

NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2016-2017

Weekly Update

Date: 19/Dec/2016

SUMMARY

- **Climate:** over the last week, there was light to moderate rainfall across the entire state. For November, rainfall was average for most of the state with parts of the coast and northern inland being drier than normal. Maximum temperatures for November were 1-2 degrees above average, while minimum temperatures were slightly below average.
- **Three Month Forecast:** for January to March 2017, rainfall predictions for NSW are for below average precipitation, with a higher probability of eastern areas being drier than average. Maximum and minimum temperatures are predicted to be above normal and warmer in eastern areas. According to the BOM as of 6/Dec/16, a La Niña is unlikely in the coming months.
- **Tidal:** the tides over this week have been over 2.1m which has resulted in a large larval emergence at Homebush Bay with control operations ensuring. The next series of high tides that may result in larval hatching are due to occur over 29/Dec/2016 – 1/Jan/2017, although these are not predicted to be very high.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of November 2016 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** mosquito numbers were overall greater this week and 'very high' from Griffith and Leeton. Several sites did yield 'low' numbers, although Albury and Leeton had 'high' collections.
- **Mosquito Numbers Coast:** mosquito numbers were 'low' at most sites, although 'high' from Ballina and Lake Macquarie, but few *Aedes vigilax* were trapped.
- **Mosquito Numbers Sydney:** collections tended to be 'low', with a 'high' yield from Georges River where numbers of *Aedes vigilax* were also 'high'.
- **Arboviral Isolates:** new arboviral isolates included; Moama (1RRV), Griffith (3RRV, 10SINV) and Leeton (2RRV, 2SINV).
- **Chicken Sentinel Seroconversions:** there have been no seroconversions.
- **Human Notifications:** for the current fiscal year, there have been 106 RRV and 4 BFV notifications; the total represents just over half the long term average, however case numbers have dramatically increased over the last two weeks.

Comment: the isolates from the mosquitoes trapped from the inland continue. Historically, for the 28 years that the program has been undertaking viral isolation from the mosquitoes, a total of 20 Ross River viruses have been isolated. For this season alone, there has been an astonishing 40! Human notifications of RRV are now on the rise; this week there were 18, up from 13 in the previous week and 8 from

the week before. It is expected that there will be many more before the season is finished in light of the record number of Ross River detections.

For information on Ross River notifications, see:

<http://www0.health.nsw.gov.au/data/diseases/rossriver.asp>

Media resources on mosquitoes:

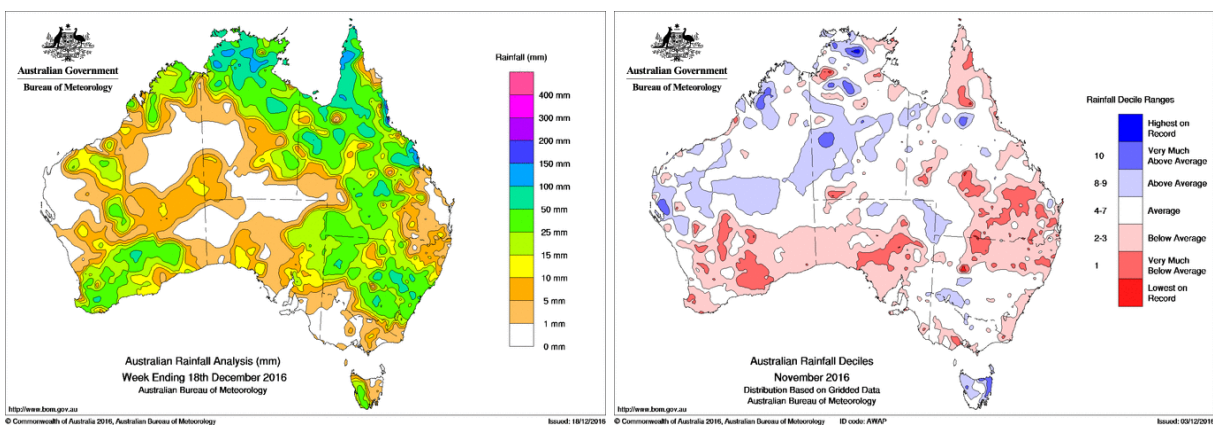
<http://www.health.nsw.gov.au/environment/pests/vector/Pages/resources.aspx>

<http://www.health.nsw.gov.au/Infectious/factsheets/Pages/mosquito.aspx>

ENVIRONMENTAL CONDITIONS

Rainfall

Rainfall across Australia for the week ending 18/Dec/2016 is depicted on the left and monthly rainfall deciles for October 2016 are on the right. Over the last week, there was light to moderate rainfall across the entire state. Rainfall during November (right graph below) was average for most of the state with parts of the coast and northern inland being drier than normal. Maximum temperatures for November were 1-2 degrees above average, while minimum temperatures were slightly below average.



