NSW Seasonal Conditions Report - November 2013

Highlights

- Near normal to slightly drier conditions are expected, with lower rainfall probabilities for northern NSW.
- Warmer daytime temperatures are likely, & also warmer overnight temperatures, particularly in the north west, east & south east.
- October was warmer than normal. The west, north west & areas of the central west generally received less than 10 mm of rainfall.
- Pasture growth declined across most of NSW. Stock water supplies are low areas of the west, central west, north west & tablelands.
- Crop yields were affected by poor rainfall in the north west & frosts in the central west & south west slopes.
- Modelled topsoil moisture continued to decline & is low across 99% of NSW. Subsoil moisture also declined.
- Stock condition & pasture production will depend upon follow up rainfall over the coming months. Considerable resources are available to assist in management at http://www.dpi.nsw.gov.au/agriculture/emergency/drought/managing

1. Summary

Over November to January lower than normal rainfall is likely in the north, with near normal rainfall over southern and south eastern NSW. November is likely to be drier than normal, but December is likely to have near normal rainfall. Warmer than normal daytime and overnight temperatures are likely over the November to January period, particularly across the north and areas of the coast. November is likely to be warmer than normal, as are December overnight temperatures.

Over October, 94% of NSW received below average rainfall, with most areas receiving 40% or less of average. Daytime temperatures were the tenth warmest on record.

Areas of the north west, central west, tablelands, Riverina, Hunter Valley and coast received extremely low October rainfall relative to historical records. Limited sections of the coast, northern tablelands and alpine areas received average relative rainfall (6% of NSW). Rainfall across much of the west, north west, central west and western Riverina was less than 10 mm, with many areas receiving less than 5 mm. The east of NSW had higher rainfall of 25-50 mm, with limited areas receiving 50-100 mm or more.

In relative terms, quarterly rainfall was below average across 89% of NSW, and was extremely low across an area extending across the southern tablelands, central coast, Hunter valley, mid-north coast, north coast and the northern tablelands and the north west, and also across large areas of the far west. Quarterly relative rainfall was average or above over 11% of NSW.

Relative rainfall for the last six months was below average across the north west, Hunter and parts of the northern and central tablelands, north coast and far north west but average or above over 61% of NSW.

Modelled topsoil moisture continued to decline due to low rainfall and high temperatures, and was low over 99% of NSW in October. Modelled subsoil moisture also declined slightly during the month, with an additional 8% of NSW in the low category. Higher than normal rainfall is needed to replenish depleted profiles.

Modelled pasture growth for October was limited across most of NSW, apart from areas over the south west slopes, tablelands and south east. Relative to historical records, it was well below average across most of NSW. Biomass levels declined over the month, and were low across the north and north east and across coastal areas. Biomass levels were average to good in some areas in the south. Biomass levels and poor rainfall have resulted in reduced runoff in some areas. Due to this and high evaporation, stock water supplies are low in areas of the west, north west, central west and tablelands.

Quarterly relative pasture growth was low over much of the north west, far west, Hunter valley, central coast, central and northern tablelands and north coast.

Heavy frosts in mid-late October caused severe crop damage across areas of the central west and south west slopes. Crops in areas of the north west and the northern areas of the central west failed due to insufficient rainfall.

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 6th November 2013.

2. Seasonal outlook

Seasonal outlook and ENSO information are sourced from the Australian Bureau of Meteorology (BoM) and international sources. The BoM's official forecasts are based on modelled output from the Predictive Climate 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 forecasts 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 from late October to early November and were up to date as at 6th November 2013. Some minor updates to the Southern Annular Mode and IRI ENSO outlook were included on the 11th November.

2.1 Seasonal rainfall outlook

- For the three month period from November to January, near normal rainfall conditions are likely over the south and south east of the State. There is a slightly reduced (40-45%) chance of exceeding median rainfall moving northward, and lower than normal rainfall is likely across the northern quarter of the State. Here the probability of exceeding median rainfall is at 35-40% (Figure 1).
- This means that for every ten years with similar climate patterns to those at present, in northern NSW three to four November to January periods would be expected to be wetter than average, and six to seven drier than average.
- The outlook confidence (skill) for this forecast is moderate across most NSW, (ranging from 55-65%), but moderate to high in the south (ranging from 65-75%). The skill is low (50-55%) for the far west and south west, and for the central tablelands (Figure 4).

2.2 Seasonal temperature outlook

- Over the three month period from November to January, warmer than normal daytime temperatures are likely, with the probability of exceeding the long term median maximum temperature across NSW being more than 60%. There is a 60-65% probability across most of southern and central NSW, and a 70-75% probability in the far north west, far north east and from the central to north coast of NSW. The probability is greater along the mid north coast (Figure 2).
- The outlook confidence (skill) for this forecast is moderate across most of NSW (Figure 4).
- This means that for every ten years with similar climate patterns to those at present, about six to seven November to January periods would be expected to have warmer than average daytime temperatures and three to four cooler than average.
- Warmer than normal overnight temperatures over November to January are likely across NSW, particularly in the south east and north west. The probability of November to January minimum temperatures being higher than the long term median is 65-75% across most of NSW, 75-80% over the north west and south to mid north coast and hinterland, and 60-65% across the far south west (Figure 3).
- The confidence (skill) for the minimum temperature outlook is moderate to high across central NSW, low to moderate across the far west and most of the coast, and low in the south west and across the mid-north coast (Figure 4).

2.3 Monthly rainfall and temperature outlook (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.

- The experimental rainfall outlook for November (Figure 5) suggests drier than normal conditions, with a 0-30% probability of above median rainfall across most of the State, with the exception of the far south west and south east. The outlook has a moderate confidence (skill) over most of the State, but is low in the north east.

- The experimental maximum temperature outlook for November (Figure 5) suggests warmer than normal daytime conditions, with a 60-70% probability of above median maximum temperatures occurring in the southern and central areas, 70-80% in the north and far west and 80-100% probability for the central coast. The outlook confidence (skill) for this forecast is moderate.
- Overnight temperatures are also likely to be high during November, with a 70-80% probability of above median temperatures across most of the State. There is a slightly lower probability (60-70%) for the south west, and a higher probability (80-100%) on the central coast. The outlook confidence (skill) for this forecast is moderate for north western NSW, and low for the rest of the State.
- Weekly experimental outlook information suggests that drier than normal conditions will occur over much of the State during early-mid November, followed by continuing dry conditions in the north west, a slightly higher likelihood of wetter conditions on the coast and tablelands, and near normal conditions over the rest of NSW. However, skill for this forecast is low. Warmer than normal daytime temperatures are likely across the State during early-mid November. Skill levels are moderate for the forecast. Overnight temperatures for early-mid November are likely to be warmer than normal across NSW. However, skill levels are low for the minimum temperature forecasts mid-month.
- The experimental rainfall outlook for December (Figure 6) suggests near normal rainfall conditions are likely across the State. However, the outlook confidence (skill) for this forecast is low, except for the far south and south east of the State.
- The experimental maximum temperature outlook for December suggests near normal daytime temperatures across most of the State, with warmer than normal temperatures likely in the far north east (a 60-70% probability of above median temperatures). The outlook confidence (skill) is for this forecast is moderate.
- For overnight temperatures during December, the experimental outlook indicates the probability higher than normal minimum temperatures across the central and western areas of the State (a 60-70% probability of above median temperatures) and near normal temperatures along the coast. However, the outlook confidence (skill) is low for all but the north west of the State.

Other climatic models

- The Bureau of Meteorology's old statistical model indicates a likelihood of near neutral rainfall conditions across most of the State over the next three months, with a slightly increased probability of rainfall across the north west. It indicates a probability of warmer than normal overnight temperatures in the south, south west and north of the State, and a slightly increased probability of above average daytime temperatures. The statistical forecast is based on past trends in sea surface temperatures, and 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 UK Meteorology Office's global long range probability modelled output indicates a 60-80% probability of above average rainfall for most of NSW over the November to January period, with the exception of the north, north east and south east, and above average temperatures (a 60-80% probability) over NSW except for the north east. For December to February, the outlook is for near normal temperatures except for the far north west and coast, and above average rainfall except for the north west and north east of NSW. No skill assessment is available for this model output, and its output is provided for the use of international meteorological centres and not as seasonal forecasts.
- The International Research Institute (IRI) for Climate and Society's seasonal climate forecast rainfall probabilities are not available for much of the State, but indicate a likelihood of near normal conditions (30% above normal, 40% normal and 30% below normal) over November to January in the far north east and far south west. The model indicates the same likelihood in the same areas over December to February. No skill assessment is available for this model output.
- The International Research Institute (IRI) for Climate and Society's seasonal climate forecast indicates that temperatures are likely to be higher than normal across the State over the November to January period. The IRI forecast over most of NSW indicates a 45% likelihood of being in the warmest third of years, 35% the middle third and 25%

of falling into the coolest third. The south east has slightly higher probabilities, and the north east slightly lower at 40%, 35% and 25% respectively. A slightly lower range of likelihoods is given for the December to February period, with the south and south east having higher probabilities. No skill assessment is available for this model output.

2.4 El Niño-Southern Oscillation (ENSO)

- The Pacific Ocean remains in a neutral ENSO state (neither El Niño nor La Niña). Most international climate models indicate this state is likely to continue through summer. Currently (as at 7th November) the CPC/IRI consensus ENSO forecast probabilities are 86% for ENSO neutral conditions over November to January, 9% for La Niña and 5% for El Niño conditions. Over December to February, the probabilities are 82% for ENSO neutral conditions, 9% for La Niña and 9% for El Niño.
- Monthly sea surface temperatures from the Bureau of Meteorology and the US National Oceanic and Atmospheric Administration (NOAA) indicate close to average conditions over most of the central and eastern tropical Pacific. Cool anomalies are present in the far eastern Pacific south of the equator along the South American coast, with weak warm anomalies to the north. Weak to moderate warm anomalies are present in the west, and along areas of the southern and eastern coastline of Australia. Conditions are near average in the central Pacific. The most recent monthly temperature index value in the NINO3.4 region is -0.1°C, with +0.2°C for the week ending 3rd November. Most models suggest the NINO3.4 region will remain in the neutral range over spring and into summer.
- The sub surface sea temperatures in the eastern Pacific (to the 4th November) remain slightly cooler than average in the east and slightly warmer in the west. Small areas of cool anomalies near the surface remain in the east and have weakened near the surface, but remain at about 150m depth to the east of the date line. The pattern has remained generally similar over the last three months.
- The Southern Oscillation Index (SOI) fell slightly over the two weeks. The latest 30-day value to 4th November is -1.9 and the average for the last 90 days to 5th November (supplied by QDSITIA) is +1.6. Values of 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.
- The Indian Ocean Dipole (IOD) returned to the neutral range after a negative event between May and August. The latest IOD index value is +0.07°C for the week ending 3rd November, and most climate models surveyed by the Bureau of Meteorology favour a neutral IOD until the development of the monsoon. After this, the IOD has little effect on Australian climate until autumn or winter. A negative IOD 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.
- Trade wind patterns over the tropical Pacific are near average. They are slightly stronger than average across the western tropical Pacific and average over the eastern tropical Pacific. Trade winds strengthen across the tropical Pacific during La Niña events and weaken during El Niño events.
- Cloud conditions at the equator near the International Date Line have been close to average, following a period of generally below average cloudiness from April to September. Over the last 6 weeks they have fluctuated from slightly below to slightly above average. Cloudiness in this area decreases during La Niña and increases during El Niño events.

