NSW Arbovirus Surveillance & Mosquito Monitoring Program, 2017-2018

Weekly Update: 20/Apr/2018



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Contents

Summary

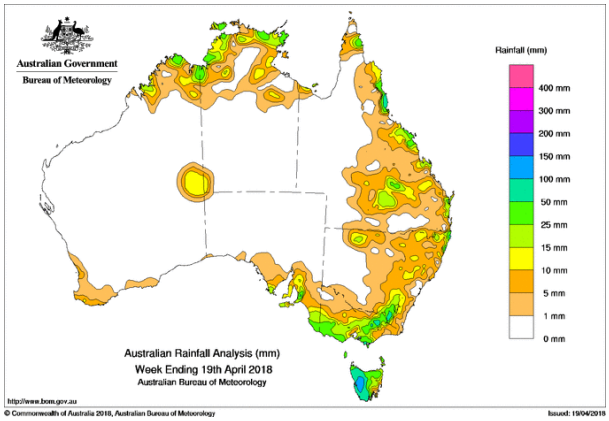
- **Climate**: over the last week, there was light rainfall across eastern Australia. For March, most of the state had below average rainfall with only a pocket of the mid-north coast had above average precipitation.
- **Three Month Forecast**: rainfall predictions for NSW over May to July are for average precipitation for most of the state, with a slight chance of exceeding the average for the far south coast. Maximum and minimum temperatures are expected to be around average, although minimum temperatures are predicted to be above average along the Murray. According to the BOM as 10/Apr/2018, the El Niño–Southern Oscillation remains neutral.
- **Tidal**: the next series of tides that may trigger *Aedes vigila*x hatching are currently occurring over 16-22/Apr with tides of up to 1.86m predicted. At this stage, tides have reached up to 1.91m.
- **MVEV models**: the data relevant to both the Forbes' and Nichols' hypotheses have been updated to the end of Mar 2018. Neither model are suggestive of an MVEV epidemic.
- **Mosquito Numbers Inland**: all inland surveillance activities have ceased for this season.
- **Mosquito Numbers Coast**: collections were 'medium' or lower from all trapping sites, except Tweed, which continues with the 'high' numbers (but only just).
- **Mosquito Numbers Sydney**: no collections were undertaken at the saltmarsh sites (Homebush and Georges River) this week and the other Sydney sites produced only 'low' numbers.
- **Arboviral Isolates**: there were no further arboviral detections this week.
- **Chicken Sentinel Flocks**: all inland surveillance activities have ceased for this season.
- **Human Notifications**: for the current fiscal year, there have been 378 RRV and 76 BFV notifications, this is below the average compared with past years (the prior 18 season averages to the end of April are 484RRV and 291BFV).

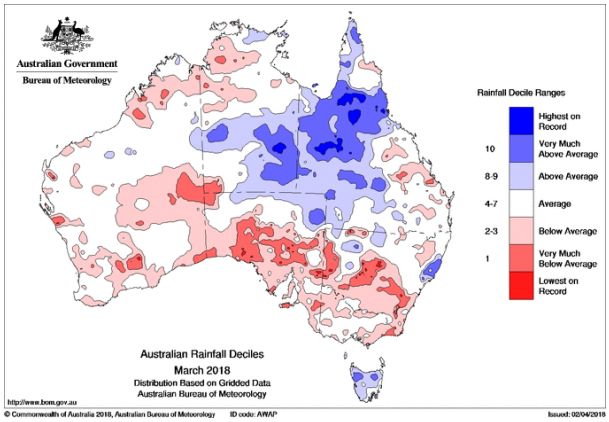
Comment: finally we have some cooler weather and mosquito numbers appear to be on the decline, with only the one site (Tweed) producing a 'high' collection this week. Some wet weather is forecast ahead for the north coast and so the nights will be warmer and more humid, which may see larger collections. However, it now looks like were are in the last throws of this season's mosquito activity.

Environmental Conditions

Rainfall

Rainfall across Australia for the week ending 19/Apr/2018 is depicted on the left and monthly rainfall deciles for March 2018 are on the right. Over the last week, there was light rainfall across eastern Australia. For March, rainfall was below to very much below average across southern inland regions and around average for the remainder of the state. Only a pocket of the mid-north coast had above average precipitation. Maximum and minimum temperatures for March were 1-2 degrees above average.





