-1°C above normal.
- Average monthly overnight temperatures were -0.2°C below normal for the State during July.
- The mid-north coast, Hunter valley, central and southern tablelands, south west slopes and much of the south coast had average minimum temperatures that were near normal to slightly above normal (0-1°C above normal). An area of the central west between Dubbo, Coonabarabran and Nyngan, and an area of the far north west around Tibooburra had similar average minimum temperatures.
- The remainder of the State, including most of the plains, south west, central west, north, north west, north east and northern tablelands had average overnight temperatures that were near normal to slightly below normal (-1-0°C). The far north east had average overnight temperatures of -1 to -2°C below normal. The central-northern area of the far west had average overnight temperatures that were -1 to -3°C below 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 26 and Figure 27 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 28 and Figure 29. 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	74%	25%	1%
Subsoil	41%	51%	8%

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

5.2 Topsoil

- Modelled topsoil moisture declined markedly between June and July across NSW, as a result of the low July rainfall.
- Overall, only 25% of NSW had moderate topsoil moisture, down from 56% last month. The area of low topsoil moisture increased

from 43% of NSW in June to 74% in July (Figure 26, Table 7).

- Most of the Western, North West, Northern Tablelands, North Coast, Hunter and Greater Sydney LLS districts had low modelled topsoil moisture for July.
- Since June, the area of moderate to high topsoil moisture contracted to the south and south east of Central West LLS district, the eastern and central areas of Riverina LLS district, and the south and west of South East LLS district. Levels in the Central Tablelands LLS district declined slightly.
- On a percentile rank basis (Figure 28), topsoil moisture levels were below average across most of the north of the State and the coast, as well as much of the far west. The northern half of Western LLS, and most of North West, Northern Tablelands, Hunter and Greater Sydney had below average relative topsoil moisture. In particular, the coastal areas ranked generally as extremely low in monthly relative topsoil moisture.
- Over most of the west and north west, total topsoil moisture levels were 10-20 mm or less.
- Across the much of Central West, Northern Tablelands, North Coast, Hunter and Greater Sydney LLS districts, as well as the eastern edge of South East LLS district, total topsoil moisture levels were 10-40 mm.
- Across most of the Central Tablelands, the western half of the South East and the eastern edge of the Murray and Riverina LLS districts, total modelled topsoil moisture 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 June and July (Figure 27, Table 7).
- There was an improvement in modelled subsoil moisture in the east of the Murray and Riverina LLS districts, and over areas of the South East LLS district. There was a slight decrease in modelled subsoil moisture over areas of the North Coast LLS district.
- The North West LLS district had the lowest overall relative subsoil moisture during the month, with 77% of its area in the low category. This was followed by 53% of Western, 45% of Northern Tablelands, 38% of Central West, 32% of Murray and 25% of Riverina LLS districts. All LLS districts apart from North West, Northern Tablelands and Western had more than 55% 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 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 29), modelled subsoil moisture was below average across the north west between Bourke, 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 Central Tablelands and the north-north east of 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, the eastern and central areas of Murray, the eastern and northern areas of Riverina, the southern and western areas of South East and areas of Western LLS districts had above average subsoil moisture for July.

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 August to October suggests somewhat below average growth across much of NSW. The outlook for the coastal areas improved slightly since the July to September outlook and is near average. However, the outlook for pasture growth across central and western areas of the State declined, and is mostly below average.
- Very limited growth is suggested for the eastern areas of the Western LLS district, and the western half of the Central West, Riverina and Murray LLS districts.

6.2 Modelled pasture growth

- Modelled pasture growth declined markedly across the west and north of the State during July. It also continued to decline across the tablelands and upper slopes as temperatures fell, as well as along the north coast (Figure 30).
- Lack of rainfall in July across most of the western and northern areas of the State, as well as the north and south coast, contributed to poor pasture growth.
- Alternative pasture growth models show very low growth for temperate pasture species over the tablelands, Monaro and slopes. Growth across central NSW, most of the coast and the Hunter valley was also low to very low. Most of the growth in these areas was limited by either temperature, soil moisture or a combination of the two.
- The best pasture growth during the month continued to occur across most of the Murray and Riverina LLS districts (apart from the upper slopes and tablelands in the east), across the Central West LLS district and the north and west of the Central Tablelands LLS district.
- Modelled pasture growth across most of Western and North West LLS districts declined from about 50-500 kg/ha of dry matter (DM) in June to generally less than 10-20 kg DM/ha in July. Pasture growth over most of the Northern Tableland, North Coast, Greater Sydney and the coastal and alpine areas of South East LLS districts remained at less than 10-20 kg DM/ha.
- Modelled growth across the Murray and Riverina LLS districts and the Central West LLS district declined slightly over June. Over most of these districts, modelled growth ranged between 200-1,000 kg DM/ha, with the majority of growth between 200-500 kg DM/ha.
- Growth improved slightly in the west and north of the Central Tablelands LLS district, and across the west of the Hunter LLS district to between 50-200 kg DM/ha. Over the Monaro and southern tablelands areas of the South East LLS district, growth improved to 20-100 kg DM/ha.
- Areas across the Northern Tablelands, North Coast and South East LLS districts and the Hay area of Riverina LLS district may experience a ‘green drought’ until spring.

6.2 Modelled biomass

- Modelled total standing dry matter (biomass) levels declined from those of June across the Northern Tablelands, North Coast, Greater Sydney, Hunter and South East LLS districts. (Figure 31). Biomass levels in these areas were generally less than 500 kg/ha of dry matter (DM), and in many cases were less than 250 kg DM/ha.
- Declines also occurred in the south east and north of the Central Tablelands LLS district from 500-1,000 kg DM/ha to less than 500 kg DM/ha.
- Biomass levels across the Western and North West LLS districts were similar to June. Some improvements occurred in the west of the North West LLS district.
- Biomass levels across the Central West LLS district and the western and central areas of the Murray and Riverina LLS districts generally improved from about 500-1,500 kg DM/ha to 1,000-2,500 kg DM/ha or more.

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	9%	43%	29%	18%	1%
Quarter	3%	15%	38%	43%	1%
Half Year	1%	10%	32%	56%	1%
Year	0%	31%	47%	21%	1%
Biomass					
Month	0%	15%	41%	43%	1%

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

July

- Relative to historical records, 47% of NSW had average or above average pasture growth during July, a substantial decrease from 82% in June (Table 8, Figure 32).
- The area of the State with above average growth increased between May and June from 49% to 57%, but declined in July to 18%.
- The area showing below average growth increased from 4% in June to 43% in July, as a result of the poor July rainfall.
- The major declines in monthly relative pasture growth occurred across the Western, North West, Northern Tablelands, North Coast and Greater Sydney LLS districts. Declines also occurred in the north eastern areas of South East and Hunter LLS districts.
- In the Western LLS district, relative growth declined from well above average in June to well below average in July. Across the other LLS districts, the decline was primarily from average to well below average or to extremely low.
- Across the remainder of the State, areas of well above average relative growth declined to near average, and extremely high relative growth declined to above average or average. This included the Central West, Central Tablelands, Riverina and Murray LLS districts and much of the South East LLS district. The most marked decline in relative growth in these areas occurred along the western margins of the Riverina, Murray and Central West LLS districts.
- Areas of missing data accounted for 9% of the area of NSW, primarily across far north west, the south east and the north east.

May to July (3 months)

- Over the three months to July, relative pasture growth across the State declined, but still remained relatively high.
- Some 43% of the area of NSW had above average relative growth and 38% had average growth, compared to 75% and 18% for the three months to June (Table 8, Figure 33). The southern half of the State (with the exception of the Sydney basin) generally showed average to well above average relative pasture growth, with areas of extremely high relative growth.
- The area of the State with below average relative growth over the three month period was 15%, and this mostly included areas across the north of the State and along the central to north coast. The majority of Greater Sydney (69%) and North Coast (55%) LLS districts had below average relative growth for the period. A significant proportion of Hunter (31%) and North West (22%) LLS districts also had below average growth.
- Areas of highest relative pasture growth for the period occurred across the south of the Western and Central West LLS district, across the central areas of the Riverina and Murray LLS districts, in the south of the Northern Tablelands LLS district and over the Monaro in the South East LLS district.

February to July (6 months)

- Over the six month period from February to July relative pasture growth was similar to the previous six month period. Relative growth was above average across much of southern, central and western NSW, and 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.
- Relative pasture growth deteriorated across the coastal areas over the period.
- The northern areas of the State also had generally average relative growth, except for an area between Walgett, Collarenebri, Carinda, Lightning Ridge and Goodooga, to the north of Moree and near Tibooburra.
- Some 47% of North Coast and 39% of the Greater Sydney LLS districts had below average relative growth for the period, as did

27% of the North West, 19% of the Hunter and 18% of the South East LLS district.

- Relative growth over the period was average or above over 88% of the State (Table 8, Figure 34), and above average over 56% of the State.

August to July (12 months)

- Relative pasture growth over the last 12 months declined from the previous 12 month period to June.
- Relative growth was average or above across 68% of the State (Table 8, Figure 35).
- The best relative growth extended across the central and southern tablelands, and over areas of south western and western NSW, covering 21% of the State.
- Below average relative growth covered 31% 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, Northern Tablelands, North Coast and Greater Sydney LLS districts. Areas of the Hunter and South East LLS districts also showed below average growth.
- Relative growth across the far west and much of central and south eastern NSW was average (47% of the State), with pockets of above average growth, particularly in the south of Western LLS district and the western half of the Murray LLS district.

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.

- Relative total standing dry matter (biomass) levels declined from those of June (Table 8, Figure 36), with an increase in below average and average relative biomass, and a decrease in above average relative biomass.
- Relative to historical records, biomass remained high across the Northern Tablelands, Central Tablelands, Central West, Riverina and Murray LLS districts. It was also high across the west of the Hunter and South East LLS districts, and the east and south of the Western LLS district.
- Above average relative biomass made up 43% of the State in June (Table 8).
- However, relative biomass remained low across the far west of the North West LLS district and the far north east of the Western LLS district. It declined over the North Coast, Greater Sydney LLS districts, and the coastal areas of the Hunter and South East LLS districts.

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 August 2014.

- Levels in water storages are low-moderate, with the average capacity being 53%.
- Changes in storage levels during the last month occurred mainly in the south, with increases in the capacity of the Hume (14%), Burrinjuck (8%) and Blowering Dams (6%) and Lake Cargelligo (18%). Minor increases occurred in Dartmouth, Wyangala and Burrendong Dams.
- Most other dams were either stable or had minor decreases in storage level.