Three Month Rainfall & Temperature Forecast

For January to March 2017, rainfall predictions for NSW are for below average precipitation, with a higher probability of eastern areas being drier than average. Maximum and minimum temperatures are expected to be above normal across the state and warmer in eastern areas. The following pages contain graphics of the seasonal outlook:

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

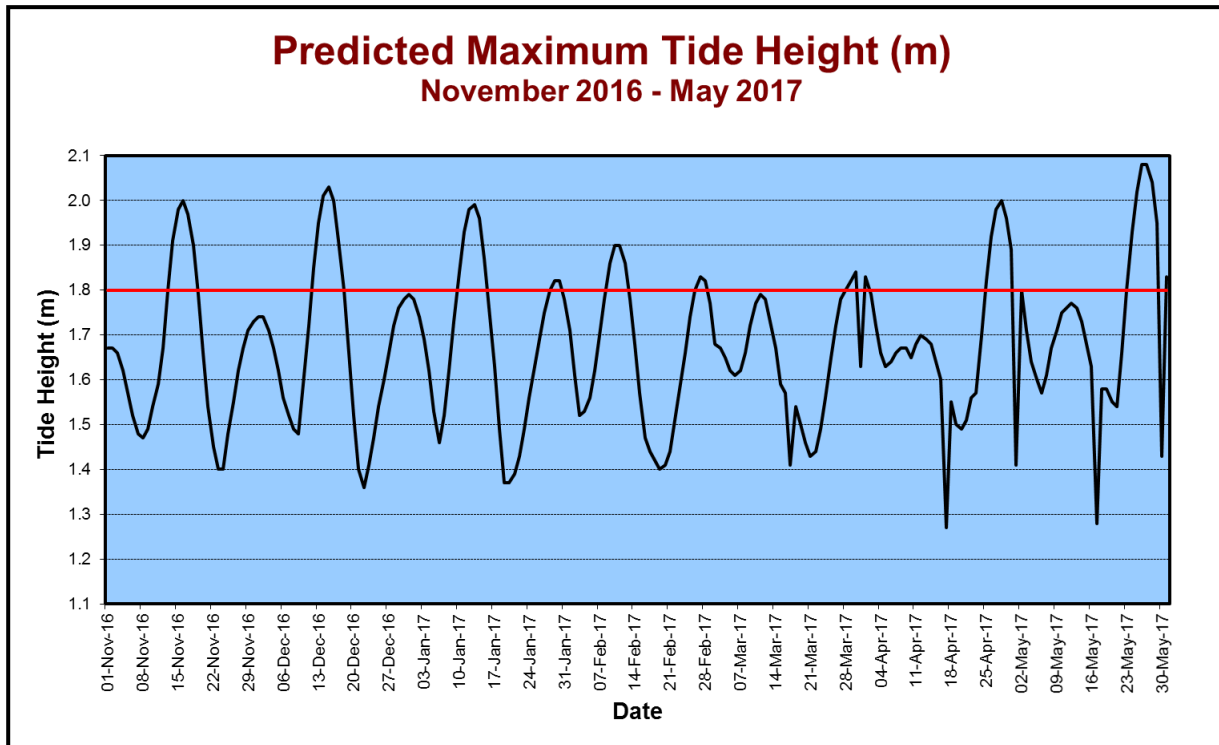
www.bom.gov.au/climate/outlooks/#/temperature/summary (Max & min temperature outlook).

According to the BOM as of 6/Dec/16, a La Niña is unlikely in the coming months (a La Niña event is typically associated with wetter than average conditions).

For more information: www.bom.gov.au/climate/enso/ and, <http://www.bom.gov.au/climate/iod/>

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 tides over this week have been over 2.1m which has resulted in a large larval emergence at Homebush Bay with control operations ensuring (C. Webb, *pers. comm.*)

The next series of tides that may lead to *Aedes vigilax* larval hatching are due this week over 29/Dec/2016 – 1/Jan/2017, although these are not predicted to be very high.

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.

