**Rhode Island Department of Health**
**Division of Infectious Disease Epidemiology**
**Arbovirus Surveillance: Epidemiologic Report, 2014**

*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:

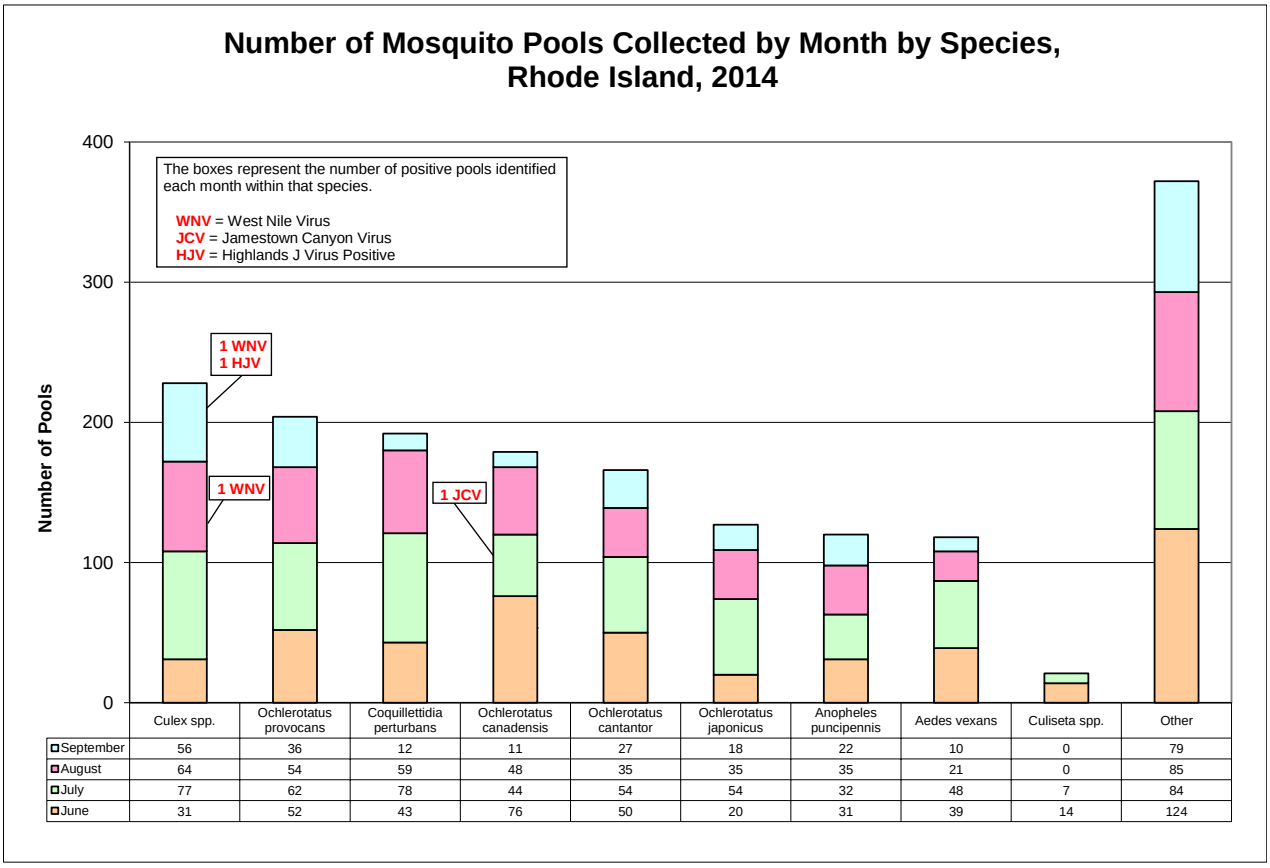
- The Rhode Island Department of Environmental Management (DEM) traps mosquitoes at various locations throughout Rhode Island. Mosquito traps are placed strategically throughout the state based on knowledge of environments conducive to West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) amplification 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 mosquitos. The State Health Laboratory tests each pool for the presence of virus by polymerase chain reaction (PCR).
- Mosquito traps were set weekly from June 9$^{th}$ through September 22$^{nd}$, 2014.
- In 2014, 1,727 mosquito pools (10,244 individual mosquitos) were tested for the presence of arboviruses, of which four tested positive (0.2%). Of the four positive pools, 2 tested positive for WNV, 1 tested positive for Highlands J Virus (HJV) and 1 tested positive for Jamestown Canyon Virus (JCV). In 2013, there were seventeen positive pools for arboviruses (EEE: 4, WNV: 8, HJV: 5).
- The first positive pool for the season (JCV, Ochlerotatus canadensis) was collected on July 21, 2014 in New Shoreham. The last positive pools of the season (HJV and WNV, Culex spp.) were both collected on September 2, 2014 in Tiverton and South Kingstown.
- Culex species had the highest arboviral positivity rate (1.0%) followed by Ochlerotatus canadensis (0.6%).
- The greatest number of mosquito pools (12.8% of total pools) were collected in Westerly; whereas the highest arboviral positivity rate of pools was noted in South Kingstown.
- In 2014, there were no veterinary cases of EEE, WNV or JCV
- In 2014, there were no human cases of EEE, WNV or JCV. In 2013, the only human case was an individual co-infected with neuro-invasive West Nile Virus (WNV) and Jamestown Canyon Virus (JCV).

