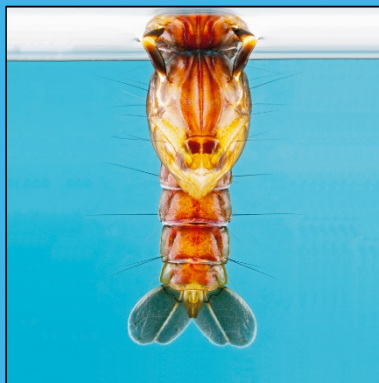


# NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2018-2019

Weekly Update: 14 December 2018



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**All reports for the season are available at:**

<https://www.health.nsw.gov.au/environment/pests/vector/Pages/nswasp-weekly-report-2018-19.aspx>

## Summary

- **Climate:** over the last week, there was light rainfall along the coast and in the Murray Valley. For November, rainfall was average for most of the state, with bands of above average precipitation across the inland. The north coast had below average rainfall. Maximum temperatures and minimum temperatures for November were slightly above average for the state.
- **Three Month Forecast:** for December 2018 to February 2019, rainfall is predicted to be around average for NSW. Maximum and minimum temperatures are predicted to exceed the average. According to the Bureau of Meteorology (BOM) as of 4 December 2018, the El Niño Alert continues, although the positive Indian Ocean Dipole has weakened.
- **Tides:** the next series of high tides are due over 21-27 December 2018, with heights of over 2m predicted.
- **Murray Valley Encephalitis virus (MVEV) Models:** the data relevant to both the Forbes' and Nichol's hypotheses have been updated to November 2018. Neither model is suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland:** mosquito collections continue to be 'low' (<50 mosquitoes/trap) at most locations, although Forbes and Macquarie Marshes both yielded 'high' numbers (100-1,000 mosquitoes/trap).
- **Mosquito Numbers Coast:** mosquito numbers have increased this week, with several 'high' collections, however *Aedes vigilax* continue to be 'low' at all sites.
- **Mosquito Numbers Sydney:** larger than expected mosquito collections were obtained from two sites this week. These collections were at 'very high' levels; the thresholds for reporting are described on page 10. One collection was from Duck River (over 4,100 mosquitoes) near Sydney Olympic Park, and the other was from Alford's Point (over 4,500 mosquitoes) along the Georges River. Deepwater also along the Georges River, had 'high' numbers with almost 900 mosquitoes collected. All of these sites were heavily dominated by *Aedes vigilax*. The non-saline locations had 'low' numbers.
- **Arboviral Isolates:** there are no arboviral isolates to date.
- **Chicken Sentinel Flocks:** all chickens were negative to MVEV and Kunjin virus (KUNV).
- **Human Notifications:** for the current fiscal year, there have been 183 Ross River virus (RRV) and 25 Barmah Forest virus (BFV) notifications, which is slightly below the previous four season average.

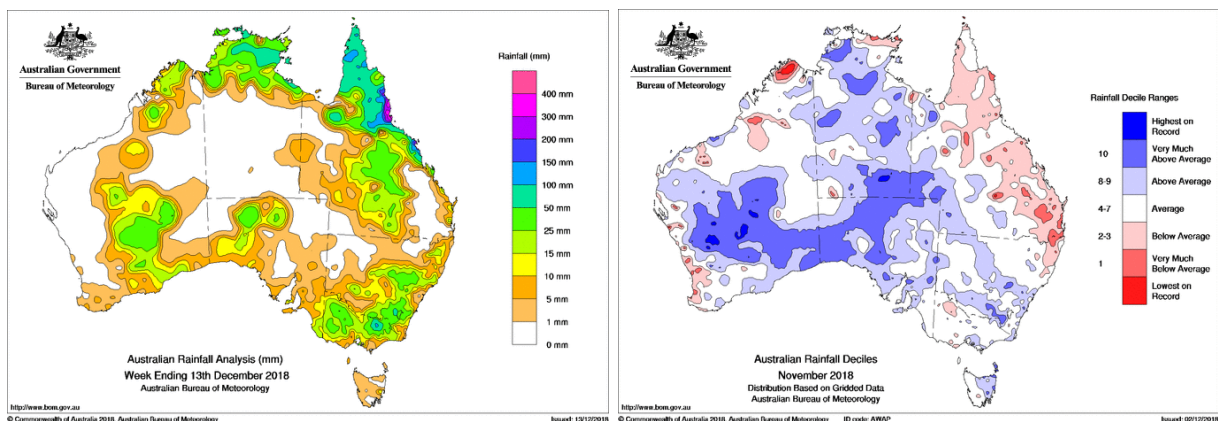
**Comment:** the combination of the recent very high tides coupled with heavy rainfall has resulted in some large mosquito collections this week for the Sydney region. These numbers are much higher than normally experienced at this time of the year. The issue with such big mosquito numbers so early in the season, is that arbovirus cycles can be given a rapid boost, which has the potential to produce large arboviral epidemics. In contrast, the inland has been quieter, with few mosquitoes continuing to be trapped.