2.5 Other climatic indicators

- The experimental Southern Annular Mode (SAM) index was mostly negative throughout September and October, and is currently near neutral on the latest NOAA assessment (11th November) and is showing as neutral/weakly negative with an upward trend on the latest POAMA assessment (7th November). Predictions from POAMA and the US National Oceanic and Atmospheric Administration (NOAA) are slightly different. NOAA indicates the SAM index is likely to shift from being neutral to weakly negative in the next week, and then shift to being more strongly negative in late November. POAMA is currently forecasting the SAM index to be weakly positive for the next two weeks, then dip to being weakly negative for a short period before returning to being weakly positive.
- 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 during October was near normal across most of the coast and tablelands, and slightly lower than normal along the south coast and alpine areas. It was above normal across the north west and west of the State, and slightly higher than normal across the central areas of the State. High atmospheric pressure is linked to drier than normal conditions.

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 1900.

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.

October

- Relative to historical records, rainfall for October was ranged from below average to well below average across most of the State. (Figure 7). Some 94% of the State received below average rainfall over the month, with October being the 8th driest on record.
- Only small areas of the far south west, the northern tablelands, central and mid north coast and Monaro and alpine areas (6% of the State) received rainfall in the average range.
- The western half of the Western LLS district had generally below average relative rainfall, with the eastern half being generally well below average. The area surrounding Bourke and Brewarrina had extremely low relative rainfall.
- Most of the Central West, North West, Central Tablelands and Greater Sydney LLS districts received well below average relative rainfall, as did areas of the Riverina, Northern Tablelands, North Coast, Hunter and South East LLS districts.

August to October (3 months)

- Over the period from August to October, relative rainfall was below average across 89% of the State (Figure 8).
- Above average or better relative rainfall was confined to the alpine areas, and amounted to just 1% of the State.
- Average relative rainfall was generally restricted to the south east corner of the State, covering the southern two-thirds of the South East LLS district, the far east of the Murray LLS district, the northern edge of Riverina, the south western edge and central area of Central West, and the far south west of Western LLS districts.
- Over the period, 100% of the Central Tablelands, Greater Sydney, Hunter, North Coast, North West, and Northern Tablelands LLS districts had below average relative rainfall.
- The area of Central West, Murray, Riverina and Western LLS districts with below average relative rainfall ranged from 74-95%.
- Only 9% of the South East LLS district received above average or better rainfall over the period.

May to October (6 months)

- Over the six months to October, relative rainfall was below average or worse across most of the north and north east of NSW (Figure 9). This area extended from the north of Western LLS district, through most of North West, Northern Tablelands and Hunter LLS districts. It also extended into the north and east of Central West, most of Central Tablelands, the north of Greater Sydney and the central and southern areas of North Coast LLS districts.
- Areas of above average to well above average relative rainfall were restricted to an area between Ivanhoe, Wilcannia and Tilpa in the Western LLS district and between Nymagee, Euabalong, Tullamore, Lake

Cargelligo and Condobolin in the Western and Central West LLS districts.

- Some 88% of Northern Tablelands, 99% of North West and 100% of Hunter LLS districts had below average relative rainfall for the period, as well as 56% of North Coast, 58% of Greater Sydney and 70% of Central Tablelands LLS districts.

February to October (9 months, BoM)

- Over the 9 month period from February to October, relative rainfall across the State was below average across areas of far western and north western NSW (Figure 10), as well as areas of the northern slopes, northern, central and southern tablelands and south west and central west slopes. Most of these areas received 60-80% of their normal rainfall.
- Areas of particular deficiency occurred in the far north west between Bourke, Walgett and Collarenebri (in Western and North West LLS districts) and in the far west north of Broken Hill, with these areas receiving between 40-60% of the long term average rainfall.
- Limited areas received above average rainfall over the period, including areas on the mid north coast, parts of the alpine areas and an area between Ivanhoe and Wilcannia. The remainder of the State was near average.

November to October (12 months)

- Relative rainfall for the last 12 months was generally below average to well below average across much of the north west, central areas of the State and parts of the far west, south west, and northern tablelands (Figure 11).
- Areas of the Western, North West, Central West, Central Tablelands, Riverina and Murray LLS districts had below average relative rainfall, along with the western edges of the Northern Tablelands and the South East LLS districts.
- Over the last year, areas of extremely low relative rainfall extended in a belt from Goodooga and Brewarrina to Collarenebri, Walgett, Carinda, Wee Waa and Pilliga. Other areas occurred around Wentworth, north of Broken Hill and between White Cliffs and Tibooburra, between Young and Harden, and between Armidale and Murrurundi.
- The eastern side of Northern Tablelands LLS district and much of the North Coast LLS district had above average to well above average relative rainfall for the period. The remainder of the State was generally within the average range.

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.

October

- Rainfall during October was between 20-40% of average across most of NSW. The north west, parts of the far west, central west central coast, and parts of the central and southern tablelands received less than 20% of their average rainfall. It was the eighth-driest October on record, and the driest since 2006. The average rainfall for the State was 12.4 mm, well below the long term average of 44.4 mm. Parts of the Blue Mountains experienced record dry conditions.
- With the exception of the far south east and the alpine areas, rainfall across the State ranged from 0-50 mm, with most of the State receiving between 5-25 mm (Figure 12).
- Rainfall across much of the west, north west central west and western Riverina was restricted to falls of less than 10 mm, with much of the area receiving less than 5 mm.
- The far south east, alpine areas, parts of the northern tablelands and central to mid north coast and far north coast generally received 25-50 mm. Some heavier falls were experienced in the alpine areas and on the mid north coast. The remainder of the State received 10-25 mm.

August to October (3 months)

- Total rainfall over the three months to September ranged from 25-100 mm over most of the State. The far north west and much of the far west received 2-25 mm. The far north western corner of the State received 2-10 mm.
- Limited areas of the State received 100 mm or more, including an area in the Central Tablelands LLS district, most of the South East LLS district and the east of Murray and Riverina LLS district.
- The alpine areas received 200-400 mm, with a limited area receiving more than 400 mm (Figure 13).

May to October (6 months)

- Rainfall across the State during the April to September period ranged from 25-800 mm (Figure 14).
- The lowest rainfall over the period (25-50 mm) fell in the far north west to the north of Tibooburra.
- The area west of Walgett, and extending across most of the far north west received 50-100 mm. The remainder of the State generally received 100-300 mm.
- The eastern edge of the coastal LLS districts generally received 300-400 mm with more falling between Ballina and Tweed Heads, and between Ulladulla and Wollongong. An area of the south west slopes, southern tablelands and alpine areas received 400-1,200 mm, with the highest falls between Khancoban and Jindabyne.

4. Temperature anomalies

Temperature information is sourced from the Bureau of Meteorology.

- Maximum temperatures across the State in October averaged 2.5°C above normal, and October was the tenth warmest on record.
- Maximum temperatures were 3-6°C above normal across most of the State, with the highest temperatures across the far west and north west.
- Maximum temperatures were highest in a band running from the north west through the west of the northern tablelands and central west across to the mid north coast and through parts of the southern tablelands and south coast. In these areas, maximum temperatures were generally 4-5°C above normal. The north coast and much of the Riverina, central west and the rest of the tablelands had maximum temperatures of 2-3°C above normal. Parts of the south and far west were 1-2°C above normal (Figure 16).
- Minimum temperatures during the month averaged 0.2°C above normal. Major frosts occurred in some areas on the 4th, 15th, 18th and 25th. Major damage was caused to cereal and oilseed crops, with some estimates of damage of over 50%.
- Overnight temperatures in the far north east were 1-2°C above normal, but across most of the State were at least 0-1°C below normal. The Murray, Riverina, Central Tablelands, Greater Sydney and parts of the Central West, South East and Hunter LLS districts had overnight temperatures down to 1-3°C below normal (Figure 17).

5. Relative soil moisture

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

5.1 Topsoil

- Modelled topsoil moisture continued to decline across most of the State in October, as a result of the lower than normal rainfall and higher than average temperatures (Figure 17). Approximately 99% of the State now had low modelled topsoil moisture in October, up from 95% in September. On a percentile rank basis, about 95% of the State ranked as having below average to extremely low relative soil moisture.
- Levels were particularly low across the Western, North West, Central West, Hunter and Greater Sydney LLS districts, and across the south of the Northern Tablelands and North Coast LLS districts, and the west of the Riverina and Murray LLS districts. In these areas, modelled topsoil moisture was generally less than 10 mm.
- Levels in the South East and over the far east of the Murray and Riverina LLS districts, which were moderate in September, declined back to low during October, except in the alpine areas. Over most of these areas, topsoil moisture ranged from 10-40 mm.

5.2 Subsoil

- Modelled subsoil moisture levels also declined during October. The areas of lowest subsoil moisture were in the north west of the State. Some 44% of NSW had low subsoil moisture over October.
- Levels across most of the cropping areas remained generally moderate, apart from the western half of North West, the north of Central West and the west of the Riverina and the western and central areas of the Murray LLS districts (Figure 18). However, the area of each LLS in the low category continued to rise, with the increase ranging from 6-13%. Modelled subsoil moisture also declined in the west of the Hunter LLS district.
- Average modelled subsoil moisture for the month was less than 200 mm across most of the State, with some areas having less than 100 mm. The exceptions were the alpine and coastal areas.

- Another 8% of the State moved into the low from the moderate category during October. Only 3% of the State remained in the high subsoil moisture category.
- The greatest declines in modelled subsoil moisture occurred over the North Coast, Greater Sydney and Hunter LLS districts, although most of the declines were from the high to the moderate category. The declines ranged from 16-36% of the area of the LLS districts.
- Smaller declines in subsoil moisture occurred in the Central West, Central Tablelands, Northern Tablelands, South East, North West, Riverina, Western and Murray LLS districts. Declines were limited to 7-13% of the area of the LLS districts.
- The North West LLS district has the lowest overall relative subsoil moisture, with 76% of its area in the low category. This is followed by 61% of the Central West, 57% of Murray, 48% of the Western and 45% of the Riverina LLS districts.
- Subsoil moisture levels remain moderate along a narrow coastal strip from Bega to Tweed Heads.

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

- Declines in modelled pasture growth occurred across much of the Western, North West, Central West, North Coast and Greater Sydney LLS districts over the month (Figure 20).
- Declines also occurred along the west and north of the Hunter LLS district, the north of the Central Tablelands, the west and north of Hunter, and the west of the Riverina and Murray LLS districts
- In these areas, modelled pasture growth decreased to less than 50 kg/ha dry matter (DM) in October. In many cases, modelled growth declined to less than 10 kg/ha DM in these areas.
- The best areas of modelled pasture growth remained the east of the Murray and Riverina LLS districts, as well as the southern half of Central West the central areas of the Northern Tablelands, and the north west and west of the South East LLS district. Modelled growth in these areas ranged from 100-500 kg/ha DM, with some southern areas achieving more than 1,000 kg/ha DM.

6.2 Modelled biomass

- Modelled total standing dry matter (biomass) levels declined from September across the far west and north east of the Western LLS district, the North West and Hunter LLS districts.
- Levels also declined across the Hunter and North Coast LLS districts, and the north of the Central Tablelands LLS district (Figure 21). In these areas, modelled biomass was generally less than 500 kg/ha dry matter (DM).
- Lesser declines occurred over most other LLS districts.
- Modelled biomass levels remained moderate across the west of the Central West LLS district, and moderate to high across the Riverina and Murray LLS districts and the south east and central areas of the Western LLS district. In these areas, modelled biomass generally ranged from 500-2,000 kg/ha DM, with some areas on the south west slopes exceeding 3,000 kg/ha DM.

6.3 Relative pasture growth

Relative pasture growth and biomass area calculated by comparing and ranking the current modelled growth and biomass against that for the same period over every year since 1957. 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.

October

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.

- Relative pasture growth during October was poor across most of the State (Figure 22).
- Some 66% of the State was below average in relative growth for the month, 12% average and just 4% above average. Areas of missing data accounted for the remainder.
- The worst areas of relative pasture growth extended from the north of the Riverina, south east of the Western and the north of the South East LLS districts through central

and eastern NSW to the Queensland border. Poor relative growth also occurred in areas of southern NSW and along the south coast.

