



**Rhode Island Department of Health
Center for Acute Infectious Disease Epidemiology
Arbovirus Surveillance: Epidemiologic Report, 2016**

Purpose: To monitor the epidemiology, incidence and geographic distribution of West Nile Virus (WNV) and other arboviruses in Rhode Island for early detection and prevention of any human transmission.

Quick Facts:

- The Rhode Island Department of Environmental Management (DEM) traps mosquitoes at various locations throughout Rhode Island. Mosquito traps are placed strategically throughout the state based on knowledge of environmental conditions conducive to West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) amplification in the mosquito population. Once the traps are collected, the mosquitoes collected in each trap are sorted by species into 'pools'. A pool can contain anywhere from 1 to 50 mosquitoes. The Rhode Island State Health Laboratory tests each pool for the presence of virus through tissue culture testing. Viruses causing a cytopathogenic effect in tissue culture are identified through direct fluorescent antibody testing with monoclonal antibodies.
- Mosquito traps were set weekly from June 6th through September 26th, 2016.
- In 2016, 1,969 mosquito pools (16,728 individual mosquitoes) were tested for the presence of arboviruses, of which four tested positive (0.2%). Of the four positive pools, 2 tested positive for EEE, 1 tested positive for WNV and 1 tested positive for Jamestown Canyon Virus (JCV). In 2015, there were five pools positive for arboviruses (WNV: 4, HJV: 1).
- The first positive pool for the season (WNV, *Culex* spp.) was collected on July 25, 2016 in Pawtucket. The last positive pool of the season (EEE, *Culex* spp.) was collected on September 27, 2016 in Westerly.
- *Culiseta melanura* had the highest arboviral positivity rate (1.0%) followed by *Culex* species (0.5%) and *Coquilletidia perturbans* (0.4%).
- The greatest number of mosquito pools were collected in Westerly (15.2% of total pools); whereas the highest arboviral positivity rate of pools was noted in Pawtucket (1.1% positivity).
- In 2016, there were no veterinary cases of arboviral disease.
- In 2016, there were 2 human cases of neuroinvasive WNV. In addition, in 2016 Rhode Island identified its first human case of Powassan virus. Powassan virus is an arbovirus that is transmitted by an infected tick.
- In 2016, 75 cases of Zika virus were identified (Disease, Non-congenital: 56, Infection, Non-congenital: 18, Infection, congenital: 1). All cases were travel-acquired.

Figures and Tables

Figure 1 and Table 1: Mosquito Pools by Type of Mosquito and Month

Between June 6th, 2016 and September 26th, 2016, The Rhode Island Department of Environmental Management submitted a total of 1,969 mosquito pools comprised of 16,728 individual mosquitoes to the Rhode Island State Health Laboratory where they were tested for WNV, EEE, HJV and JCV. The highest arboviral positivity was found in September (0.4%), followed by August (0.3%) and July (0.2%).