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 2015 or the majority of the catchments for the first quarter of 2016 (Table 1). For the Oct-Dec 2016 period, rainfall was not above Decile 7 in any of the catchment basins.

Table 1. Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2016-2017 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2015	Jan-Mar 2016	Oct-Dec 2016*	Jan-Mar 2017
Darling River	0.72	0.67	0.53	
Lachlan/Murrumbidgee/Murray Rivers	0.70	1.14	0.91	
Northern Rivers	1.35	0.57	0.86	
North Lake Eyre system	1.35	0.63	0.66	

*Data for Oct-Nov 2016 only

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2016-2017 season.

	Autumn 2016	Winter 2016	Spring 2016
2015 Value	1010.30	1012.57	1010.07
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

Only the Winter period pertaining to the Nichol's hypothesis is in line with past MVEV active years.

ARBOVIRAL ISOLATES

LOCATION - Site	Date Trapped	Mosquito Species	Virus
LEETON – Farm 347	13/Dec/16	<i>Culex annulirostris</i>	Ross River
LEETON – Farm 347	13/Dec/16	<i>Culex annulirostris</i>	Ross River
LEETON – Farm 347	13/Dec/16	<i>Culex annulirostris</i>	Sindbis
LEETON – Farm 347	13/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	12/Dec/16	*	Ross River
GRIFFITH – Barren Box	12/Dec/16	<i>Anopheles annulipes</i>	Sindbis
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	12/Dec/16	<i>Culex annulirostris</i>	Sindbis
GEORGES RIVER – Illawong	8/Dec/16	*	Ross River
LEETON – Farm 347	7/Dec/16	*	Ross River
LEETON – Farm 347	7/Dec/16	<i>Culex annulirostris</i>	Sindbis
MURRAY – Moama	6/Dec/16	*	Ross River
ALBURY – Kremur St	5/Dec/16	*	Ross River
ALBURY – Kremur St	5/Dec/16	<i>Culex annulirostris</i>	Ross River
ALBURY – Kremur St	5/Dec/16	<i>Aedes bancroftianus</i>	Ross River
FORBES – STP	5/Dec/16	*	Ross River
FORBES – STP	5/Dec/16	<i>Culex annulirostris</i>	Ross River
FORBES – STP	5/Dec/16	<i>Culex annulirostris</i>	Ross River
FORBES – STP	5/Dec/16	<i>Culex annulirostris</i>	Ross River
FORBES – STP	5/Dec/16	<i>Culex australicus</i>	Ross River
GRIFFITH – Barren Box	5/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	5/Dec/16	<i>Culex australicus</i>	Ross River
GRIFFITH – Lake Wyangan	5/Dec/16	<i>Culex australicus</i>	Ross River
GRIFFITH – Hanwood	31/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Hanwood	31/Nov/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	31/Nov/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	31/Nov/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	31/Nov/16	<i>Anopheles annulipes</i>	Ross River
GRIFFITH – Lake Wyangan	31/Nov/16	<i>Anopheles annulipes</i>	Ross River
GRIFFITH – Lake Wyangan	31/Nov/16	*	Ross River
FORBES – STP	29/Nov/16	<i>Culex annulirostris</i>	Ross River
FORBES – STP	29/Nov/16	<i>Culex australicus</i>	Ross River
FORBES – Toms Lagoon	29/Nov/16	<i>Culex annulirostris</i>	Ross River
LEETON – Farm 347	29/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	21/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	21/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	21/Nov/16	<i>Anopheles annulipes</i>	Ross River

GRIFFITH – Barren Box	21/Nov/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	21/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Hanwood	21/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Hanwood	21/Nov/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	21/Nov/16	*	Ross River
LEETON – Farm 347	16/Nov/16	<i>Culex annulirostris</i>	Ross River
LEETON – Farm 347	16/Nov/16	<i>Anopheles annulipes</i>	Ross River
LEETON – Farm 347	16/Nov/16	*	Ross River
FORBES – Toms Lagoon	15/Nov/16	<i>Culex annulirostris</i>	Ross River
FORBES – STP	15/Nov/16	<i>Culex annulirostris</i>	Barmah Forest
FORBES – STP	15/Nov/16	*	Barmah Forest
GRIFFITH – Lake Wyangan	14/Nov/16	<i>Aedes sagax</i>	Barmah Forest
GRIFFITH – Lake Wyangan	14/Nov/16	*	Barmah Forest
MURRAY – Moama	8/Nov/16	*	Ross River
MURRAY – Moama	8/Nov/16	<i>Aedes sagax</i>	Ross River
FORBES – Toms Lagoon	7/Nov/16	<i>Aedes sagax</i>	Sindbis
GRIFFITH – Lake Wyangan	1/Nov/16	<i>Aedes theobaldi</i>	Ross River
GRIFFITH – Lake Wyangan	1/Nov/16	<i>Anopheles annulipes</i>	Ross River

