

# NSW ARBOVIRUS SURVEILLANCE & MOSQUITO MONITORING PROGRAM 2016-2017

## Weekly Update

**Date:** 13/Feb/2017

### SUMMARY

- **Climate:** over the last week, the last week, there was light rainfall along the Murray and the coastal strip. For January, rainfall was average for most of the state with parts of the south coast being drier than normal, and parts of the west being wetter than average. Maximum and minimum temperatures for January were up to 4-5 degrees above average.
- **Three Month Forecast:** for February to April 2017, rainfall predictions for NSW are for below average precipitation, with central areas of the state having a higher probability of being drier than average. Maximum and minimum temperatures are expected to be above normal across the state. According to the BOM as of 31/Jan/2017, the El Niño-Southern Oscillation remains neutral.
- **Tidal:** the recent series of tides that occurred over 8-13/Feb/2017 reach 2m and this prompted larval control at Homebush Bay. The next series of high tides are forecasted for 26/Feb-1/Mar/2017, but not expected to be very high.
- **MVEV models:** the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of January 2017 and both theories remain inconsistent with past MVEV outbreaks.
- **Mosquito Numbers Inland:** mosquito numbers are continuing to decline with the ongoing the hot and dry weather conditions and were 'low' at all but one site. Griffith continues with the 'very high' numbers only because of the large collections at the new site of Lake Wyangan; the other sites have dropped in number.
- **Mosquito Numbers Coast:** numbers were down this week, although still 'high' at Ballina, Gosford and Tweed. Numbers of *Aedes vigilax* remain 'low' at most sites.
- **Mosquito Numbers Sydney:** the sites where *Aedes vigilax* dominate notably the Georges River sites and Homebush, continue with the 'high' mosquito collections, although collections were lower this week. At other locations, collections were 'low'.
- **Arboviral Isolates:** new isolates included 1 Kunjin, 1 Kokobera and 2 Sindbis from Griffith.
- **Chicken Sentinel Seroconversions:** there were five new Kunjin virus seroconversions at Macquarie Marshes.
- **Human Notifications:** there were 82 new Ross River virus notifications for the week 29/Jan to 4/Feb/2017.

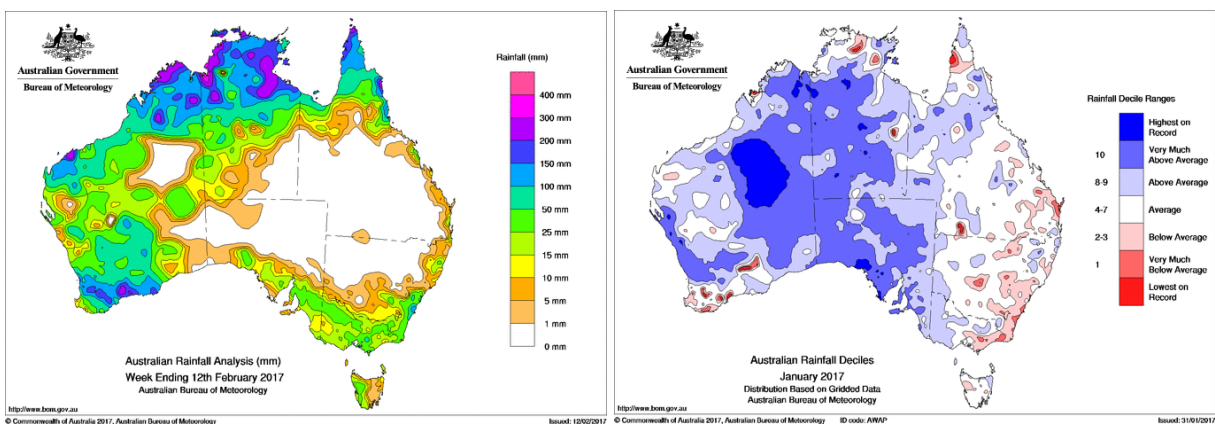
**Comment:** extremely high numbers of Ross River notifications continue to be reported, with the period of December 2016 to January 2017 being almost double

the previous record high. However, the continuing hot and dry conditions has resulted in mosquito populations dropping across the state and the number of arboviral detections (especially Ross River virus) have concomitantly decreased. Despite this, there have also been a number of recent Kunjin virus detections. This virus is thought to have birds as a reservoir host and its activity often follows other bird related arboviruses such as Sindbis. This year has seen numerous isolates of Sindbis from mosquitoes, with a multitude detected during December and January.

