

NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2015-2016

Weekly Update

Date: 4/Dec/2015

SUMMARY

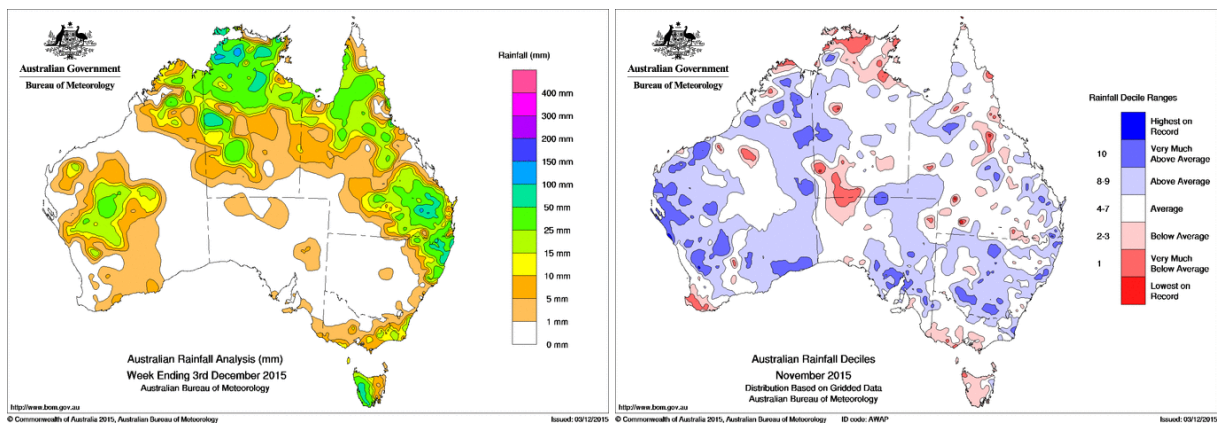
- **Climate:** the far north coast had a small amount of precipitation, with little rainfall elsewhere. For November, rainfall was above average across most of the state. Maximum and minimum temperatures for November were 1-2 degrees above average.
- **Three Month Forecast:** for December 2015 to February 2016, rainfall predictions for NSW are for average rainfall for most of the state, with above average for the north coast. According to the BOM as of 24/Nov/15, the current El Niño episode is expected to persist until the end of the year and then ease during the first quarter of 2016.
- **Tidal:** the next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 11-15/Dec/15.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to November 2015 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** mosquito numbers are starting to creep up, with 'high' collections from both Griffith and Macquarie Marshes although numbers are close to the long term average.
- **Mosquito Numbers Coast:** mosquito numbers were 'low' from most locations. Ballina yielded 'high' mosquito collections at both sites, although *Aedes vigilax* remain low.
- **Mosquito Numbers Sydney:** mosquito numbers were 'low'.
- **Arboviral Isolates:** there were no arboviral detections in the mosquitoes.
- **Chicken Sentinel Seroconversions:** there were no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 333 RRV and 43 BFV notifications.

Comment: the good news is that there is very little news...for now. Mosquito collections for the first week from the coast are almost all low, but expect these to rise following last weeks high tide. Our Department was hoping to have begun trapping along the Georges River, but were short staff due to the mosquito training course this week – thus we have put this back for one week. For the inland, most sites still have either low collections or are close to normal. As of yet there have been no mosquito isolates or sentinel chicken seroconversions.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 3/Dec/2015 is depicted on the left and monthly rainfall deciles for November 2015 are on the right. Over the last week, the far north coast had a small amount of precipitation, with little rainfall elsewhere. For November, rainfall was above average across most of the state. Maximum and minimum temperatures for November were 1-2 degrees above average.



Three Month Rainfall & Temperature Forecast

For December 2015 to February 2016, rainfall predictions for NSW are for average rainfall for most of the state, with above average for the north coast. Minimum temperatures are expected to be above normal for the coast and northwest of the state, especially in the southeast, while maximum temperatures are expected to be above average for the south coast and state northwest. The following pages contain graphics of the seasonal outlook:

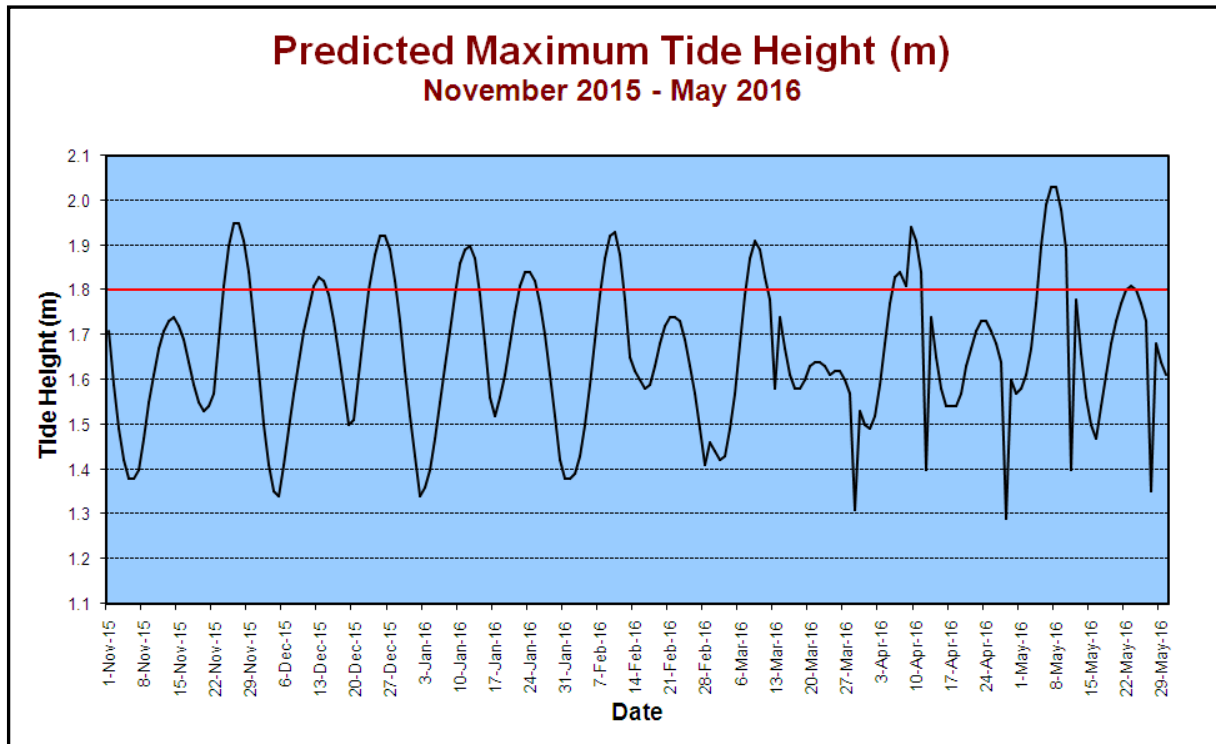
www.bom.gov.au/climate/outlooks/#/rainfall/median (Rainfall outlook).

www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 24/Nov/15, the current El Niño is comparable to record events of 1997-98 and 1982-83. The forecast is still that the El Niño will continue until the end of the year, before declining during the first quarter of 2016 (note: an El Niño is associated with decreased rainfall eastern Australia, whereas a La Niña is associated with increased rainfall). For more information:

www.bom.gov.au/climate/enso/

Tidal



Tidal information is relevant for the prediction of the activity of the salt marsh mosquito, *Aedes vigilax*. Typically for NSW, tides of over 1.8m can induce hatching of *Aedes vigilax* larvae and the graph below of predicted tide heights can provide some indication of when this is likely to occur.

The next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 11-15/Dec/15, however these are predicted to be not very high. A higher and longer set of spring tides are predicted to occur over 23-28/Dec/15.

Note that actual tide heights can vary by 0.3m (or more in unusual circumstances) due to variations in atmospheric pressure, rainfall, wind and other climatic phenomena. Thus predicted tide height should be used as a gauge only for potential *Aedes vigilax* activity. The larvae of the saltmarsh mosquito relies on a inundation/drying cycle for the mudflats in which it lives; continual wet weather prevents the drying cycles thereby reducing larval production.