- Modelled growth across the far south of NSW was generally below average to average.
- Patches of above average growth occurred in the west of the Central Tablelands, the east of Riverina and Murray and the west of South East LLS districts.
- Missing data covered large areas of the Western LLS district (about 36% of its area).

August to October (3 months)

- Over the three months to September, relative pasture growth was below average or worse across most of north west, north east, the far west and parts of the central west and central tablelands (Figure 23). Some 51% of the State had below average relative growth for the period.
- Most of these areas had relative growth that ranged from well below average to extremely low for the period.
- In the Western LLS district, some 42% of the district had below average relative growth for the period. This area extended from Pooncarie and Wilcannia to the north and west, and across to White Cliffs, Wanaaring, Bourke, Brewarrina and further north.
- Much of North West (89%), Hunter (93%), Northern Tablelands (91%), North Coast (79%) and Greater Sydney (94%) LLS districts had well below average to extremely low relative growth. The northern half of Central Tablelands and the north and north east of Central West LLS districts also had well below average or extremely low growth.
- The eastern areas of the Western LLS district, the west of Central West and much of the Riverina, Murray and South East LLS districts had average or better relative growth over the three months to October.

May to October (6 months)

- In the period from May to October, relative pasture growth was average or better over all but areas of the north west, far north east, northern tablelands, Hunter and central coast (Figure 23).
- Areas of below average relative growth over the period extended from Goodooga in Western LLS district thought to the western half of the North West LLS district. Most of the Northern Tablelands (73%), Greater Sydney (76%) and Hunter (91%) LLS districts had below average relative growth, as did the southern half of North Coast, the east of Central Tablelands and the north of the Central West LLS districts.
- Areas of Western LLS district between Broken Hill, Wilcannia, Tilpa, Ivanhoe and Booligal had above average relative growth over the period, amounting to some 25% of the total area of the district. Areas west of Warren, Tottenham and Tullibigeal the Central West LLS district (19% of the district) also had above average relative growth.
- The major areas of above average growth for the period were the eastern and central areas of the Riverina and Murray LLS districts, and the south west of the South East LLS districts (covering parts of the Monaro and alpine areas).
- The remainder of the State (55%), including much of the far west and the central and southern areas had average relative pasture growth over the six monthly period.

November to October (12 months)

- Relative pasture growth across the State over the last 12 months was below average to extremely low across the north west and areas of the mid north coast (Figure 25).
- The Western LLS district had generally average relative growth, with the exception of the far north east and areas of the far north west and south west.
- An area of below average to extremely low relative growth in the north west extended from Wanaaring, Louth, Cobar, Enngonia, Goodooga, Bourke and Brewarrina in Western LLS district to Walgett, Pilliga, Narrabri, Bellata, Moree, Warialda and Boggabilla in North West LLS district, and south to Coonamble and Coonabarabran in the Central West LLS district.
- Another major area of below average relative growth extended along the central and mid-north coast from Gosford to Kempsey and west to Maitland, Dungog and Gloucester in the Hunter LLS district.
- Relative growth across most of the tablelands, the remainder of central and southern NSW and the remainder of the coast was generally average, with pockets of above and below average growth.
- Relative growth across the eastern edge of the south west slopes and in west of the South East LLS district was generally above average or better, but was also very variable.

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 declined across NSW between September and October, with an overall increase of 19% of the area of the State with below average growth. For the time of year, modelled relative biomass levels across much of the central, southern and most of far western NSW were average (Figure 26).
- Better areas of relative biomass (above average or higher) occurred in areas of the Western LLS district, in areas of the Riverina and Murray LLS districts (primarily in the east), and the western and alpine areas of the South East LLS district.
- Areas of below average or worse relative biomass occurred between Wanaaring, Louth, Bourke, Brewarrina, and Goodooga in the Western LLS district. These areas also extended across most of the North West, Northern Tablelands, Hunter and Greater Sydney LLS districts. Other areas occurred in the southern and central areas of the North Coast LLS district, in the north and east of the Central West and Central Tablelands LLS districts.

6.5 Pasture curing

- The curing index indicated a high degree of pasture curing across most of Western, North West, and the Central West, Hunter, North Coast and Greater Sydney LLS districts (Figure 27).
- Other areas of high curing were in the south of the Murray, the west of the Riverina, the far east and far west of the Northern Tablelands, the north and east of Central Tablelands and the coastal areas of the South East LLS districts.
- Curing was variable across the Northern Tablelands, Murray and the western and central areas of the Riverina LLS district. Curing over most of the Northern Tablelands, the Central Tablelands and the west of the South East LLS districts was low to average, as was curing in the east of the Murray and Riverina 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 5st November 2013.

- Levels in water storages remain generally moderate, with the average effective capacity being 75%, a 5% decrease from last month.
- Changes in storage levels were generally small, with the exception of the Hume (-10%) and Keepit (-12%) Dams and Lake Wetherell (-18%). Minor decreases occurred across most of the other storages.

Table 1: Capacity of storages

Storage	Current Volume (GL)	Effective Capacity (%)	Monthly Change (%)
Toonumbar	-	-	-
Glenbawn	726	97	-2
Glennies	264	93	-
Lostock	18	87	-
Brogo	9	100	-
Cochrane	-	-	-
Dartmouth	3814	99	0
Hume	2661	88	-10
Blowering	1456	89	-2
Burrinjuck	672	65	-2
Brewster	-	-	-
Carcoar	23	62	-
Cargelligo	-	-	-
Wyangala	812	67	-4
Glenlyon	230	-	-
Pindari	196	63	0
Copeton	-	-	-
Chaffey	45	71	-7
Keepit	120	27	-12
Split Rock	342	86	-
Burrendong	493	40	-
Oberon	37	81	-3
Windamere	202	55	-
Lake Cawndilla	316	42	-7
Lake Menindee	190	23	-8
Lake Pamamaroo	346	126	-2
Menindee	-	-	-
Total Menindee	-	-	-
Wetherell	201	104	-18
Total	**13434**		
Average		**75**	

8.2 Irrigation allocations

Allocations are given as at 5th November 2013.

- High security and general security allocations remained the same as last month.
- Irrigators in the Murrumbidgee River Valley will be able to access an additional 5% of their entitlement after February 2014.

Table 2: 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*	43%	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	40%	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 1: Quarterly rainfall outlook

