NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2015-2016
W e e k l y U p d a t e

Date: 4/Mar/2016

SUMMARY

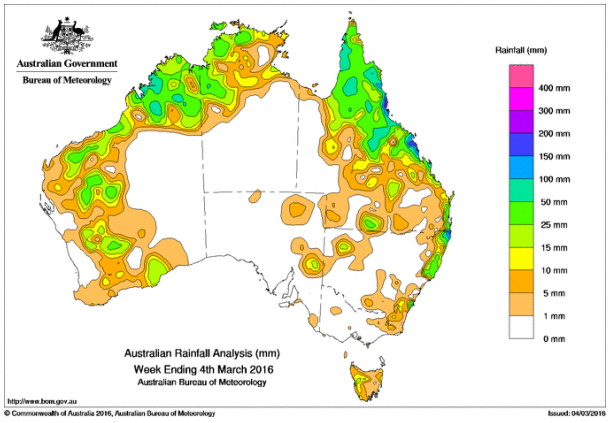
- **Climate**: over the last week, rainfall was mostly light and mainly confined to coastal areas. For January, rainfall was below to very much below average for most of the state. Maximum and minimum temperatures for February were 2-3 degrees above average.
- **Three Month Forecast**: for March to May 2016, rainfall predictions for NSW are for slightly above average rainfall for most of state, and the probability of exceeding the average is greater in the south west of the state. Maximum and minimum temperatures are expected to be warmer than normal and higher along the coast. According to the BOM as of 1/Mar/16, the current El Niño continues its gradual decline, is now at moderate levels and should end in the second quarter of 2016.
- **Tidal**: the next series of high tides are due over 7-12/Mar/2016.
- **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 to be well below the long term average, albeit remaining 'high' from Griffith and Leeton (but below average).
- **Mosquito Numbers Coast**: the mosquito season continues to be quiet with 'low' *Aedes vigilax* numbers from all sites, in fact overall mosquito numbers were down this week.
- **Mosquito Numbers Sydney**: mosquito numbers were much lower this week and no Sydney site had 'high' numbers.
- **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 491 RRV and 49 BFV notifications. The notifications for 2016 are lower than the comparable period for 2015 and similar to 2014.

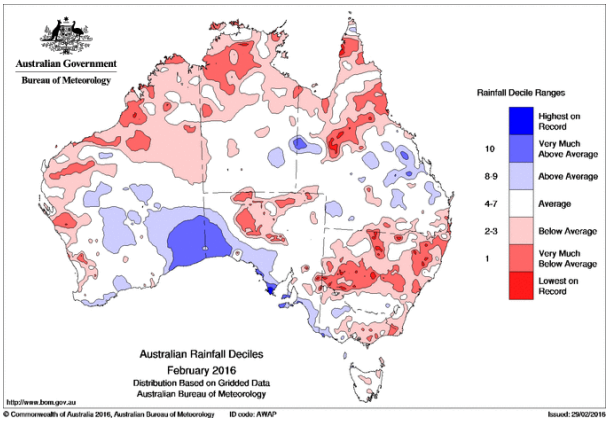
Comment: February was a hot and dry month, which helped to keep the mosquito numbers well down below average across the state. The El Niño continues to decline but it is unlikely that we will see too many arboviral problems for the remainder of the season. There have been no further arboviral isolates from the mosquitoes and no seroconversions in the sentinel chickens.

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 4/Mar/2016 is depicted on the left and monthly rainfall deciles for February 2016 are on the right. Over the last week, rainfall was mostly light and mainly confined to coastal areas. For February, rainfall was below to very much below average for most of the state. Maximum and minimum temperatures for February were 2-3 degrees above average.





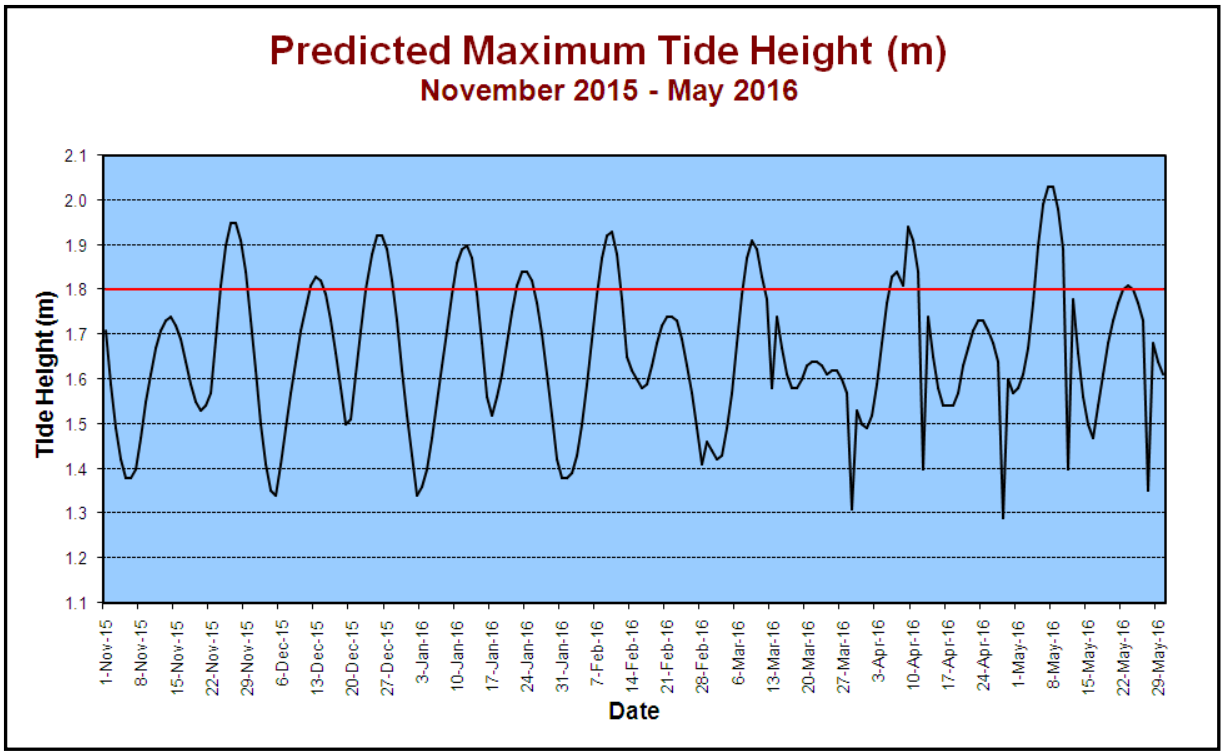
Three Month Rainfall & Temperature Forecast