## Figures and Tables

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

Between June 9th, 2014 and September 22th, 2014, The Rhode Island Department of Environmental Management submitted a total of 1,727 mosquito pools comprised of 10,244 individual mosquitoes to the Rhode Island State Health Laboratory where they were tested for WNV, EEE, HJV and JCV. Because the summer was unusually dry, 2014 saw a large decrease in the number of mosquitos collected during the arboviral season when compared to past years. For instance, in 2014 there was a 25% decrease in the number of mosquito pools collected and a 53% decrease in the number of individual mosquitoes collected when compared to 2013 (2,311 mosquito pools collected comprised of 21,920 individual mosquitos). The substantial decrease in the number of mosquitos also brought about an early conclusion of mosquito trapping by DEM in 2014. Normally, mosquito trapping will conclude in early October, but in 2014 the last traps were set on September 22nd, two weeks earlier than usual.

**Figure 1**




| | Culex spp. | Ochlerotatus provocans | Coquillettidia perturbans | Ochlerotatus canadensis | Ochlerotatus cantantor | Ochlerotatus japonicus | Anopheles puncipennis | Aedes vexans | Culiseta spp. | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| September | 56 | 36 | 12 | 11 | 27 | 18 | 22 | 10 | 0 | 79 |
| August | 64 | 54 | 59 | 48 | 35 | 35 | 35 | 21 | 0 | 85 |
| July | 77 | 62 | 78 | 44 | 54 | 54 | 32 | 48 | 7 | 84 |
| June | 31 | 52 | 43 | 76 | 50 | 20 | 31 | 39 | 14 | 124 |

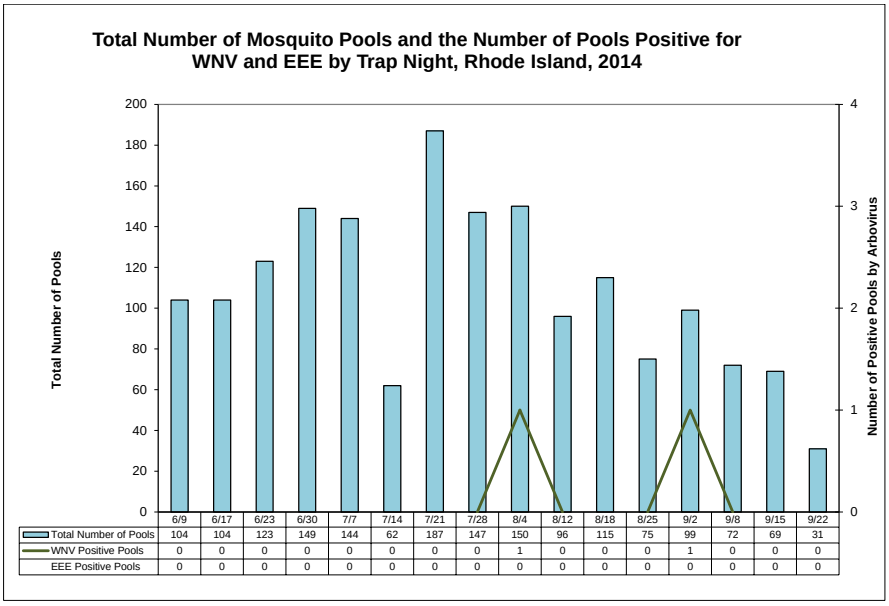
## Table 1: Mosquito Surveillance: Pools by Species, Rhode Island, 2014