Figure 1

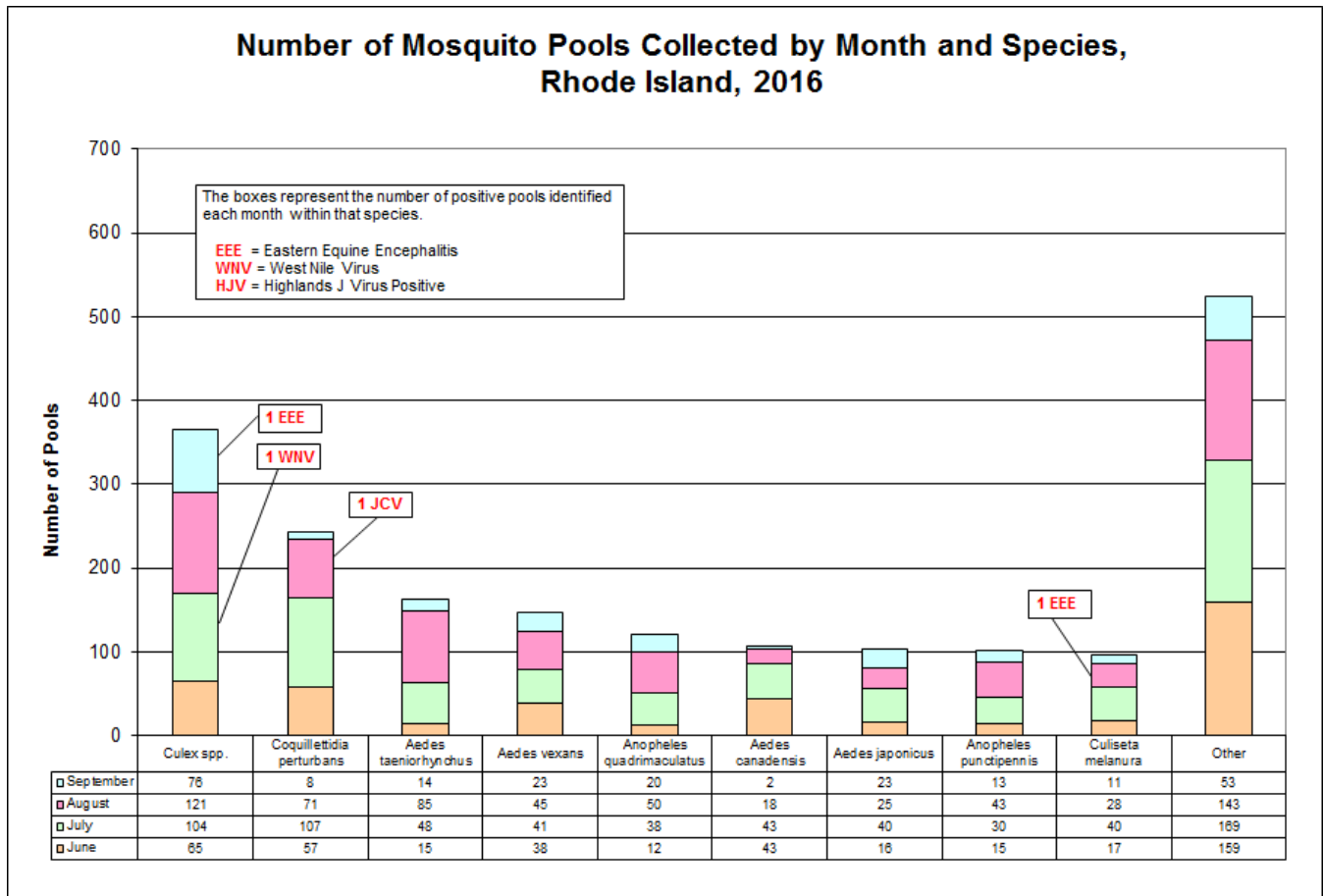


Table 1: Mosquito Surveillance: Pools by Species, Rhode Island, 2016*

Species	June	July	August	September	Total
Aedes abserratus	5				5
Aedes aurifer	21	19	12	2	54
Aedes canadensis	43	43	18	2	106
Aedes cantador	10	11	6		27
Aedes cinereus	7				7
Aedes communis	9				9
Aedes excrucians	16	12	6		34
Aedes intrudens	8		2		10
Aedes japonicus	16	40	25	23	104
Aedes orifer				1	1
Aedes provocans	1				1
Aedes punctor	4	2			6
Aedes sollicitans	5	12	16	1	34
Aedes sticticus	6	4	3		13
Aedes stimulans	6	4			10
Aedes taeniorhynchus	15	48	85	14	162
Aedes thibaulti	21	17	11		49
Aedes triseriatus	5	18	7	6	36
Aedes trivittatus		1			1
Aedes vexans	38	41	45	23	147
Anopheles crucians	1	7	12	8	28
Anopheles punctipennis	15	30	43	13	101
Anopheles quadrimaculatus	12	38	50	20	120
Anopheles trivetatus			1		1
Anopheles walkeri	10	20	18	11	59
Coquilletidia perturbans	57	107	71 1 JCV (+)	8	243 (0.4% Positivity)
Culex spp.	65	104 1 WNV (+)	121	76 1 EEE (+)	366 (0.5% Positivity)
Culiseta melanura	17	40	28 1 EEE (+)	11	96 (1.0 % Positivity)
Culiseta morsitans	24	36	16	6	82
Orthopodomyia signifera		1			1
Psorophora ferox				1	1
Uranotaenia sapphirina		5	33	17	55
Total	437	660	629	243	1,969

* All pools tested negative, unless otherwise specified.