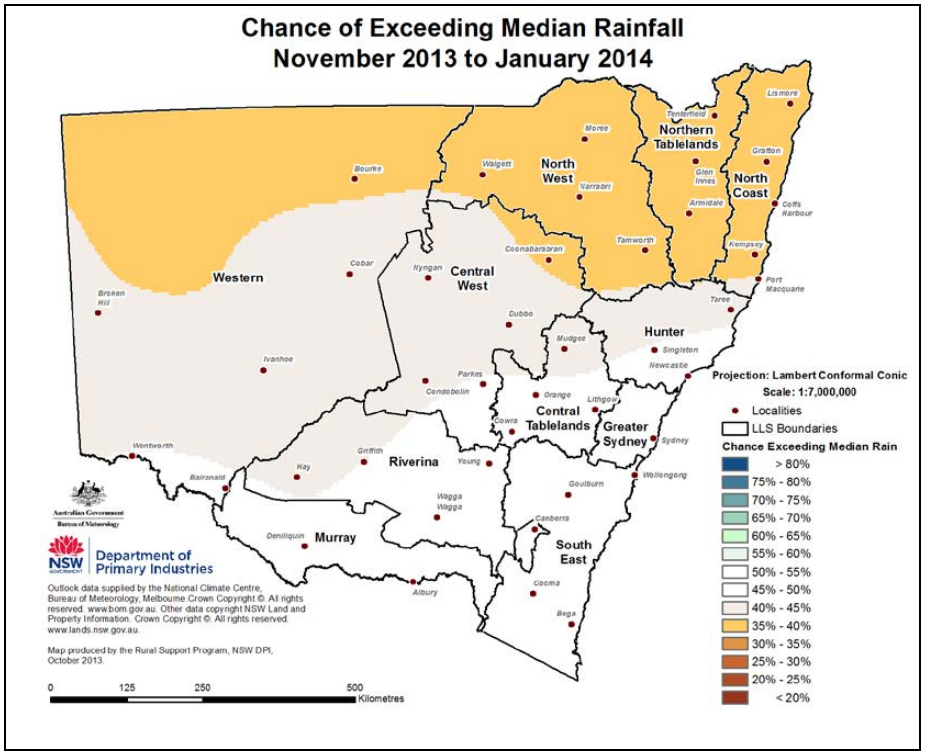


Figure 2: Quarterly maximum temperature outlook

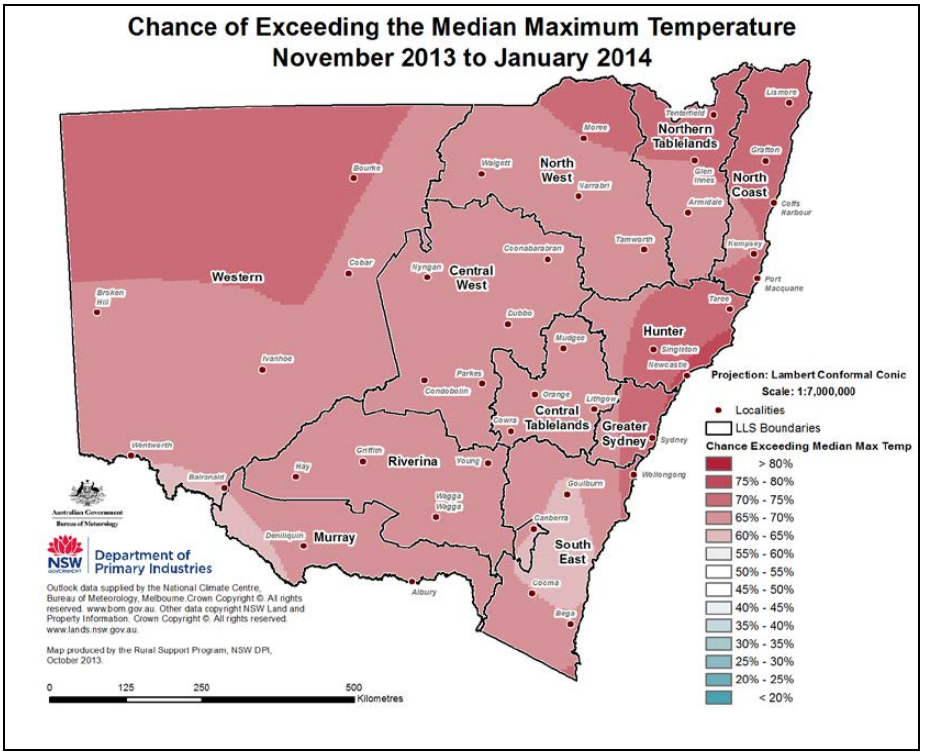


Figure 3: Quarterly minimum temperature outlook

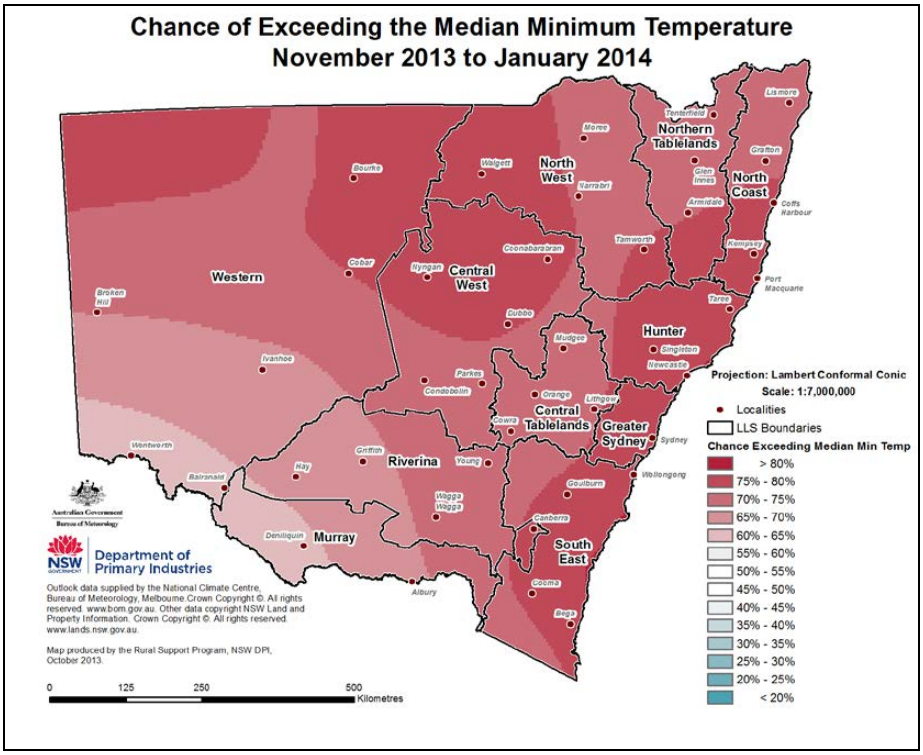
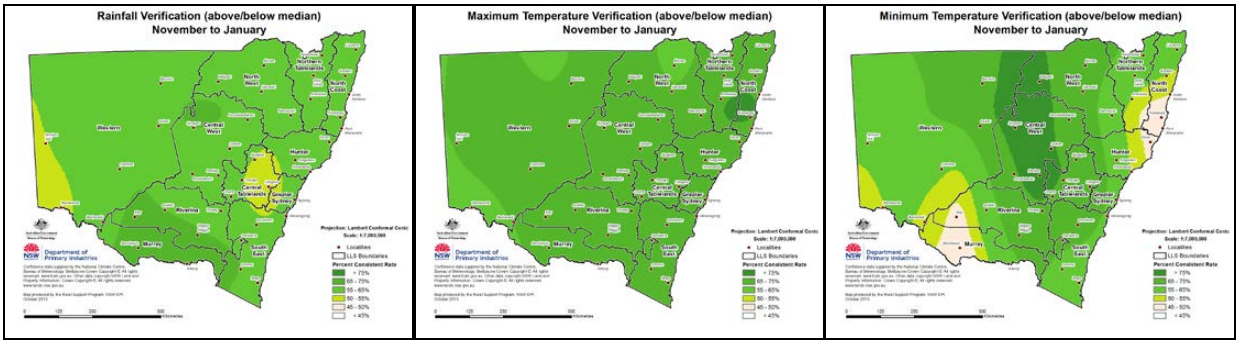


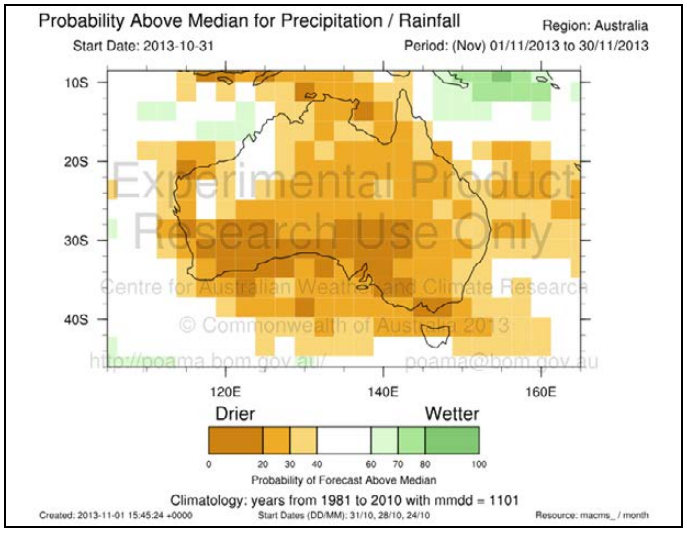
Figure 4: Outlook skill maps

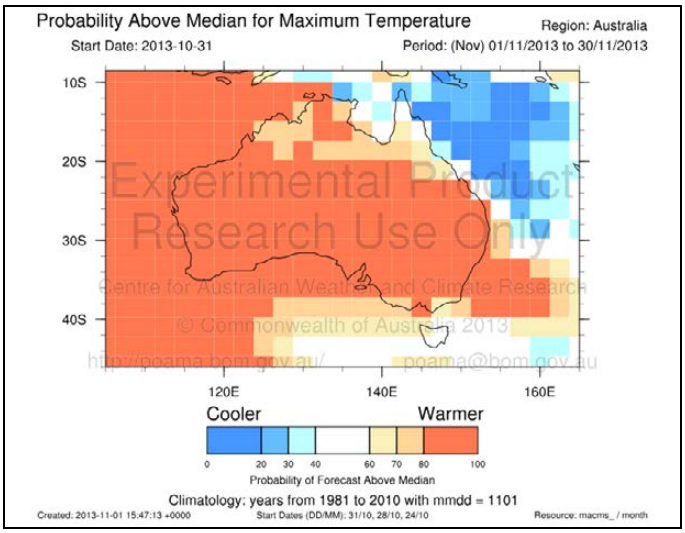


Monthly rainfall & temperature outlook

(Bureau of Meteorology, POAMA - experimental)

Figure 5: Experimental November rainfall and temperature outlooks





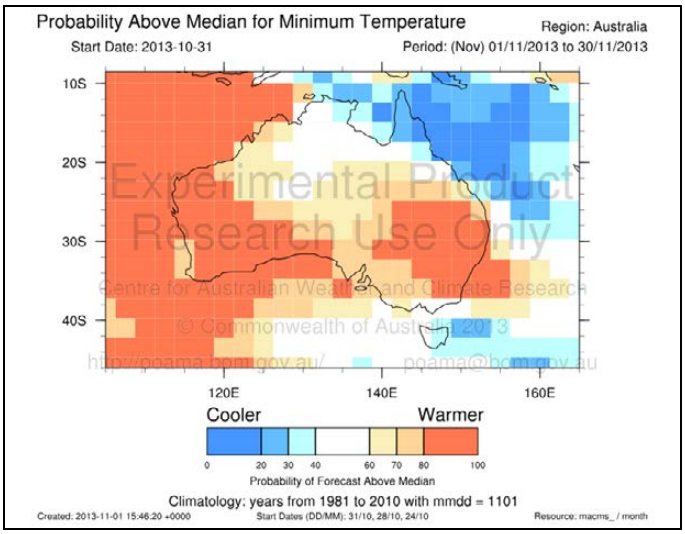
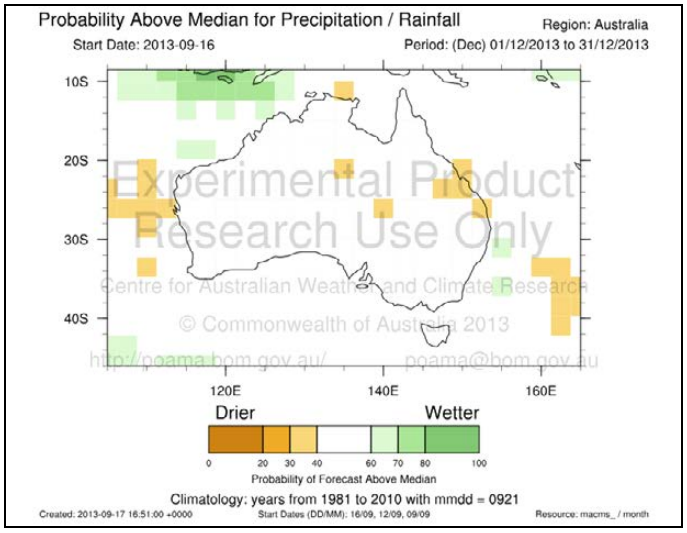
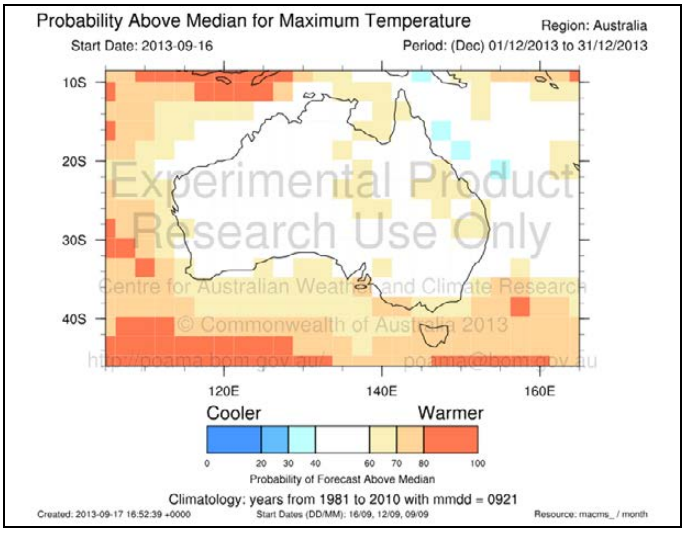
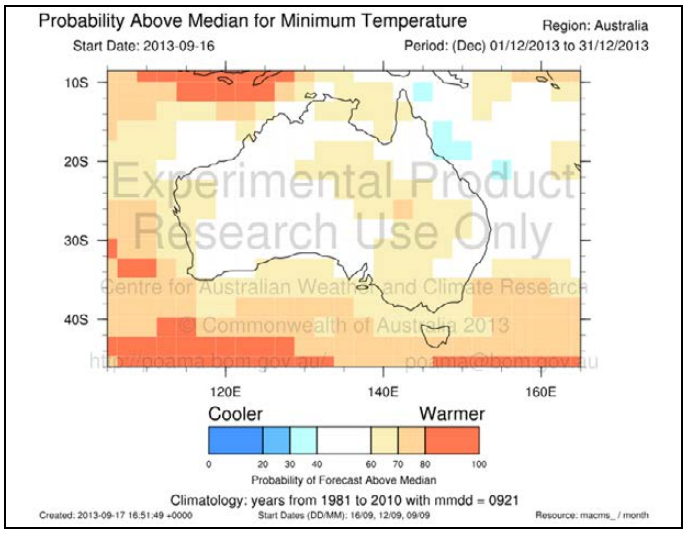