| | June | July | August | September | Total |
|---|---|---|---|---|---|
| Aedes cinereus | 3 | 0 | 0 | 0 | 3 |
| Aedes vexans | 39 | 48 | 21 | 10 | 118 |
| Anopheles barberi | 7 | 10 | 15 | 6 | 38 |
| Anopheles crucians | 1 | 0 | 0 | 0 | 1 |
| Anopheles puncipennis | 31 | 32 | 35 | 22 | 120 |
| Anopheles quadrimaculatus | 5 | 6 | 4 | 7 | 22 |
| Anopheles walkeri | 7 | 14 | 13 | 14 | 48 |
| Coquillettidia perturbans | 43 | 78 | 59 | 12 | 192 |
| Culex spp. | 31 | 77 | 64<br>**1 WNV (+)** | 56<br>**1 WNV (+)**<br>**1 HJV (+)** | 228<br>**(1.3% Positivity)** |
| Culiseta morsitans | 12 | 0 | 0 | 0 | 12 |
| Culiseta spp. | 2 | 7 | 0 | 0 | 9 |
| Ochlerotatus abserratus | 1 | 2 | 0 | 0 | 3 |
| Ochlerotatus atropalpus | 3 | 0 | 0 | 0 | 3 |
| Ochlerotatus aurifer | 9 | 0 | 1 | 0 | 10 |
| Ochlerotatus canadensis | 76 | 44<br>**1 JCV (+)** | 48 | 11 | 179<br>**(0.6% Positivity)** |
| Ochlerotatus cantantor | 50 | 54 | 35 | 27 | 166 |
| Ochlerotatus dorsalis | 1 | 0 | 0 | 0 | 1 |
| Ochlerotatus excrucians | 11 | 1 | 1 | 0 | 13 |
| Ochlerotatus fitchii | 2 | 0 | 0 | 0 | 2 |
| Ochlerotatus hendersoni | 5 | 7 | 8 | 4 | 24 |
| Ochlerotatus intrudens | 28 | 3 | 0 | 0 | 31 |
| Ochlerotatus japonicus | 20 | 54 | 35 | 18 | 127 |
| Ochlerotatus provocans | 52 | 62 | 54 | 36 | 204 |
| Ochlerotatus punctor | 2 | 0 | 0 | 0 | 2 |
| Ochlerotatus sollicitans | 8 | 4 | 3 | 4 | 19 |
| Ochlerotatus stimulans | 10 | 1 | 4 | 1 | 16 |
| Ochlerotatus taeniorhynchus | 8 | 12 | 10 | 9 | 39 |
| Ochlerotatus thibaulti | 2 | 0 | 0 | 0 | 2 |
| Ochlerotatus triseriatus | 10 | 12 | 9 | 7 | 38 |
| Ochlerotatus trivittatus | 0 | 1 | 0 | 0 | 1 |
| Orthopodomyia signifera | 0 | 0 | 1 | 1 | 2 |
| Psorophora ferox | 0 | 4 | 3 | 1 | 8 |
| Psorophora sarophora | 0 | 3 | 0 | 0 | 3 |
| Psorophora spp. | 1 | 0 | 0 | 0 | 1 |
| Unknown | 0 | 1 | 1 | 0 | 2 |
| Uranotaenia sappherina | 0 | 3 | 12 | 25 | 40 |
| **Total** | **480** | **540** | **436** | **271** | **1,727** |