Table 9: Capacity of storages

Storage	Current Volume (GL)	Effective Capacity (%)	Monthly Change (%)
Toonumbar	11	95	-3
Glenbawn	651	87	0
Glennies	244	86	-1
Lostock	19	96	-1
Brogo	9	100	0
Cochrane	-	-	-
Dartmouth	3624	94	3
Hume	2123	70	14
Blowering	1142	69	6
Burrinjuck	757	74	8
Brewster	-	-	-
Carcoar	11	30	1
Cargelligo	26	64	18
Wyangala	630	52	4
Glenlyon	95	-	-
Pindari	52	17	0
Copeton	458	33	0
Chaffey	24	36	-1
Keepit	83	18	0
Split Rock	82	20	0
Burrendong	299	23	3
Oberon	29	64	0
Windamere	182	49	0
Lake Cawndilla	132	8	-1
Lake Menindee	-	0	0
Lake Pamamaroo	149	51	-3
Wetherell	71	35	-1
Total	**10903**		
Average		**53**	

8.2 Irrigation allocations

Allocations are given as at 5 August 2014.

- General security allocations were remained unchanged from July, except for an increase in the allocation for the Murrumbidgee River Valley from 10% to 24% and the Murray River Valley from 6% to 12%.

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*	0%	General security
	100%	High security
Murray*	12%	General security
	97%	High security
Murrumbidgee*	24%	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 outlook

Figure 7: Quarterly rainfall outlook

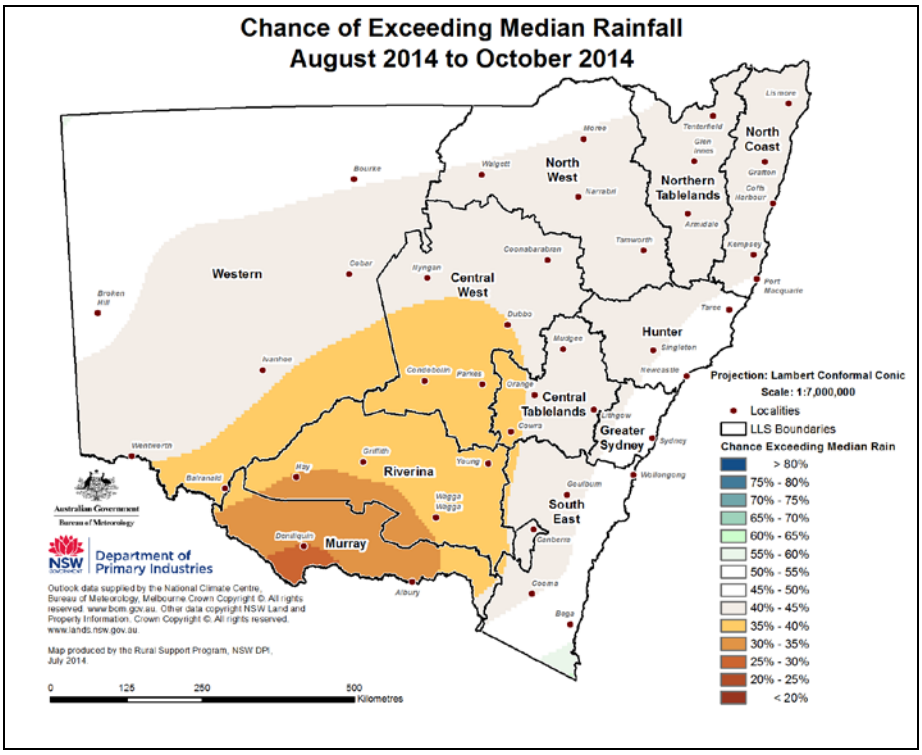


Figure 8: Quarterly maximum temperature outlook

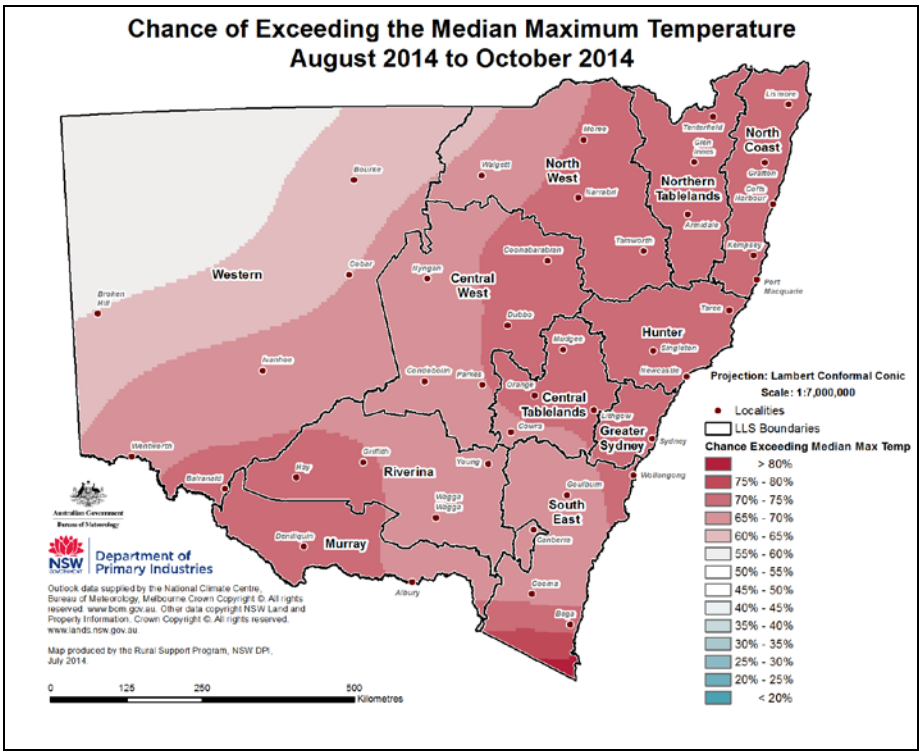


Figure 9: Quarterly minimum temperature outlook

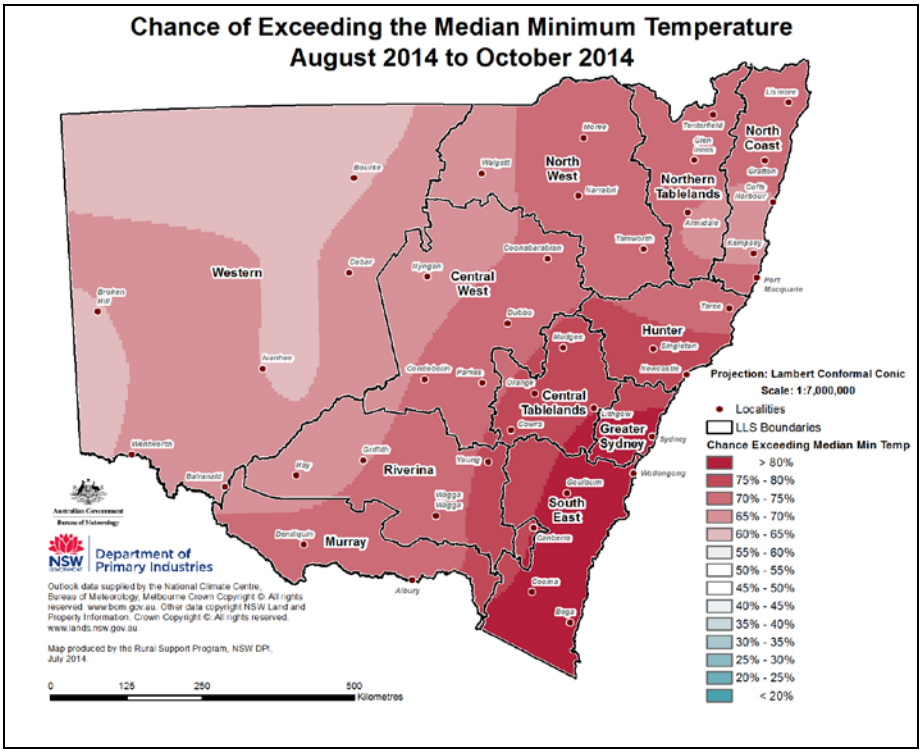
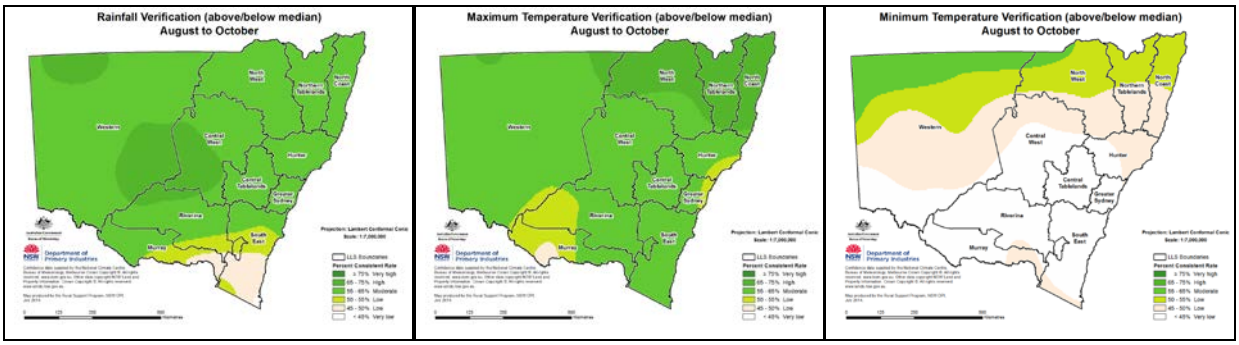
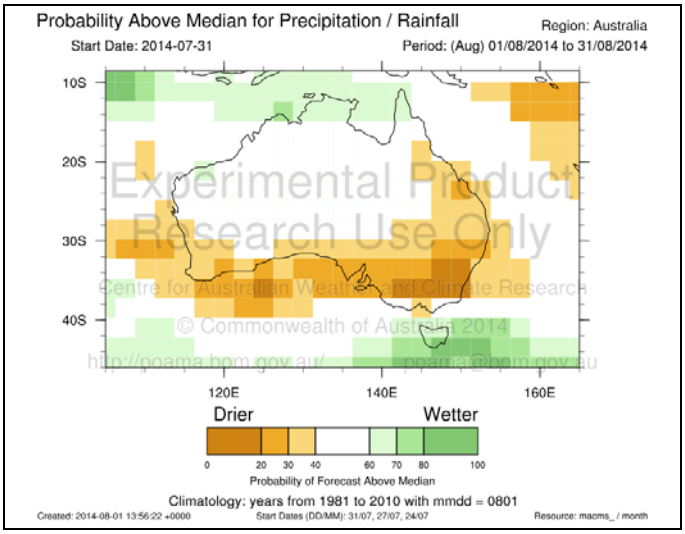