For March to May 2016, rainfall predictions for NSW are for slightly above average rainfall for most of state, and the probability of exceeding the average is greater in the south west of the state. Maximum and minimum temperatures are expected to be above average, with warmer conditions towards the coast and especially the southeast of NSW. 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 1/Mar/16, the current El Niño continues its gradual decline, is now at moderate levels and should end in the second quarter of 2016. Neutral conditions are now favoured for the second half 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/

On 2/Jan/16, the BOM released the Australian Annual Climate Statement for 2015 (www.bom.gov.au/climate/current/annual/aus/). The highlights include: 2015 was the fifth hottest year on record, with the last three months being especially warm; the El Niño event was one of the strongest recorded to date; and rainfall nationally was down by 5%.

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 7-12/Mar/2016.

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
PORT MACQUARIE – Stevens St	8/Feb/16	*	EHV
GRIFFITH – Hanwood	1/Feb/16	*Culex annulirostris*	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.

Week Ending	RRV	BFV	DENV†	Malaria†	CHIKV†	ZIKV†	Total
3-Jan-16	7	1	7	1	0	1	17
10-Jan-16	12	1	5	0	0	0	18
17-Jan-16	3	2	3	2	0	0	10
24-Jan-16	8	0	8	0	2	1	19
31-Jan-16	8	0	3	0	2	0	13
7-Feb-16	15	1	15	2	0	0	33
14-Feb-16	13	0	2	1	0	0	16
Total	491	49	137	29	7	2	718

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

Comment: For January, the number of notifications are not extraordinary and lower than the previous two years.

It should also be noted that notifications are for NSW residents and that infection may have been acquired elsewhere.

*The data in this table is updated once available from the NSW Ministry of Health.

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:

Low (<50) **Medium (50-100)** **High (101-1,000)**

Very High (1,001-10,000) **!** **Extreme (>10,000)**

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	*Cx. annul*																										
	Total Mosq.																										
Bourke	*Cx. annul*																										
	Total Mosq.																										
Griffith	*Cx. annul*																										
	Total Mosq.																										
Leeton	*Cx. annul*																										
	Total Mosq.																										
Macquarie Marshes	*Cx. annul*																										
	Total Mosq.																										
Mathoura	*Cx. annul*																										
	Total Mosq.																										
Wagga	*Cx. annul*																										
	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	*Ae. vigilax*																										
	Total Mosq.																										
Coffs Harbour	*Ae. vigilax*																										
	Total Mosq.																										
Gosford	*Ae. vigilax*																										
	Total Mosq.																										
Lake Macquarie	*Ae. vigilax*																										
	Total Mosq.																										
Port Macquarie	*Ae. vigilax*																										
	Total Mosq.																										
Tweed	*Ae. vigilax*																										
	Total Mosq.																										
Wyong	*Ae. vigilax*																										
	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	*Ae. vigilax*																										
	Total Mosq.																										
Blacktown	*Ae. vigilax*																										
	Total Mosq.																										
Georges River	*Ae. vigilax*																										
	Total Mosq.																										
Hawkes-bury	*Ae. vigilax*																										
	Total Mosq.																										
Hills Shire	*Ae. vigilax*																										
	Total Mosq.																										
Penrith	*Ae. vigilax*																										
	Total Mosq.																										
Sydney Olympic Park	*Ae. vigilax*																										
	Total Mosq.																										
Ryde	*Ae. vigilax*																										
	Total Mosq.																										

Sentinel Chicken Seroconversions

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

	Nov-15					Dec				Jan-16					Feb				Mar				Apr			
Location	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										
Forbes			15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N											
Griffith	15N	15N	15N	15N	15N	15N	15N	14N		14N	14N	14N	15N	14N	14N	14N										
Hay	15N	15N	13N	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									
Macquarie Marshes		15N	13N	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										
Wee Waa			13N	14N	15N		15N	15N		15N	15N			15N	13N	13N										

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