Figure 6: Experimental December rainfall and temperature outlooks







Rainfall

Figure 7: Relative rainfall – monthly

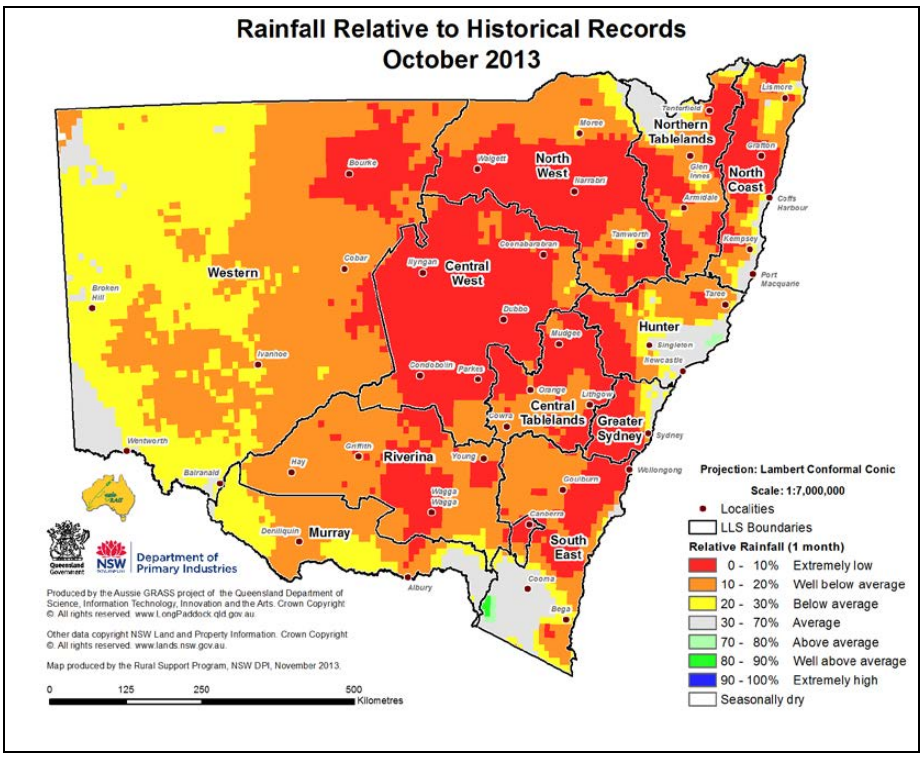


Figure 8: Relative rainfall – quarterly

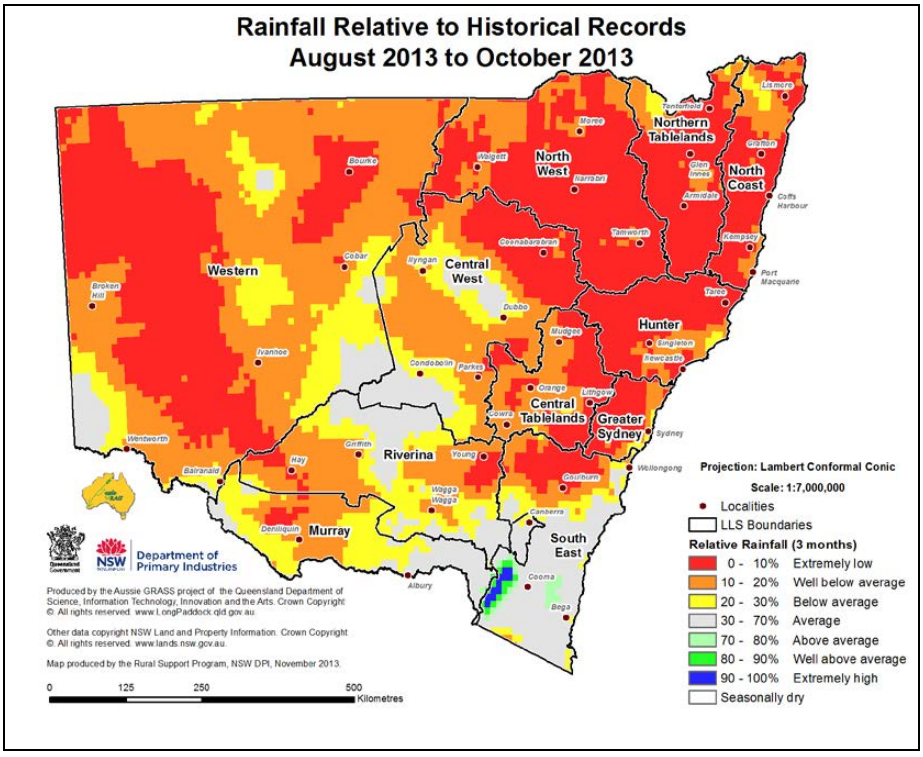


Figure 9: Relative rainfall – half yearly

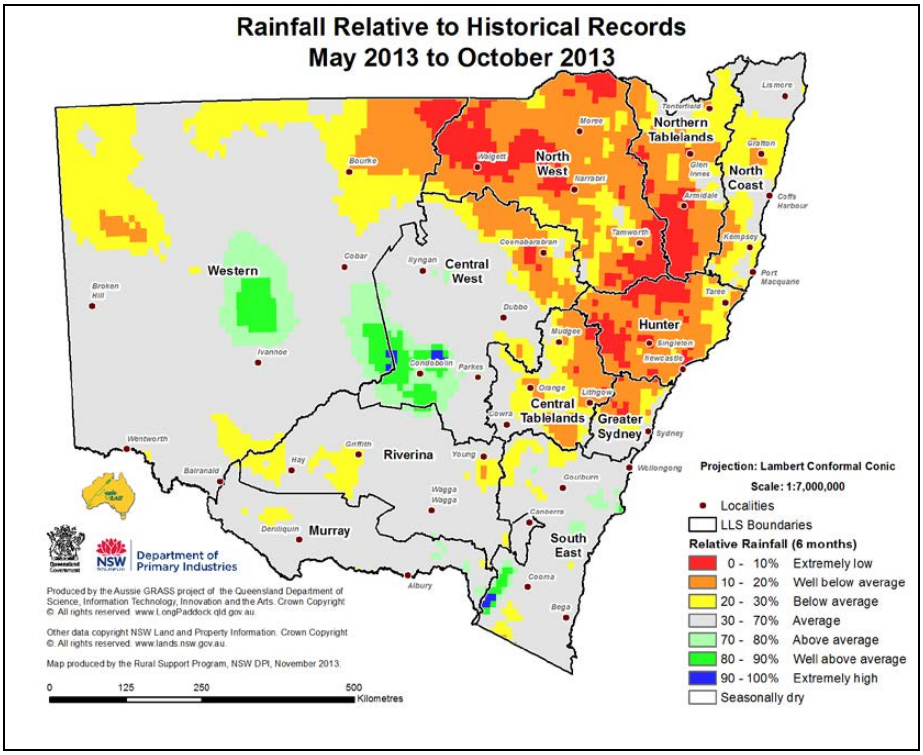


Figure 10: Relative rainfall – nine monthly

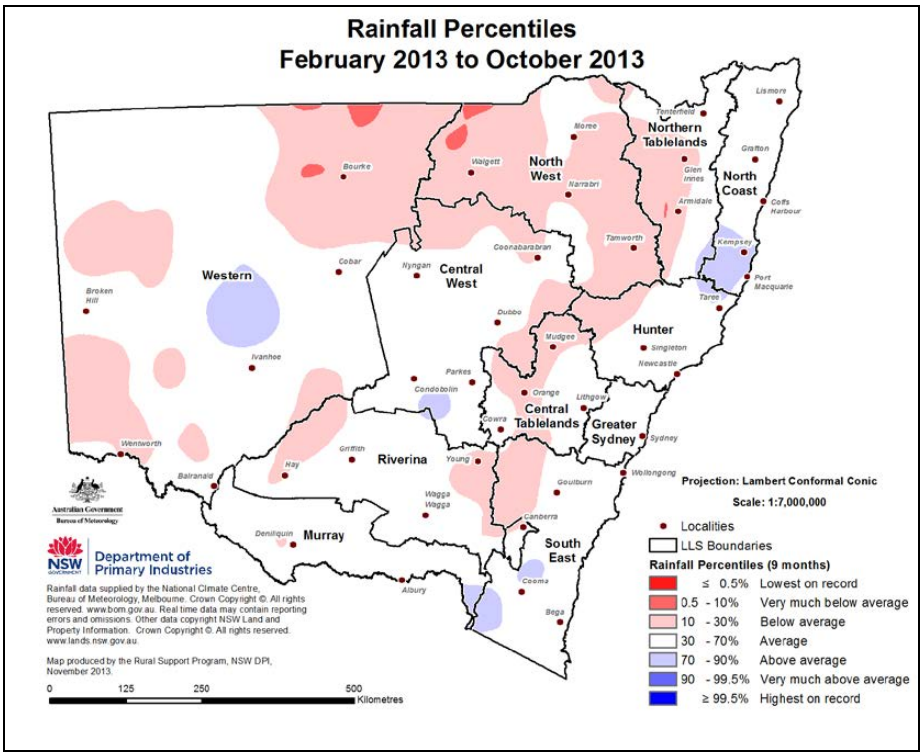


Figure 11: Relative rainfall – yearly

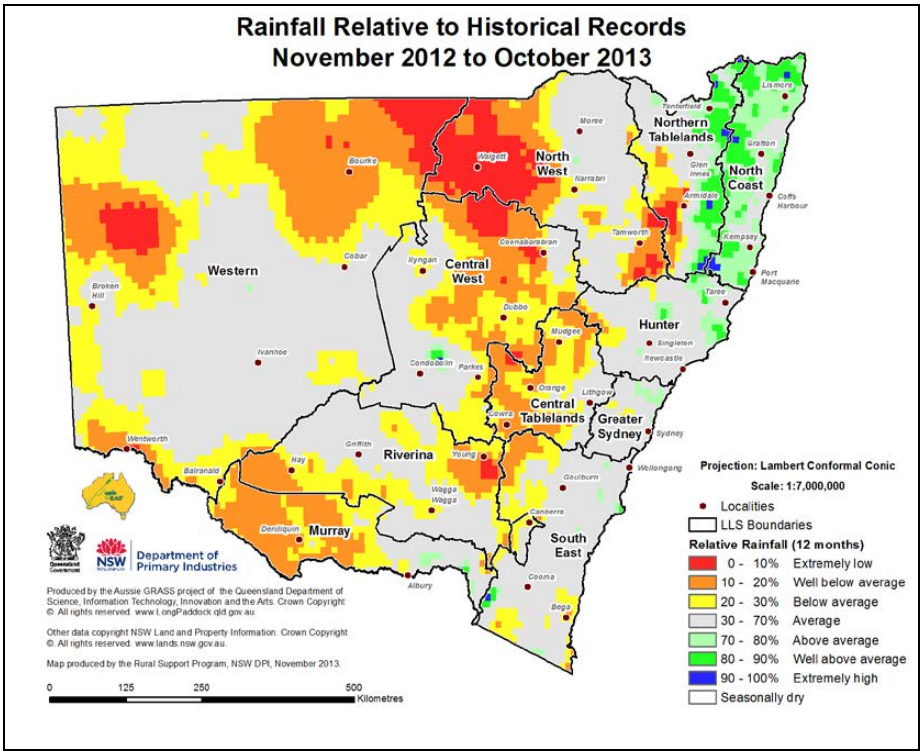