Full tidal information and the implications of the tide heights relevant to the breeding of the salt marsh mosquito, *Aedes vigilax*, can be obtained from: <http://medent.usyd.edu.au/arbovirus/climate/tideheights201516.htm>

MVEV Climatic Models

Three predictive environmental based models for MVEV activity have been developed; the Forbes (which relies on rainfall in the river catchment basins of Eastern Australia), Nichols (based on the Southern Oscillation), and the Bennett theory (based on the Indian Ocean Dipole). The latter theory is poorly developed (and unreliable), and is not considered below. Note that all the predictive models have been developed on a limited data set and do not always forecast activity. There can also be unusual environmental conditions that may lead to the introduction of the virus to southeastern Australia, such as the movement of low pressure cells from the north to the south of the country during 2008 and 2011. Vertical transmission of the virus (from adult to the egg in *Aedes* species) can result in restricted activity following localised heavy precipitation (as per 2003 at Menindee).

i. Forbes' Hypothesis

Rainfall was not above Decile 7 in all of the river catchment basins in eastern Australia for the last quarter of 2014 or most of the catchments for the first quarter of 2015 (Table 1). For the Oct-Dec 2015 period, rainfall so far, has been below Decile 7 in all catchment basins.

Table 1. Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2015-2016 season. Note that a value of 1 equals Deciles 7 rainfall.

| Catchment Basin | Oct-Dec 2014 | Jan-Mar 2015 | Oct-Dec 2015* | Jan-Mar 2016 |
|------------------------------------|--------------|--------------|---------------|--------------|
| Darling River | 0.80 | 0.65 | 0.71 | |
| Lachlan/Murrumbidgee/Murray Rivers | 0.97 | 1.05 | 0.73 | |
| Northern Rivers | 0.94 | 0.67 | 0.56 | |
| North Lake Eyre system | 1.07 | 0.67 | 0.50 | |

*data for October & November only

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2015-2016 season.

| | Autumn 2015 | Winter 2015 | Spring 2015* |
|-----------------------|-------------|-------------|--------------|
| 2015 Value | 1010.83 | 1014.37 | 1014.57 |
| Pre past MVEV seasons | <1009.74 | <1012.99 | <1009.99 |

None of seasonal periods pertaining to the Nichol's hypothesis are in line with past MVEV active years.

ARBOVIRAL ISOLATES

| LOCATION - Site | Date Trapped | Mosquito Species | Virus |
|-----------------|--------------|------------------|-------|
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| | | | |
| | | | |

*Detection via Honey-Baited Cards, mosquito species can not be determined.
<http://medent.usyd.edu.au/arbovirus/results/virusisolates.htm>

HUMAN NOTIFICATIONS

Weekly notifications of human mosquito-borne diseases infections are available from the NSW Ministry of Health, Communicable Disease Weekly Report and summarised in the Table below:

<http://www.health.nsw.gov.au/Infectious/reports/Pages/Communicable-Diseases-Weekly-Report.aspx>

Notifications of Mosquito-Borne Disease in NSW, 2015-2016*

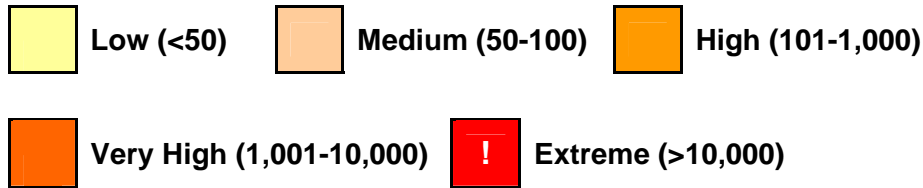
| Week Ending | RRV | BFV | DENV | Malaria | CHIKV | Total |
|--------------|------------|-----------|-----------|-----------|----------|------------|
| 5-Jul-15 | 14 | 4 | 5 | 2 | 0 | 25 |
| 12-Jul-15 | 13 | 3 | 2 | 0 | 1 | 19 |
| 19-Jul-15 | 7 | 0 | 4 | 1 | 0 | 12 |
| 26-Jul-15 | 19 | 0 | 3 | 0 | 0 | 22 |
| 2-Aug-15 | 21 | 2 | 4 | 1 | 0 | 28 |
| 9-Aug-15 | 12 | 3 | 1 | 0 | 0 | 16 |
| 16-Aug-15 | 16 | 3 | 4 | 2 | 1 | 26 |
| 23-Aug-15 | 12 | 1 | 2 | 2 | 0 | 17 |
| 30-Aug-15 | 27 | 2 | 5 | 2 | 0 | 36 |
| 6-Sep-15 | 8 | 3 | 6 | 1 | 0 | 18 |
| 13-Sep-15 | 12 | 0 | 3 | 0 | 1 | 16 |
| 20-Sep-15 | 24 | 5 | 1 | 0 | 0 | 30 |
| 27-Sep-15 | 11 | 0 | 1 | 1 | 0 | 13 |
| 4-Oct-15 | 16 | 2 | 1 | 0 | 0 | 19 |
| 11-Oct-15 | 11 | 2 | 4 | 0 | 0 | 17 |
| 18-Oct-15 | 17 | 1 | 5 | 0 | 0 | 23 |
| 25-Oct-15 | 19 | 2 | 4 | 1 | 0 | 26 |
| 1-Nov-15 | 16 | 2 | 5 | 1 | 0 | 24 |
| 8-Nov-15 | 17 | 2 | 6 | 2 | 0 | 27 |
| 15-Nov-15 | 25 | 2 | 4 | 1 | 0 | 31 |
| 22-Nov-15 | 19 | 1 | 4 | 0 | 0 | 24 |
| 29-Nov-15 | 19 | 3 | 7 | 4 | 0 | 33 |
| Total | 355 | 43 | 81 | 21 | 3 | 502 |

