

NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2015-2016

Weekly Update

Date: 1/Apr/2016

SUMMARY

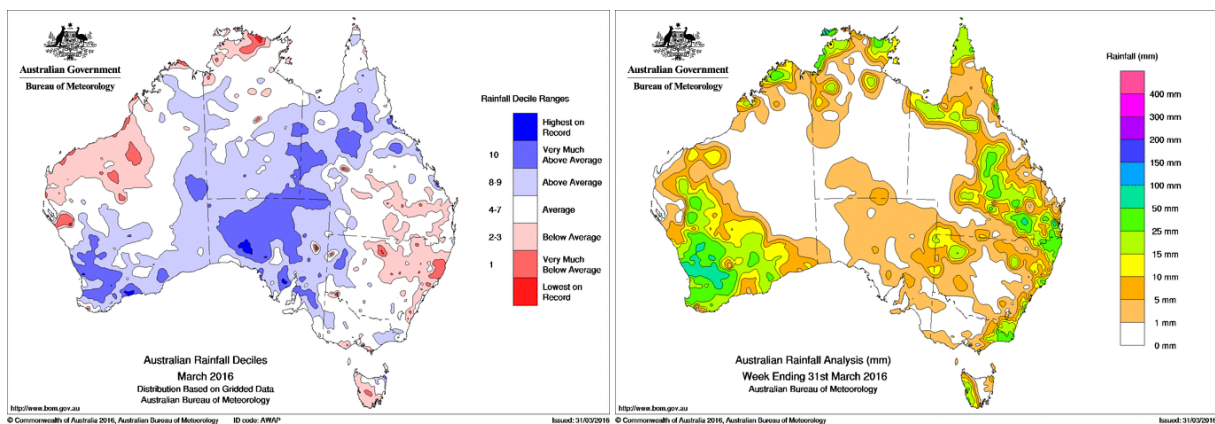
- **Climate:** the last week, light to moderate rainfall fell across most of the state, being heavier towards the coast, especially in the north. For March, rainfall was below average along the coast and above average in the far west. Maximum and minimum temperatures for March were 1-2 degrees above average.
- **Three Month Forecast:** April to June 2016, rainfall predictions for NSW are for slightly above average rainfall for the west of the state and average for the coast. Maximum and minimum temperatures are expected to be above average, although around average maximum temperatures are forecasted in the west of the state. According to the BOM as of 29/Mar/16, the current El Niño continues its decline and should return to neutral levels by mid-2016.
- **Tidal:** the next series of high tides that may result in *Aedes vigilax* hatching are due to occur over 5-11/Apr/2016, although this may be too late in the season to produce any productive hatching.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to February 2016 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** mosquito numbers continue decline and were 'low' from all sites. It is unlikely that numbers will rise substantially until next season.
- **Mosquito Numbers Coast:** few collections were made this week, however Ballina produced 'very high' mosquito numbers, dominated by *Aedes multiplex* and *Culex sitiens*. Neither species would be considered major vectors.
- **Mosquito Numbers Sydney:** for the most part mosquito numbers continue to be 'low', although there was jump in numbers at Georges River with the first 'high' collection of *Aedes vigilax* since mid-February.
- **Arboviral Isolates:** there were no further arboviral detections.
- **Chicken Sentinel Seroconversions:** there were no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 599 RRV and 53 BFV notifications. The notifications for 2016 are lower than the comparable period for 2015 and similar to 2014.

Comment: Yaaaawwwwnnnn...which pretty well sums up the season so far for the 2015-2016 NSW arboviral season. Mosquito numbers have been well below average, there have been few arboviral isolates from the mosquitoes, and no seroconversions in the sentinel chooks. Of course this is great news for the people of NSW where notifications are down as well. However, there has been a late burst in mosquito numbers at several coast sites over the last two weeks and perhaps we may see some late seasonal arboviral activity – watch this space!