Figure 12: Total rainfall – monthly

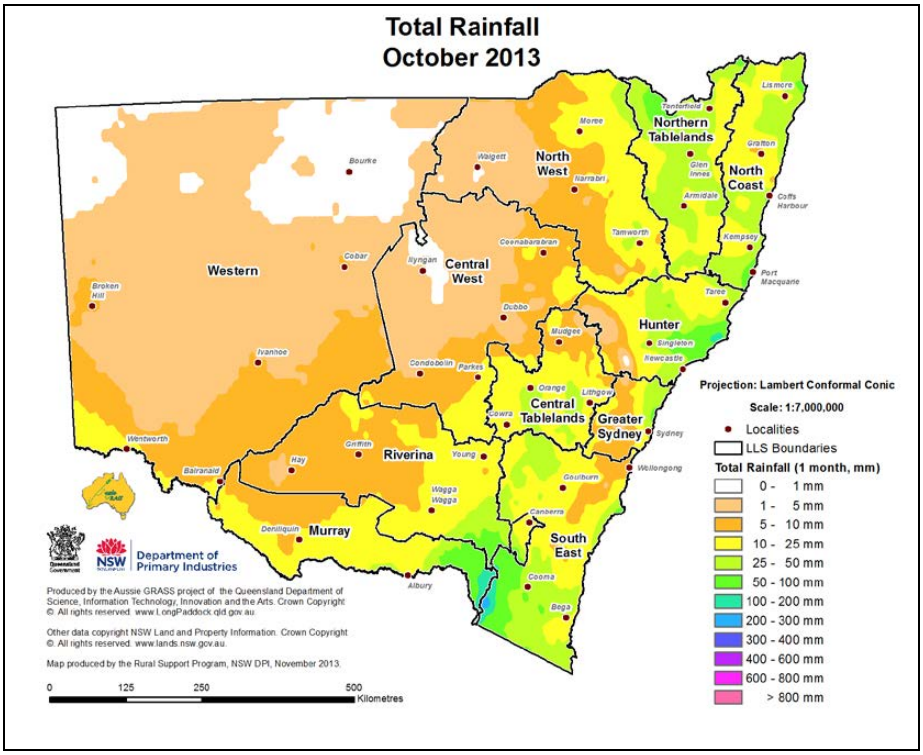


Figure 13: Total rainfall – quarterly

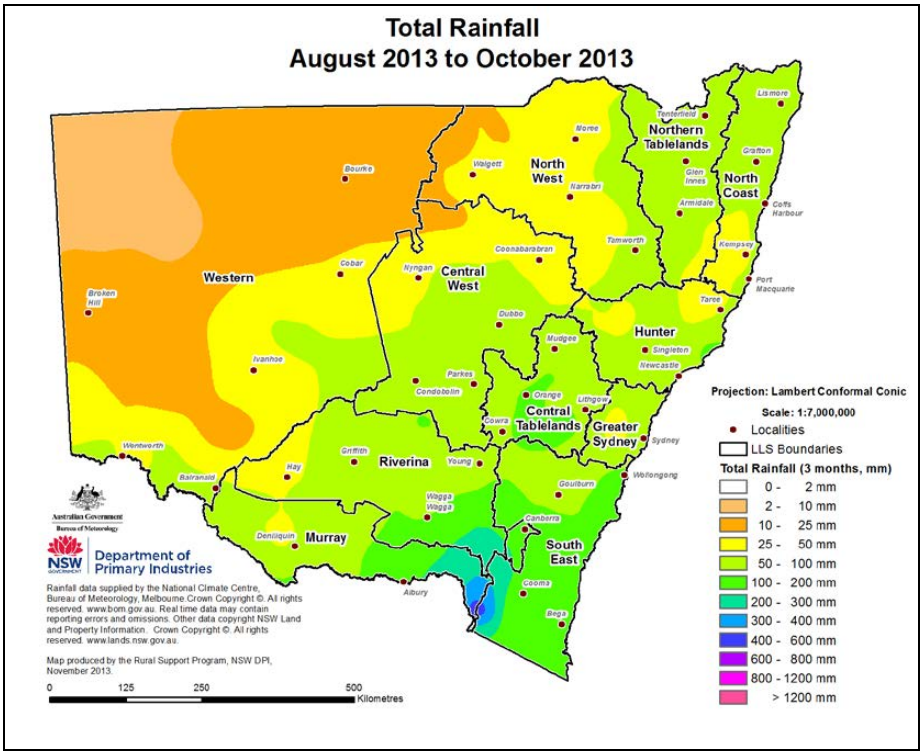


Figure 14: Total rainfall – half yearly

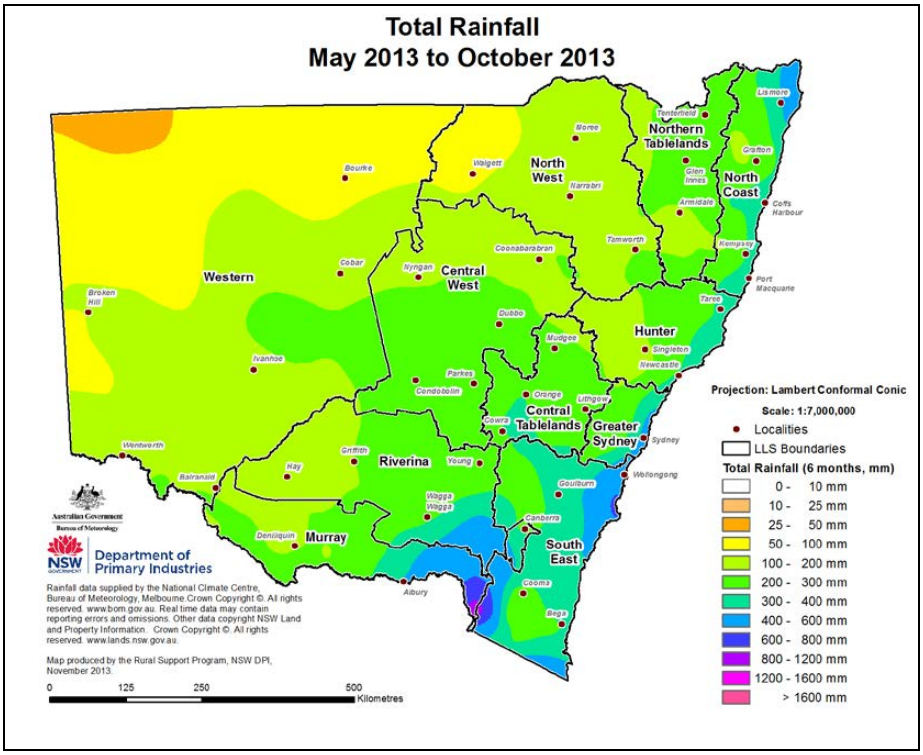
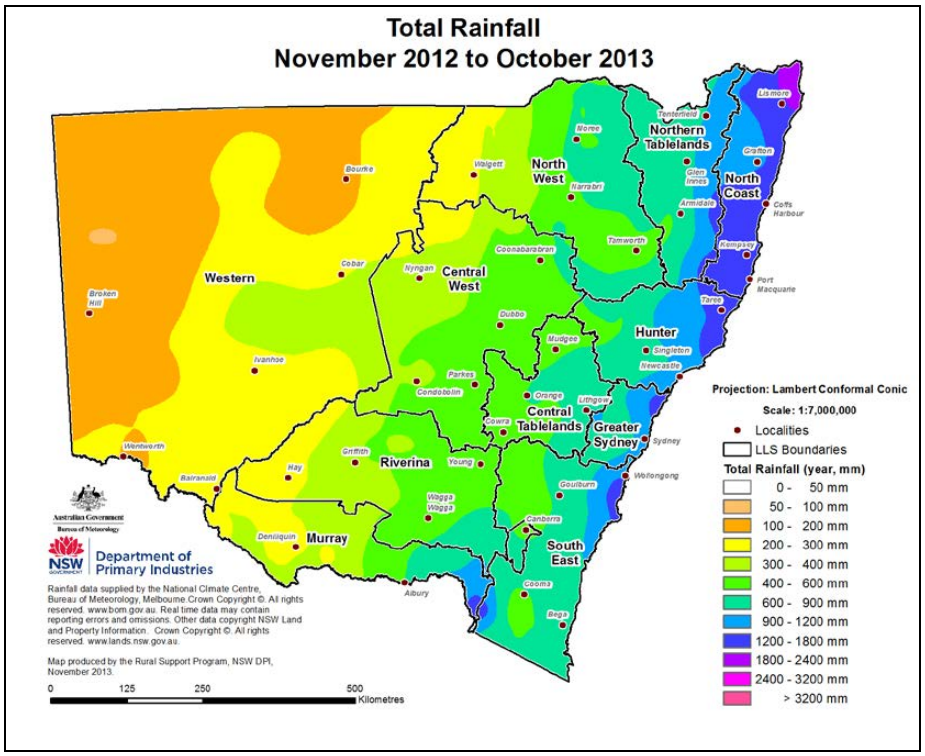


Figure 15: Total rainfall – yearly



Temperature

Figure 16: Maximum monthly temperature anomaly

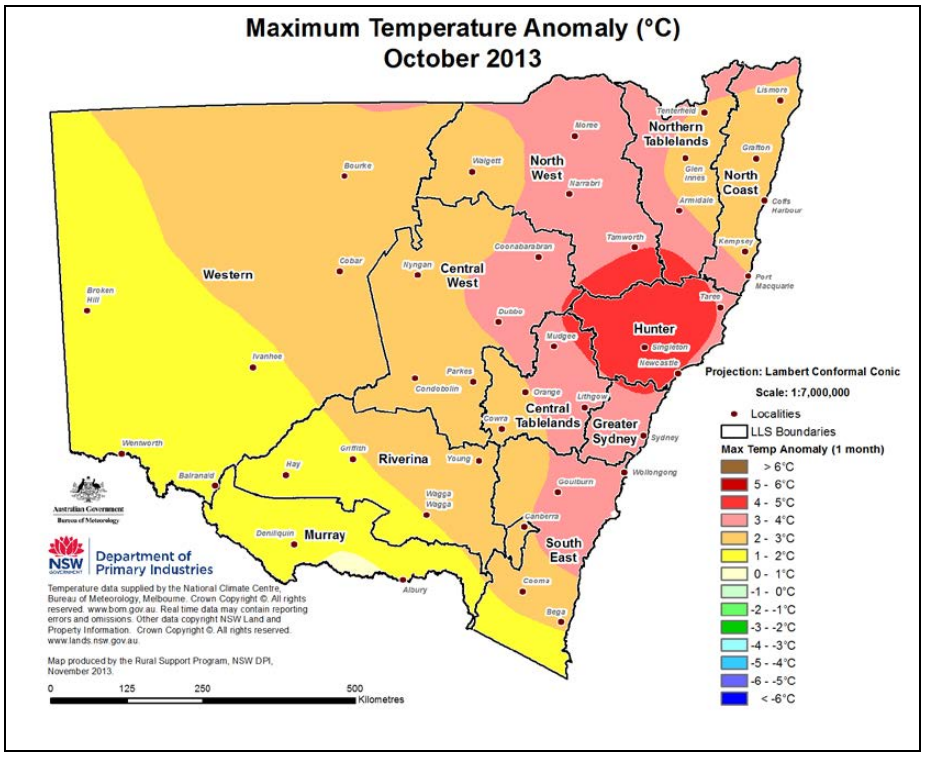
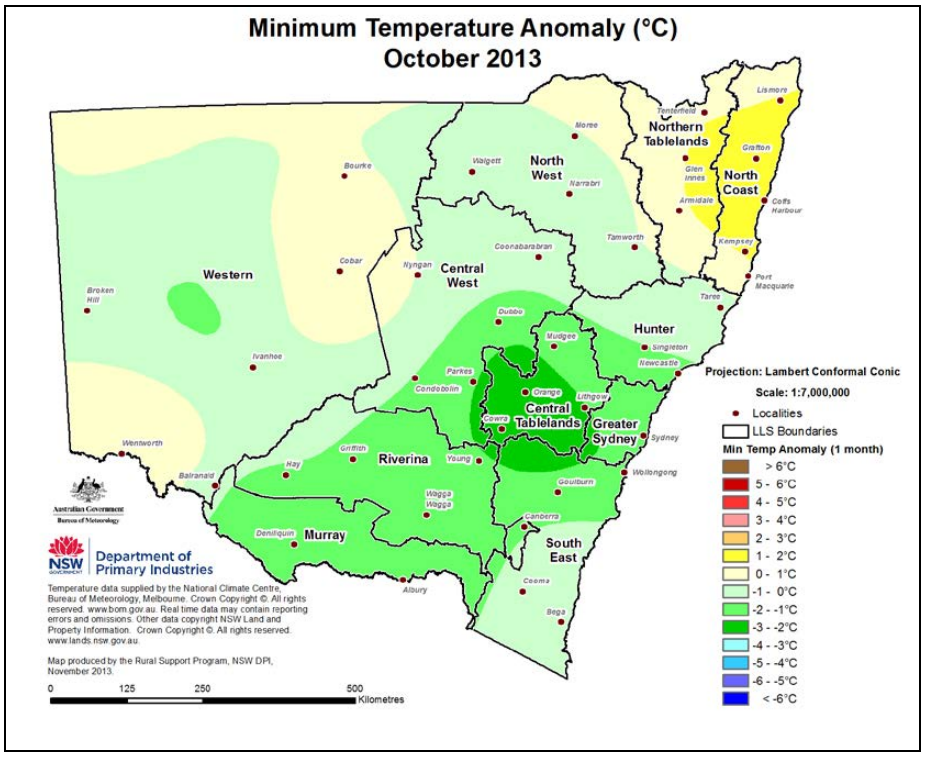