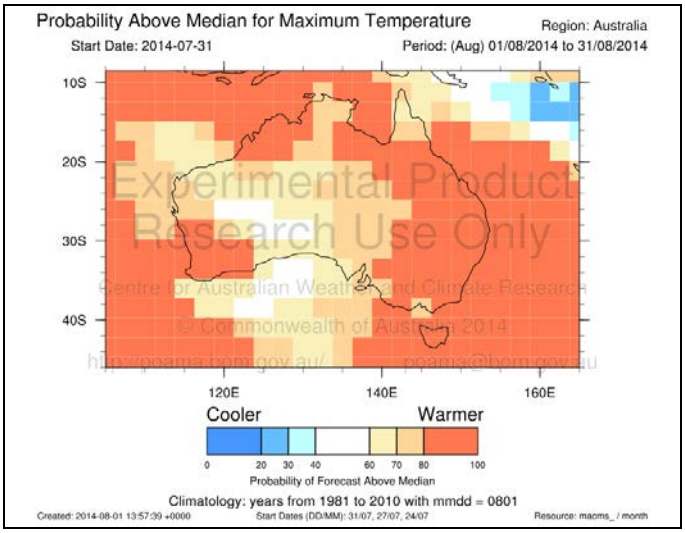
Figure 10: Outlook skill maps



Monthly rainfall & temperature outlook
(Bureau of Meteorology, POAMA - experimental)

Figure 11: Experimental August rainfall and temperature outlooks





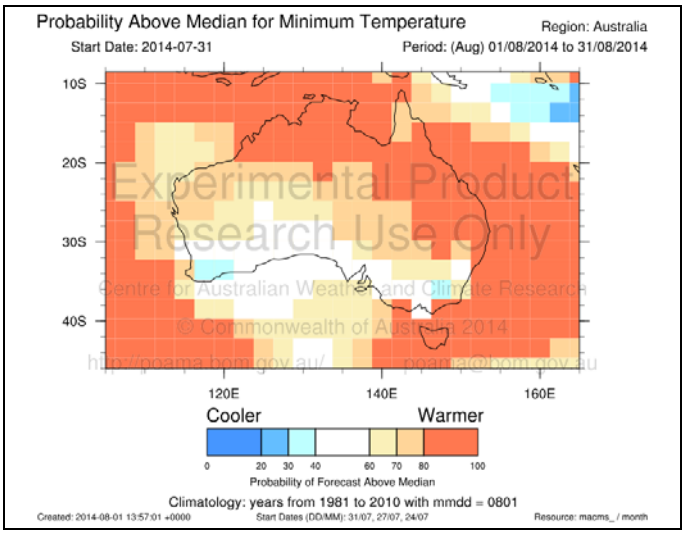
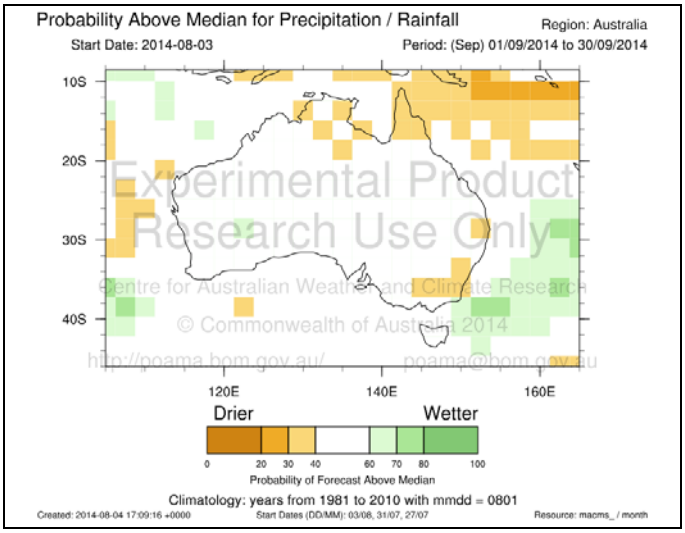
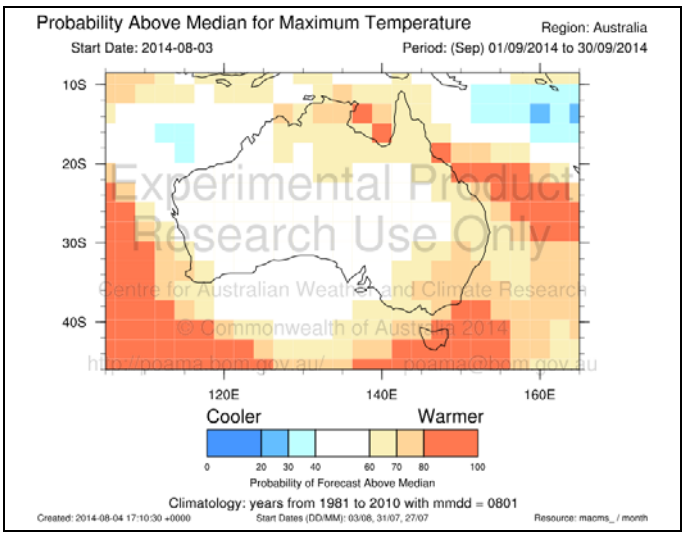
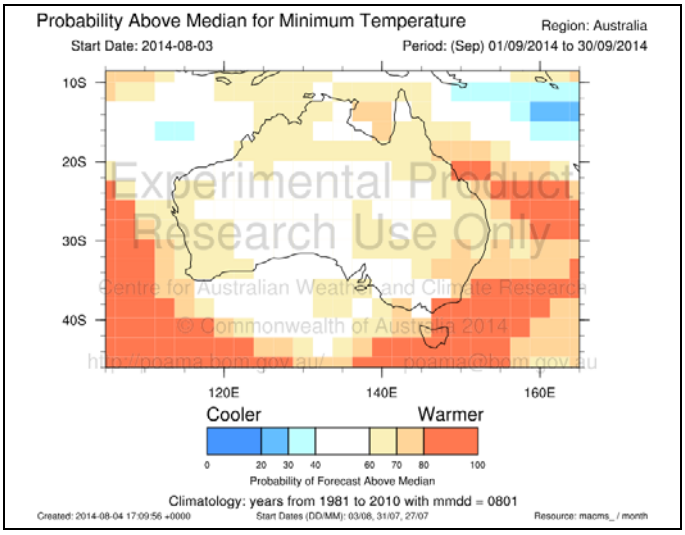


Figure 12: Experimental September rainfall and temperature outlooks

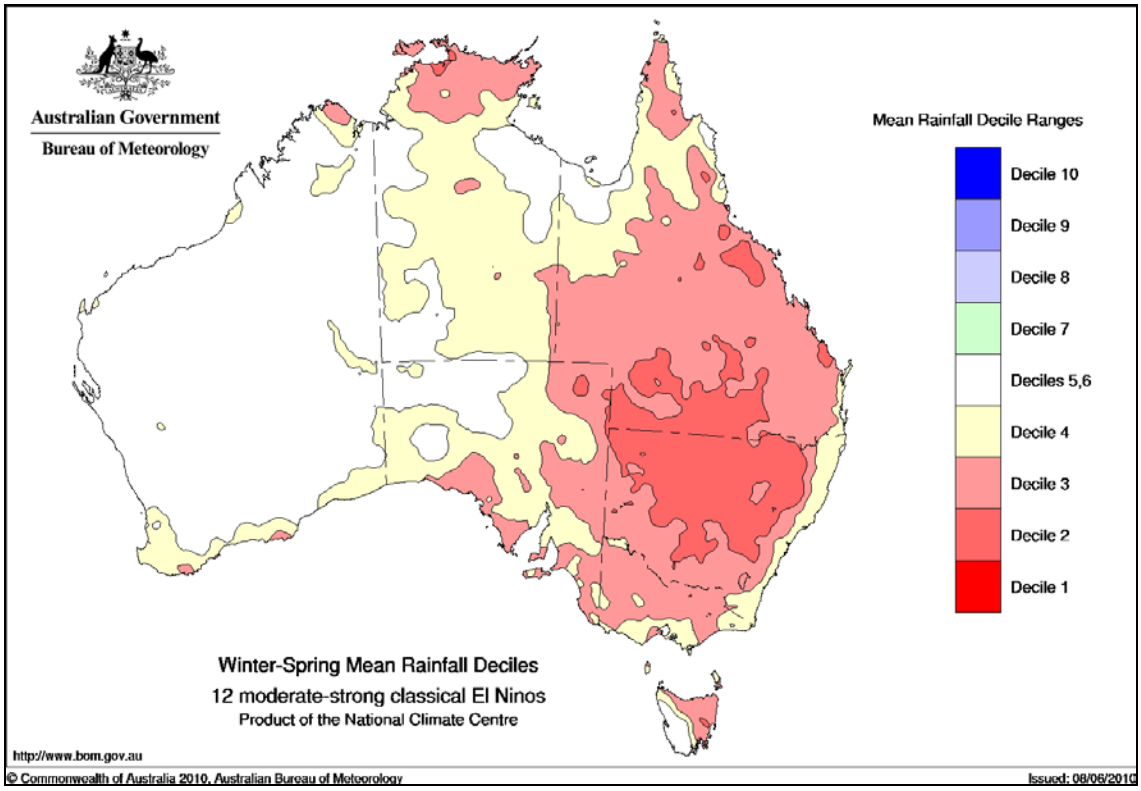






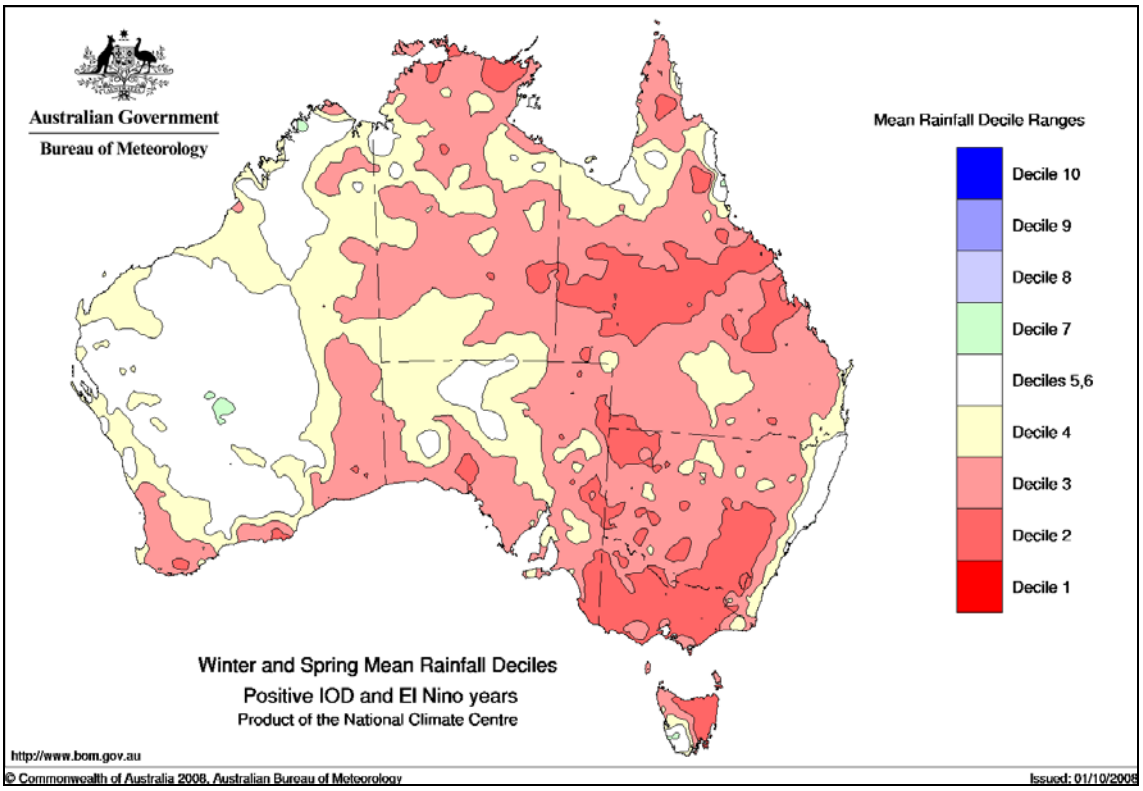
Possible effects of an El Nino event

Figure 13: Australian winter-spring mean rainfall deciles for twelve El Nino events