**Comment (continued):** Two exotic *Aedes aegypti* mosquitoes were recently detected at a Commonwealth biosecurity approved arrangement facility outside of the airport precinct. A comprehensive response has been implemented to contain the mosquitoes and examine the likely source of origin.

## Environmental Conditions

### Rainfall

Rainfall across Australia for the week ending 13 December 2018 is depicted on the left and monthly rainfall deciles for November 2018 are on the right. Over the last week, there was light to moderate rainfall for most of the state being heaviest along the southern ranges. For November, rainfall was average for most of the state, with bands of above average precipitation across the inland. The north coast had below average rainfall. Maximum temperatures and minimum temperatures for November were slightly above average for the state.



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).

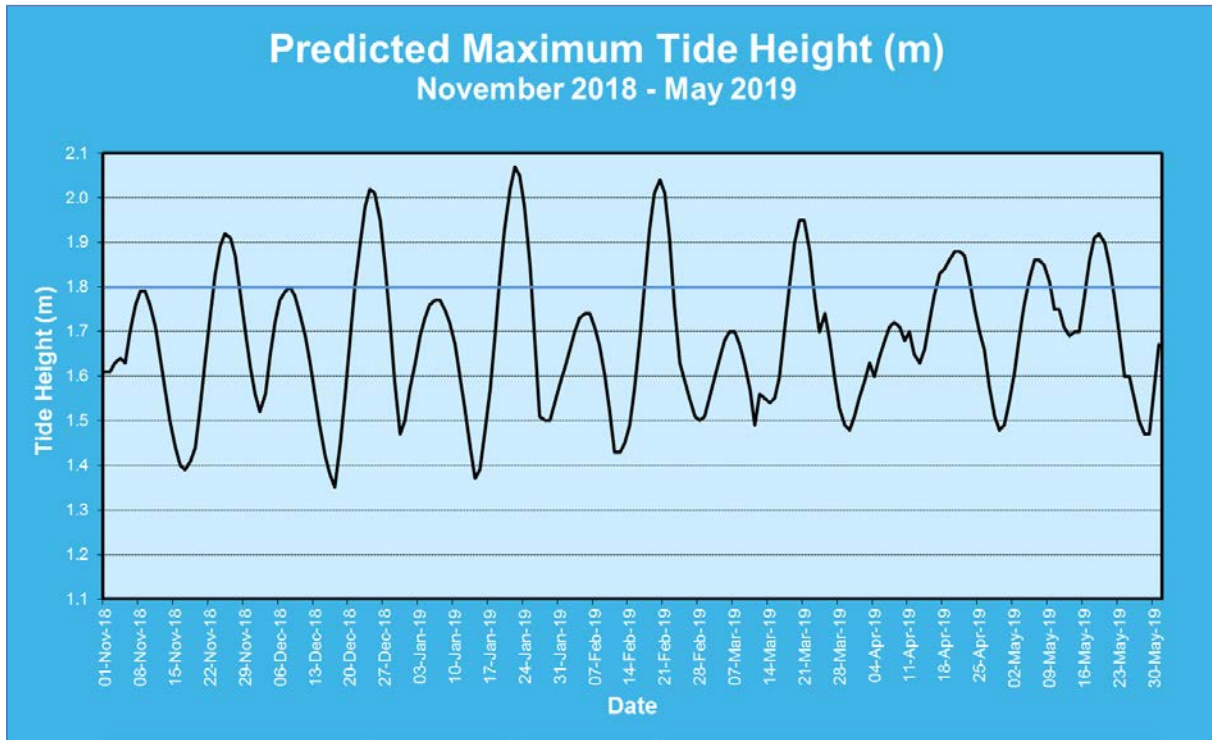
[www.bom.gov.au/climate/outlooks/#/temperature/summary](http://www.bom.gov.au/climate/outlooks/#/temperature/summary) (Max & min temperature outlook).

According to the BOM as of 4 December 2018, the El Niño Alert continues (which means that many, but not all the criteria have been met for an El Niño). A positive Indian Ocean Dipole (IOD) is now underway, however it has now weakened (positive IODs are associated with dry conditions across Australia, although has little influence on the nation's climate over December to April).

For more information: [www.bom.gov.au/climate/enso/](http://www.bom.gov.au/climate/enso/) and, [www.bom.gov.au/climate/iod/](http://www.bom.gov.au/climate/iod/)

## Tides

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, as measured at Sydney, 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. Note this trigger height varies between regions, thus at Batemans Bay, a tide height over 0.8m can initiate egg hatching.