Given the concerns about Zika virus during 2016, Rhode Island increased its surveillance for *Aedes albopictus*, the only local species that can transmit the virus. Between August 2, 2016 to September 13, 2016, 28 individual *A. albopictus* mosquitoes were trapped through various methodologies in the town of Barrington, RI. It is unclear whether this population is established in this location to be of any concern. Annual trapping and monitoring will continue. In the absence of human cases in residents of Barrington, there is no risk of local Zika transmission even if a small number of *A. Albopictus* establish themselves in this location.

Figure 2 and Figure 3: Mosquito Pools by Trap Night

As can be seen from Figure 2 below, the number of mosquito pools collected weekly from July 5th to August 15th was relatively high with two exceptions. After August 15th, the total number of mosquito pools collected each week declined until reaching a low of 45 pools collected on September 26th. This gradual decline is normal. During the later part of summer, mosquito populations decrease, but older mosquitos are more likely to carry arboviruses, thus increasing the risk of human infection. This is illustrated in Figure 3 below. This figure describes the biweekly frequency of WNV and EEE positive mosquito pools for 2001 – 2015. As can be seen from the figure, the frequency of positive pools increased through the mid-summer months until it peaks in early September. Interestingly, from mid-September until first frost, the frequency of EEE positive pools is greater than WNV positive pools.