*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, 2016-2017*

Week Ending	RRV	BFV	DENV [†]	Malaria [†]	CHIKV [†]	ZIKV [†]	Total
3-Jul-16	3	0	1	1	0	0	5
10-Jul-16	2	0	5	2	0	0	9
17-Jul-16	4	1	6	0	0	0	11
24-Jul-16	3	3	9	2	0	0	17
31-Jul-16	2	0	6	4	0	0	12
7-Aug-16	2	0	6	3	0	0	11
14-Aug-16	1	0	5	1	0	0	7
21-Aug-16	4	0	1	1	1	0	7
28-Aug-16	2	0	4	0	1	0	7
4-Sep-16	3	0	4	0	0	0	7
11-Sep-16	1	0	3	2	0	0	6
18-Sep-16	3	0	3	1	0	1	8
25-Sep-16	9	0	4	1	0	1	15
2-Oct-16	2	0	0	0	0	1	3
9-Oct-16	3	0	5	2	0	0	10
16-Oct-16	2	0	8	4	1	0	15
23-Oct-16	3	0	9	0	1	0	13
30-Oct-16	6	0	5	0	1	0	12
6-Nov-16	4	0	4	2	2	0	12
13-Nov-16	2	0	9	0	1	0	12
20-Nov-16	6	0	10	0	1	0	17
27-Nov-16	8	0	4	2	1	0	15
4-Dec-16	13	0	6	2	1	0	22
11-Dec-16	18	0	5	3	0	0	26
Total	106	4	122	33	11	3	279

[†]All of these viruses are acquired overseas, although some DENV cases may be from North Queensland. *The data in this table is updated once available from the NSW Ministry of Health.

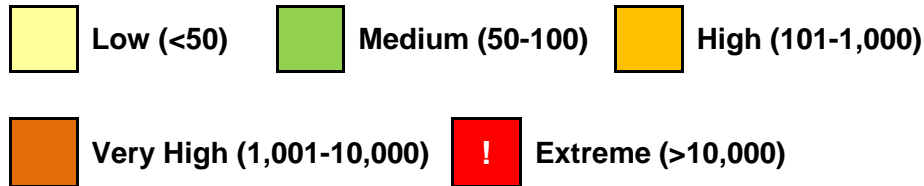
Comment: the notifications for 2016-2017 are just over half the long term average, but are rapidly rising over the last two weeks.

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

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	Oct-16					Nov					Dec				Jan-17					Feb				Mar			
		2	9	16	23	30	6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	
Albury	<i>Cx. annul</i>																											
	Total Mosq.																											
Bourke	<i>Cx. annul</i>																											
	Total Mosq.																											
Forbes	<i>Cx. annul</i>																											
	Total Mosq.																											
Griffith	<i>Cx. annul</i>																											
	Total Mosq.																											
Leeton	<i>Cx. annul</i>																											
	Total Mosq.																											
Mathoura	<i>Cx. annul</i>																											
	Total Mosq.																											
Menindee	<i>Cx. annul</i>																											
	Total Mosq.																											
Wagga	<i>Cx. annul</i>																											
	Total Mosq.																											

Coastal

Location	Mosquito	Nov				Dec				Jan-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
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				Dec				Jan-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
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	Oct-16					Nov				Dec				Jan-17					Feb				Mar				
	2	9	16	23	30	8	13	20	27	4	11	18	22	1	8	15	22	29	5	12	19	26	5	12	19	26	
Bourke																											
Deniliquin						15N	15N	13N		13N	13N																
Forbes				15N	15N	15N	15N	15N	15N	15N																	
Griffith			15N	15N	15N	15N	15N	15N	15N	15N	13N																
Hay			15N	15N	15N	15N	15N	15N	15N																		
Leeton			15N	15N	15N	15N	15N	15N	15N		15N																
Macquarie Marshes								15N	15N		15N																
Menindee					15N	15N	15N	14N	14N	15N	13N																
Moama								15N	15N																		
Moree										15N	15N																
Wee Waa							15N	13N	15N	15N																	

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

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