Department of Primary Industries

NSW Seasonal Conditions Report - May 2014

Highlights

- Good rainfall in April continued to boost conditions over much of southern, central & western NSW. However, areas of the north west & west received lighter falls.
- The chances of a drier or wetter May to July are nearly equal, as are warmer or cooler daytime temperatures. Wetter conditions are likely in the south east. Warmer overnight temperatures are likely in the east & south.
- Pasture growth continued to increase, with improved species responding well, but was limited over some areas of the north west, west & coast. Over the quarter it was average or better over 92% of NSW. Some areas may experience a 'green drought' during winter as growth slows.
- Sowing of mid-season winter crops continued over central & southern areas, which now have good soil moisture. Early sown and dual purpose crops have responded well. More rainfall is needed in the north.
- Stock water supplies remain variable in some areas.
- Resources to assist in management are available at http://www.dpi.nsw.gov.au/agriculture/emergency/drought/managing

1. Summary

Conditions continued to improve during April over southern, central and most of western NSW and areas of the coast. Rainfall was particularly good across western and southern NSW. However, some areas of the north west and west continued to receive lighter, patchy falls.

Combined with mild-warm temperatures, the rainfall continued to boost to pasture and forage crop growth and to improve conditions for winter grain crops. Improved pastures and early-sown dual purpose crops continued to respond well, although growth slowed in the tablelands. Some areas may experience a 'green drought' over winter. Mid-season winter grain crop sowings are progressing; with sowings of late season varieties yet to commence. Soil moisture levels over much of central and southern NSW continued to improve. More rainfall is still needed over much of the northern cropping area. The rainfall affected the harvesting and quality of some summer crops. Stock water supplies are variable over the tablelands and north west.

The chances of a wetter or drier than normal May to July are equal across the western and central areas. There is a slightly increased chance of wetter conditions across the south east and some of the east. Wetter conditions are likely in the far south east. The chances for warmer or cooler daytime temperatures are roughly equal, with possibly cooler daytime temperatures across central NSW. Warmer daytime temperatures are likely in the far south east. Warmer overnight temperatures are likely over the east and south, and the chances of warmer or cooler overnight temperatures are roughly equal elsewhere.

ENSO is still neutral, but El Niño conditions are likely to develop over winter. Sea surface and sub-surface temperatures have continued to warm and other indicators are showing or likely to develop El Niño trends. The Bureau of Meteorology has issued an El Niño alert.

Most of NSW received average to above average rainfall during April. Rainfall over most areas ranged from 25-100 mm. It was lower across the north but above average in the west and south. Daytime temperatures were above average in the north and average elsewhere. Overnight temperatures were above average.

In relative terms, quarterly rainfall was average or above average over 97% of NSW, with lower rainfall over the north coast and northern tablelands. Half yearly relative rainfall was average or above over 83% of NSW.

Stock water supplies have improved, but are variable. Streamflow analysis over the last year indicates well below average run off over areas of the tablelands, north coast and north west.

Modelling indicated pasture growth continued to improve, although slowing over the tablelands and low over the coast, far west and north west. Relative growth was average or better over 74% of NSW during April and 92% of NSW over the quarter. Biomass levels improved, particularly over central areas. Relative biomass and half yearly relative growth were average or above over 85% or more of NSW.

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 8th May 2014.

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 April and early May and were up to date as at 7-8th May 2014.

2.1 Seasonal outlook summary

Table 1: Seasonal outlook summary

	Current Outlook	Previous Outlook
Rainfall (quarter)	Neutral (Wetter – south eastern & areas of eastern NSW)	Neutral (Drier – northern/north-eastern NSW)
Max Temperature (quarter)	Neutral (Possibly cooler – central NSW)	Warmer (Neutral – western NSW)
Min Temperature (quarter)	Neutral (west & central NSW) Warmer (eastern & southern 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 May to July, the chances of a wetter or drier than normal season are equal across most of the western and central areas of the State. There is a slightly increased (55-60%) chance of exceeding median rainfall across most of the south east and over areas of eastern NSW. This zone extends across the southern tablelands, areas of the south west slopes, south and central coast, areas of the central tablelands, the northern slopes, the Hunter valley and the north eastern corner of NSW (Figure 7). Conditions across the far south east of NSW, south of Cooma, are likely to be wetter than normal, with the chances of exceeding median rainfall at more than 65%.
- This means that for every ten years with similar climate patterns to those at present, across most of western and central NSW about five May to July periods would be expected to be wetter than normal and five drier than normal.
- In the far south east, six to seven May to July periods would be expected to be wetter than normal and three to four drier than normal.
- The outlook accuracy (confidence or skill) is moderate to high across most of NSW, ranging from 55-75%, but low in the south eastern corner at less than 55% (Figure 10).

2.3 Seasonal temperature outlook

- Over the three month period from May to July, the chances of warmer or cooler than normal daytime temperatures are roughly equal over most of NSW. Across most of central and south eastern NSW, there is a slightly increased chance of cooler than normal daytime temperatures. In the far south eastern corner, there is an increased probability (60% or more) of warmer than normal daytime temperatures (Figure 8).
- The outlook accuracy (confidence or skill) is moderate to high (55-75% or more) across NSW (Figure 10).
- This means that for every ten years with similar climate patterns to those at present, across most of NSW about five May to July periods would be expected to have warmer than normal daytime temperatures, and five cooler than normal daytime temperatures.
- Warmer than normal overnight temperatures between May to July are likely across eastern and southern NSW (greater than 60% probability), with the probability increasing towards the coast and towards the south east. Across the west and north west, the chances of warmer or cooler than normal overnight temperatures are about equal. There is a slightly increased probability of warmer than normal temperatures over the central west and far west (55-60%) (Figure 9).
- The outlook accuracy (confidence or skill) for the minimum temperature outlook is low

(less than 55%) across most of NSW, and moderate (55-65%) over the far north east, far south east and central/southern NSW (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.

May

- The experimental rainfall outlook for May (Figure 11) indicates a roughly equal chance of receiving wetter or drier than normal conditions across NSW. The outlook has a moderate accuracy (skill) over most of the State, but low skill in the far west.
- The experimental daytime temperature outlook for May (Figure 11) indicates cooler temperatures are likely across the south and west of NSW. There is a roughly equal chance of warmer or cooler than normal daytime temperatures across the mid-north coast and the north and north east of NSW. This outlook has a moderate accuracy (skill).
- The experimental overnight temperature outlook for May indicates that cooler than normal conditions are likely across most of NSW, particularly in the south and south west (Figure 11). There is a roughly equal chance of warmer or cooler than normal overnight temperatures across an area of the mid-north coast. However, this outlook has a low accuracy (skill).

May multi-week (as at 4th May)

- Weekly experimental outlook information suggests that in the third and fourth week of May drier than normal conditions are likely across NSW, with a less than 30% chance of exceeding the median rainfall. The accuracy (skill) for this outlook is low, except for the far south east corner of NSW.
- Daytime temperatures over the third and fourth week of May are likely to be warmer than normal across the State, with a more than 80% chance of exceeding the median maximum temperatures. This outlook has moderate accuracy (skill) over most of NSW, but accuracy is low along the mid-north coast and in the south west.
- Overnight temperatures over the third and fourth week of May are likely to be warmer than normal across most of NSW. The chance of receiving warmer or cooler than normal overnight temperatures are roughly even over areas of the southern and central tablelands and the south of the State. The accuracy (skill) level for this outlook is low.

June

- The experimental outlook for June indicates a roughly equal chance of wetter or drier conditions across NSW, with a 40-60% probability of above median rainfall (Figure 12). The accuracy (skill) for this outlook is low.
- The experimental June outlook indicates warmer than normal daytime temperatures are likely, particularly along the central to north coast and across the north of the State (Figure 12). The skill for this outlook is moderate.
- Warmer than normal overnight temperatures are likely across most of NSW, except across the tablelands and inland areas of the south east (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 wetter than normal conditions are likely across northern and eastern NSW over next three months (a 55-75% probability), with an increasing probability towards the north eastern corner of the State (70-75%). A nearly equal probability for wetter or drier rainfall conditions exists over the south west of NSW

(45-55%), with lower rainfall likely in the far south and south west (40-45%).

- The statistical model indicates that warmer than normal overnight temperatures are likely across the north and north east of the State (a 60-70% probability of exceeding the median minimum temperature), with an increasing probability towards the north east. There is a slightly elevated chance of warmer than normal overnight temperatures in the south and south west (55-60%).
- The statistical model indicates that there is a nearly equal probability for warmer or cooler than normal daytime temperatures across the northern half of the State, with a slightly elevated chance of cooler than normal daytime temperatures in the north east (a 40-45% probability of exceeding the median maximum temperature). In the south and south west of the State, there is an elevated chance of warmer than normal overnight temperatures (60-70%).

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 conditions across most of NSW between May and July. Some areas in the far north east and south east have a reduced probability of exceeding average rainfall (20-40%). The skill assessment for this outlook is moderate to high over southern and parts of central NSW, moderate in north eastern NSW but low for the remainder of NSW. The model indicates that above average temperatures are likely for the period across most of NSW, particularly along the coast. An area in western NSW has a roughly equal probability of warmer or cooler than normal conditions. The skill assessment for this outlook is low to moderate for most of NSW, and moderate along the coast.
- For June to August, the UK Meteorology Office's global long range probability modelled output indicates drier conditions are likely across areas of northern and north eastern NSW and the Hunter valley. For the remainder of the State, there is an equal probability for wetter or drier conditions. The skill assessment for this outlook is moderate for the central and eastern areas of the State, and low-moderate in the west. For temperature, the outlook indicates that warmer than normal conditions are likely with a 60-80% probability of above average temperatures across the east, north east, north west and south west of NSW. The temperature outlook has a low-moderate skill over the western and central areas of NSW, and moderate-high skill over most of the east.

APEC Climate Centre

- The APEC Climate Centre's deterministic multi-model ensemble outlook of rainfall anomalies for May to July indicates that near normal rainfall is likely across most of the State, with a slightly less rainfall in far the north east. The temperature anomaly outlook indicates the likelihood of increased temperatures across the State during May to July. No skill assessment is available for these outlooks.
- During June, the APEC Climate Centre's rainfall anomaly outlook indicates a likelihood of near normal rainfall across the State. The temperature anomaly outlook indicates higher than normal temperatures are likely during April, particularly along the southern, central and mid-north coast. No skill assessment is available for these outlooks.

2.6 El Niño-Southern Oscillation (ENSO)

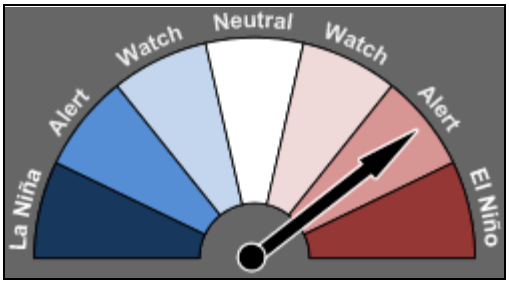
ENSO summary

- ENSO is currently neutral, but El Niño conditions are likely to develop by late winter.
- Sea surface temperatures in the key NINO3.4 region have continued to warm. Currently, anomalies in this region are in the neutral-warm range.
- Some other indicators are consistent with the development of an El Niño event during the winter to spring period, or are likely to occur. Sea sub-surface temperatures and trade winds are continuing to show El Niño-type trends. The SOI returned to the neutral range during April; however it has since begun to decline again.
- Sea sub-surface temperatures have warmed to levels that can occur prior to the development of an El Niño event. These above average sub-surface temperatures have the potential to further raise sea surface temperatures in the eastern Pacific in the near future. This could induce low level westerly winds in the central and eastern Pacific that could lead to a coupling of ocean

and atmospheric conditions, and induce an El Niño event.

- The Bureau of Meteorology's new ENSO tracker (Figure 1) is currently at El Niño 'Alert' level. In the past, about 70% of the time that this level has been reached, an El Niño event has occurred.

Figure 1: Bureau of Meteorology ENSO tracker status



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 Bureau of Meteorology's POAMA model's long range outlook indicates a 42% chance of sea surface temperatures in the NINO3.4 Pacific Ocean region reaching El Niño levels in June, increasing to 46% in July (Figure 2). This is a decrease in the probabilities since last month.
- Six of the seven climate models surveyed by the Bureau indicate that these levels will be exceeded by July, and all indicate that the levels will be exceeded by September. However, this information has not been updated since the April seasonal conditions report was released.
- Sea surface temperatures in the eastern Indian Ocean, around parts of the Australian coastline and in parts of the Tasman Sea are warmer than normal and are expected to remain so through the next quarter. These conditions are not typical of an El Niño event, and may help to minimise its effects.
- If an El Niño event does occur, it is too early to determine its strength. However, if it does occur, it is likely to continue throughout the remainder of 2014.
- It should be noted, however, that ENSO forecasts during autumn have low predictive skill due to the variable nature of ocean-atmosphere system between March and June. El Niño conditions do not always develop, even when the various indicators suggest they are possible.