Figure 2

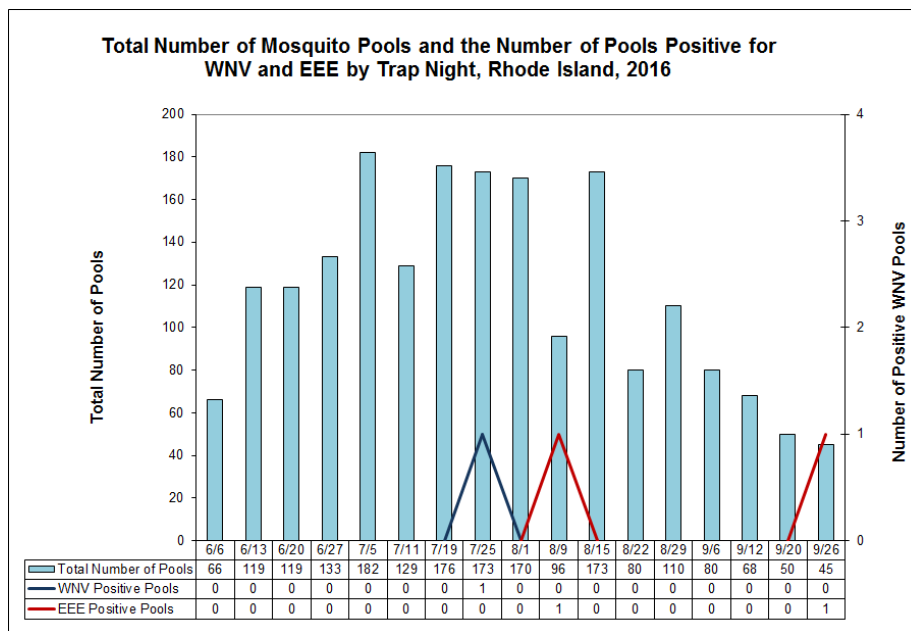


Figure 3

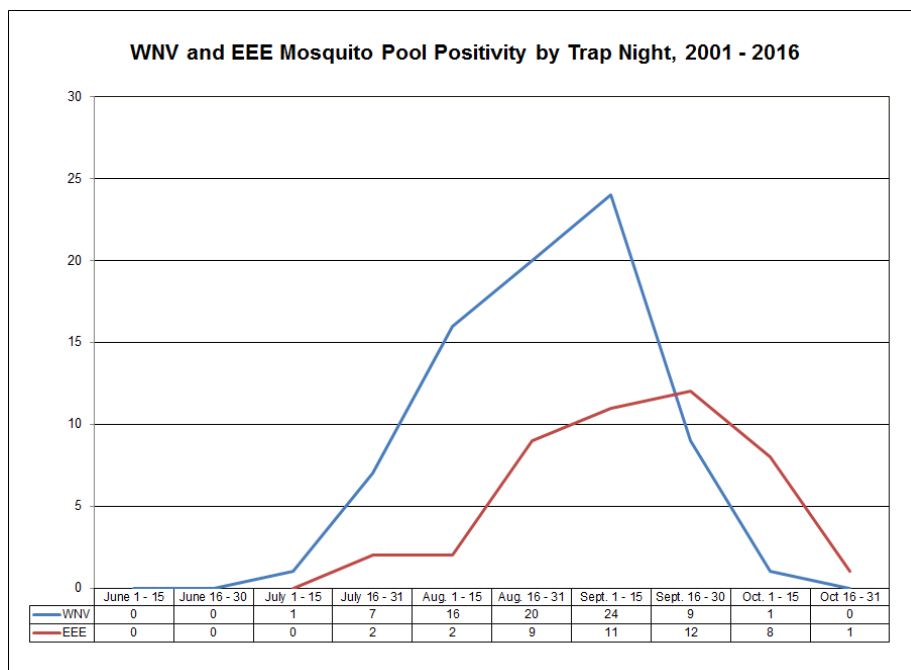


Figure 4

Arboviral Surveillance: Mosquito Pool Collection by Town, Rhode Island, 2016

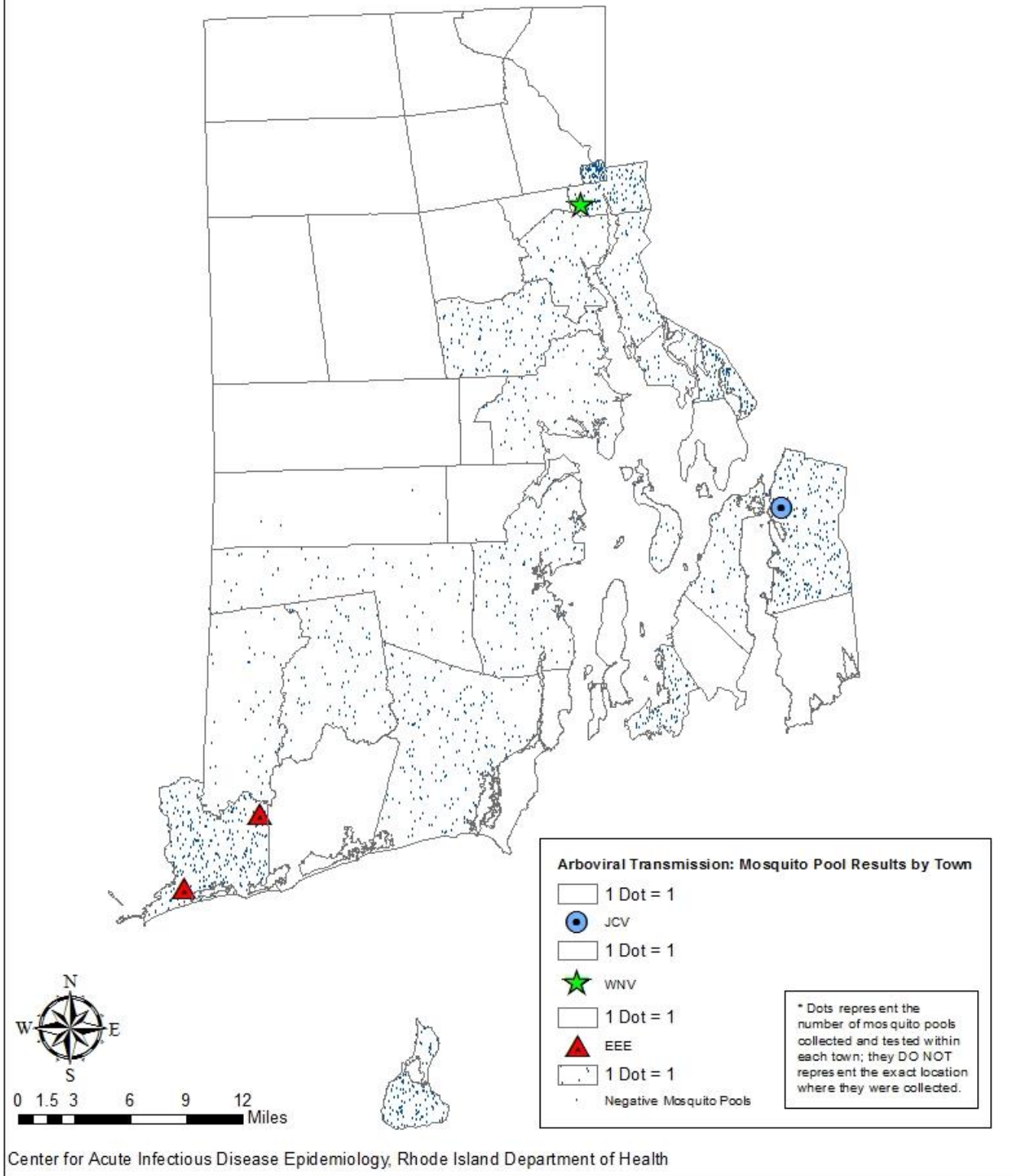


Figure 5

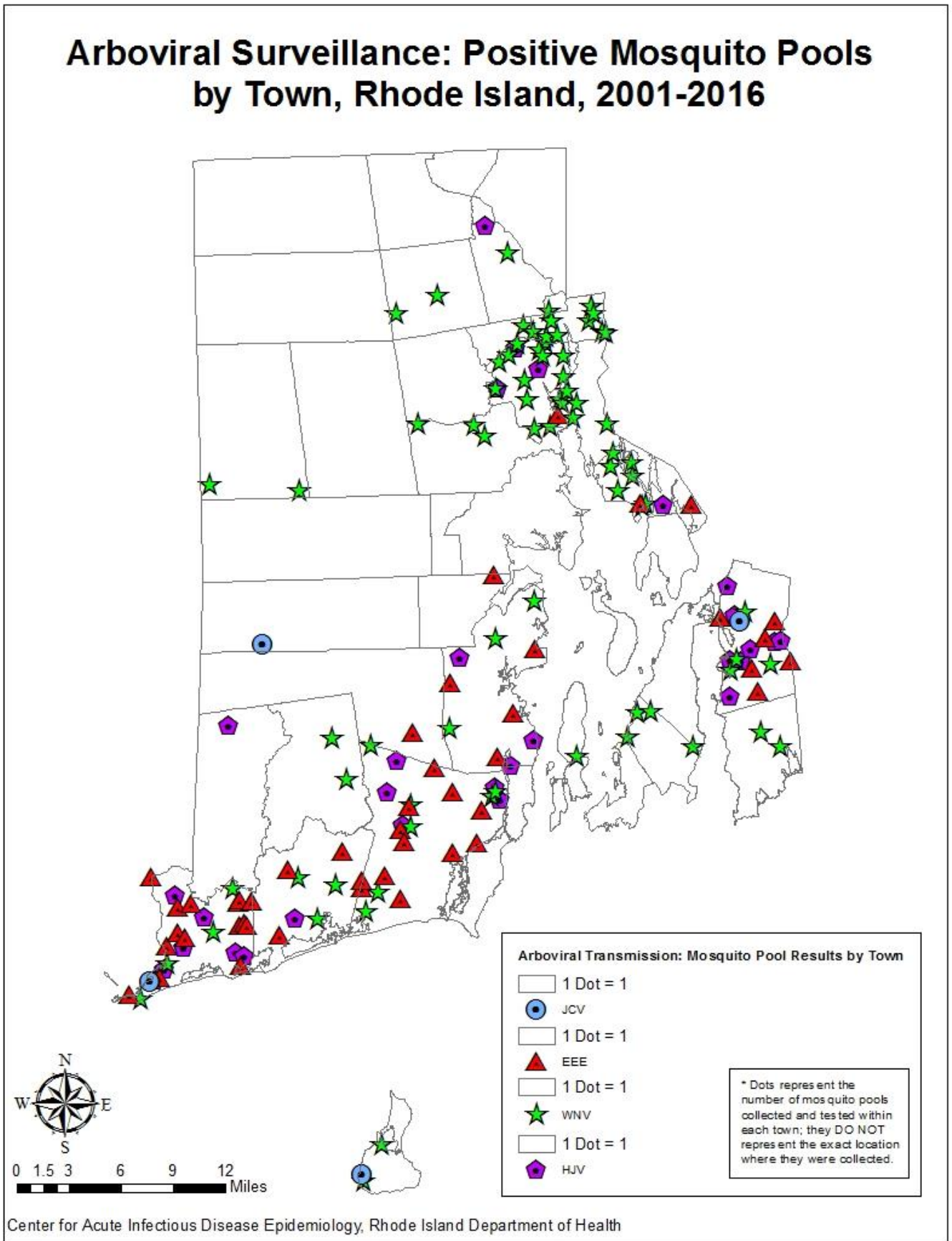


Table 2: Mosquito Surveillance: Pools by Towns, Rhode Island, 2016*

Town	Total Pools	Percentage of all Pools Collected	Positive Pools	Percent Positivity by Town
Westerly	300	15.2	2 (2 EEE)	0.7
Tiverton	251	12.7	1 (JCV)	0.4
South Kingstown	199	10.1	0	0
Cranston	130	6.6	0	0
New Shoreham	126	6.4	0	0
North Kingstown	113	5.7	0	0
Warren	107	5.4	0	0
Pawtucket	95	4.8	1 (WNV)	1.1
Richmond	87	4.4	0	0
Central Falls	84	4.3	0	0
Newport	78	4.0	0	0
Portsmouth	76	3.9	0	0
Warwick	72	3.7	0	0
Exeter	63	3.2	0	0
East Providence	57	2.9	0	0
Providence	51	2.6	0	0
Hopkinton	48	2.4	0	0
Barrington	27	1.4	0	0
West Greenwich	4	0.2	0	0
East Greenwich	1	0.1	0	0
Total	1969	100	4	0.2

* Towns without any mosquito pools collected have been excluded from the table.

Table 3: Mosquito Surveillance: Summary Data, Rhode Island, 2001-2016