The next series of high tides are due over 21-27 December 2018, with heights of over 2m predicted.

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. Sea level rise with climate change may also result increased tide heights. Thus predicted tide height should be used as a gauge only for potential *Aedes vigilax* activity. The larvae of the saltmarsh mosquito relies on an 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 has low reliability 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 2017, the first quarter of 2018, nor the last quarter of 2018 (Table 1). Thus Forbes' hypothesis for an MVEV outbreak has not been fulfilled.

**Table 1.** Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2018-2019 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2017	Jan-Mar 2018	Oct-Dec 2018*	Jan-Mar 2019
Darling River	0.93	0.52	0.84	
Lachlan/Murrumbidgee/Murray Rivers	1.15	0.70	0.77	
Northern Rivers	0.81	1.07	1.00	
North Lake Eyre system	0.75	0.69	0.73	

\*Data for October and November only

### ii. Nichol's Hypothesis

**Table 2.** The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2018-2019 season.

	Autumn 2018	Winter 2018	Spring 2018
<b>2018 Value</b>	1009.27	1011.8	1010.90
<b>Pre past MVEV seasons</b>	<1009.74	<1012.99	<1009.99

The Spring period pertaining to the Nichol's hypothesis is not in line with past MVEV active years.

## Arboviral Isolates

LOCATION – Site	Date Trapped	Mosquito Species	Virus
Nil to date			

## Exotic Detections

There were two recent detections of *Aedes aegypti* at a Commonwealth biosecurity approved arrangement facility outside of the airport precinct. The mosquitoes were collected by the Commonwealth Department of Agriculture and Water Resources as part of routine monitoring and the species identity confirmed by the Department of Medical Entomology, NSW Health Pathology.

To contain the mosquitoes, a comprehensive response was launched including an urgent insecticide application at the site (thermal fogging and residual treatment), a site survey of the area for vector breeding, and enhanced surveillance. Pathway analysis will be undertaken by reviewing cargo sources, and the mosquitoes will be analysed via molecular assays to determine likely source of origin. The second detection is considered likely to have been a new introduction and not a residual from the first detection, nor local breeding.



## Human Notifications

Weekly notifications of human mosquito-borne disease infections are available from the NSW Ministry of Health, Communicable Disease Weekly Report and summarized 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)).

**Table 4.** Notifications of mosquito-borne disease in NSW, 2018-2019\*

Week Ending	RRV	BFV	DENV <sup>†</sup>	Malaria <sup>†</sup>	CHIKV <sup>†</sup>	ZIKV <sup>†</sup>	Total
7-Jul-18	12	1	10	1	0	0	24
14-Jul-18	9	1	2	3	0	0	15
21-Jul-18	5	2	3	2	0	0	12
28-Jul-18	8	1	6	3	0	0	18
4-Aug-18	4	0	8	3	0	0	15
11-Aug-18	8	3	6	1	0	0	18
18-Aug-18	12	0	3	1	0	0	16
25-Aug-18	8	1	2	1	0	0	12
1-Sep-18	8	0	0	0	0	0	8
8-Sep-18	5	1	2	2	0	0	10
15-Sep-18	13	4	1	5	0	0	23
22-Sep-18	5	0	5	1	0	0	11
29-Sep-18	7	2	5	2	0	0	16
6-Oct-18	10	0	2	1	0	0	13
13-Oct-18	9	0	2	4	0	0	15
20-Oct-18	7	0	5	2	1	0	15
27-Oct-18	11	0	8	1	0	0	20
3-Nov-18	10	0	5	0	1	0	16
10-Nov-18	7	3	6	0	3	0	19
17-Nov-18	5	3	9	2	0	0	19
24-Nov-18	4	1	8	0	0	0	13
1-Dec-18	11	1	11	1	1	0	25
8-Dec-18							
15-Dec-18							
22-Dec-18							
29-Dec-18							

RRV = Ross River virus; BFV = Barmah Forest virus; DENV = Dengue virus; CHIKV = Chikungunya virus; ZIKV = Zika virus. <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:** It should also be noted that notifications are for NSW residents and that the infection may have been acquired elsewhere. Winter notifications of RRV and BFV are unlikely to be recent infections or may be false positives.

**Table 4 cont.** Notifications of mosquito-borne disease in NSW, 2018-2019\*

Week Ending	RRV	BFV	DENV <sup>†</sup>	Malaria <sup>†</sup>	CHIKV <sup>†</sup>	ZIKV <sup>†</sup>	Total
5-Jan-19							
12-Jan-19							
19-Jan-19							
26-Jan-19							
2-Feb-19							
9-Feb-19							
16-Feb-19							
23-Feb-19							
2-Mar-19							
9-Mar-19							
16-Mar-19							
23-Mar-19							
30-Mar-19							
6-Apr-19							
13-Apr-19							
20-Apr-19							
27-Apr-19							
4-May-19							
11-May-19							
18-May-19							
25-May-19							
1-June-19							
8-June-19							
15-June-19							
22-June-19							
29-June-19							
<b>Total</b>	<b>178</b>	<b>24</b>	<b>109</b>	<b>36</b>	<b>6</b>	<b>0</b>	<b>353</b>

RRV = Ross River virus; BFV = Barmah Forest virus; DENV = Dengue virus; CHIKV = Chikungunya virus; ZIKV = Zika virus.