Table 2: ENSO/Climatic Outlook

	Current Outlook (early May)	**Previous Outlook** (early April)
ENSO (overall)	Neutral – El Niño likely	Neutral – El Niño likely
BoM ENSO Tracker Status	El Niño Alert	El Niño Watch
SOI	Neutral	Neutral (negative trend)
Pacific Ocean SST (NINO3.4)	Neutral (warming trend)	Neutral (warming trend)
Indian Ocean (IOD)	Neutral	Neutral
Southern Annular Mode (SAM/AAO)	Neutral/ weakly-moderately negative	Weakly-moderately positive/neutral

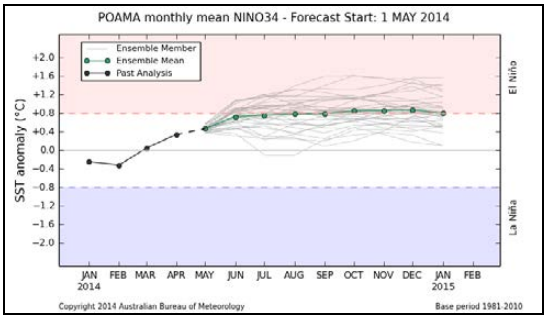
Summary Legend: Grey = Neutral, i.e. neither El Niño nor La Niña.
Red = El Niño range or trend.
Blue = La Niña range or trend.

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

- The CPC/IRI consensus ENSO forecast of the NINO3.4 index (as at 8th May) indicates an increasing likelihood of an El Niño event developing during the remainder of the year, potentially over winter. Of the 24 climate prediction models surveyed by IRI, 41% indicate ENSO neutral conditions will continue over May to July (Table 3), a decrease since last month, and 58% indicate the likelihood of an El Niño event developing during this period.
- Of the models surveyed, 67% indicate El Niño conditions are probable between the June to August period, increasing to 78% over the October to December period (Table 3). There is, however, considerable uncertainty as to when El Niño conditions may develop and how strong they may become, due to the lower skill of ENSO forecasts during autumn.
- The Bureau of Meteorology's POAMA model currently indicates ENSO neutral conditions continuing into winter although with increasing warming and subsequently approaching El Niño conditions in June/July. The most recent mean forecast indicates sea surface temperatures warming to marginal El Niño levels only, although the range of the ensembles (grey lines) varies quite widely (Figure 2).
- The most recent POAMA forecast indicates a 42% probability of reaching El Niño thresholds in sea surface temperature anomalies over the NINO3.4 Pacific Ocean region in June, increasing to 46% in July and

55% in August but declining slightly to 52% in September (Figure 2). These represent a decline in the probabilities since last month's analysis.

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



Source: Australian Bureau of Meteorology

- 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. However, this is not always the case. Lower than normal rainfall is more likely if there is a positive IOD event in conjunction with an El Niño event.
- 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 in when various meteorological organisations report that El Niño or La Niña conditions are developing.
- ENSO neutral conditions also do not guarantee normal seasonal conditions, as more localised weather extremes can and do occur due to the influence of secondary or local factors, such as warmer than normal sea surface temperatures occurring around parts of the Australian coastline.

Table 3: Current consensus ENSO forecast probabilities

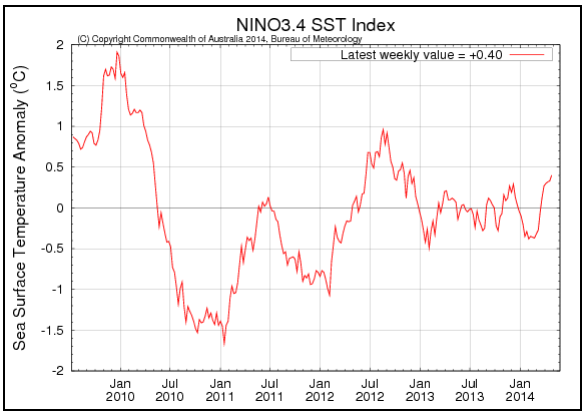
Season	La Niña	Neutral	El Niño
Apr-June	1%	58%	41%
May-Jul	1%	41%	58%
Jun-Aug	1%	32%	67%
Jul-Sep	2%	27%	71%
Aug-Oct	2%	24%	74%
Sep-Nov	2%	23%	75%
Oct-Dec	2%	20%	78%
Nov-Jan	3%	19%	78%
Dec-Feb	3%	20%	77%

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

Sea temperatures

- Monthly sea surface temperatures from the Bureau of Meteorology and the US National Oceanic and Atmospheric Administration (NOAA) indicate warming has occurred across equatorial Pacific between February and March.
- Much of the equatorial Pacific is now warmer than average in temperature.
- The most recent monthly temperature index value in the NINO3.4 region is 0.3°C for April, an increase of 0.3°C since March and 0.6°C since February.
- Weekly sea surface temperatures have increased, with above-average anomalies across the entire equatorial Pacific. The latest weekly sea surface temperature index over the NINO3.4 region is +0.44°C (Figure 3), an increase of +0.04°C over the last two weeks and a steady increase from early February's index value of -0.38°C.
- Warm anomalies are present around most of the Australian coastline, but have declined in the south due to cold southerly winds.

Figure 3: NINO3.4 Sea Surface Temperature Index

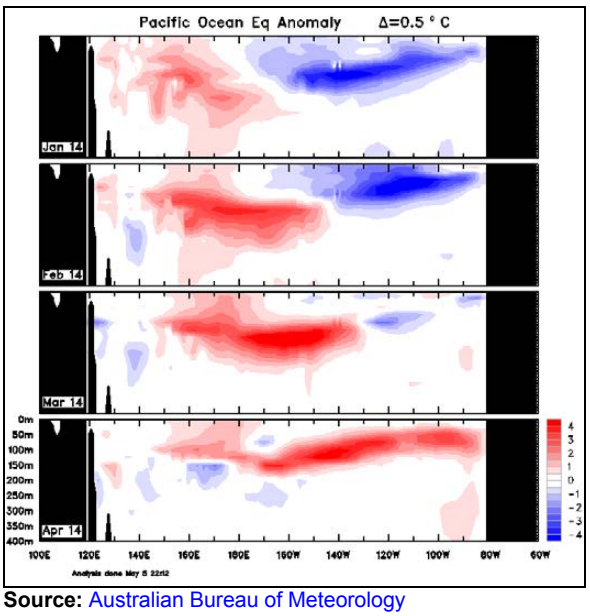


Source: Australian Bureau of Meteorology

- The sub surface sea temperatures in the Pacific show the development of a strong warm anomaly in the western Pacific over the last four months that moved eastwards (Figure 4), known as a downwelling oceanic Kelvin wave. This has now reached the eastern Pacific.
- Sub surface temperatures in the central Pacific are more than 3°C warmer than normal, and more than 5°C above normal in the eastern Pacific.
- Positive sub surface anomalies have weakened slightly in recent weeks, but still remain strong. This weakening represents the upwelling phase of the Kelvin wave. 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 Southern Oscillation Index fell during January to March, but after remaining negative in early April and increasing to positive values in late April, it has returned to the neutral range. However, it has since started to fall again.
- The SOI is currently remains within the neutral range.
- The SOI decreased from a peak of +14.5 in early February to a low of -13.7 in mid-late March, but increased back to neutral levels after early-mid April.
- In late April, the SOI increased to a positive level, but has since declined to the neutral range.
- The Bureau of Meteorology reported the 30-day value to be +8.6 as at 30th April, falling to +5.2 on 4th May, +2.3 on the 6th May (Figure 5) and to +0.9 on 7th May (Table 4).

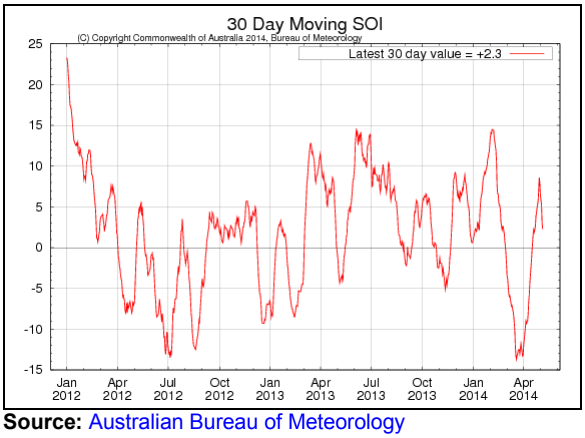
Table 4: Values of the Southern Oscillation Index

	Current monthly value (7th May)	Previous monthly value (7th April)
SOI (30 day)	+0.9	-9.3

Source: Australian Bureau of Meteorology.

- The late March SOI level was the lowest 30-day value since March 2010, during the last El Niño event.

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)

- The sub-tropical ridge moved slightly north during the month, as indicated on NOAA and Bureau of Meteorology mean sea level pressure charts, but has not reached its normal winter position.
- 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.

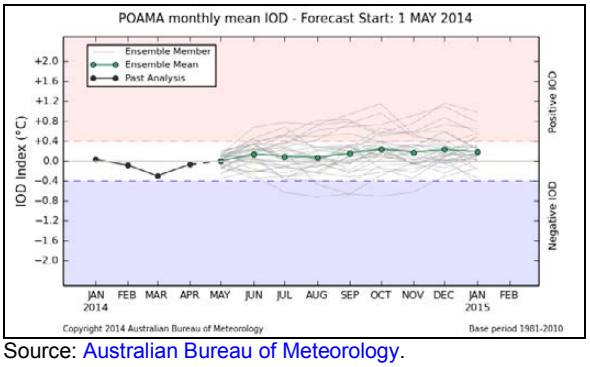
Indian Ocean dipole (IOD)

- The Indian Ocean dipole remains neutral. The latest IOD index value for the week ending the 4th May is -0.04°C, decreasing slightly from the previous weekly value of +0.21°C (to the 27th April), and after spending three weeks in late March to early April at negative levels.
- The Bureau of Meteorology's POAMA model and most climate models surveyed by the Bureau of Meteorology favour a neutral IOD over the coming months, although the chances for a positive IOD event will increase if an El Niño event occurs (Figure 6). The IOD is consistent with El Niño or La

Niña conditions in the Pacific about 70% of the time.

- Two of the international climate models surveyed by the Bureau of Meteorology indicate the development of a positive IOD event in spring. However, this information has not been updated since the April seasonal conditions report was released.

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 now near normal along the equator near the central to eastern tropical Pacific, but anomalies continue to be present in the west.
- There have been two particularly strong westerly wind bursts during the last few months. This has moved warm water from the north/north east of Australia to the east, and assisted in warming the sea surface in the central and eastern Pacific.
- 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.
- Weakening of the trade winds over the last few months has allowed a strong warm anomaly in the sea sub surface of the western tropical Pacific to move eastwards into the central Pacific (an equatorial Kelvin wave - Figure 4). If it results in the warming of the sea surface in the eastern Pacific, it can lead to a greater risk of El Niño conditions.
- Cloud conditions at the equator near the International Date Line have been above average since late February, but decreased in late April and early May.
- 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 positive to near neutral. As at 4th May, the SAM index from POAMA was weakly positive at about +0.5, and as at 6th May the AAO index from NOAA was close to zero.
- The outlook from POAMA indicates the SAM index is likely to fall to be weakly to moderately negative, returning to near neutral by the third week of the month. The NOAA outlook suggests it will decrease to be moderately to strongly negative by early to mid-month, and possibly oscillate between this and neutral.
- 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.

Atmospheric pressure and NSW cloud conditions

- Atmospheric pressure during April was below normal across the State, particularly along the far south coast and in the far south west. High atmospheric pressure can be linked to drier than normal conditions.

  Cloud conditions over most NSW were above normal over the last month, but near normal across the north and north east of the State.