Year	Number of pools tested	Number of positive counties	Total number of positive pools	Number of WNV positive pools	Earliest positive trap date for WNV	Number of EEE positive pools	Earliest positive trap date for EEE
2001	1856	3	14	14	7/16/2001	0	NA
2002	1417	2	4	4	8/28/2002	0	NA
2003	2383	4	27	7	8/21/2003	17	9/10/2003
2004	3062	2	7	0	NA	7	7/19/2004
2005	1466	2	2	1	9/19/2005	0	NA
2006	1382	4	19	10	8/8/2006	3	9/17/2006
2007	1048	2	5	5	8/20/2007	0	NA
2008	1207	2	10	10	8/26/2009	0	NA
2009	1138	2	14	3	9/8/2009	3	8/24/2009
2010	1621	3	9	2	8/30/2010	2	8/23/2010
2011	1690	3	3	2	8/22/2011	0	NA
2012	2234	4	16	5	7/9/2012	6	8/06/2012
2013	2311	4	17	8	7/29/2013	4	8/26/2013
2014	1727	2	4	2	8/04/2014	0	NA
2015	2117	3	5	4	8/12/2015	0	NA
2016	1969	3	4	1	7/25/2016	2	8/1/2016

Table 4: Human Arboviral Cases, Rhode Island, 2012-2016

In 2016, there were 2 human cases of neuroinvasive WNV identified in Rhode Island residents. Both cases became ill in August with the first case initially becoming ill on August 12, 2016. One of the two cases had no history of recent travel outside Rhode Island prior to illness onset. These were the first human cases of WNV identified since 2013. In addition, in 2016 