Comment: last season saw the largest outbreak of RRV since notifications began to be reported on a routine basis in 1985. The high number of RRV notifications during the winter months of this year makes no epidemiological sense as vector numbers are low and the risk of acquiring the virus is small. These reports are highly unlikely to represent recent infections (recent as in the previous week) and could relate to delays in notifications, past infections as IgM can persist for long periods, or errors in the serological testing.

MOSQUITO RESULTS

All the full mosquito results can be obtained from:
<http://medent.usyd.edu.au/arbovirus/results/results.htm#site>

Mosquito abundances are best described in relative terms, and in keeping with the terminology from previous NSWASP Annual Reports, mosquito numbers are depicted on the tables below as:



Each location represents the average for all trapping sites at that location.

Inland

| Location | Mosquito | Nov-15 | | | | | Dec | | | | Jan-16 | | | | | Feb | | | | Mar | | | | Apr | | | |
|-----------------------------------|------------------|--------|---|----|----|----|-----|----|----|----|--------|----|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|
| | | 1 | 8 | 15 | 22 | 29 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 |
| Albury | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bourke | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Griffith | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leeton | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macquarie Marshes | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mathoura | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wagga | <i>Cx. annul</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |

Coastal

| Location | Mosquito | Nov-15 | | | | | Dec | | | | Jan-16 | | | | | Feb | | | | Mar | | | | Apr | | | |
|--------------------------------|--------------------|--------|---|----|----|----|-----|----|----|----|--------|----|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|
| | | 1 | 8 | 15 | 22 | 29 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 |
| Ballina | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coffs Harbour | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gosford | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lake Macquarie | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nambucca | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Port Macquarie | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shoal-haven | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tweed | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wyong | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | |

Sydney

| Location | Mosquito | Nov-15 | | | | | Dec | | | | | Jan-16 | | | | | Feb | | | | Mar | | | | Apr | | | |
|-------------------------------------|--------------------|--------|---|----|----|----|-----|----|----|----|---|--------|----|----|----|---|-----|----|----|---|-----|----|----|---|-----|----|----|--|
| | | 1 | 8 | 15 | 22 | 29 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | |
| Banks-town | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blacktown | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Georges River | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hawkes-bury | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Penrith | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sydney Olympic Park | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ryde | <i>Ae. vigilax</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Mosq. | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Sentinel Chicken Seroconversions

http://medent.usyd.edu.au/arbovirus/results/chicken_results_all_sites.htm

| Location | Nov-15 | | | | | Dec | | | | Jan-16 | | | | | Feb | | | | Mar | | | | Apr | | | | |
|-----------------------------------|--------|-----|----|----|----|-----|----|----|----|--------|----|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|--|
| | 1 | 8 | 15 | 22 | 29 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | 31 | 7 | 14 | 21 | 28 | 6 | 13 | 20 | 27 | 3 | 10 | 17 | 24 | |
| Bourke | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Deniliquin | 15N | 15N | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forbes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Griffith | 15N | 15N | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hay | 15N | 15N | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leeton | 15N | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Macquarie Marshes | | 15N | | | | | | | | | | | | | | | | | | | | | | | | | |
| Menindee | 6N | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Moama | 15N | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Moree | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wee Waa | | | | | | | | | | | | | | | | | | | | | | | | | | | |

N= Negative for MVEV & KUNV

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