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 5: 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	10%	9%	36%	45%
Quarter	0%	3%	25%	72%
Half year	0%	17%	68%	15%
Year	0%	30%	63%	7%

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

April

- Relative to historical records, rainfall for April was average or above over more than 81% of NSW.
- Above average rainfall occurred across 45% of NSW (Figure 13, Table 5), covering most of southern and western NSW, as well as the central and southern tablelands.
- Areas of the North West, Northern Tablelands, Greater Sydney and the North Coast LLS districts received below average rainfall during April.
- Above average rainfall extended across most of the western and southern areas of the State (Western, Riverina and Murray LLS districts), and into the southern and central tablelands, Monaro, far south coast and the south west of the Hunter Valley (Central Tablelands, South East and Hunter LLS districts).
- An area of extremely high relative rainfall extended from the west of Western LLS district along the south of Murray LLS district and into the Monaro in South East LLS district (Figure 13). In these areas, rainfall was 25-100 mm above normal for the month.
- Above average rainfall extended across 39% of Central West, 60% of Western, 65% of South East, 84% of Riverina and 99% of Murray LLS districts.

February to April (3 months)

- Over the 3 month period from February to April, relative rainfall was average or above over 97% the State (Figure 14, Table 5).
- Below average rainfall was restricted to areas of the North Coast and Northern Tablelands LLS districts. In these areas, rainfall was 40-80% of normal.
- Above average or better relative rainfall over the period occurred across 72% of the State. It extended across most of the western and central areas of the State, with the exception of areas of North West and Northern Tablelands LLS districts, and the coastal areas of North Coast, Hunter, Greater Sydney and South East LLS districts.

November to April (6 months)

- Over the six months to April, relative rainfall was average across 68% of NSW, and above average across 15% (Figure 15, Table 5).
- Much of the North West, Northern Tablelands and North Coast LLS districts, and areas of the Hunter and Central West

LLS districts received below average or worse relative rainfall. These areas generally received less than 80% of their normal rainfall over the period, with rainfall of 100-400mm or more below average.

- A large proportion of this area received rainfall in the lowest 20% of years. An area extending from Walgett to Lightning Ridge, Collarenebri and Goodooga received relative rainfall for the six months in the lowest 10% of years. The same was the case for areas between Coonabarabran and Pilliga, between Bingara, Warialda and Inverell, between Tenterfield and Armidale, between Coffs Harbour and Dorrigo, between Ballina, Lismore and Tweed Heads, and over an area to the north of Moree.
- Areas in the far south and south west of NSW extending between Broken Hill, Wentworth, Deniliquin and Albury and areas in the central west between Nyngan, Parkes and Orange received above average rainfall.

August to April (9 months, BoM)

- Over the 9 month period from August to April, relative rainfall across the State was below average across the North West, Northern Tablelands and North Coast LLS districts, and across the majority of the Central Tablelands, Hunter and Greater Sydney LLS districts.
- Other areas of below average rainfall occurred across areas of the Western and South East LLS districts, and in the far west of the Riverina LLS district (Figure 16). Most of these areas received between 40-80% of their normal rainfall, with an area between Walgett, Collarenebri and Lightning Ridge receiving less than 40%.
- Areas of very much below average relative rainfall occurred in the far north west between Coonabarabran, Pilliga, Walgett, Collarenebri and Goodooga. Other areas extended across most of the Northern Tablelands LLS district, the north of Hunter and Central West LLS districts, the north eastern corner of North West LLS district and much of the North Coast LLS district.
- Areas between Walgett, Collarenebri and Lightning Ridge, near Pilliga and near Glen Innes had the lowest rainfall on record for the period.
- The remainder of the State has generally average relative rainfall over the period.

May to April (12 months)

- Over the twelve months to April, below average relative rainfall extended across most of the North West, Northern Tablelands and North Coast LLS districts, as well as areas of the Western, Central West, Hunter, Greater Sydney and Central Tablelands LLS districts (Figure 17, Table 5), and covering 30% of NSW.
- Areas of Western, North West, Northern Tablelands, North Coast, Central West and Hunter LLS districts received extremely low rainfall over the period, that is, rainfall in the lowest 10% of years.
- Some 63% of the State, including most of the south east, southern, central and western areas had average relative rainfall for the period. Isolated areas, particularly in the far south west and in the central west, received above average relative rainfall.

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.

April

- Overall, NSW received a State-wide average rainfall of 43 mm for the month, in comparison to the historical average of 47 mm.
- Most of the rainfall over inland NSW fell over the first two weeks of the month in two significant events (over the 3rd-6th April and 10th-12th April), and was associated with surface low pressure troughs crossing the State. These events were more tropical in origin rather than the classic ‘autumn break’ winter storms.
- Rainfall during April was between 125-400% of average (based on historical records between 1961 and 1990) across southern NSW, and the southern and central areas of western NSW. In the north of the State, and between the upper south coast and north coast, rainfall generally ranged between 20-80% of average.
- Some 45% of the State received above average rainfall during April (Table 5).
- Total rainfall over the State ranged from about 1-200 mm, with isolated areas receiving falls of between 200-300 mm. The majority of the State received between 25-100 mm (Figure 18).

- Areas across the north of the State, including areas of the Western, North West, Central West and Northern Tablelands LLS districts, received 0-25 mm over the month. Rainfall in these areas was generally less than 40% of average for the month, with some areas being below 20% of average. Lower rainfall of 10-25 mm also occurred in other limited areas around the State, such as near Hay and Parkes.
- Part of the drought affected area in the north west of the State received average rainfall, but over other areas of the north west, west and northern tablelands, rainfall was patchy and below average. Some of these areas are likely to experience a 'green drought' during winter.

February to April (3 months)

- Total rainfall over the three months to April ranged from 50-300 mm over most of the State, with parts of the coast, eastern fall and the alpine areas receiving 300-400 mm or more (Figure 19).
- The area between Walgett, Lightning Ridge and Goodooga in north western NSW received 50-100 mm over the period. Areas to the north and north east of Broken Hill and around Hay received less than 50 mm. Much of the rainfall in these areas was patchy.
- Most of the western and central areas of the State received 50-200 mm. The eastern areas of the State, including most of the tablelands, received 200 mm or more.
- The eastern and central areas of the Central West LLS district, the Central Tablelands LLS district, the eastern half of the Northern Tablelands LLS district and the east of Riverina and Murray LLS districts also received 200 mm or more over the three month period.

November to April (6 months)

- Rainfall across the State during the November to April period ranged from 50-800 mm (Figure 20), with most areas receiving between 100-400 mm.
- Some of the lowest rainfall over the period (50-100 mm) fell to the north of Broken Hill near Packsaddle and Tibooburra.
- The plains generally received between 100-300 mm and the central areas of the State, including the slopes and much of the tablelands, received 200-400 mm during the period.
- The coastal LLS districts generally received 400-600 mm. Some areas of the coast received up to 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 22 and Figure 23 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 22 and Figure 23 are provided for a general assessment only.

- Mean temperatures (the average of maximum and minimum temperatures) across the State were 1.1°C above normal for the month, and it was the 10th warmest April on record.
- Daytime temperatures across the State during the month averaged 0.7°C above normal. Daytime temperatures were warmer in the northern areas of the State, but close to average over the rest of the State.
- The north of the State had maximum temperature anomalies of 2-3°C above normal.
- Minimum temperatures during the month averaged 1.5°C above normal, and it was the seventh warmest April on record.
- Most of the State recorded overnight temperatures of between 1-2°C above normal. Temperatures in the north west and far north western corner of NSW were 2-3°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 show the average monthly (or weekly) soil moisture content for the topsoil and subsoil, as a proportion of its saturated capacity. They do not show monthly soil moisture relative to historical records (percentile ranking).

- Unfortunately, AWAP soil moisture data and maps were not available at the time of production of this report.

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.

6.1 Modelled pasture growth

- During April, modelled pasture growth continued to improve as a result of the widespread rainfall and warm temperatures.
- Modelled pasture growth across the west of the State was generally in the range of 50-500 kg/ha dry matter (DM) during April. There was a particular improvement in growth across the far west, where growth was less than 50 kg/ha DM in March.
- The central areas of the State also improved to generally between 200-1,000 kg/ha DM over April, an increase from between 20-100 kg/ha DM in March. Particular improvements occurred across Murray and North West LLS districts.
- Growth slowed or stabilised across much of the tablelands, remaining at levels of 100-500 kg/ha DM. Growth in the Central Tablelands declined from that of March, with the onset of cooler conditions. However, growth continued to improve across the Monaro.
- Levels of growth were maintained (from those in March) across the inland of the South East, Hunter and North Coast LLS districts. However, areas of the coastal strip across these LLS districts continued to show poor growth. There were some improvements along the south and north coast, but patches of low-moderate pasture growth still remain.
- Areas of relatively poor pasture growth also occurred in the far north western corner of the State, in areas of the north west near Walgett and Lightning Ridge, and over the alpine areas and adjacent tablelands (Figure 28).
- Anecdotal information suggests that the best responses over the last few months have been in improved pastures, with native pastures not responding as dramatically. Also, in some areas, growth has been restricted by patchy rainfall or by the onset of colder overnight temperatures. In the latter case, these areas may experience a ‘green drought’ until spring.

6.2 Modelled biomass

- Modelled total standing dry matter (biomass) levels improved during April across the central areas of the State, particularly across the Murray, Riverina and Central West LLS districts (Figure 29). In these areas, levels generally improved from less than 500 kg/ha DM to between 500-1,500 kg/ha DM. In many areas, the improvement was from less than 250 kg/ha DM in March.
- Modelled biomass levels were maintained across the tablelands at around 500-1,500 kg/ha DM, with some improvements in the upper areas of the Hunter LLS district and areas of the Monaro in the South East LLS district.
- Modelled biomass levels across much of the far west and north west of NSW remained relatively low at less than 500 kg/ha DM (Figure 29). Declines also occurred in the Riverina and Central Tablelands LLS districts.
- Along the coast, modelled biomass levels remained relatively stable at low or low to moderate levels, and showing little change from March.
- Levels of modelled biomass were greatest across Central Tablelands LLS district and areas of the south-central west slopes.

6.3 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 6: 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	23%	1%	9%	66%	1%
Quarter	2%	5%	20%	72%	1%
Half Year	1%	13%	43%	42%	1%
Year	0%	20%	48%	31%	1%
Biomass					
Month	0%	12%	39%	48%	1%

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

April

- Relative to historical records, pasture growth continued to improve during April, with 66% of the State having above average relative growth in comparison to 52% in March. Most of the improvement was a shift from average to above average relative growth (Figure 30).
- Areas of major improvement in relative growth during April were over the Riverina and Murray LLS districts, where over 50% of each district improved from average to above average relative growth.
- There was also an improvement over the North West and North Coast LLS districts, where over 20% of the districts shifted from average to above average relative growth. Over South East LLS district, there was an improvement in relative growth across the coastal areas. In April, 24% of this district had average or worse relative growth in comparison to 40% in March.
- Anecdotal information suggests that the best responses occurred in improved pastures, with native pastures not responding as dramatically.
- Only 1% of the State was below average in relative growth for the month (Table 6).
- Areas of missing data accounted for 23% of the area of NSW, primarily across the west of the State.

February to April (3 months)

- Over the three months to April, relative pasture growth improved dramatically across the State.
- The area of above average relative growth increased to 72% of NSW, up from 22% over the previous quarterly period (Table 6, Figure 31).
- Below average relative growth across the State fell from 17% over the previous period to 5% in the current period. Areas of particular improvement occurred in across the North West LLS district, and across the upper north and upper south coast.
- Areas that continued to show below average relative growth for the period included areas of the South East LLS district along the far south coast, and areas of the North West LLS district between Walgett, Lightning Ridge and Carinda, and to the north of Moree.
- Some 19% of the South East, 16% of the North West and 14% of the North Coast LLS districts continued to show below average growth.
- A belt of extremely high relative pasture growth over the quarter extended along the tablelands and into the western areas of the Hunter LLS district, and into the Central West LLS district.

November to April (6 months)

- The six month period from November to April also showed a dramatic shift in relative pasture growth, particularly across the tablelands, central west and areas of western NSW.
- Relative growth over the period was average or above over 86% of the State (Table 6, Figure 32), an improvement from 50% over the previous half yearly period.
- However, large areas of below relative average growth still occurred across much of the North West LLS district (54% of the area of the LLS district, compared to 87% last month). These areas extended into the west of the Northern Tablelands and the north of the Central West LLS districts.
- Areas of below average relative growth also remained in the east of the Riverina and Murray LLS districts, and amounted to 12-13% of their area.

May to April (12 months)

- Relative pasture growth over the last 12 months was average or above across 79% of the State, an increase from 68% over the last period (Table 6, Figure 33).
- The best relative growth extended across the central and southern tablelands, and areas

of western NSW, and made up 31% of the State (an increase of 20%).