Figure 17: Minimum monthly temperature anomaly



Soil moisture

Figure 18: Relative topsoil moisture

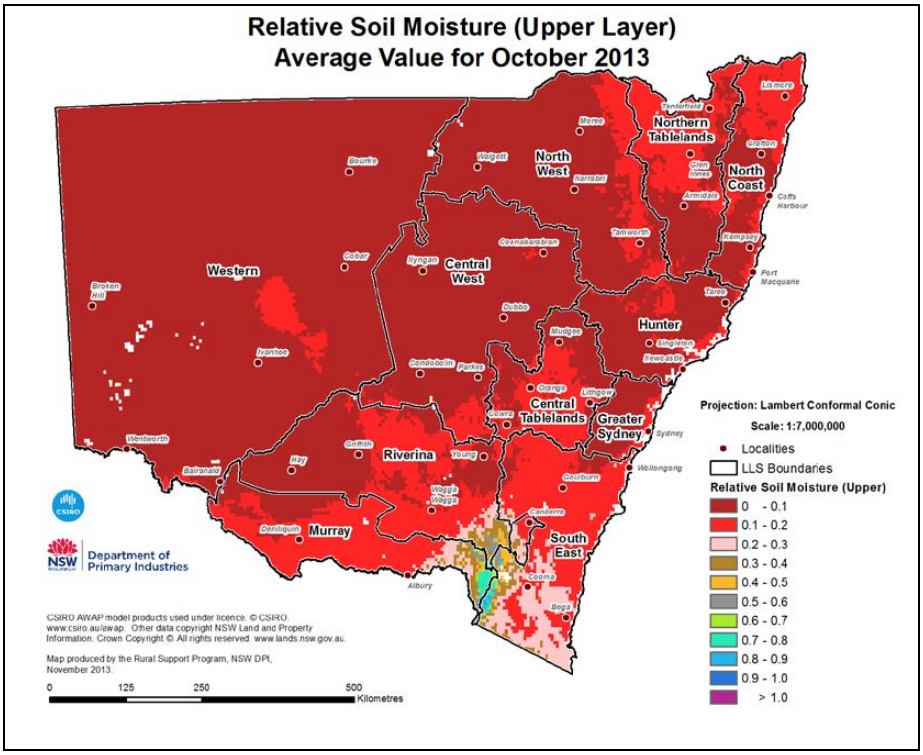
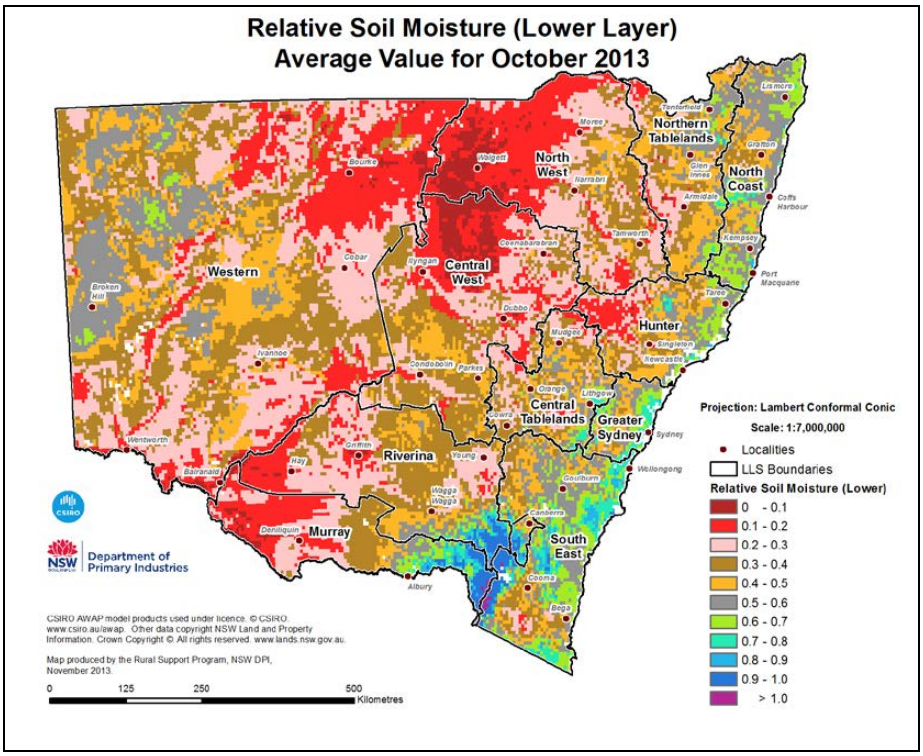