## Figure 2 and Figure 3: Mosquito Pools by Trap Night

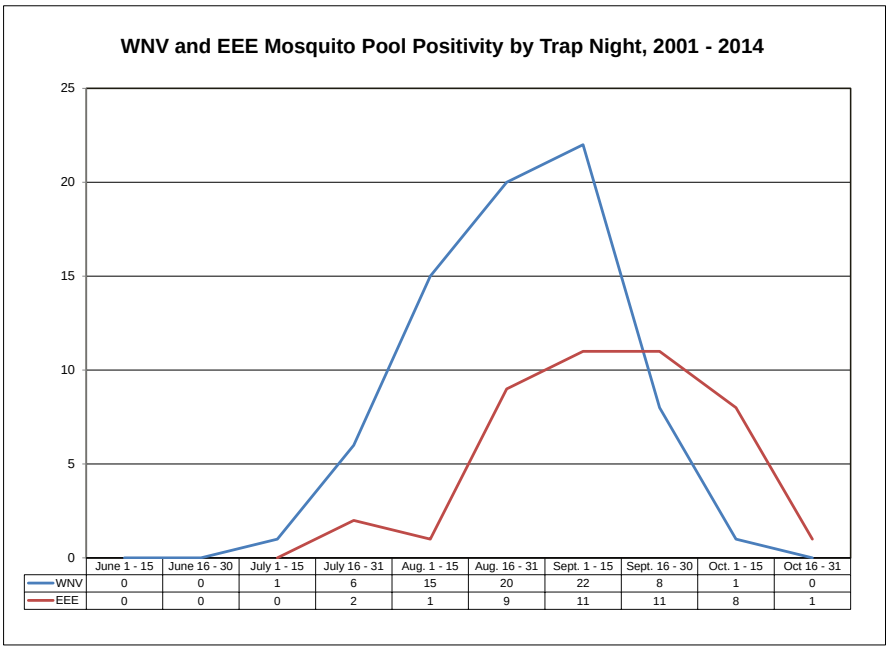
As can be seen from Figure 2 below, after reaching a peak of 187 mosquito pools collected on July 21st, 2014, the total number of mosquito pools collected each week gradually declined until reaching a low of 31 pools collected on September 22nd. This gradual decline is normal. During the later part of 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 – 2014. 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**




| | 6/9 | 6/17 | 6/23 | 6/30 | 7/7 | 7/14 | 7/21 | 7/28 | 8/4 | 8/12 | 8/18 | 8/25 | 9/2 | 9/8 | 9/15 | 9/22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Number of Pools | 104 | 104 | 123 | 149 | 144 | 62 | 187 | 147 | 150 | 96 | 115 | 75 | 99 | 72 | 69 | 31 |
| WNV Positive Pools | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| EEE Positive Pools | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Figure 3**




| | June 1 - 15 | June 16 - 30 | July 1 - 15 | July 16 - 31 | Aug. 1 - 15 | Aug. 16 - 31 | Sept. 1 - 15 | Sept. 16 - 30 | Oct. 1 - 15 | Oct 16 - 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| WNV | 0 | 0 | 1 | 6 | 15 | 20 | 22 | 8 | 1 | 0 |
| EEE | 0 | 0 | 0 | 2 | 1 | 9 | 11 | 11 | 8 | 1 |