## ENVIRONMENTAL CONDITIONS

### Rainfall

Rainfall across Australia for the week ending 12/Feb/2017 is depicted on the left and monthly rainfall deciles for January 2017 are on the right. Over the last week, there was light rainfall along the Murray and the coastal strip. Precipitation during January (right graph below) was average for most of the state with parts of the south coast being drier than normal, and parts of the west being wetter than average. Maximum and minimum temperatures for January were up to 4-5 degrees above average.



### Three Month Rainfall & Temperature Forecast

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

[www.bom.gov.au/climate/outlooks/#/rainfall/median](http://www.bom.gov.au/climate/outlooks/#/rainfall/median) (Rainfall outlook).

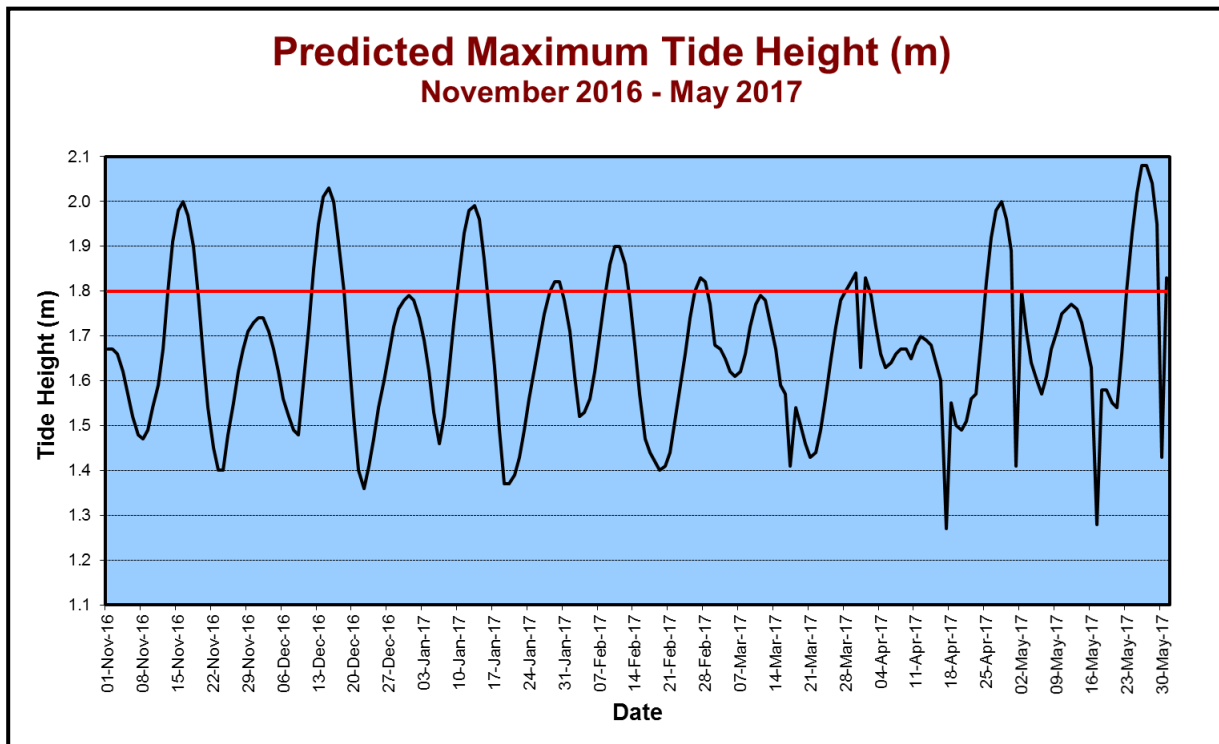
[www.bom.gov.au/climate/outlooks/#/temperature/summary](http://www.bom.gov.au/climate/outlooks/#/temperature/summary) (Max & min temperature outlook).