- Below average relative growth extended across the north west and the north eastern corner of NSW, covering the majority of the North West, Northern Tablelands and North Coast LLS districts. Areas of Hunter and Greater Sydney LLS districts also showed below average growth.
- Relative growth across the far west and much of central and south east NSW was average (48% of the State), with pockets of above average growth.

6.4 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.

- Modelled relative total standing dry matter (biomass) levels continued to improve during April, particularly across central NSW, the tablelands, the Hunter LLS district and across the east of the Western LLS district. There was an improvement in relative biomass levels across parts of North West LLS district, particularly in the east, but also across some of the drought affected areas. However, relative biomass remained low across the west and the north of the district.
- Relative biomass levels last month were well above average to extremely high across most of the Central Tablelands, Northern Tablelands and Central West LLS districts, the west of Hunter LLS district and the tablelands and Monaro areas of the South East LLS district (Figure 34), reflecting the good rainfall across these areas. Relative biomass was also above average over eastern areas of the Western LLS district, and over much of the Riverina and Murray LLS districts. Above average relative biomass made up 48% of the State in April.
- Below average relative biomass made up 12% of NSW in April (Table 6), extending primarily across the central and western areas of the North West LLS district, the north east of the Western LLS district, areas of the North Coast LLS district and the coastal areas of the South East LLS district.

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 8th May 2014.

- Levels in water storages are low-moderate, with the average capacity being 51%. Changes in storage levels were minor, with the exception of Lake Cargelligo (-32%).

Table 7: Capacity of storages

Storage	Current Volume (GL)	Effective Capacity (%)	Monthly Change (%)
Toonumbar	11	100	-
Glenbawn	684	91	-1
Glennies	250	88	-1
Lostock	19	94	-
Brogo	9	101	0
Cochrane	-	-	-
Dartmouth	3428	89	0
Hume	1144	38	2
Blowering	817	49	1
Burrinjuck	567	55	9
Brewster	-	-	-
Carcoar	10	27	0
Cargelligo	27	68	-32
Wyangala	550	45	1
Glenlyon	97	-	-
Pindari	53	17	0
Copeton	464	33	-1
Chaffey	-	-	-
Keepit	81	18	0
Split Rock	84	21	0
Burrendong	247	18	2
Oberon	30	66	-1
Windamere	183	50	0
Lake Cawndilla	143	10	-1
Lake Menindee	-	0	0
Lake Pamamaroo	154	53	-1
Wetherell	73	36	7
Total	**9125**		
Average		**51**	

8.2 Irrigation allocations

Allocations are given as at 8th May 2014.

- General security allocations increased in the Murrumbidgee valley to 63% (from 59% last month) and in the Bega-Brogo valley to 67% (from 52% last month).
- High security and other general security allocations remained the same as last month.

Table 8: Irrigation allocations

River valley	Allocation	Licence category
NSW Border Rivers*	100%	General security A Class
	1.7%	General security B Class
	100%	High security
Richmond	90%	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*	6%	General security
	100%	High security
Murray*	100%	General security
	100%	High security
Murrumbidgee*	63%	General security
	95%	High security
Lower Namoi*	6%	General security
	100%	High security
Upper Namoi*	100%	General security
	100%	High security
Peel	45%	General security
	100%	High security
Bega Brogo	67%	General security
	100%	High security

* Carry over water may be available

Appendix

Maps and data used in the production of this report.

Seasonal outlook

Figure 7: Quarterly rainfall outlook

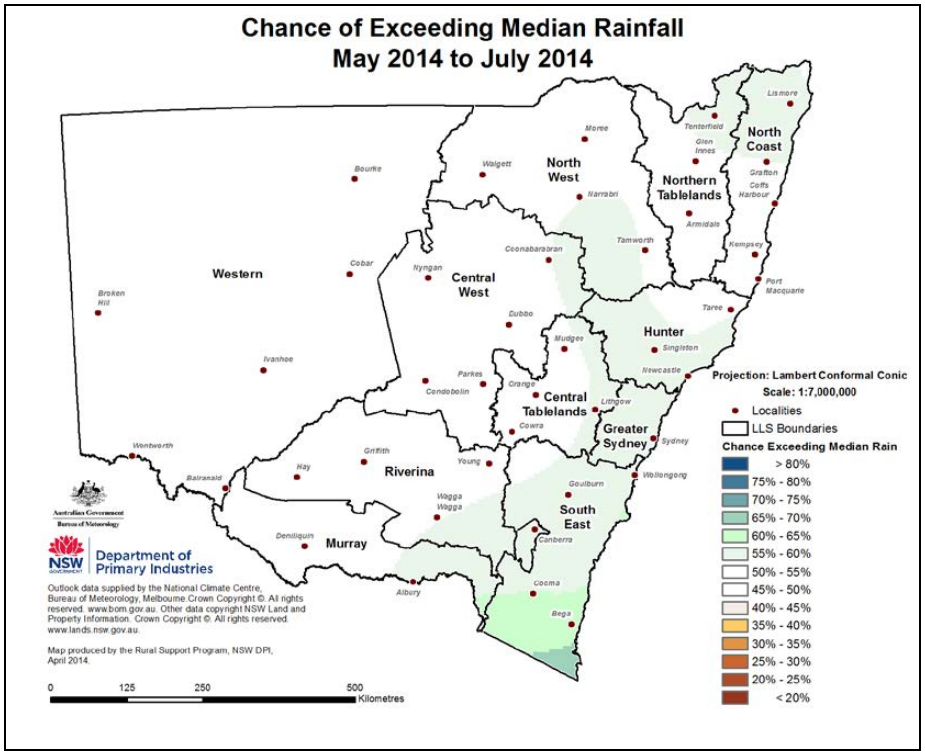


Figure 8: Quarterly maximum temperature outlook

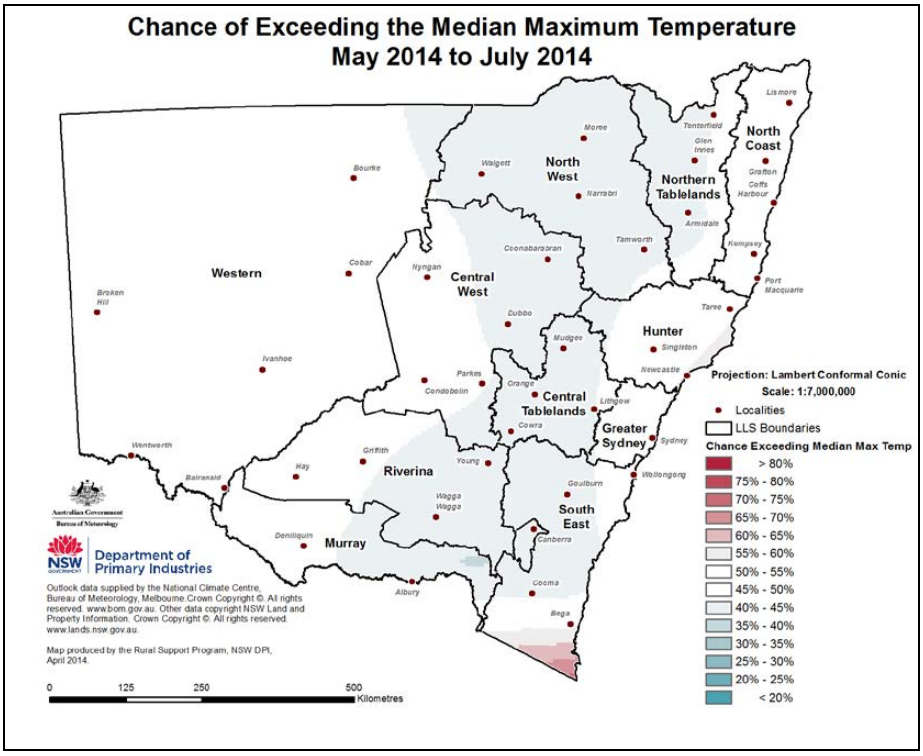


Figure 9: Quarterly minimum temperature outlook

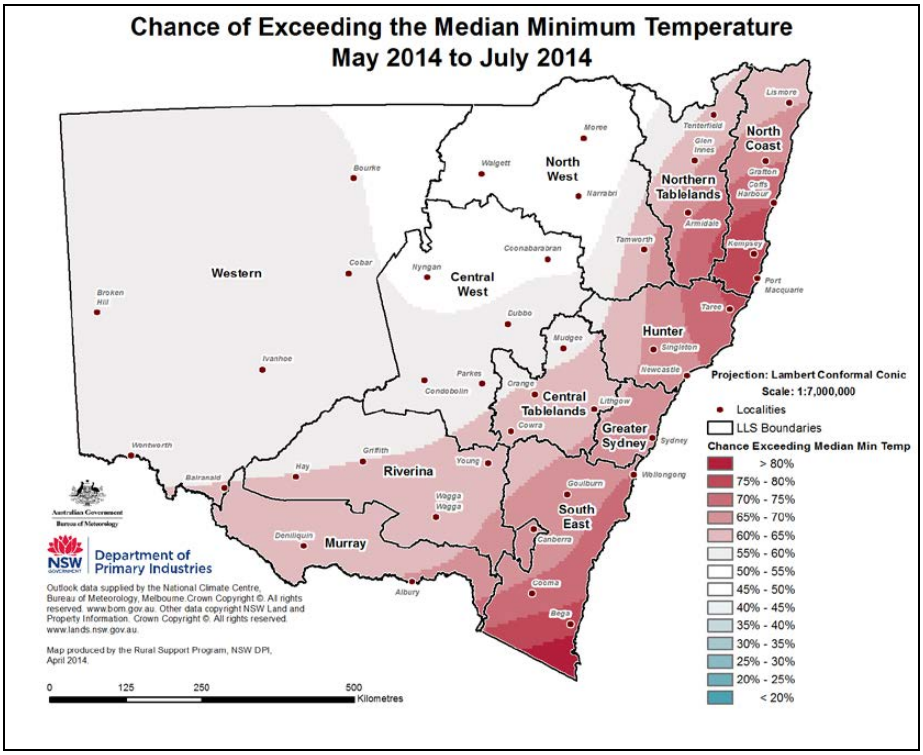
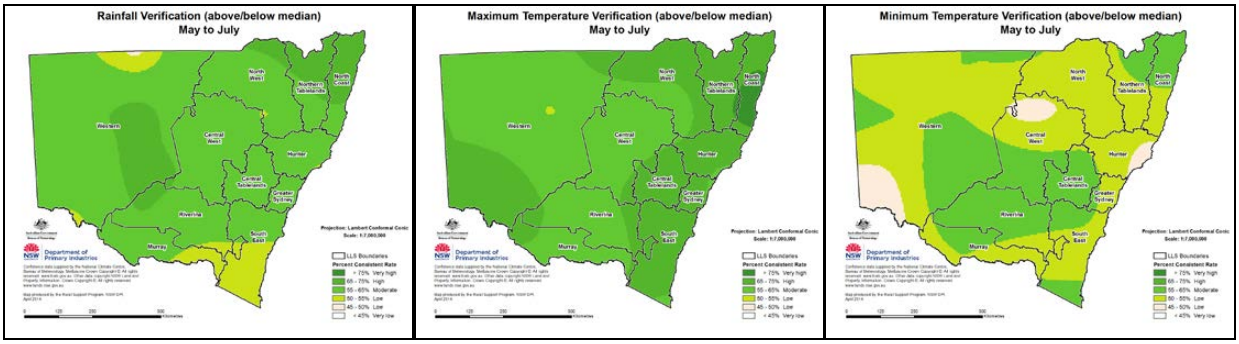