**Figure 4**

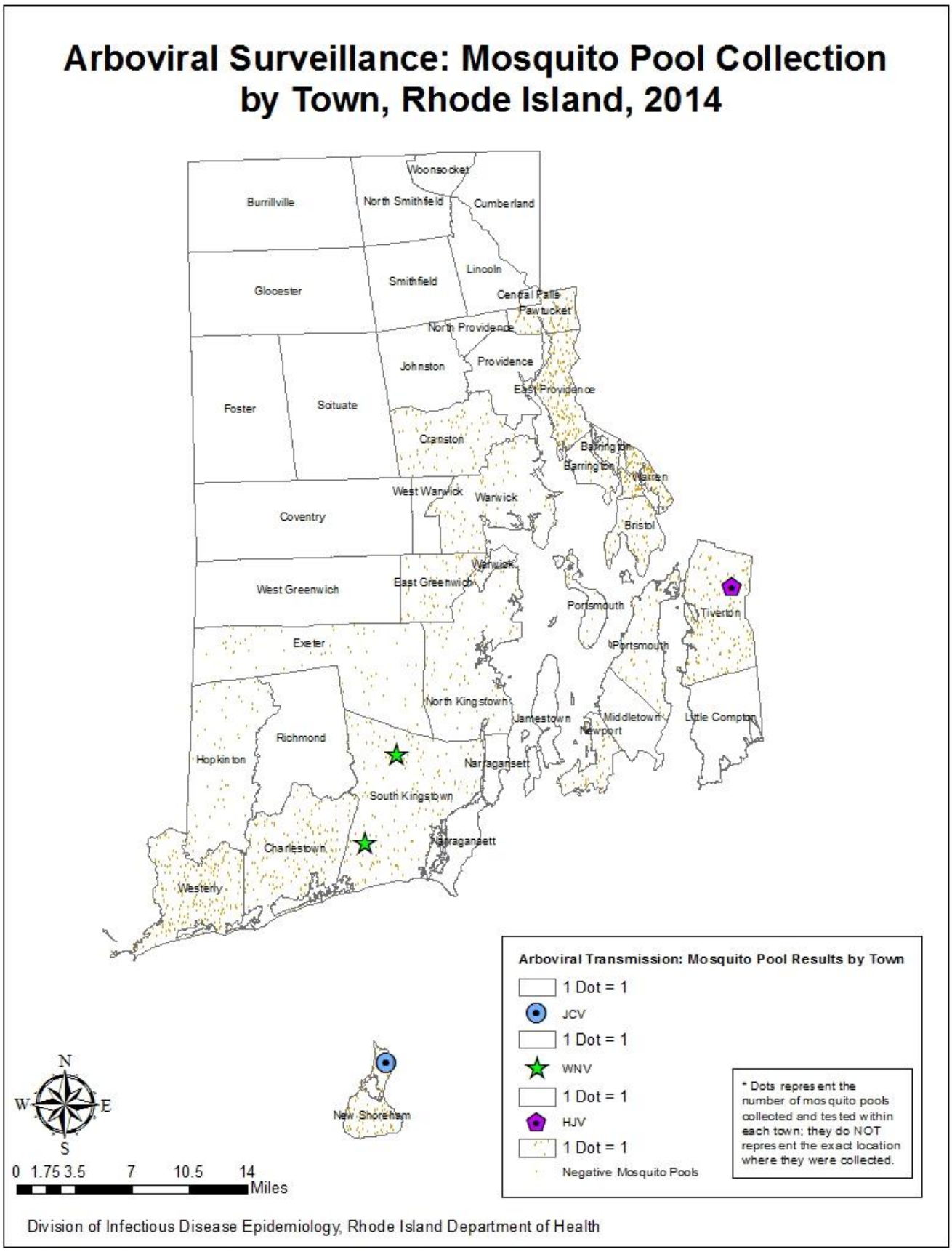
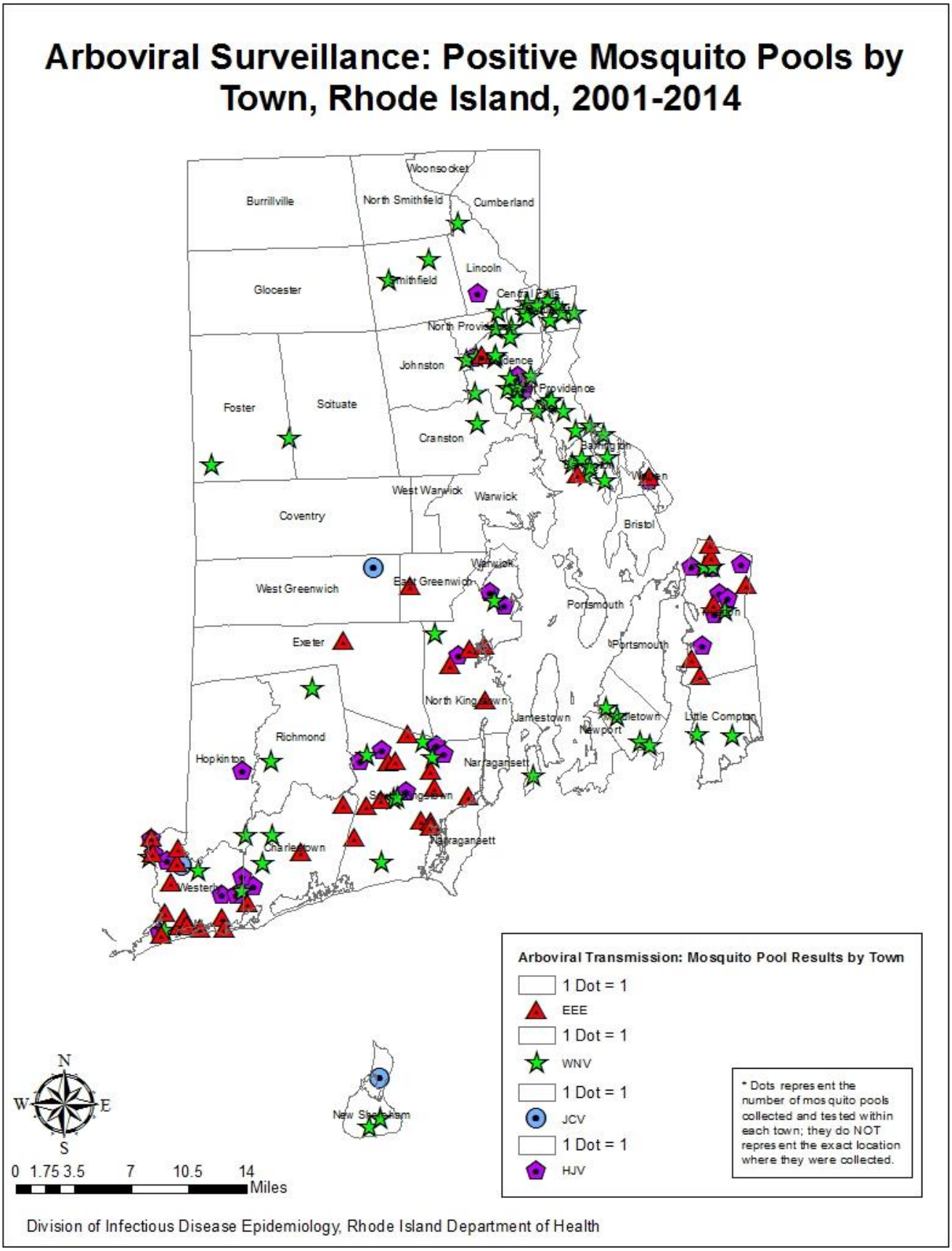