According to the BOM as of 31/Jan/2017 the El Niño-Southern Oscillation remains neutral and is likely to during the remainder of the summer and the autumn (a La Niña event is typically associated with wetter than average conditions and an El Niño with drier conditions).

For more information: [www.bom.gov.au/climate/enso/](http://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 recent high tides that occurred over 8-13/Feb/2017 topped 2m at Homebush Bay and this prompted a larval treatment (C. Webb, *pers. comm.*)

The next series of high tides that may lead to *Aedes vigilax* larval hatching are over due to occur over 26/Feb – 1/Mar/2017, but 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 and Jan-Mar 2017 periods, rainfall was not above Decile 7 in all 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	0.58	0.68
Lachlan/Murrumbidgee/Murray Rivers	0.70	1.14	0.92	2.40
Northern Rivers	1.35	0.57	0.98	1.13
North Lake Eyre system	1.35	0.63	1.09	1.03

\*Data for January 2017 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.

**Table 3. ARBOVIRAL ISOLATES**

LOCATION - Site	Date Trapped	Mosquito Species	Virus
GRIFFITH – Lake Wyangan	6/Feb/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	6/Feb/17	*	Kokobera
GRIFFITH – Hanwood	31/Jan/17	<i>Culex annulirostris</i>	Kunjin
GRIFFITH – Hanwood	31/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	31/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	31/Jan/17	<i>Anopheles annulipes</i>	Sindbis
GRIFFITH – Lake Wyangan	31/Jan/17	<i>Culex annulirostris</i>	Sindbis
ALBURY – Kremur St	23/Jan/17	*	Kokobera
GRIFFITH – Hanwood	22/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	22/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	22/Jan/17	*	Sindbis
GRIFFITH – Lake Wyangan	22/Jan/17	*	Sindbis
LEETON – Farm 347	17/Jan/17	<i>Culex annulirostris</i>	Sindbis
LEETON – Farm 347	17/Jan/17	<i>Culex annulirostris</i>	Sindbis
ALBURY – Waterworks Rd	16/Jan/17	<i>Culex annulirostris</i>	Ross River
ALBURY – Waterworks Rd	16/Jan/17	*	Ross River
GRIFFITH – Hanwood	16/Jan/17	*	Barmah Forest
GRIFFITH – Hanwood	16/Jan/17	<i>Culex annulirostris</i>	Barmah Forest
GRIFFITH – Hanwood	10/Jan/17	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Hanwood	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Hanwood	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	10/Jan/17	<i>Culex annulirostris</i>	Sindbis
LEETON – Almond Rd	9/Jan/17	<i>Culex annulirostris</i>	Ross River
LEETON – Almond Rd	9/Jan/17	*	Ross River
LEETON – Farm 347	9/Jan/17	*	Sindbis
GRIFFITH – Lake Wyangan	3/Jan/17	<i>Culex annulirostris</i>	Sindbis
GEORGES RIVER – Alford's Point	29/Dec/16	<i>Aedes alboannulatus</i>	Ross River
GEORGES RIVER – Alford's Point	29/Dec/16	*	Ross River
ALBURY – Kremur St	19/Dec/16	*	Ross River
ALBURY – Kremur St	19/Dec/16	<i>Culex annulirostris</i>	Ross River
GRIFFITH – Barren Box	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Barren Box	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	19/Dec/16	<i>Culex annulirostris</i>	Sindbis
GRIFFITH – Lake Wyangan	19/Dec/16	<i>Culex annulirostris</i>	Sindbis

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 – 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>