Three Month Rainfall & Temperature Forecast

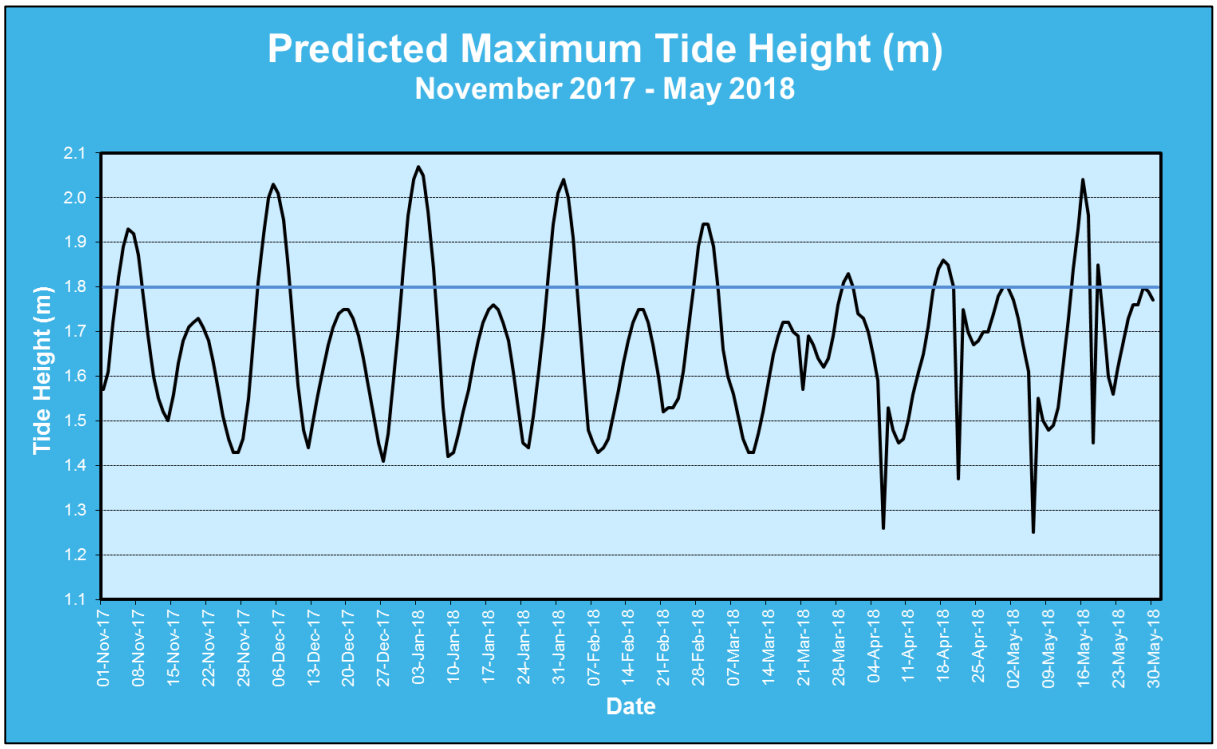
For May to July 2018, rainfall predictions for NSW are for average precipitation for most of the state, with a slight chance of exceeding the average for the far south coast. Maximum and minimum temperatures are expected to be around average, although minimum temperatures are predicted to be above average along the Murray. 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 10/Apr/2018, the El Niño–Southern Oscillation remains neutral. The Indian Ocean Dipole (IOD) remains neutral. This all suggests that rainfall patterns are likely to be average over the upcoming months.

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, 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 height various between regions, thus at Batemans Bay, a tide height over 0.8m can trigger egg hatching.



The next series of tides that may trigger *Aedes vigilax* hatching are currently occurring over 16-22/Apr with tides of up to 1.86m predicted. At this stage, tides have reached 1.91m as measured at Sydney.

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. Climate change will also result in much higher 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 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 localized 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 2016, the first quarter of 2017, the last quarter of 2017 or the first quarter of 2018 (Table 1).

Table 1. Rainfall indices for the main catchment basins of eastern Australia as per Forbes' hypothesis, relevant to the 2017-2018 season. Note that a value of 1 equals Decile 7 rainfall.

Catchment Basin	Oct-Dec 2016	Jan-Mar 2017	Oct-Dec 2017	Jan-Mar 2018
Darling River	0.58	0.81	0.93	0.52
Lachlan/Murrumbidgee/Murray Rivers	0.92	1.01	1.15	0.70
Northern Rivers	0.98	1.03	0.81	1.07
North Lake Eyre system	1.09	0.73	0.75	0.69

ii. Nichol's Hypothesis

Table 2. The seasonal atmospheric pressures (in mm) according to Nichol's hypothesis, relevant to the 2017-2018 season.