Source: Australian Bureau of Meteorology

Figure 14: Australian winter-spring mean rainfall deciles for seven positive IOD events coinciding with El Nino events



Source: Australian Bureau of Meteorology

Rainfall

Figure 15: Relative rainfall – monthly

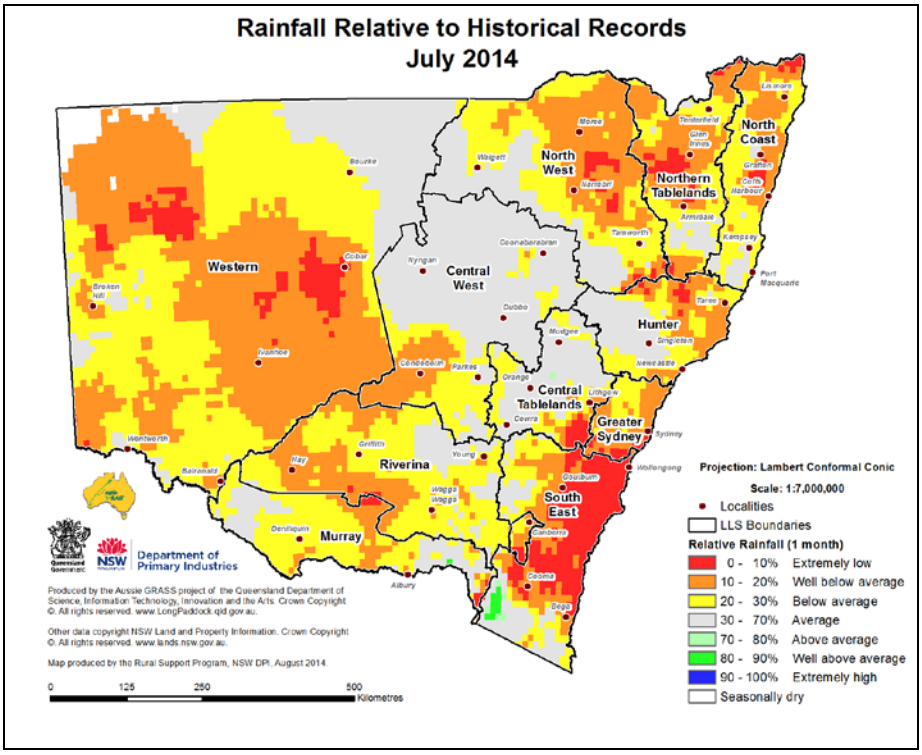


Figure 16: Relative rainfall – quarterly

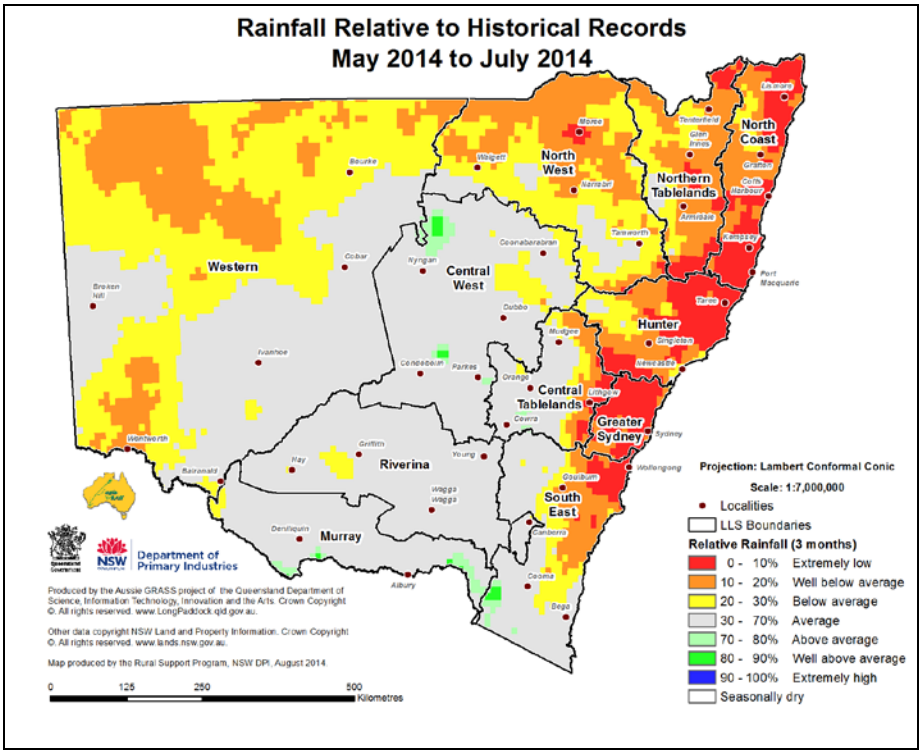


Figure 17: Relative rainfall – half yearly

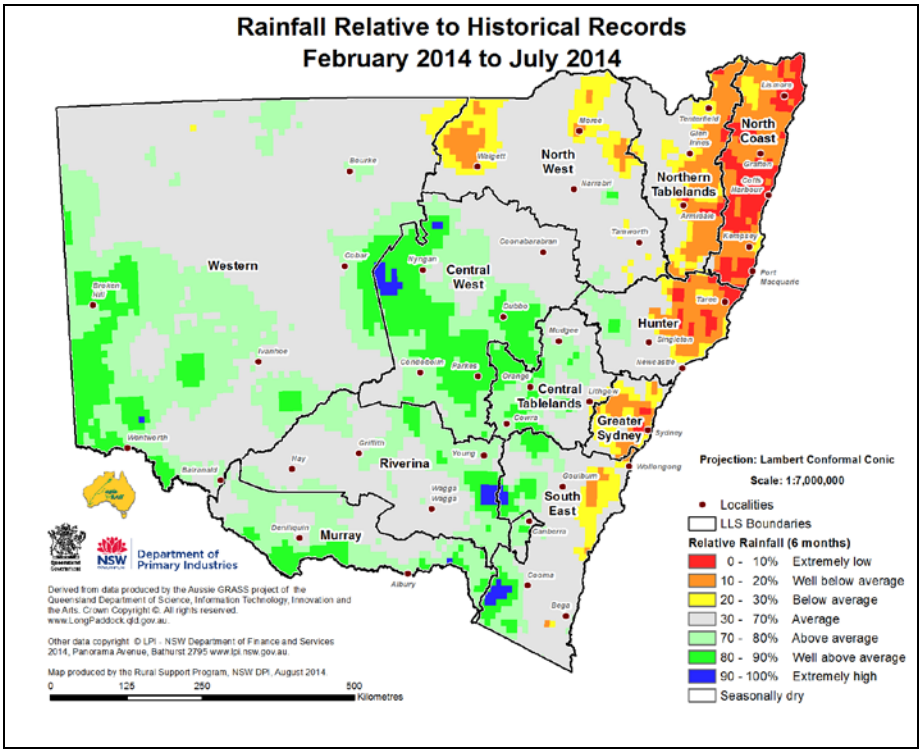