**Table 4. Arboviral Detections\* 2016-2017, Summary Table**

LOCATION	Date Trapped	Virus					Total
		BFV	RRV	SINV	KOKV	KUNV	
ALBURY	23/Jan/17				1		1
ALBURY	16/Jan/17		2				2
ALBURY	19/Dec/16		2				2
ALBURY	5/Dec/16		3				3
FORBES	5/Dec/16		5				5
FORBES	29/Nov/16		3				3
FORBES	15/Nov/16	2	1				3
FORBES	7/Nov/16			1			1
GEORGES RIVER	29/Dec/16		2				2
GEORGES RIVER	8/Dec/16		1				1
GRIFFITH	6/Feb/17			1	1	1	3
GRIFFITH	31/Jan/17			4			4
GRIFFITH	22/Jan/17			4			4
GRIFFITH	16/Jan/17	2					2
GRIFFITH	10/Jan/17		1	7			8
GRIFFITH	3/Jan/17			1			1
GRIFFITH	19/Dec/16			9			9
GRIFFITH	12/Dec/16		3	7			10
GRIFFITH	5/Dec/16		2	1			3
GRIFFITH	31/Nov/16		4	3			7
GRIFFITH	21/Nov/16		7	1			8
GRIFFITH	14/Nov/16	2					2
GRIFFITH	1/Nov/16		2				2
LEETON	17/Jan/17			2			2
LEETON	9/Jan/17		2	1			3
LEETON	13/Dec/16		2	2			4
LEETON	7/Dec/16		1	1			2
LEETON	29/Nov/16		1				1
LEETON	16/Nov/16		3				3
MURRAY	6/Dec/16		1				1
MURRAY	8/Nov/16		2				2
<b>TOTAL</b>		<b>6</b>	<b>50</b>	<b>46</b>	<b>2</b>	<b>1</b>	<b>104</b>

\*This is a summary of the detections via FTA card and cell culture, in some cases both systems will be detecting the same virus.



## 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](http://www.health.nsw.gov.au/Infectious/reports/Pages/CDWR.aspx). It should also be noted that notifications are for NSW residents and that infection may have been acquired elsewhere.

**Table 5.** Notifications of Mosquito-Borne Disease in NSW, 2016-2017\*

Week Ending	RRV	BFV	DENV <sup>†</sup>	Malaria <sup>†</sup>	CHIKV <sup>†</sup>	ZIKV <sup>†</sup>	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	8	3	0	0	29
18-Dec-16	21	0	2	0	2	0	25
25-Dec-16	31	0	0	2	0	0	33
1-Jan-17	8	0	3	1	0	0	12
7-Jan-17	35	0	2	2	1	0	40
14-Jan-17	82	1	7	1	1	0	92
21-Jan-17	122	1	8	3	0	0	134
28-Jan-17	84	3	12	0	0	0	99
4-Feb-17	82	0	9	1	0	0	92

<b>Total</b>	<b>571</b>	<b>9</b>	<b>168<sup>†</sup></b>	<b>43<sup>†</sup></b>	<b>15<sup>†</sup></b>	<b>3<sup>†</sup></b>	<b>604</b>
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<sup>†</sup>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:* high notifications of Ross River virus disease for 2016-2017 are continuing with another 82 cases reported. The December 2016 and January 2017 notifications are the highest since 2013 (Table 6). The total for this period was 537 notifications and this is several times higher than for the most recent years during the comparable period; e.g. 2015-2016 (96), 2014-2015 (207), and 2013-2014 (63). In comparison to previous years that had high case numbers in December and January, the season of 2005-2006 had 295 notifications, and 1998-1999 produced 276. The difference for this season highlights the dramatic nature of the outbreak.

Barmah Forest virus disease notifications continue to be very low despite some arboviral detections. This decline appears to be artificial and due to the withdrawal of the commercial test that was over diagnosing patients.

**Table 6.** Ross River virus infection notifications in NSW residents, by month of disease onset. January 2013 to February 2017\*.