	Autumn 2017	Winter 2017	Spring 2017
2017 Value	1009.60	1013.23	1009.70
Pre past MVEV seasons	<1009.74	<1012.99	<1009.99

Only the Winter 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
GRIFFITH – Lake Wyangan	3/Jan/2018	*Culex annulirostris*	Ross River
GEORGES RIVER - Deepwater	30/Jan/2018	*	Stratford
GRIFFITH – Lake Wyangan	31/Jan/2018	*Culex annulirostris*	Ross River
GRIFFITH – Hanwood	5/Feb/2018	*Culex annulirostris*	Ross River
GEORGES RIVER – Alfords Point	7/Feb/2018	*	Stratford
GEORGES RIVER - Deepwater	12/Feb/2018	*Aedes vigilax*	Stratford
CENTRAL COAST – Empire Bay	27/Feb/2018	*	Barmah Forest
CENTRAL COAST – Halekulani	14/Mar/2018	*	Barmah Forest
GEORGES RIVER – Alfords Point	21/Mar/2018	*	Barmah Forest
GEORGES RIVER – Deepwater	21/Mar/2018	*	Barmah Forest

*Detection via PCR on pooled samples; the mosquito species cannot be determined.

Human Notifications

Weekly notifications of human mosquito-borne diseases 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).

Table 4. Notifications of Mosquito-Borne Disease in NSW, 2017-2018*

Week Ending	RRV	BFV	DENV†	Malaria†	CHIKV†	ZIKV†	Total
1-Jul-17	14	6	3	2	0	0	**25**
8-Jul-17	6	4	0	4	1	0	**15**
15-Jul-17	8	0	2	1	0	0	**11**
22-Jul-17	10	3	7	2	0	0	**22**
29-Jul-17	6	0	2	2	0	0	**10**
5-Aug-17	8	0	4	0	0	0	**12**
12-Aug-17	11	1	3	2	5	0	**22**
19-Aug-17	5	2	1	2	2	0	**12**
26-Aug-17	6	3	3	2	0	1	**15**
2-Sep-17	6	0	1	0	1	0	**8**
9-Sep-17	14	0	1	2	1	0	**18**
16-Sep-17	9	1	5	0	0	0	**15**
23-Sep-17	9	1	3	1	0	0	**14**
30-Sep-17	7	0	1	1	1	0	**10**
7-Oct-17	7	0	3	2	0	0	**12**
14-Oct-17	10	1	2	1	0	0	**14**
21-Oct-17	11	2	8	2	1	0	**24**
28-Oct-17	16	1	6	1	1	0	**25**
4-Nov-17	14	3	7	3	1	0	**28**
11-Nov-17	5	2	7	0	0	0	**14**
18-Nov-17	3	2	10	0	0	0	**15**
25-Nov-17	9	2	6	1	1	0	**19**
2-Dec-17	14	1	8	0	0	0	**23**
9-Dec-17	9	0	3	1	0	0	**13**
16-Dec-17	9	4	2	1	2	0	**18**
23-Dec-17	7	0	6	0	0	0	**13**
30-Dec-17	5	0	1	0	0	0	**6**
Total	**238**	**39**	**105**	**33**	**17**	**1**	**433**

†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 infection may have been acquired elsewhere and that winter notifications of RRV are likely to be false positives**.**

Table 4 cont. Notifications of Mosquito-Borne Disease in NSW, 2017-2018*

Week Ending	RRV	BFV	DENV†	Malaria†	CHIKV†	ZIKV†	Total
6-Jan-18	5	0	4	2	1	0	**12**
13-Jan-18	2	2	13	1	0	0	**18**
20-Jan-18	6	0	9	0	1	0	**16**
27-Jan-18	3	0	10	1	0	0	**14**
3-Feb-18	9	3	8	1	0	0	**21**
10-Feb-18	8	2	6	0	0	0	**16**
17-Feb-18	4	2	3	0	0	0	**9**
24-Feb-18	15	1	4	1	1	1	**23**
3-Mar-18	9	2	3	6	0	0	**20**
10-Mar-18	19	3	6	0	1	0	**29**
17-Mar-18	10	1	3	0	0	0	**14**
24-Mar-18	10	4	1	2	0	0	**17**
31-Mar-18	8	1	6	0	0	0	**15**
7-Apr-18	14	2	2	0	0	0	**18**
Total	**360**	**62**	**183**	**47**	**21**	**2**	**675**

†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 April 2018*.