Figure 18: Relative rainfall – nine monthly

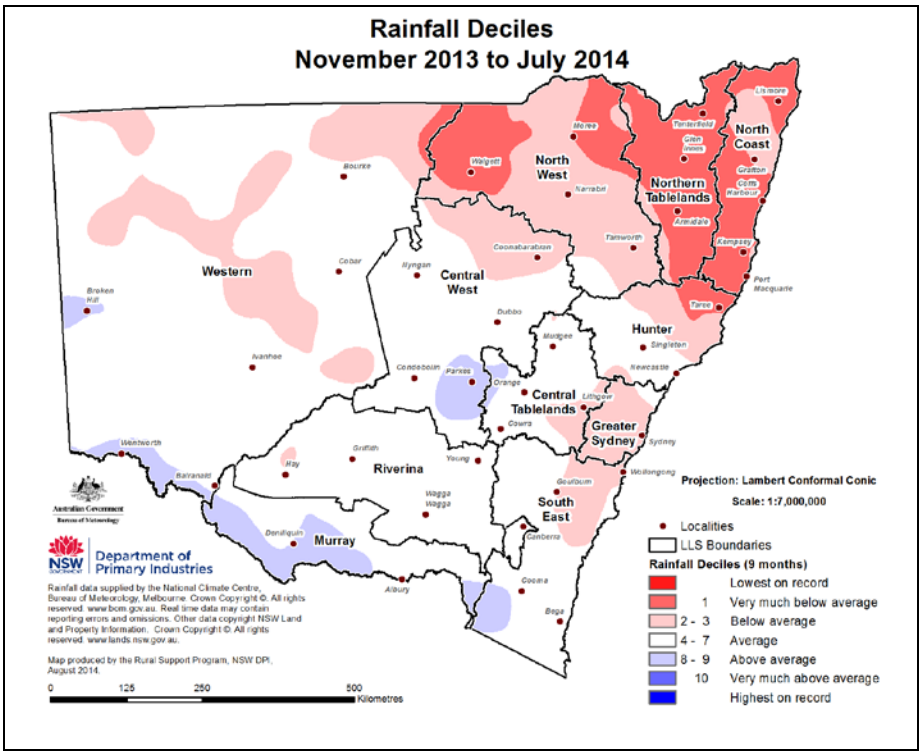


Figure 19: Relative rainfall – yearly

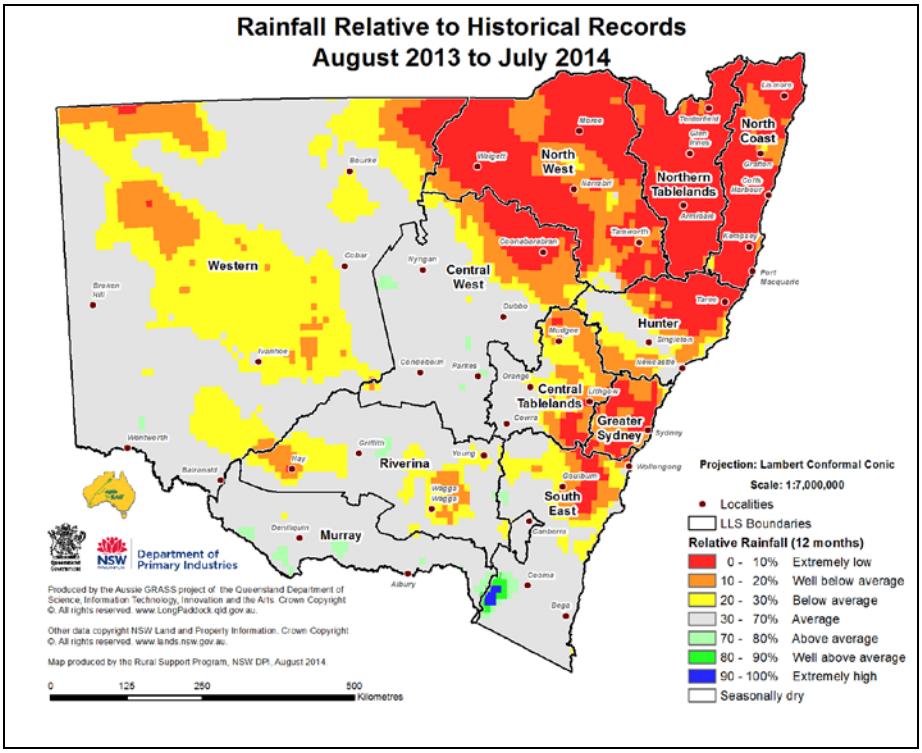


Figure 20: Total rainfall – monthly

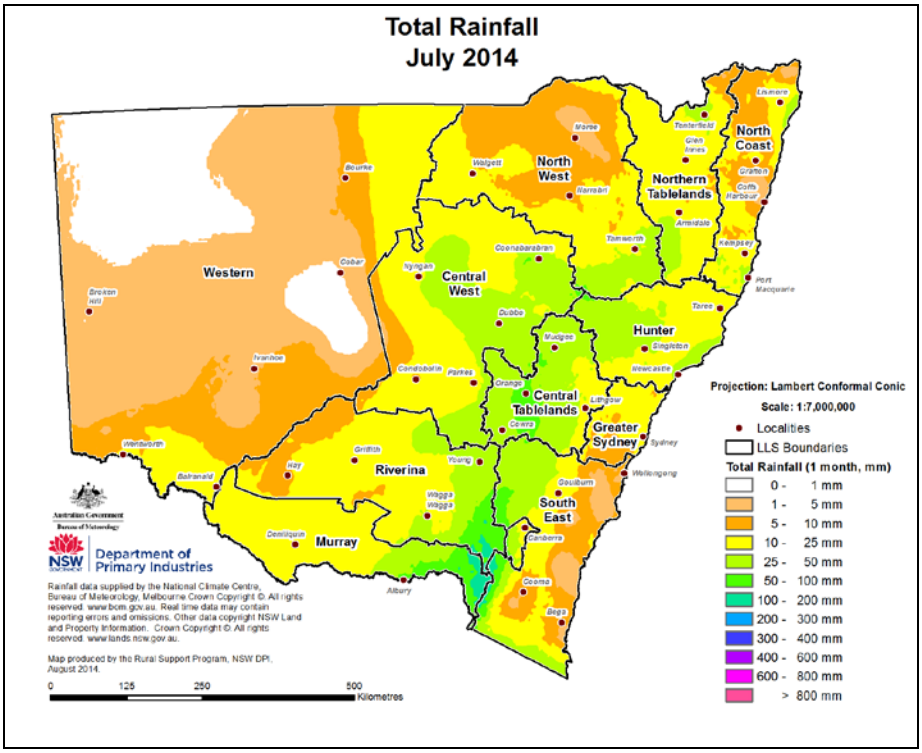


Figure 21: Total rainfall – quarterly

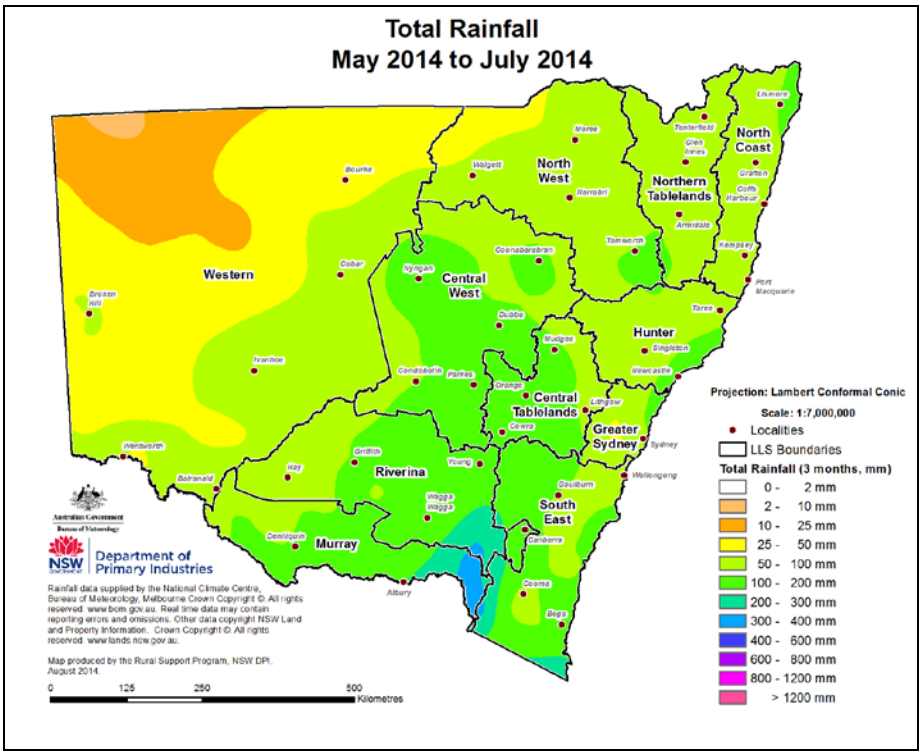


Figure 22: Total rainfall – half yearly

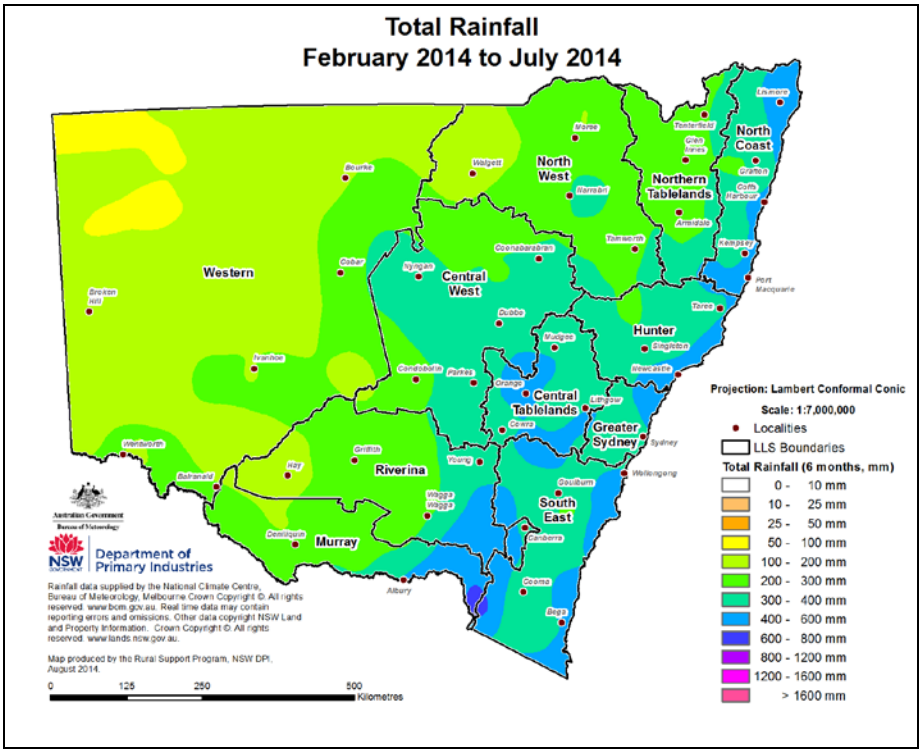
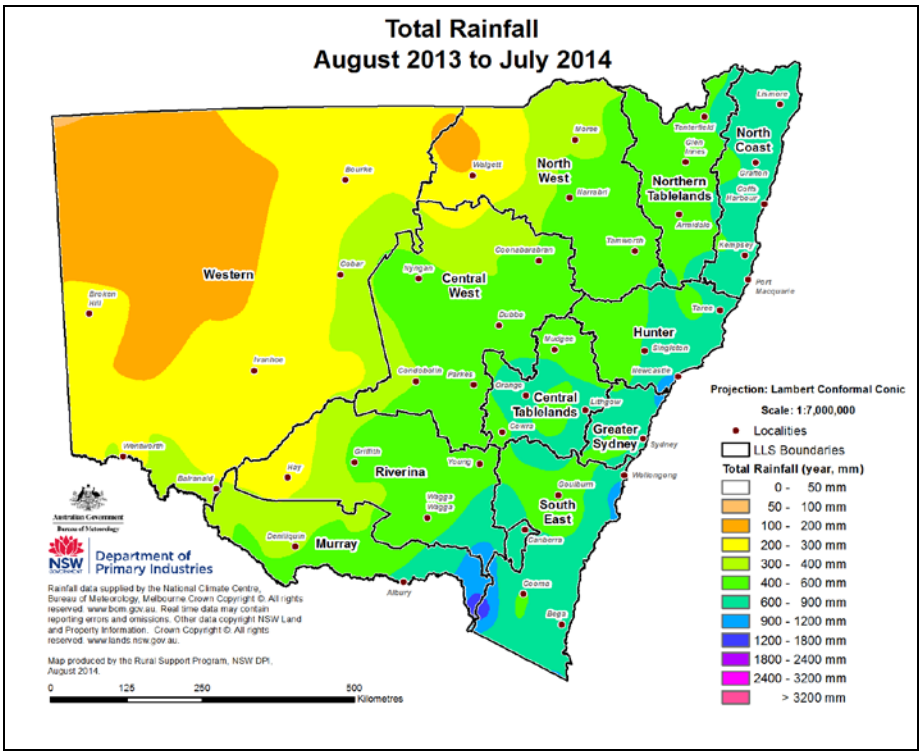