the first human case of Powassan virus was identified in a Rhode Island resident. This individual initially became ill in early May and had no history of recent travel outside Rhode Island prior to illness onset.

There were also 83 cases of other arboviral diseases reported to the Rhode Island Department of Health in 2016. All cases of Zika virus, chikungunya virus and dengue virus were acquired outside of the United States in countries where these diseases are endemic.

Cases are classified using current CSTE case definitions and can be locate at <https://www.cdc.gov/nndss/conditions/notifiable/2016/infectious-diseases/>.

Year	2012	2013	2014	2015	2016	5-Year Total
Eastern Equine Encephalitis	0	0	0	0	0	0
Jamestown Canyon Virus (Neuroinvasive)	0	1	0	0	0	1
Powassan Virus (Neuroinvasive)	0	0	0	0	1	1
West Nile Virus	4	1	0	0	2	7
Neuroinvasive	2	1	0	0	2	-
Non-neuroinvasive	2	0	0	0	0	-
Travel Associated Arboviral Cases						
Chikungunya	0	0	54	5	3	62
Dengue	0	9	5	3	5	22
Zika Virus	0	0	0	0	75	75
Zika Virus Disease, Non-congenital	0	0	0	0	56	-
Zika Virus Infection, Non-congenital	0	0	0	0	18	-
Zika Virus Infection, Congenital	0	0	0	0	1	-