<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.

**Table 5.** Ross River virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2013 to Jun 2019\*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2014-2015	38	50	46	67	59	90	117	305	431	264	102	50	<b>1,619</b>
2015-2016	54	61	53	61	70	54	42	60	78	79	52	16	<b>680</b>
2016-2017	12	11	20	17	38	216	429	274	200	142	174	89	<b>1,622</b>
2017-2018	29	37	52	56	37	31	30	39	51	74	96	70	<b>602</b>
2018 - 2019	32	41	30	45	31	4							<b>183</b>
Ave <sup>†</sup>	<b>33</b>	<b>40</b>	<b>43</b>	<b>50</b>	<b>51</b>	<b>98</b>	<b>155</b>	<b>170</b>	<b>190</b>	<b>140</b>	<b>106</b>	<b>56</b>	<b>1,132</b>

\*updated 14 December 2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).

<sup>†</sup>Average for 2014-15 to 2017-18.

Table modified from: <http://www1.health.nsw.gov.au/IDD/#/ROSS>

**Table 6.** Barmah Forest virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2014 to Jun 2019\*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2014-2015	10	3	11	11	8	4	12	17	43	43	16	11	<b>189</b>
2015-2016	6	9	7	9	6	3	4	5	2	3	10	2	<b>66</b>
2016-2017	4	3	0	0	1	9	9	5	8	6	24	24	<b>93</b>
2017-2018	8	10	6	8	8	6	5	12	8	10	8	7	<b>96</b>
2018 - 2019	4	6	5	2	6	2							<b>25</b>
Ave <sup>†</sup>	<b>7</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>15</b>	<b>16</b>	<b>15</b>	<b>11</b>	<b>113</b>

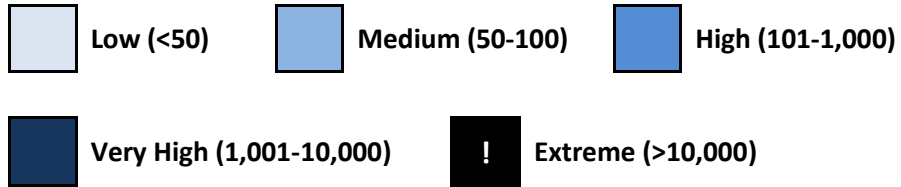
\*updated 14 December 2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).

<sup>†</sup>Average for 2014-15 to 2017-18.

Table modified from: <http://www1.health.nsw.gov.au/IDD/#/BF>

## Mosquito Results

Mosquito abundance is best described in relative terms, and in keeping with the terminology from previous NSW Arbovirus Surveillance and Mosquito Monitoring Program Annual Reports, mosquito numbers are depicted in the tables below as:



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

## Inland

Location	Mosquito	Oct-18				Nov				Dec					Jan-19				Feb				Mar					
		7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	
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.																											
Macquarie Marshes	<i>Cx. annul</i>																											
	Total Mosq.																											
Wagga	<i>Cx. annul</i>																											
	Total Mosq.																											

## Coastal

Location	Mosquito	Nov-18				Dec					Jan-19				Feb				Mar					Apr			
		4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28
Ballina	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Coffs Harbour	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Gosford	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Kempsey	<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-18				Dec					Jan-19				Feb				Mar					Apr			
		4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28
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>Cx. annul</i>																										
	Total Mosq.																										
Hills Shire	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Parramatta	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Penrith	<i>Ae. vigilax</i>																										
	Total Mosq.																										
Sydney Olympic Park	<i>Ae. vigilax</i>																										
	Total Mosq.																										

## Sentinel Chicken Flocks – MVEV and Kunjin Virus Antibody Test Results

Location	Oct	Nov				Dec					Jan-19				Feb				Mar				Apr				
	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	7	14	21	28	
Deniliquin			15N	15N	15N	15N																					
Dubbo*																											
Forbes			12N	12N	12N																						
Griffith		15N	15N	15N	15N																						
Hay		15N	15N	15N	15N	15N																					
Leeton	15N	15N	15N	15N	15N																						
Macquarie Marshes		15N		15N	15N	15N																					
Menindee		15N		15N	15N	15N																					
Moree				15N	15N																						

N= Negative for MVEV & Kunjin virus

\*Dubbo is commencing monitoring in January 2019.

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