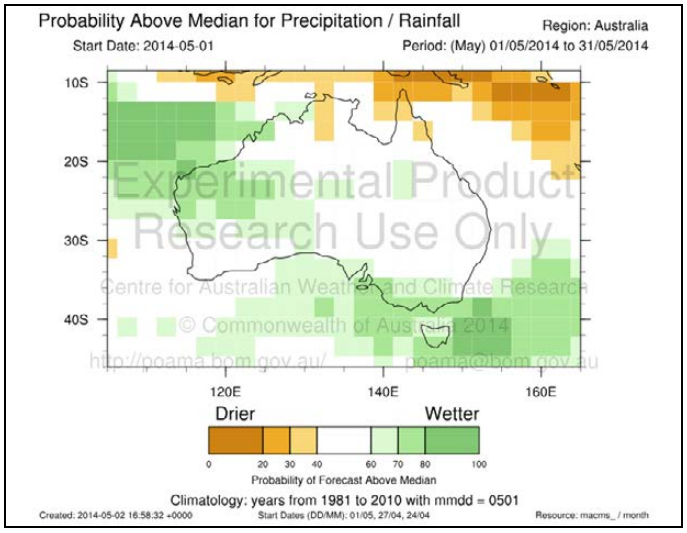
Figure 10: Outlook skill maps

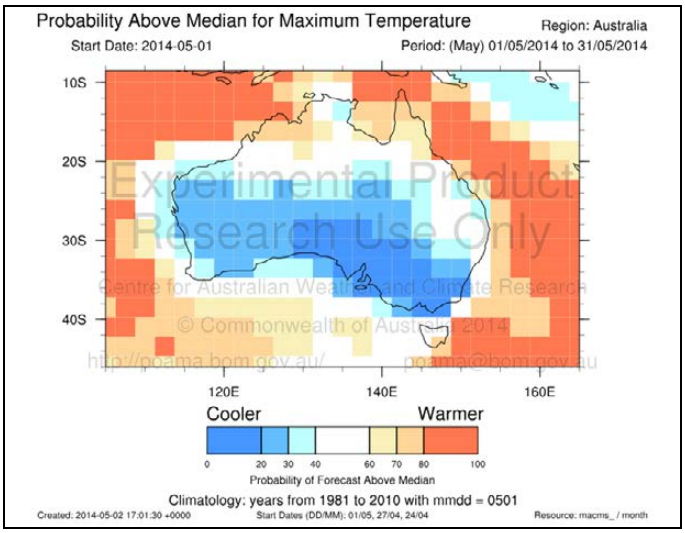


Monthly rainfall & temperature outlook

(Bureau of Meteorology, POAMA - experimental)

Figure 11: Experimental May rainfall and temperature outlooks





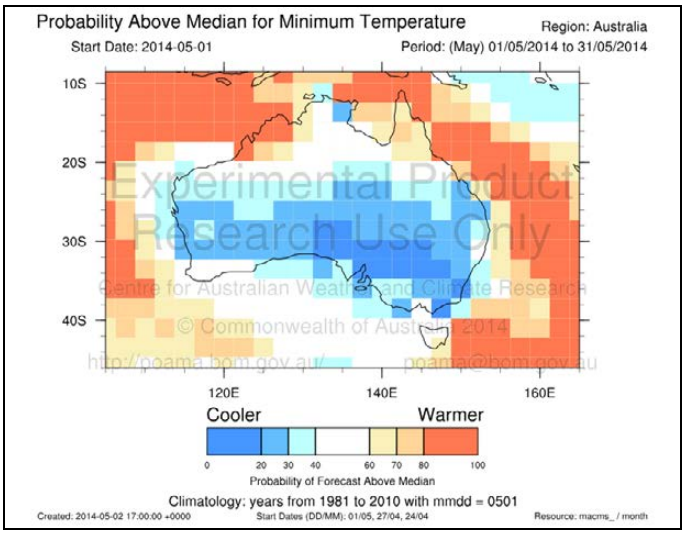
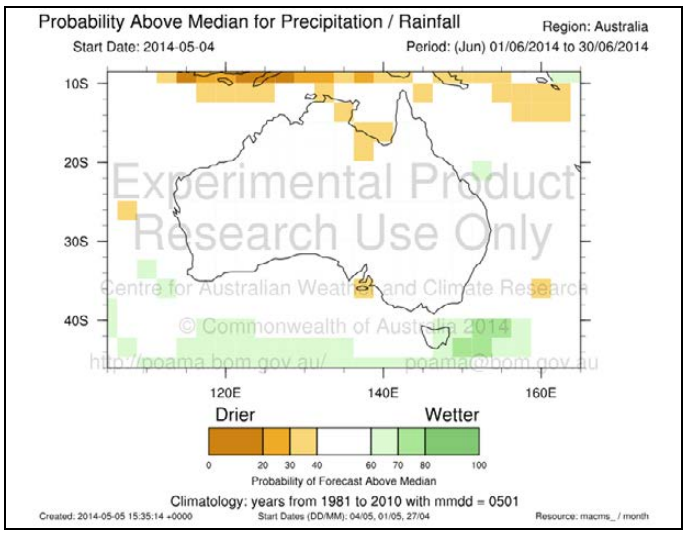
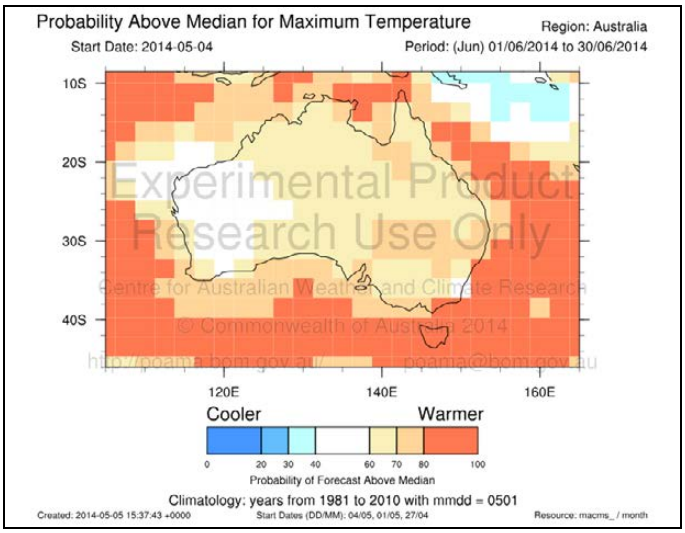
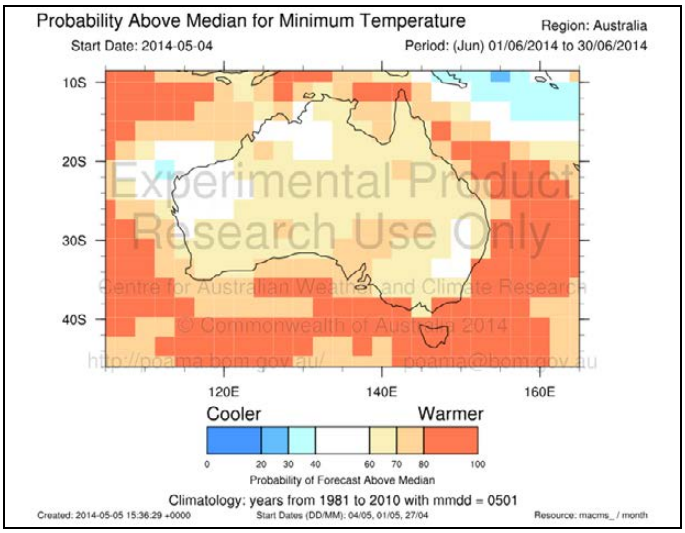