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 31/Mar/2016 is depicted on the left and monthly rainfall deciles for March 2016 are on the right. Over the last week, light to moderate rainfall fell across most of the state, being heavier towards the coast, especially in the north. For March, rainfall was below average along the coast and above average in the far west. Maximum and minimum temperatures for March were 1-2 degrees above average.



Three Month Rainfall & Temperature Forecast

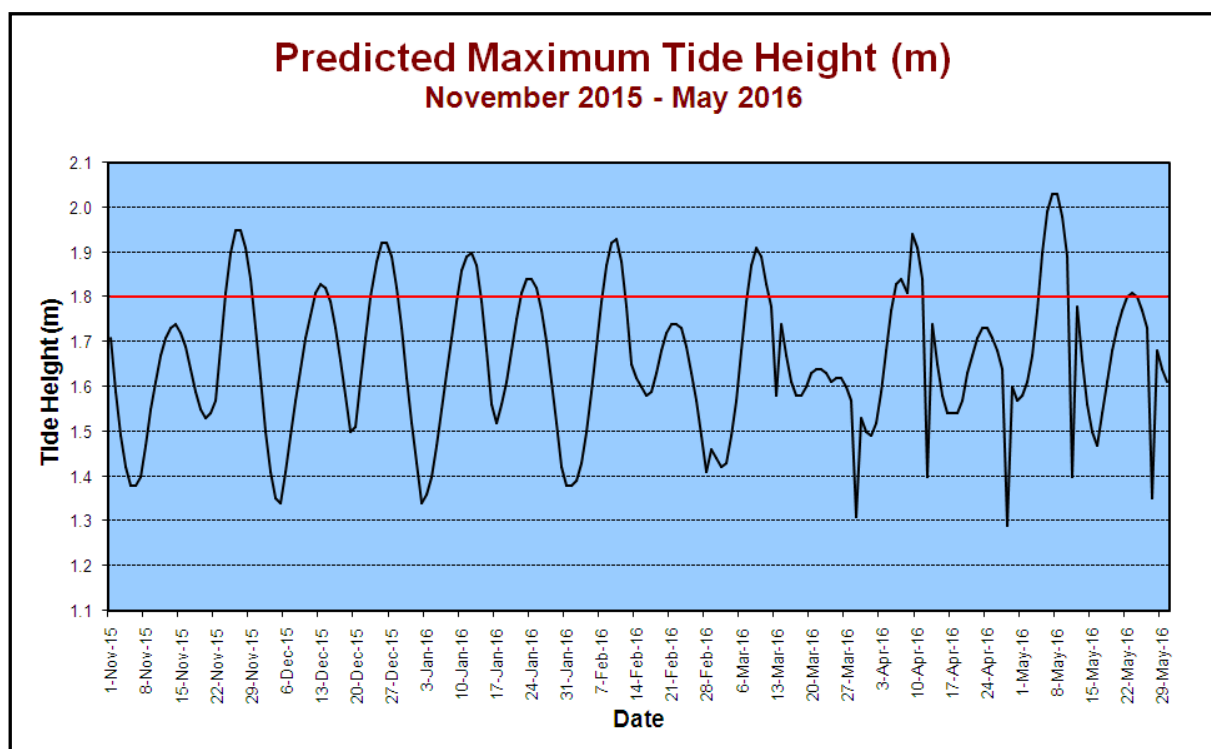
For April to June 2016, rainfall predictions for NSW are for slightly above average rainfall for the west of the state and average for the coast. Maximum and minimum temperatures are expected to be above average, although around average maximum temperatures are forecasted in the west of the state. The 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 29/Mar/16, the current El Niño continues its decline and should return to neutral levels by mid-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 5-11/Apr/2016, although this is late in the season and these tides may not influence vector numbers for most of the state.