Figure 23: Total rainfall – yearly



Temperature

Figure 24: Maximum monthly temperature anomaly

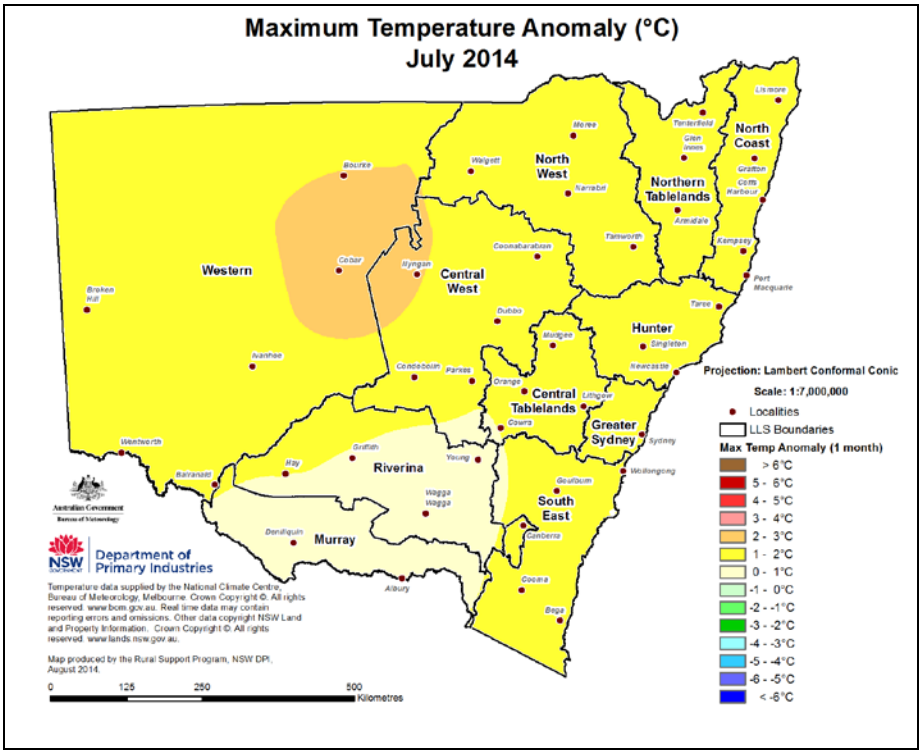
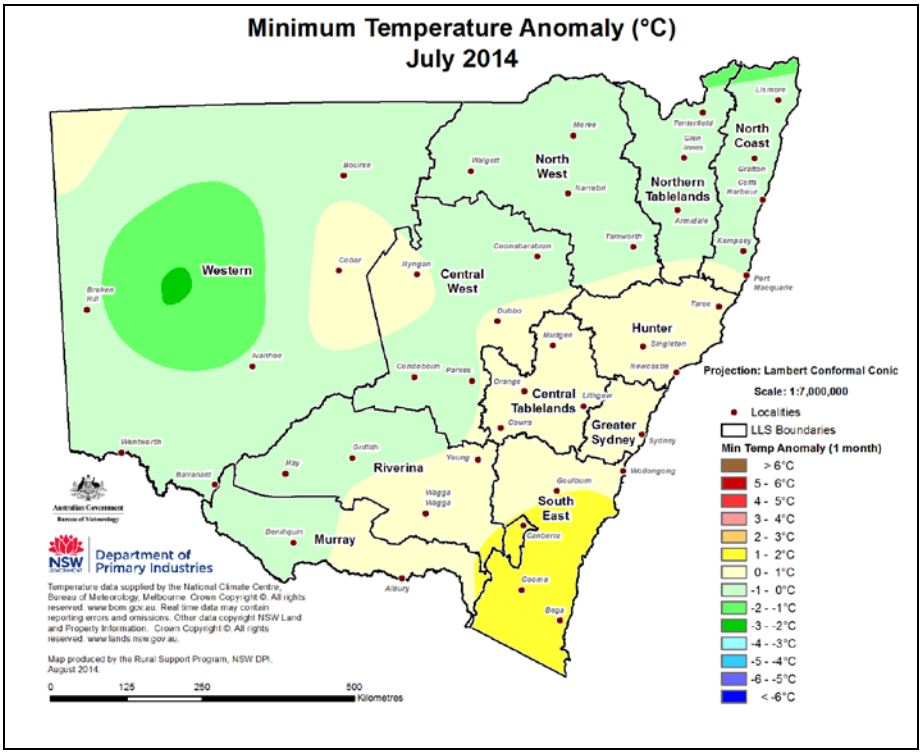


Figure 25: Minimum monthly temperature anomaly



Soil moisture

Figure 26: Relative monthly topsoil moisture (fraction of a saturated profile)

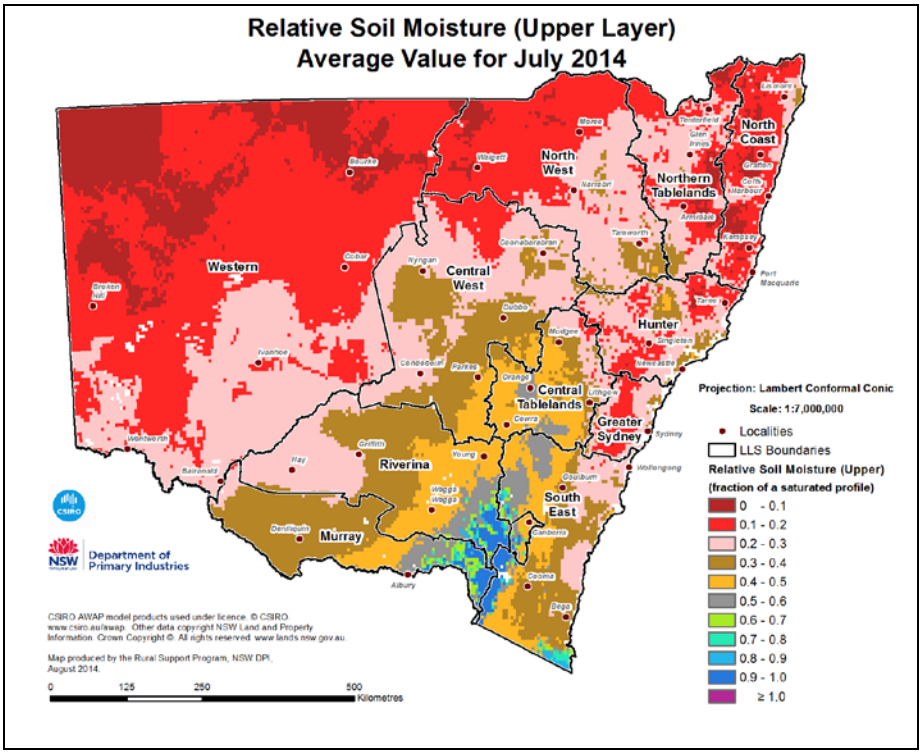


Figure 27: Relative monthly subsoil moisture (fraction of a saturated profile)

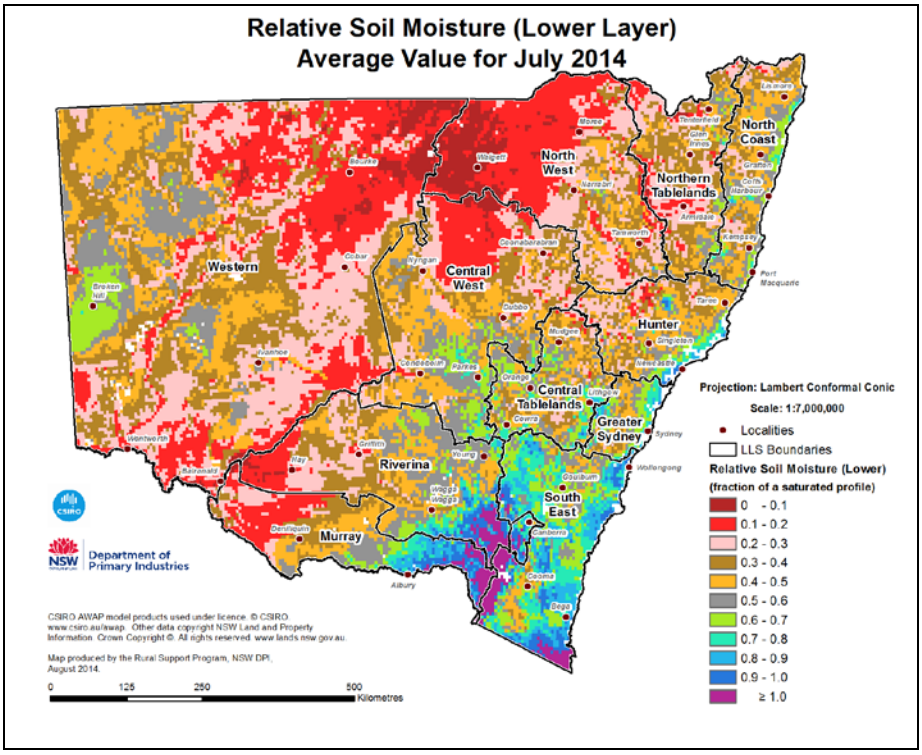


Figure 28: Relative monthly topsoil moisture (percent rank)