Figure 12: Experimental June rainfall and temperature outlooks







Rainfall

Figure 13: Relative rainfall – monthly

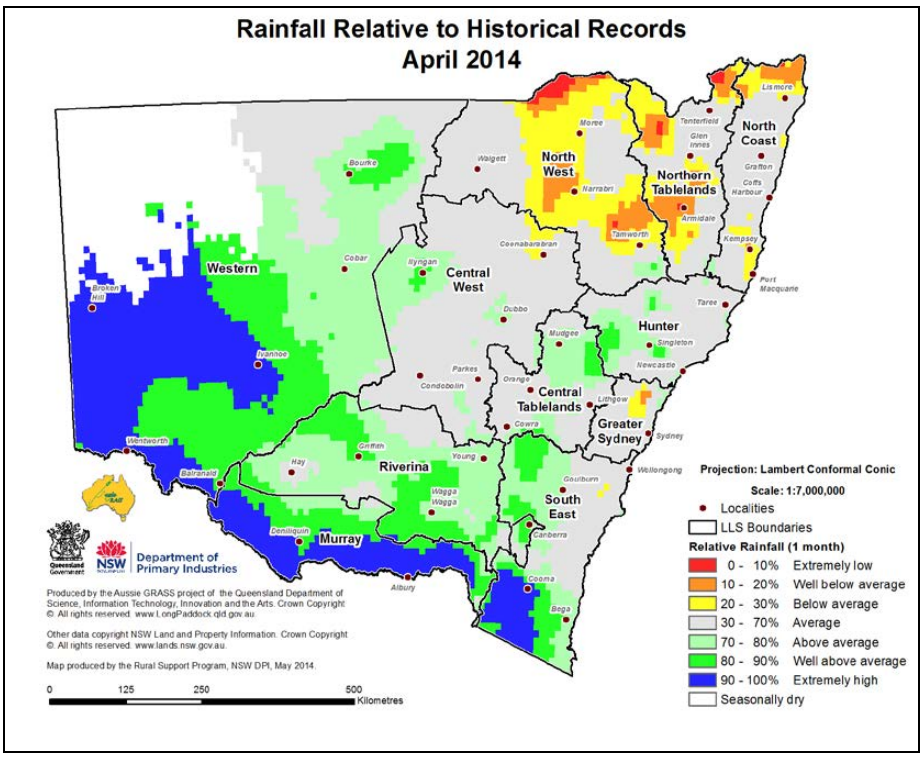


Figure 14: Relative rainfall – quarterly

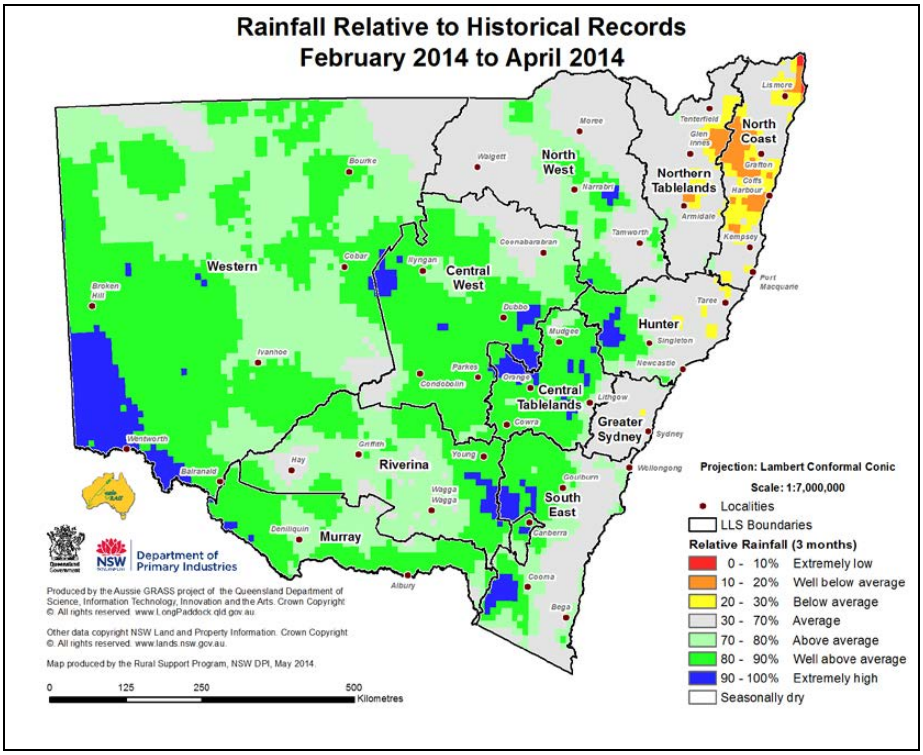


Figure 15: Relative rainfall – half yearly

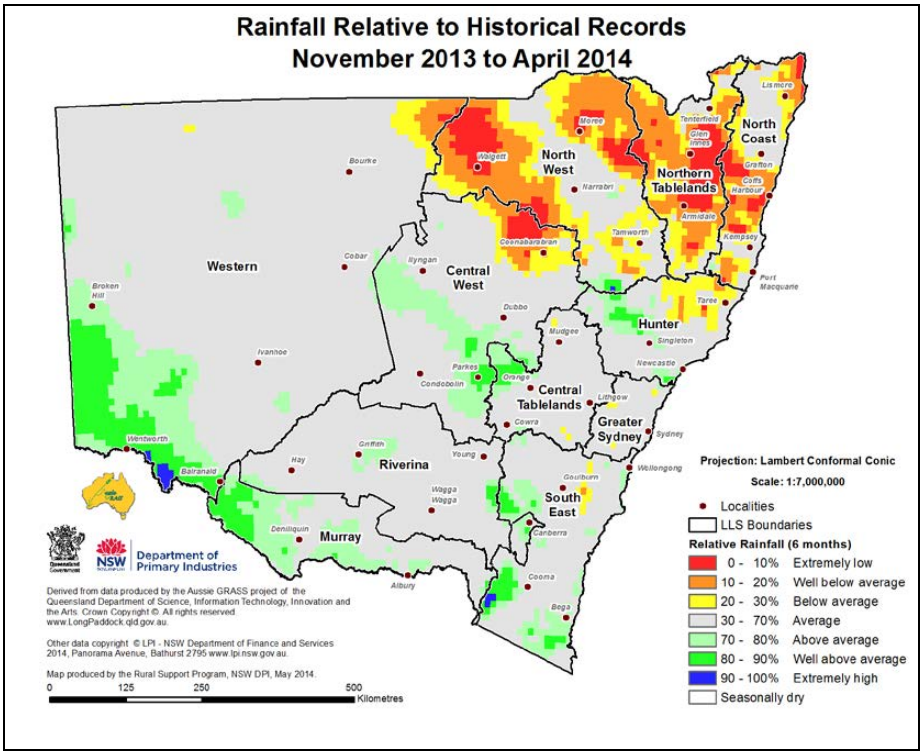


Figure 16: Relative rainfall – nine monthly

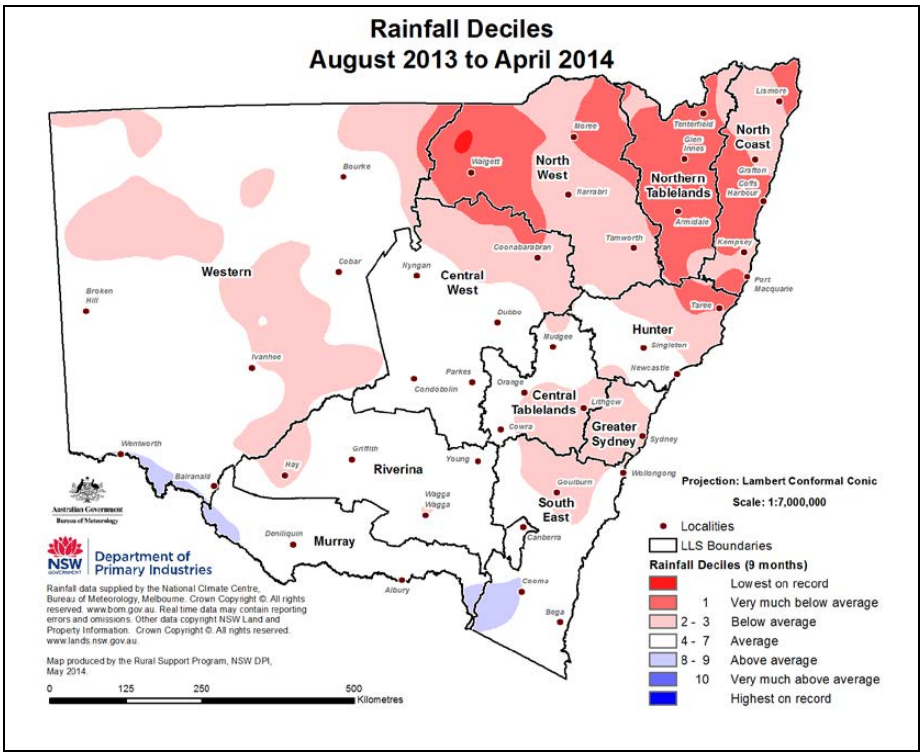


Figure 17: Relative rainfall – yearly

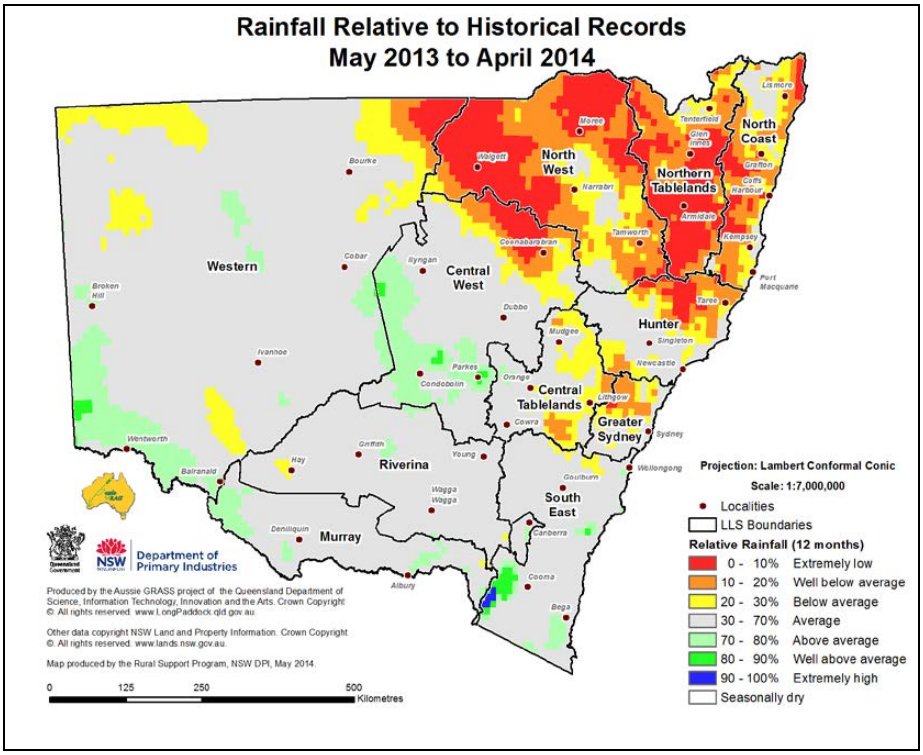


Figure 18: Total rainfall – monthly

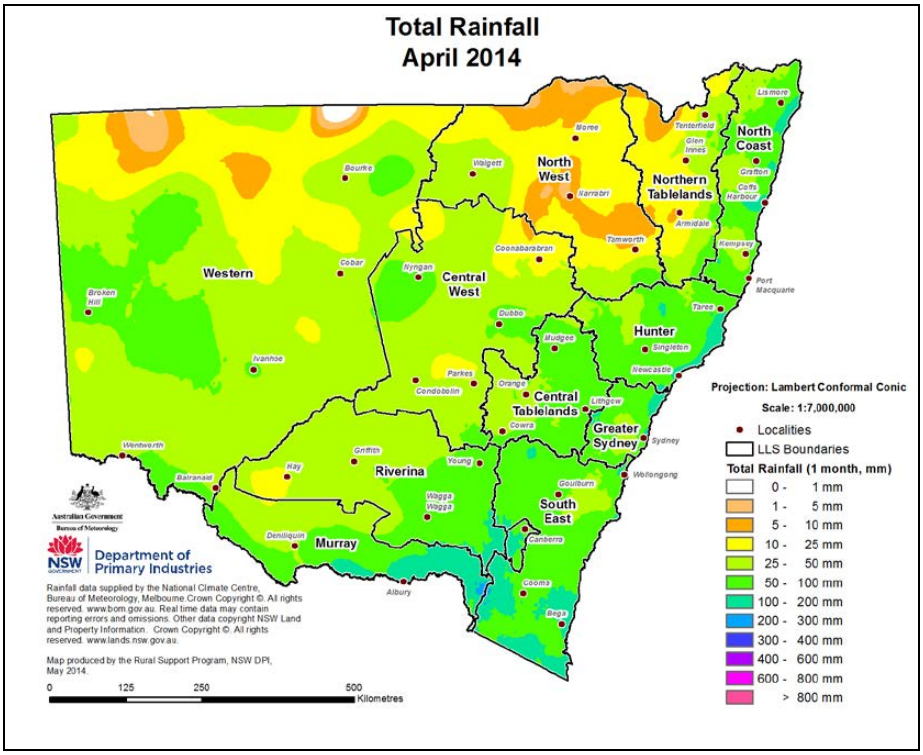


Figure 19: Total rainfall – quarterly

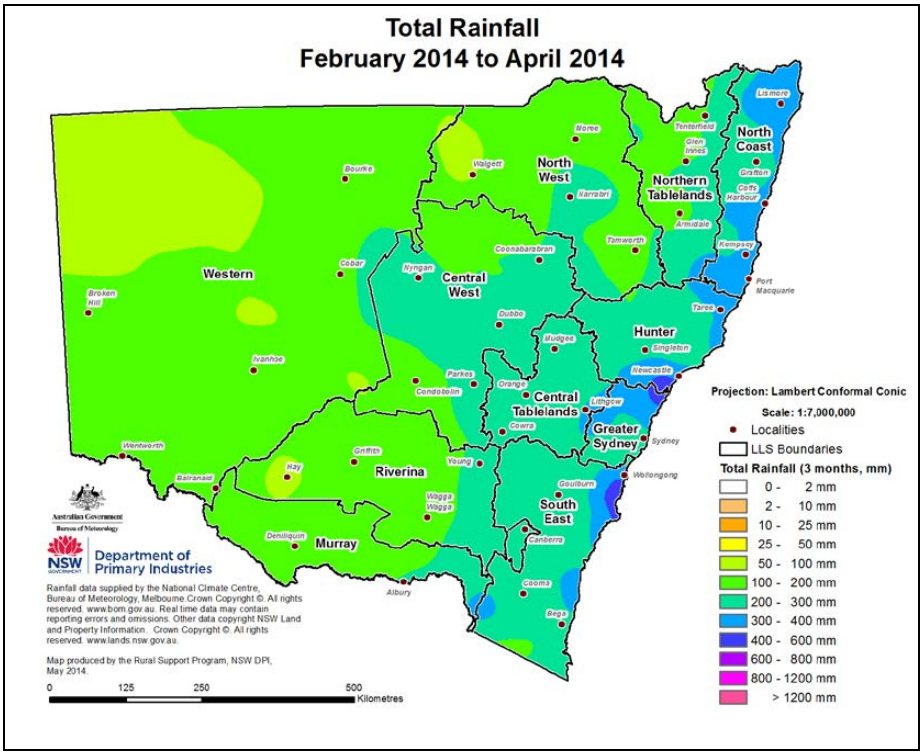


Figure 20: Total rainfall – half yearly

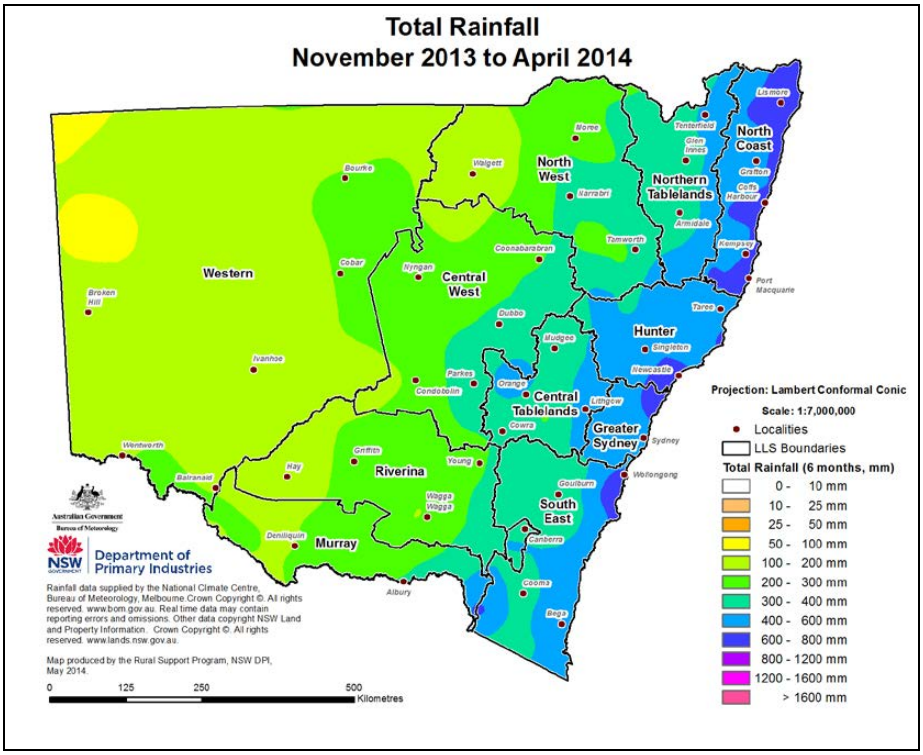
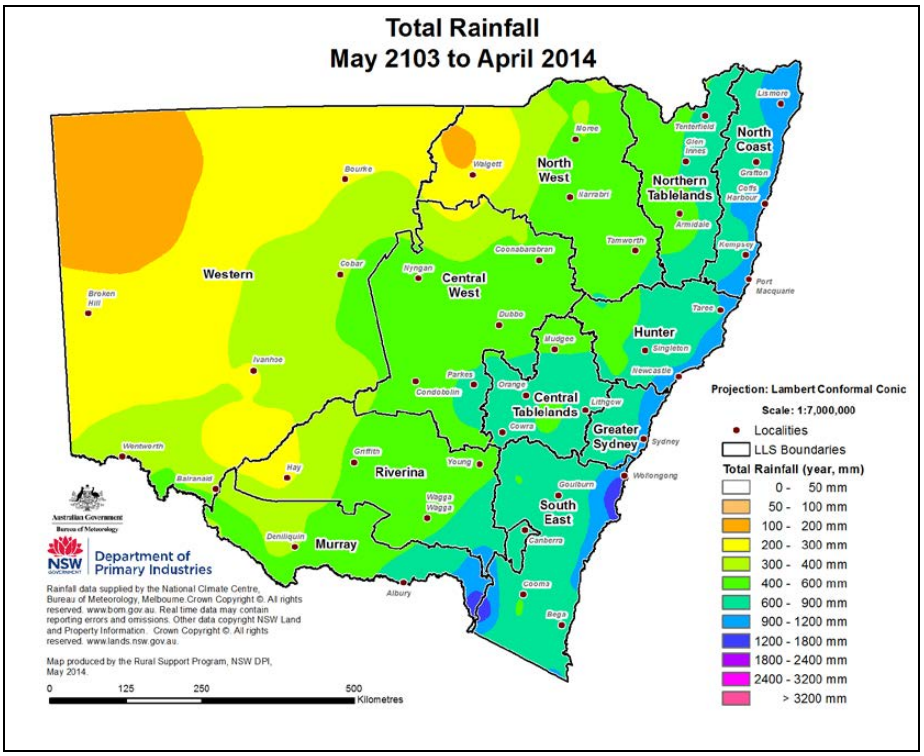