Figure 19: Relative subsoil moisture



Pasture growth and biomass

Figure 20: Modelled pasture growth

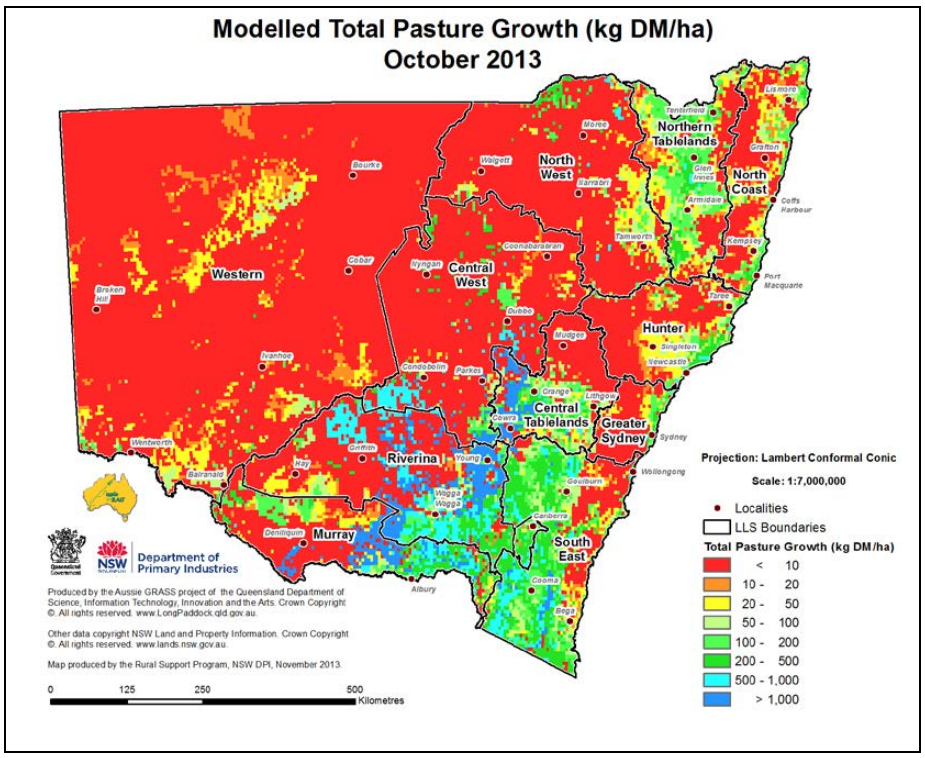


Figure 21: Modelled biomass

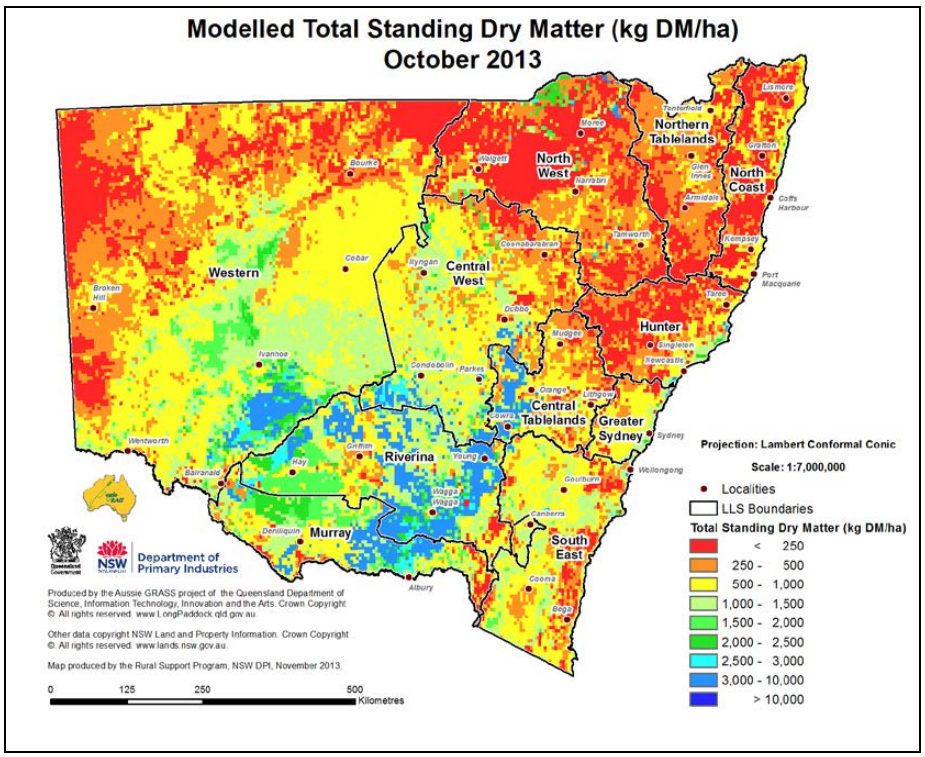


Figure 22: Relative pasture growth – monthly

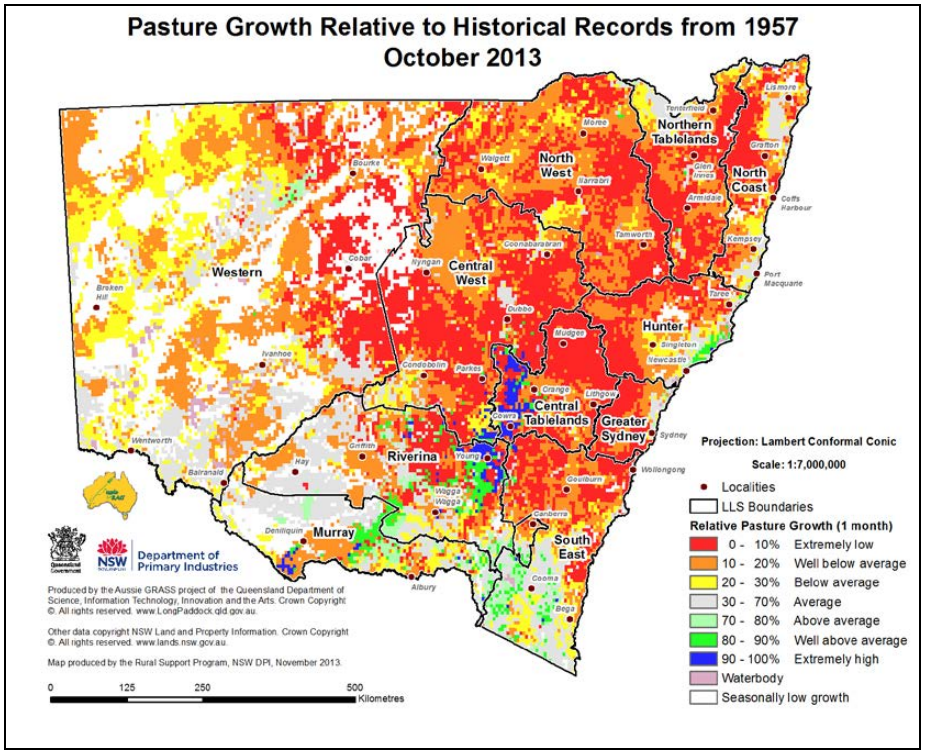


Figure 23: Relative pasture growth – quarterly

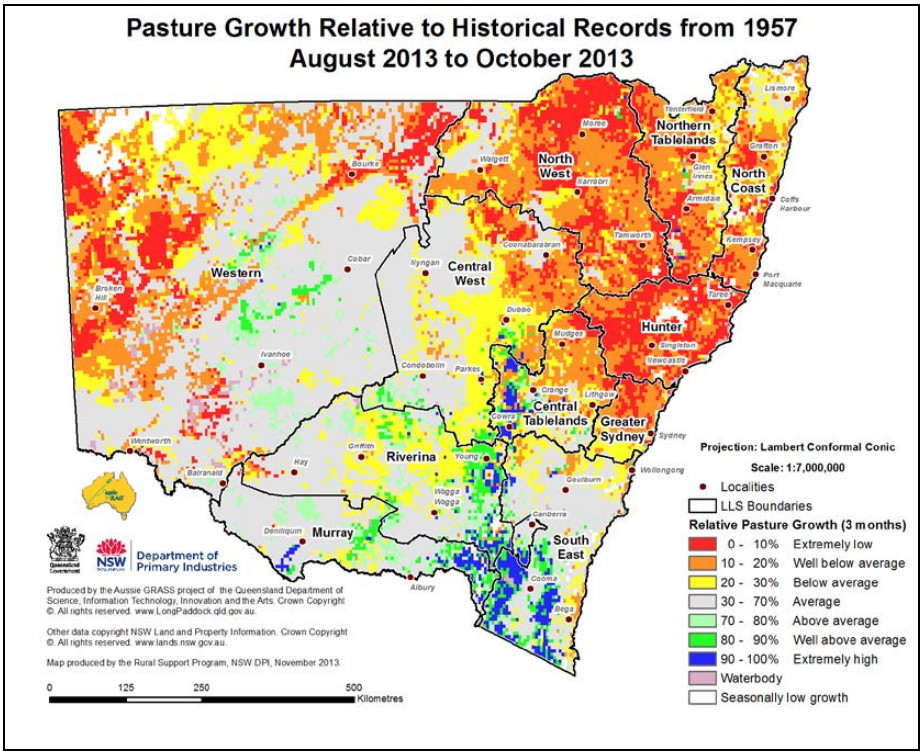


Figure 24: Relative pasture growth – half yearly

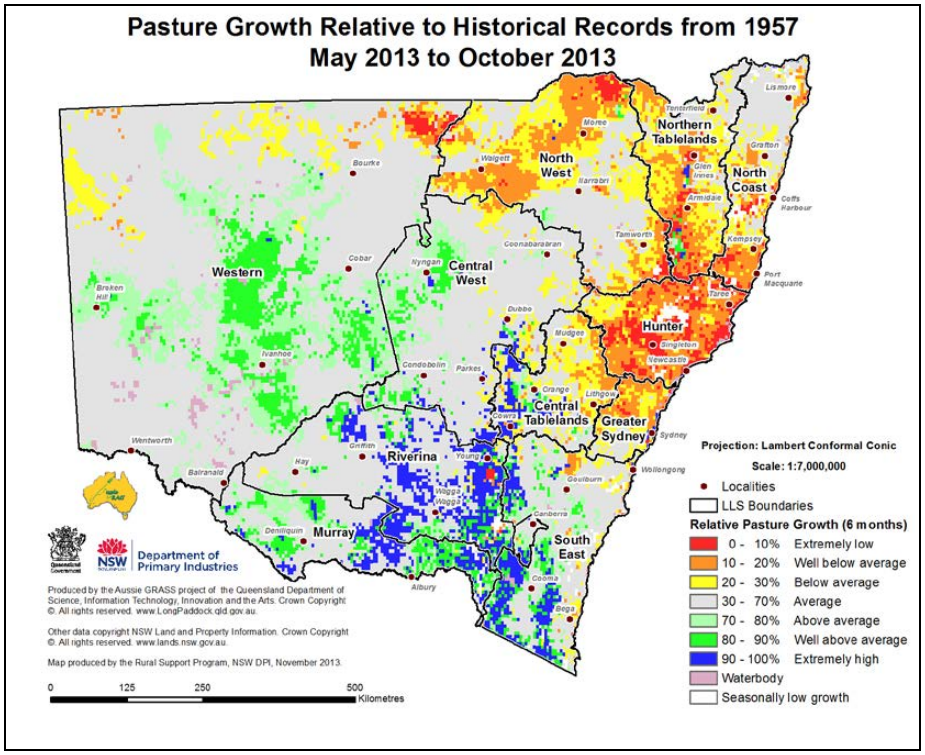


Figure 25: Relative pasture growth – yearly

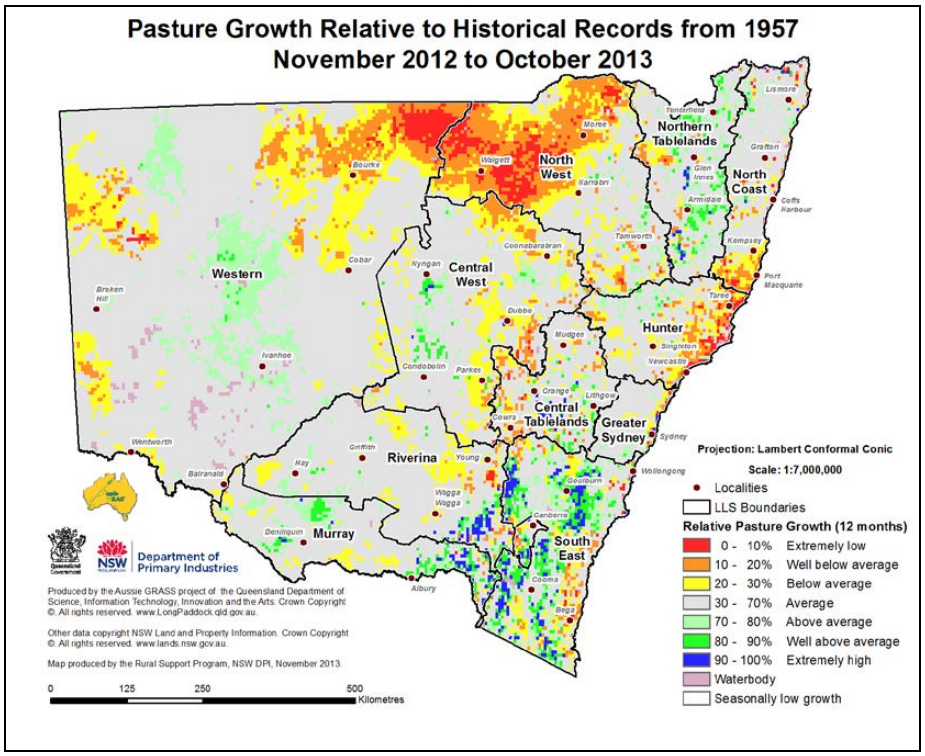


Figure 26: Relative biomass – monthly

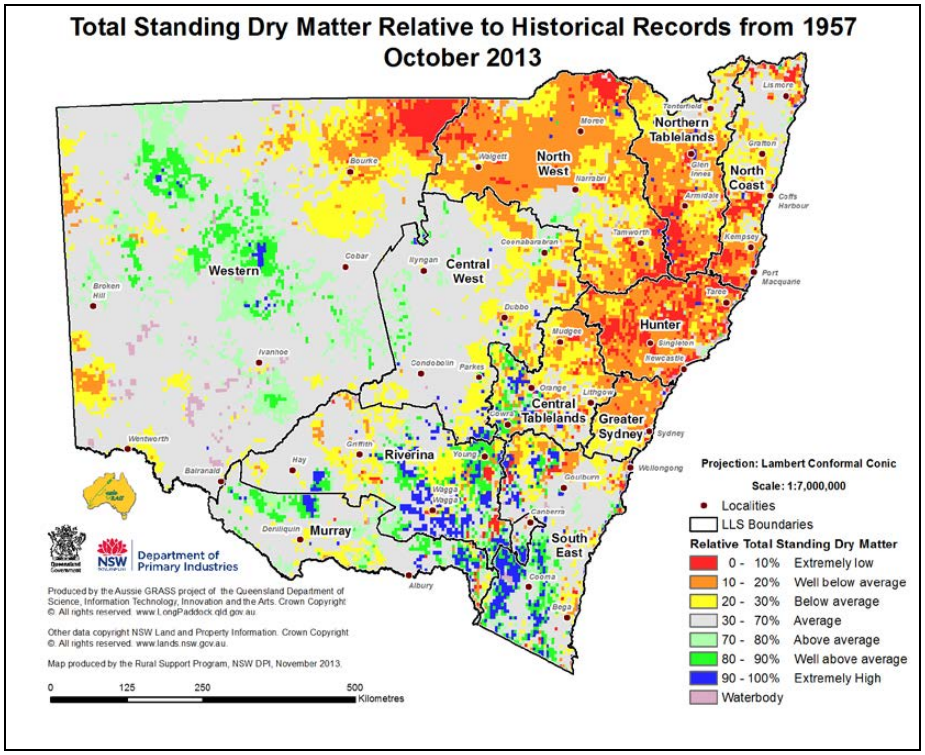
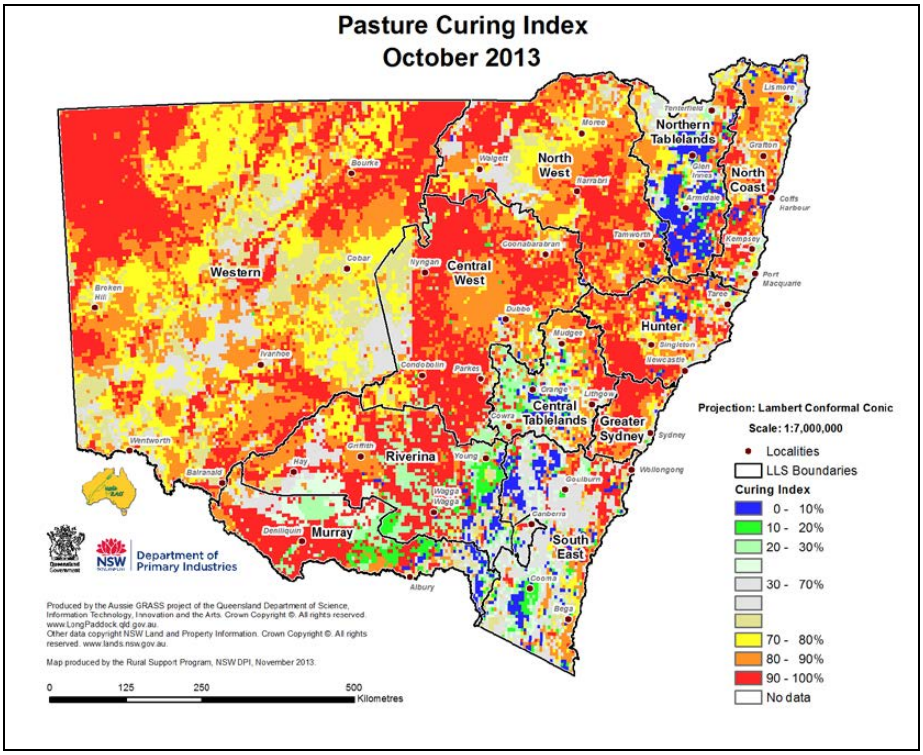


Figure 27: Pasture curing index



More information

For more information, contact the NSW Department of Primary Industries on 02 6391 3100.

Acknowledgments

Information used in this report was sourced from the Bureau of Meteorology, CSIRO, Queensland Department of Science, Information Technology, Innovation and the Arts, NSW Livestock Health and Pest Authorities, Catchment Management Authorities, the US National Oceanic and Atmospheric Administration, the International Research Institute for Climate and Society (Columbia University), the UK Meteorological Office and NSW Department of Primary Industries.

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