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2013-2014	36	23	27	36	30	30	33	35	44	72	86	57	**509**
2014-2015	38	50	46	67	59	90	117	305	431	264	102	50	**1,619**
2015-2016	54	61	53	61	70	54	42	60	78	79	52	16	**680**
2016-2017	12	11	20	17	38	216	429	274	200	142	174	89	**1,622**
2017-2018	29	37	52	56	37	31	30	40	45	21			**378**
Ave†	27	26	25	30	35	42	65	71	86	78	68	37	**589**

*updated 20/Apr/2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).
†Average for 2001/02 to 2016/17.
Table modified from: http://www1.health.nsw.gov.au/IDD/#/ROSS

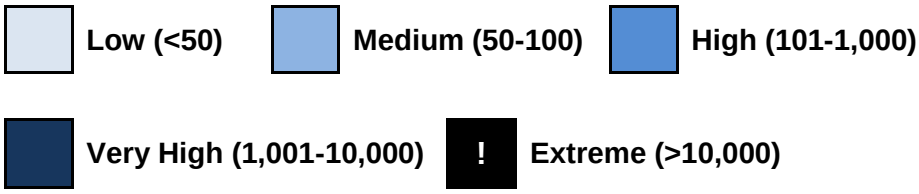
Table 6. Barmah Forest virus infection notifications in NSW residents, by month of disease onset per fiscal year, July 2014 to April 2018*.

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	**189**
2015-2016	6	9	7	9	6	3	4	5	2	3	10	2	**66**
2016-2017	4	3	0	0	1	9	9	5	8	6	24	24	**93**
2017-2018	8	10	6	8	8	6	5	12	7	6			**76**
Ave†	21	19	18	22	25	21	32	35	48	51	49	28	**367**

*updated 20/Apr/2018 (this table is updated at different times to Table 4 above, hence there maybe differences in the numbers).
†Average for 2001/02 to 2016/17.
Table modified from: http://www1.health.nsw.gov.au/IDD/#/BF

Mosquito Results

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-17					Nov				Dec					Jan-18				Feb				Mar			
		1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25
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				Dec					Jan-18				Feb				Mar				Apr				
		5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25	1	8	15	22	29
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				Dec					Jan-18				Feb				Mar				Apr				
		5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25	1	8	15	22	29
Banks-town	*Ae. vigilax*																										
	Total Mosq.																										
Blacktown	*Ae. vigilax*																										
	Total Mosq.																										
Georges River	*Ae. vigilax*																										
	Total Mosq.																										
Hawkes-bury	*Cx. annul*																										
	Total Mosq.																										
Hills Shire	*Ae. vigilax*																										
	Total Mosq.																										
Penrith	*Ae. vigilax*																										
	Total Mosq.																										
Sydney Olympic Park	*Ae. vigilax*																										
	Total Mosq.																										

Sentinel Chicken Flocks

Location	Oct-17					Nov				Dec					Jan-18				Feb				Mar			
	1	8	15	22	29	5	12	19	26	3	10	17	21	28	7	14	21	28	4	11	18	25	4	11	18	25
Deniliquin						15N	14N	15N	15N	15N	15N	15N	15N	15N	15N	14N	14N	15N	15N	15N	15N	15N	14N	15N	14N	11N
Dubbo						15N	15N	15N	15N	15N	14N	14N	14N	14N	14N	14N	14N	14N	14N	14N	14N	14N	14N			14N
Forbes						15N		15N	15N	15N	14N							15N	15N							
Griffith					15N	15N	15N	15N	15N	15N	15N	15N		15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	14N	14N	14N
Hay					15N	15N	15N	15N	15N	15N	15N			15N	15N	15N	15N	15N		15N	15N	15N	15N		15N	15N
Leeton						15N	15N		15N	15N	15N	15N	15N	15N	15N	14N	14N	14N	14N	14N	14N	14N	14N	14N	13N	14N
Macquarie Marshes							15N	15N	15N	15N	15N		15N	15N		15N	15N	15N		15N	15N	15N	15N		15N	14N
Menindee										15N	15N	15N	15N	15N	15N	15N	15N	15N	14N	15N	16N	15N	15N	15N	15N	15N
Moree										15N	15N		15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N	15N

N= Negative for MVEV & KUNV

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