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 was not above Decile 7 in all catchment basins. For Jan-Mar 2016, based on the January data alone, rainfall was not above 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	0.72	0.78
Lachlan/Murrumbidgee/Murray Rivers	0.97	1.05	0.70	1.60
Northern Rivers	0.94	0.67	1.35	0.44
North Lake Eyre system	1.07	0.67	1.35	0.56

*Data for January & February 2016 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
LEETON – Farm 347	1/Mar/16	<i>Culex annulirostris</i>	RRV
PORT MACQUARIE – Stevens St	8/Feb/16	*	EHV
GRIFFITH – Hanwood	1/Feb/16	<i>Culex annulirostris</i>	BFV

*Detection via Honey-Baited Cards, the mosquito species cannot 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*:

www.health.nsw.gov.au/Infectious/reports/Pages/CDWR.aspx

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

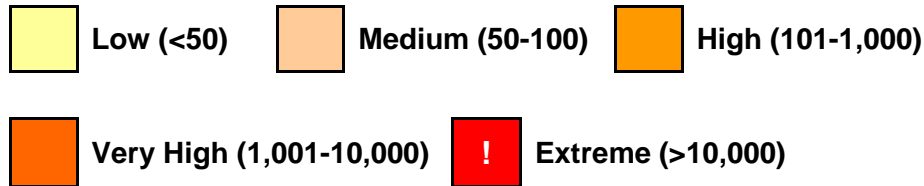
Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	Total
5-Jul-15	14	4	5	2	0	0	25
12-Jul-15	13	3	2	0	1	0	19
19-Jul-15	7	0	4	1	0	0	12
26-Jul-15	19	0	3	0	0	0	22
2-Aug-15	21	2	4	1	0	0	28
9-Aug-15	12	3	1	0	0	0	16
16-Aug-15	16	3	4	2	1	0	26
23-Aug-15	12	1	2	2	0	0	17
30-Aug-15	27	2	5	2	0	0	36
6-Sep-15	8	3	6	1	0	0	18
13-Sep-15	12	0	3	0	1	0	16
20-Sep-15	24	5	1	0	0	0	30
27-Sep-15	11	0	1	1	0	0	13
4-Oct-15	16	2	1	0	0	0	19
11-Oct-15	11	2	4	0	0	0	17
18-Oct-15	17	1	5	0	0	0	23
25-Oct-15	19	2	4	1	0	0	26
1-Nov-15	16	2	5	1	0	0	24
8-Nov-15	17	2	6	2	0	0	27
15-Nov-15	25	2	4	1	0	0	32
22-Nov-15	19	1	4	0	0	0	24
29-Nov-15	19	3	8	4	0	0	34
6-Dec-15	13	1	5	0	0	0	19
13-Dec-15	15	0	7	1	0	0	23
20-Dec-15	17	0	8	0	0	0	25
27-Dec-15	15	0	3	1	0	0	19
Total	415	44	105	23	3	0	590

[†]All of these viruses are acquired overseas, although some DENV cases may be from North Queensland.

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.																										
Port Macquarie	<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.																													
Hills Shire	<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	15N		15N	14N	15N	12N	15N	15N	15N	15N	15N	15N	15N	15N	14N	15N		15N						
Forbes			15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N		13N	13N						
Griffith	15N	15N	15N	15N	15N	15N	15N	14N		14N	14N	14N	15N	14N	14N	14N	14N			14N						
Hay	15N	15N	13N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N		15N	15N						
Leeton	15N	15N	15N		15N	15N	15N	14N	14N	14N	14N	13N	13N	13N	13N	13N	13N	13N	13N							
Macquarie Marshes		15N	13N	15N	15N		15N		15N	15N		15N	15N	15N		15N										
Menindee	6N	15N	15N	15N		15N	15N	15N	15N		15N	15N	15N	15N	15N	15N										
Moama	15N					15N																				
Moree							15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N						
Wee Waa			13N	14N	15N		15N	15N		15N	15N			15N	13N	13N	15N		15N	14N						

N= Negative for MVEV & KUNV

Prepared by: Stephen Doggett, Senior Hospital Scientist, Department of Medical Entomology, Pathology West (ICPMR), Westmead Hospital NSW 2145. Email: Stephen.Doggett@health.nsw.gov.au

Please note that these results remain the property of the NSW Ministry of Health and may not be used or disseminated to unauthorised persons or organizations without permission.