Figure 21: Total rainfall – yearly



Temperature

Figure 22: Maximum monthly temperature anomaly

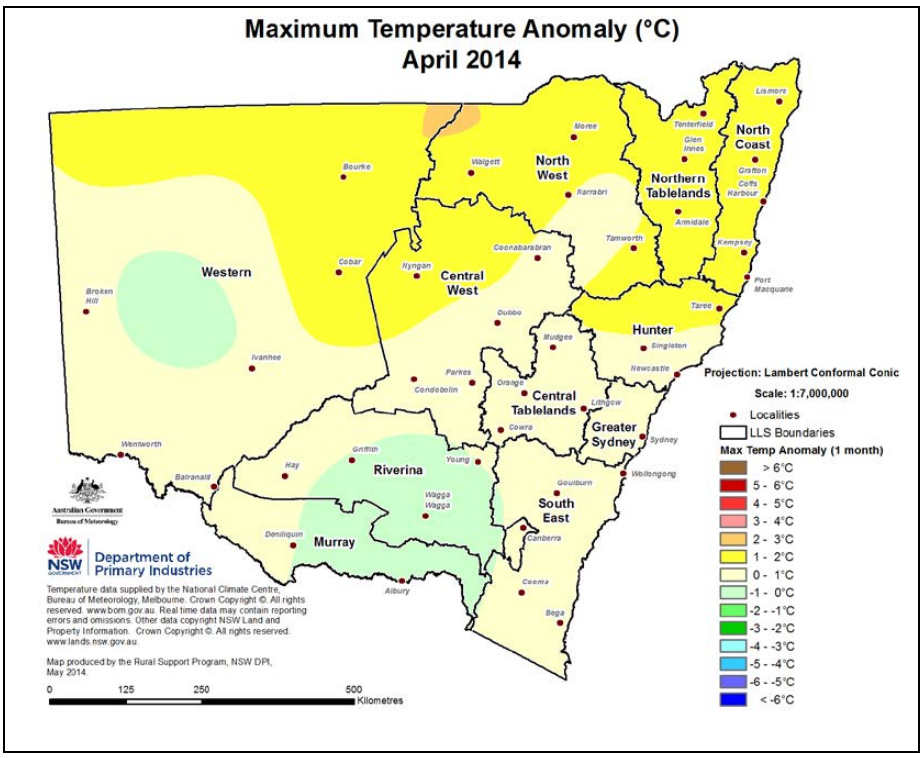
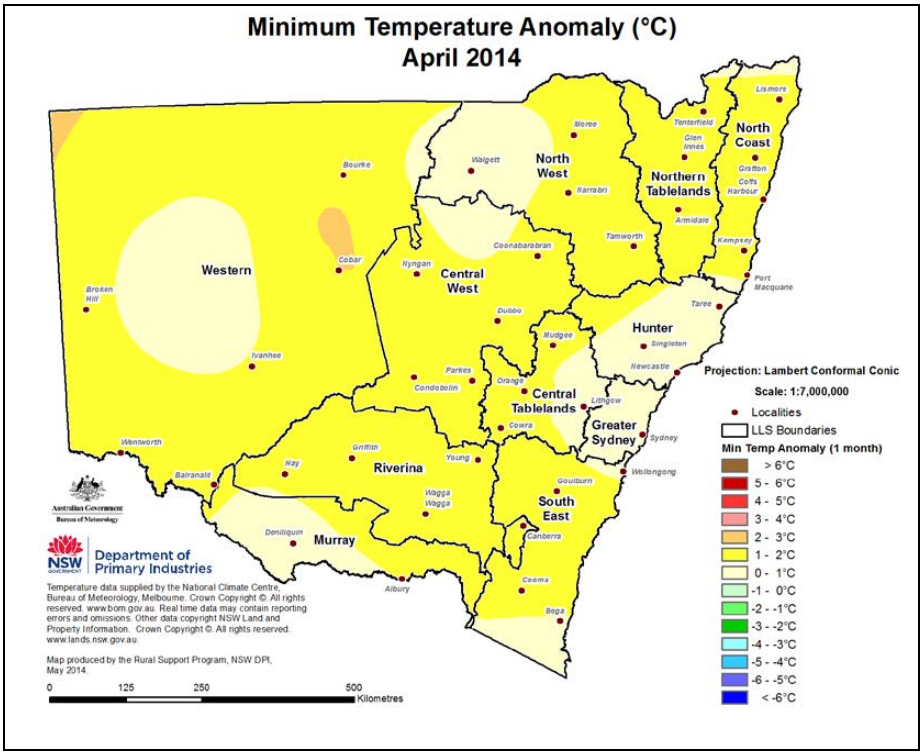