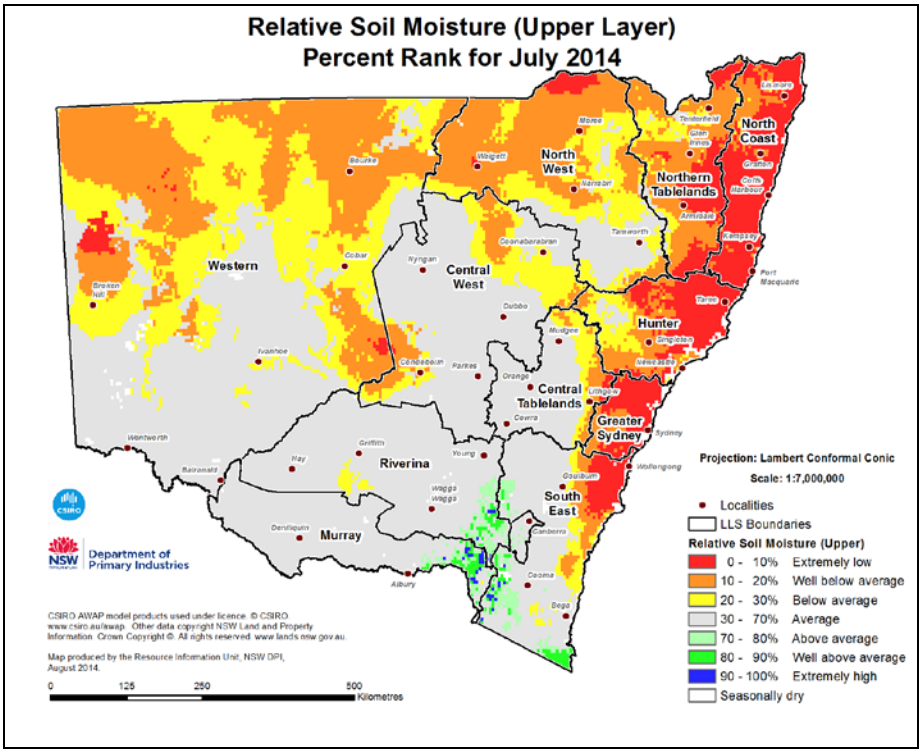
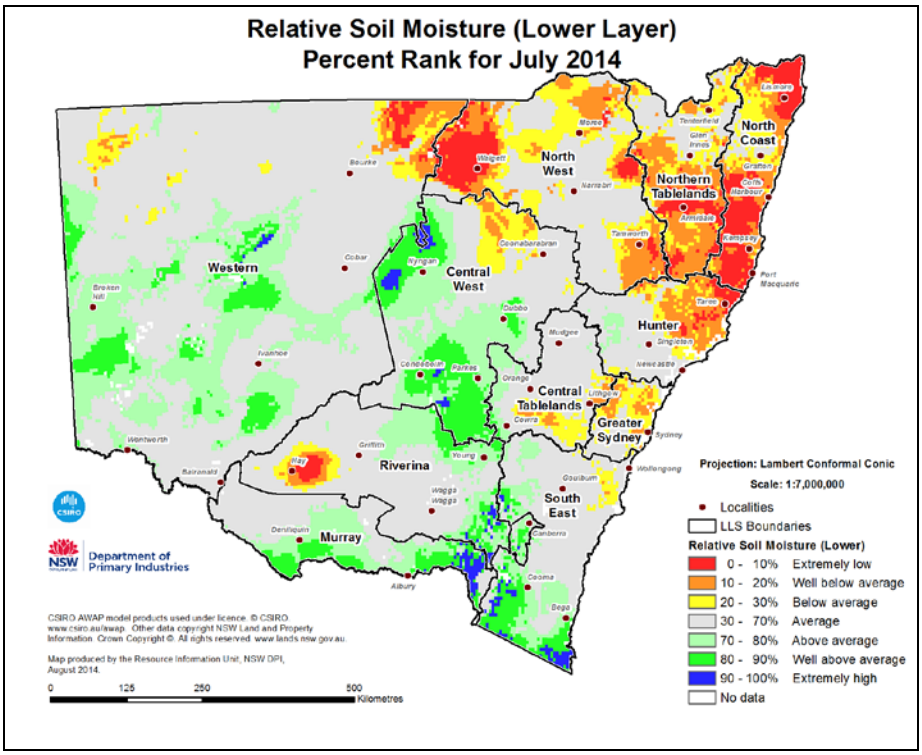


Figure 29: Relative monthly subsoil moisture (percent rank)