<b>Year</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Total</b>
<b>2013</b>	38	46	34	57	101	49	36	23	27	36	30	30	<b>507</b>
<b>2014</b>	33	35	45	72	86	57	38	50	46	67	59	90	<b>678</b>
<b>2015</b>	117	306	431	264	102	50	54	61	53	61	70	54	<b>1623</b>
<b>2016</b>	42	60	78	79	51	16	11	10	20	17	36	204	<b>624</b>
<b>2017</b>	333	43											<b>376</b>

\*updated 10/Feb/2017. Table from:

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

For more data on Ross River virus notifications in NSW see:

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

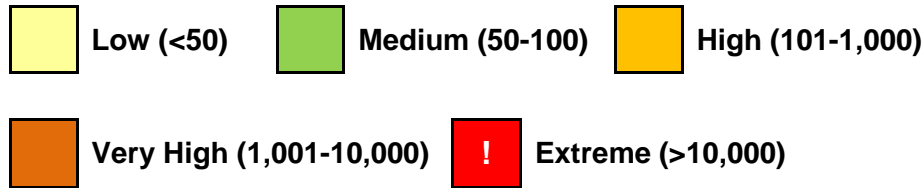
For more data on Barmah Forest virus notifications in NSW see:

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

## 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	25	1	8	15	22	29	5	12	19	26	5	12	19	26		
<a href="#">Albury</a>	<i>Cx. annul</i>																												
	Total Mosq.																												
<a href="#">Bourke</a>	<i>Cx. annul</i>																												
	Total Mosq.																												
<a href="#">Forbes</a>	<i>Cx. annul</i>																												
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<a href="#">Leeton</a>	<i>Cx. annul</i>																												
	Total Mosq.																												
<a href="#">Mathoura</a>	<i>Cx. annul</i>																												
	Total Mosq.																												
<a href="#">Menindee</a>	<i>Cx. annul</i>																												
	Total Mosq.																												
<a href="#">Wagga</a>	<i>Cx. annul</i>																												
	Total Mosq.																												

## Coastal

Location	Mosquito	Nov				Dec				Jan-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
<a href="#">Ballina</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Coffs Harbour</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Gosford</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Lake Macquarie</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Port Macquarie</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Tweed</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Wyong</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										

## Sydney

Location	Mosquito	Nov				Dec				Jan-17					Feb				Mar				Apr				
		6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
<a href="#">Banks-town</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Blacktown</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Georges River</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Hawkes-bury</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Hills Shire</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Penrith</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Sydney Olympic Park</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										
<a href="#">Ryde</a>	<i>Ae. vigilax</i>																										
	Total Mosq.																										

## Sentinel Chicken Seroconversions

[http://medent.usyd.edu.au/arbovirus/results/chicken\\_results\\_all\\_sites.htm](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	
<a href="#">Bourke</a>																											
<a href="#">Deniliquin</a>						15N	15N	13N		13N	13N	13N	13N	12N	10N	10N	15N	10N									
<a href="#">Forbes</a>				15N	15N	15N	15N	15N	15N	15N	15N	15N		15N	15N												
<a href="#">Griffith</a>			15N	15N	15N	15N	15N	15N	15N	15N	13N	14N		14N	14N	14N	14N	14N									
<a href="#">Hay</a>			15N	15N	15N	15N	15N	15N	15N		15N	15N	15N	15N	15N	15N											
<a href="#">Leeton</a>			15N	15N	15N	15N	15N	15N	15N		15N	14N	15N	15N		15N	15N	15N									
<a href="#">Macquarie Marshes</a>								15N	15N		15N			15N	15N	<sup>1</sup> KUNV, 13N	<sup>5</sup> KUNV 9N										
<a href="#">Menindee</a>					15N	15N	15N	14N	14N	15N	13N	13N	13N	13N		13N	13N										
<a href="#">Moama</a>								15N	15N			15N															
<a href="#">Moree</a>										15N	15N	15N	12N	15N	15N	15N	15N	15N									
<a href="#">Wee Waa</a>							15N	13N	15N	15N	15N		15N	15N		14N	14N										

N= Negative for MVEV & KUNV

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