Figure 23: Minimum monthly temperature anomaly



Soil moisture

Figure 24: Relative monthly topsoil moisture

Soil moisture data and maps were not available at the time of publication

Figure 25: Relative monthly subsoil moisture

Soil moisture data and maps were not available at the time of publication

Figure 26: Relative weekly topsoil moisture to March

Soil moisture data and maps were not available at the time of publication

Figure 27: Relative weekly topsoil moisture to March

Soil moisture data and maps were not available at the time of publication

Pasture growth and biomass

Figure 28: Modelled pasture growth

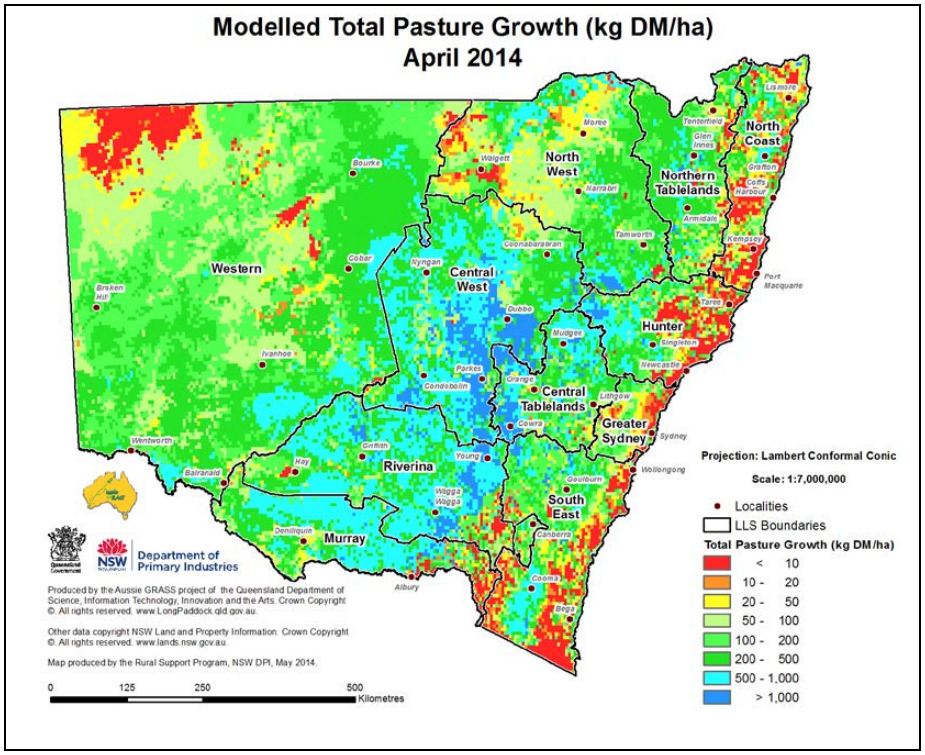


Figure 29: Modelled biomass

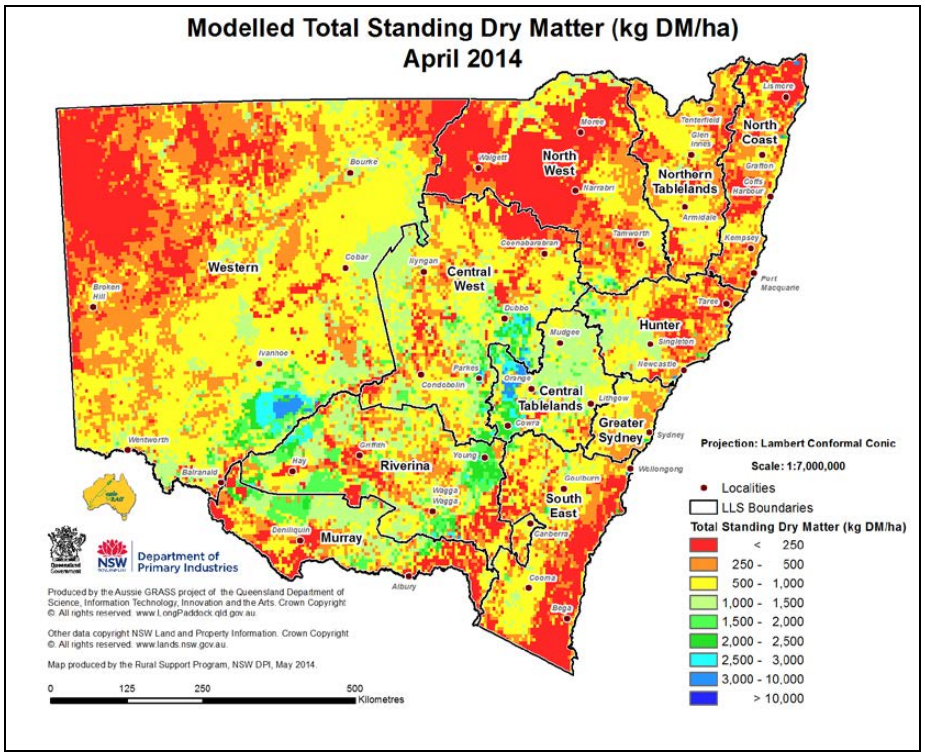


Figure 30: Relative pasture growth – monthly

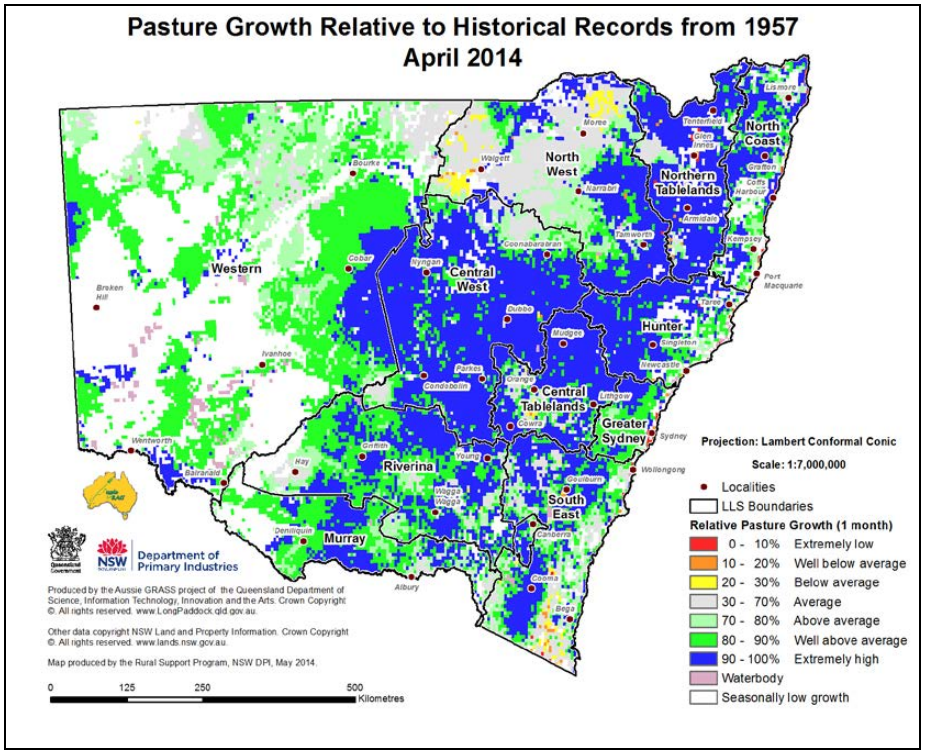


Figure 31: Relative pasture growth – quarterly

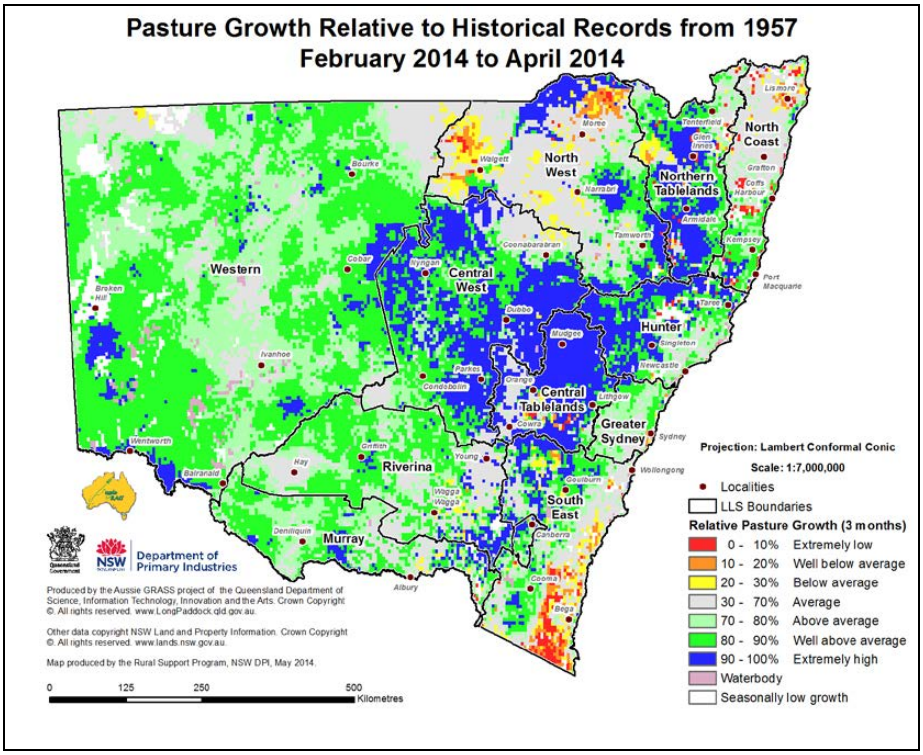


Figure 32: Relative pasture growth – half yearly

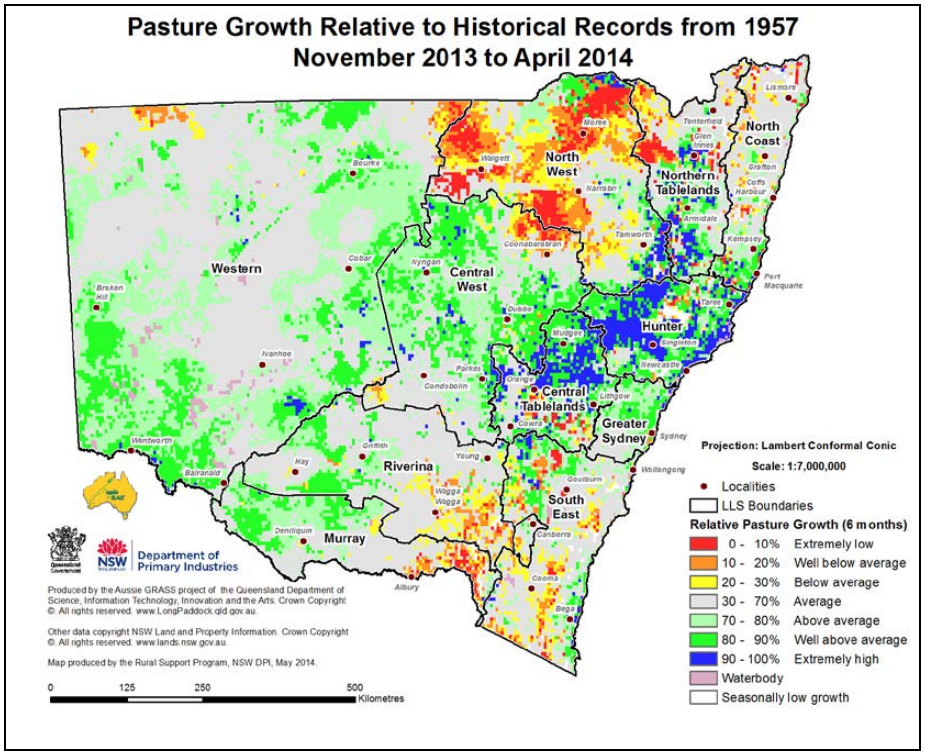


Figure 33: Relative pasture growth – yearly

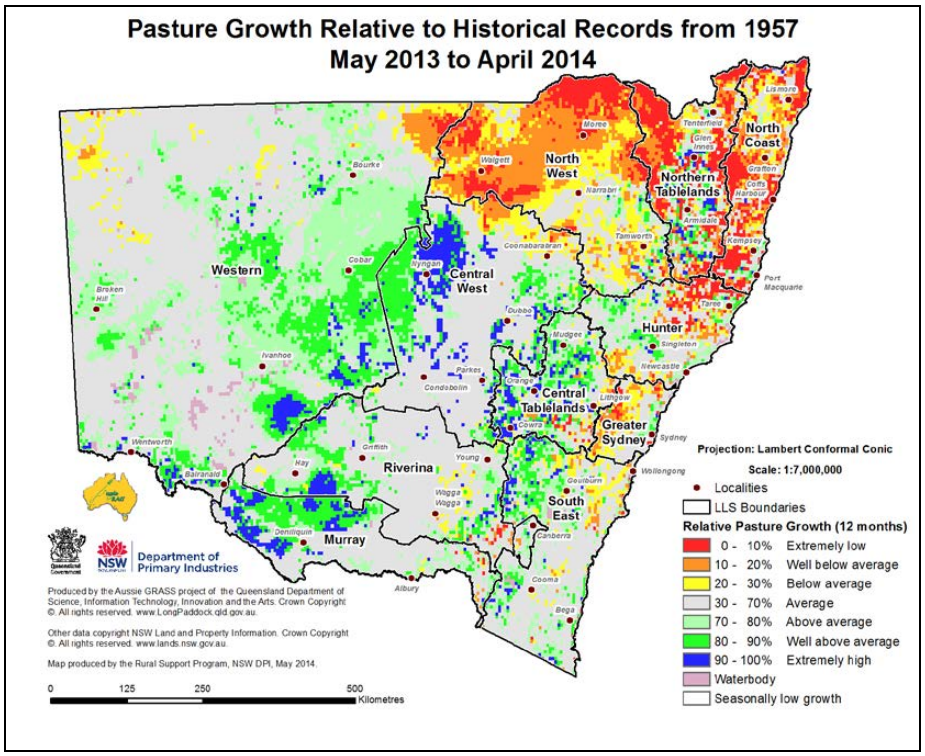


Figure 34: Relative biomass – monthly

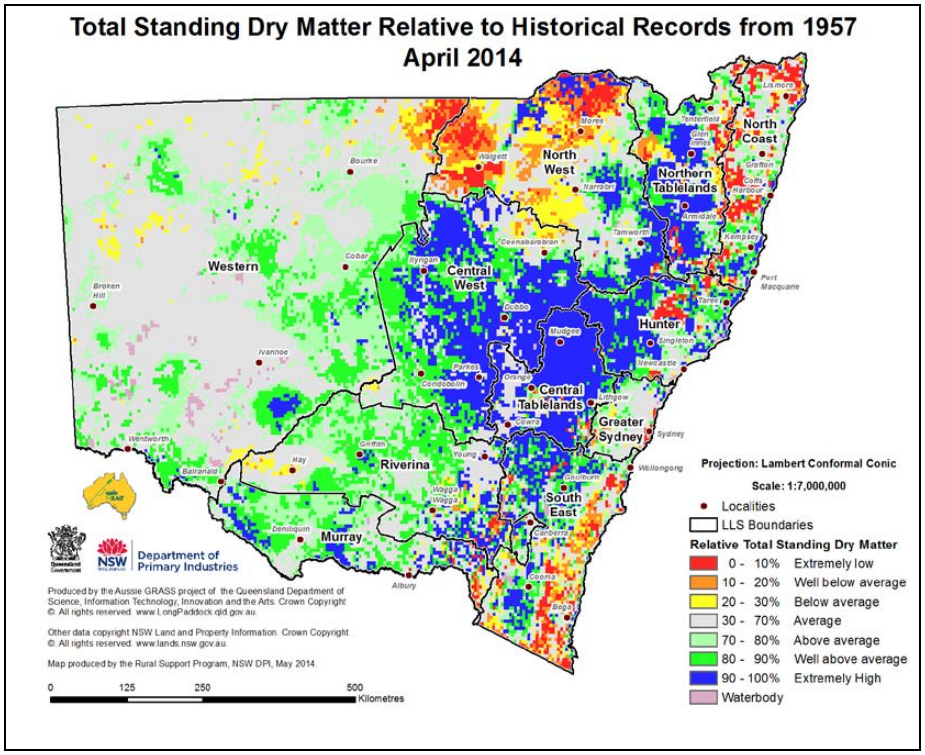
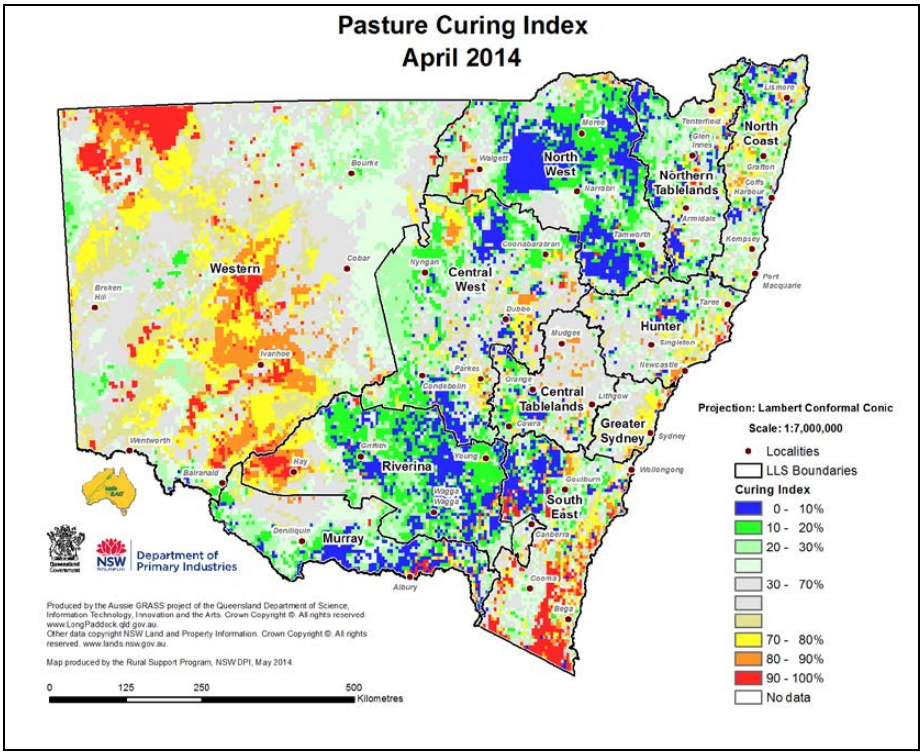


Figure 35: Pasture curing index



More information

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

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

Acknowledgments

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Warning

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