Pasture growth and biomass

Figure 30: Modelled pasture growth

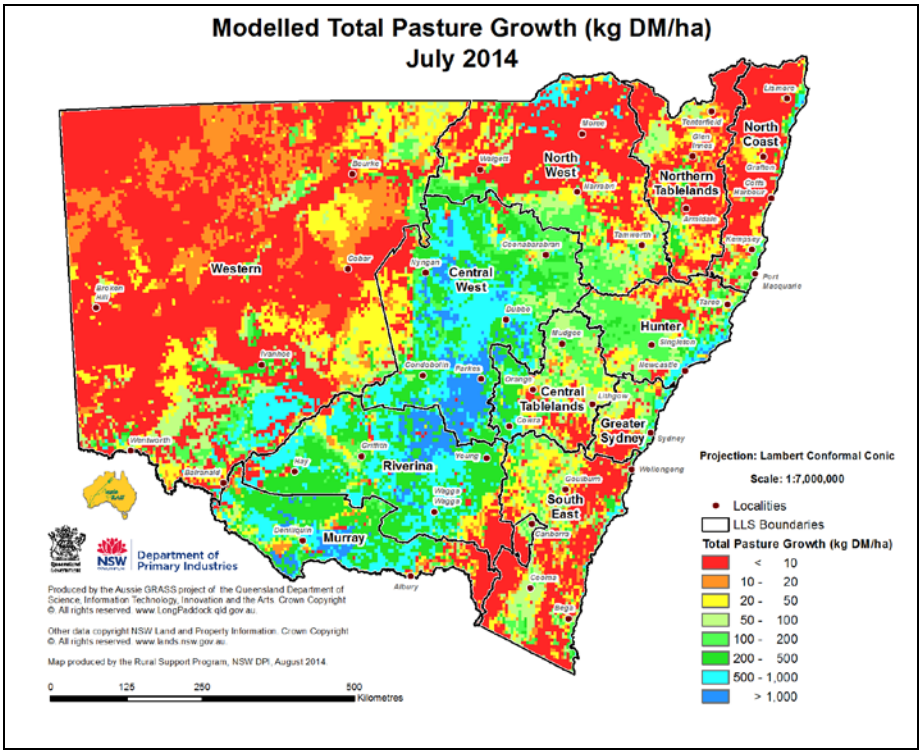


Figure 31: Modelled biomass

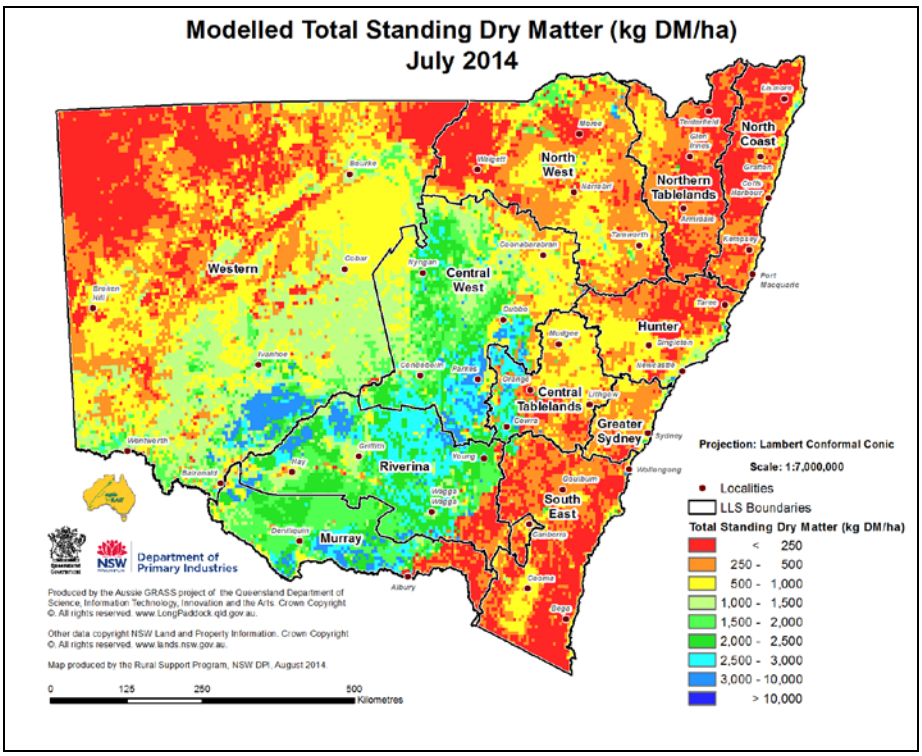


Figure 32: Relative pasture growth – monthly

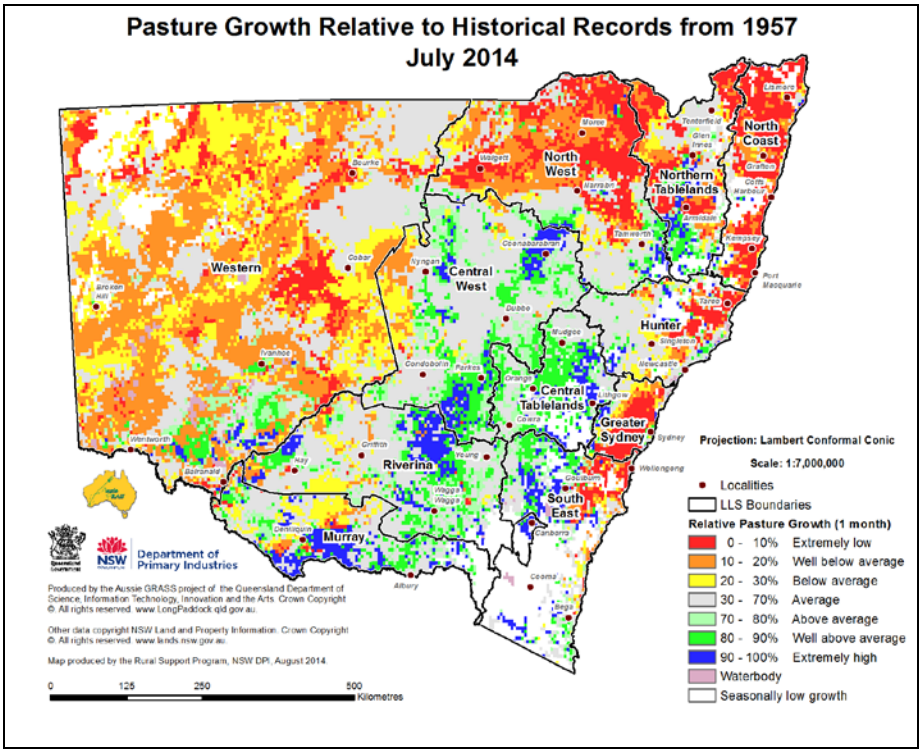


Figure 33: Relative pasture growth – quarterly

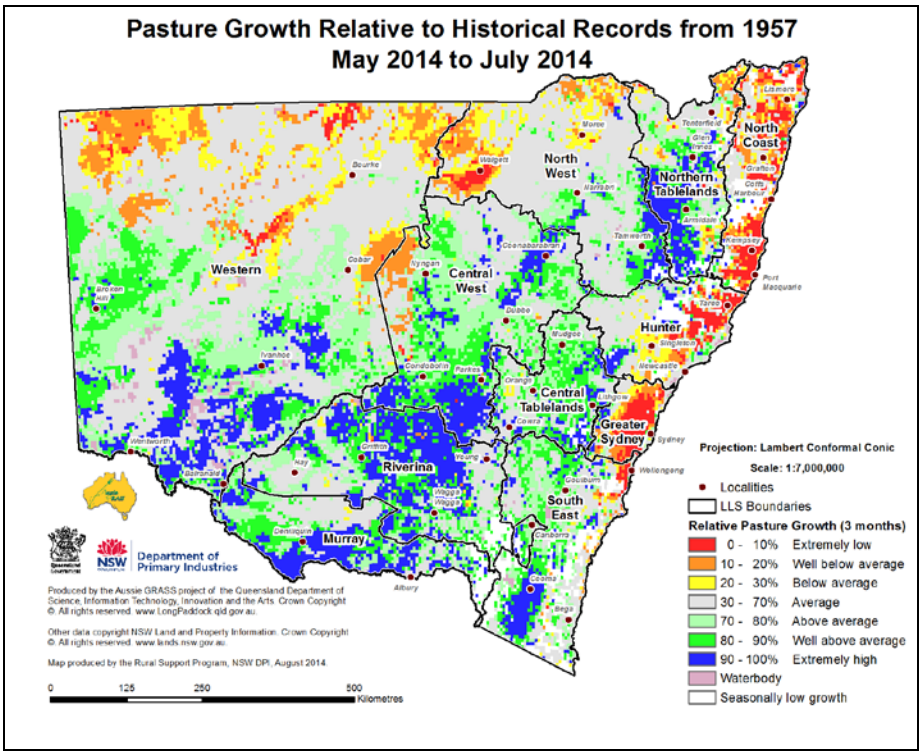


Figure 34: Relative pasture growth – half yearly

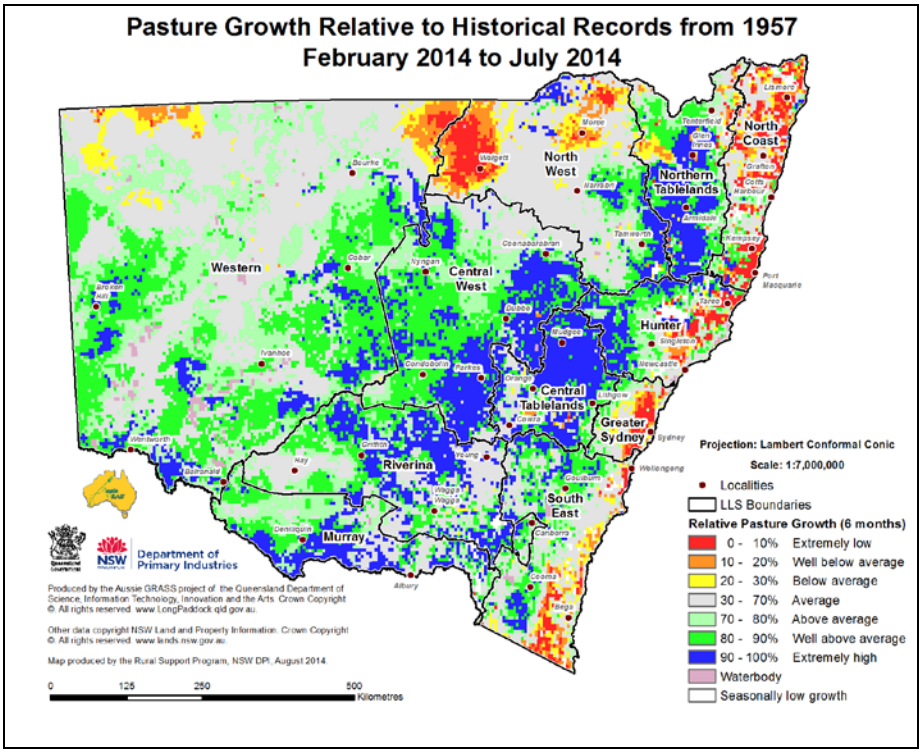


Figure 35: Relative pasture growth – yearly

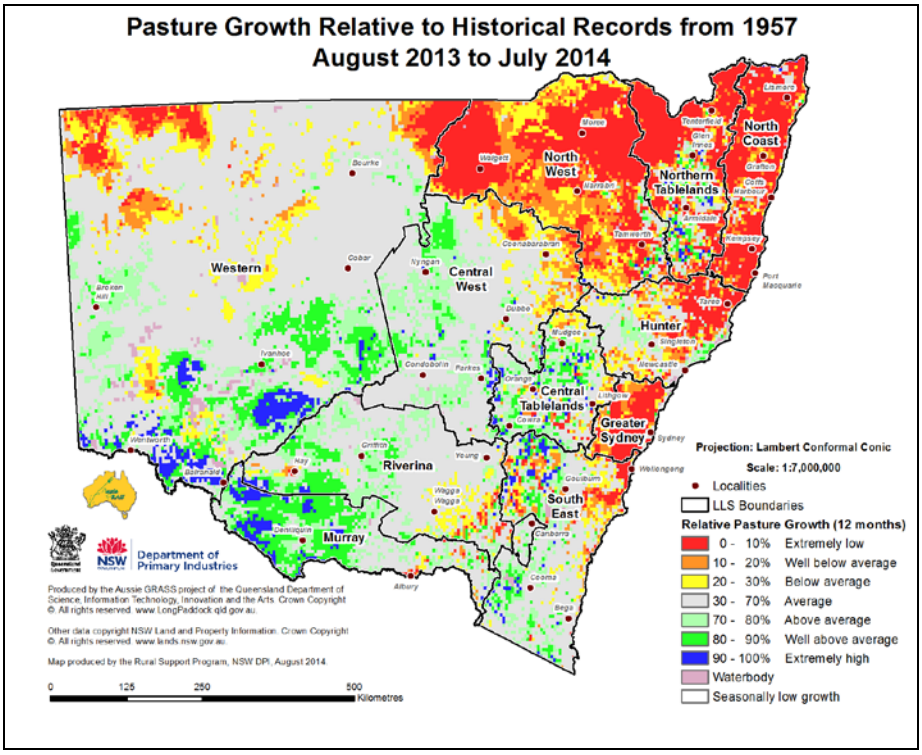


Figure 36: Relative biomass – monthly

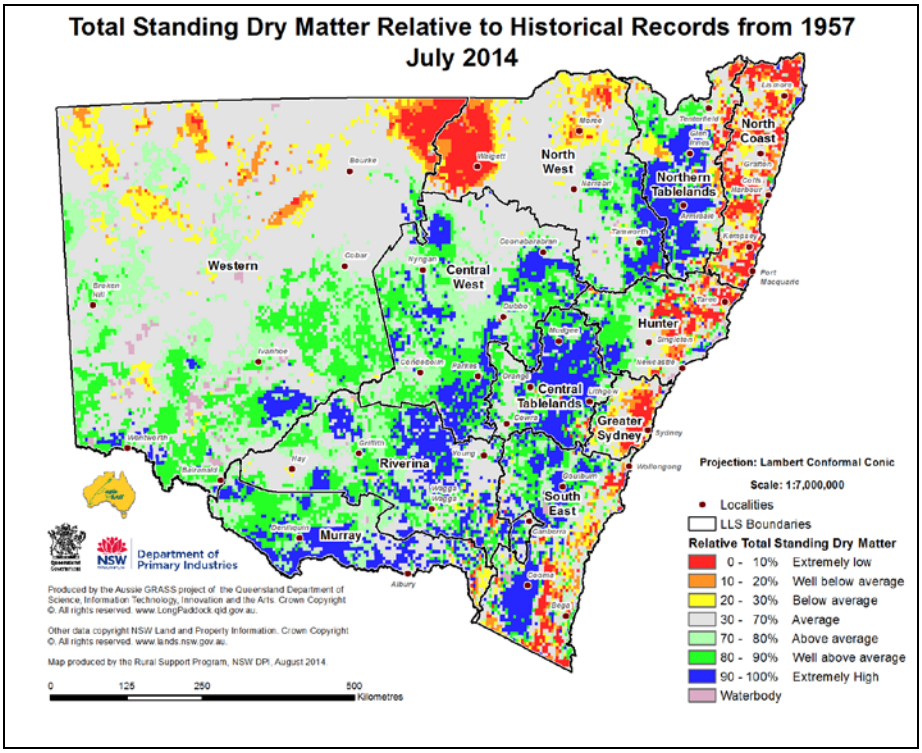
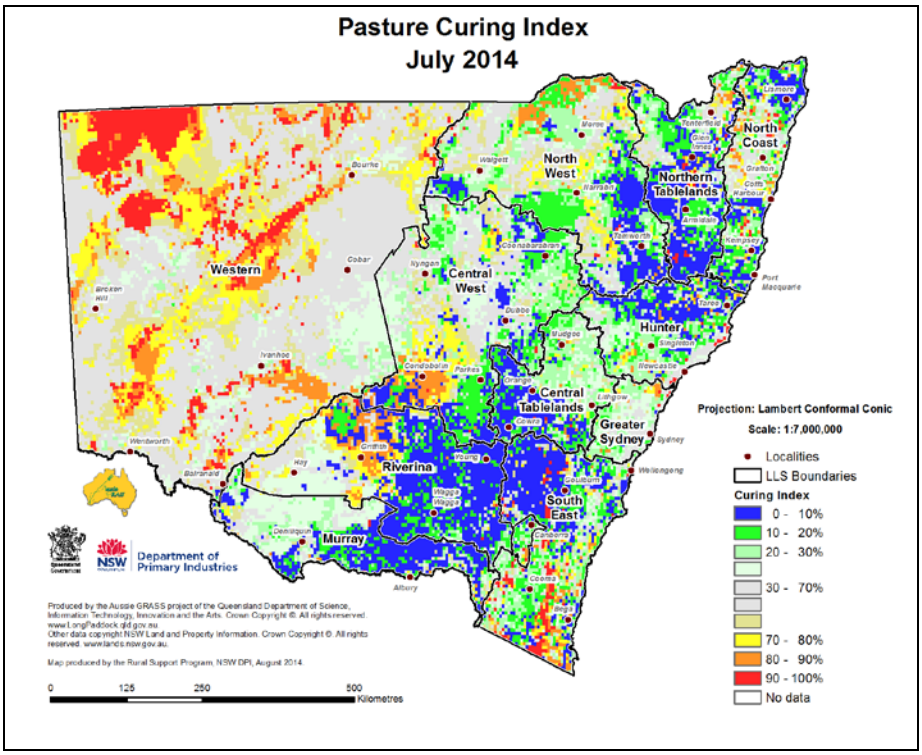


Figure 37: Pasture curing index



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

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