Arboviral Surveillance: Mosquito Pool Collection by Town, Rhode Island, 2014
Woonsocket
Burrillville
North Smithfield
Cumberland
Lincoln
Smithfield
Glocester
Central Falls
Pawtucket
North Providence
Johnston
Providence
East Providence
Foster
Scituate
Cranston
Barrington
Warren
West Warwick
Warwick
Coventry
Bristol
West Greenwich
East Greenwich
Portsmouth
Tiverton
Exeter
North Kingstown
Jamestown
Middletown
Newport
Little Compton
Richmond
Hopkinton
Narragansett
South Kingstown
Charlestown
Westerly
New Shoreham
Arboviral Transmission: Mosquito Pool Results by Town
1 Dot = 1
JCV
1 Dot = 1
WNV
1 Dot = 1
HJV
1 Dot = 1
Negative Mosquito Pools
* Dots represent the number of mosquito pools collected and tested within each town; they do NOT represent the exact location where they were collected.
N
W
E
S
0 1.75 3.5 7 10.5 14
Miles
Division of Infectious Disease Epidemiology, Rhode Island Department of Health

**Figure 5**


Arboviral Surveillance: Positive Mosquito Pools by Town, Rhode Island, 2001-2014
Woonsocket
Burrillville
North Smithfield
Cumberland
Lincoln
Glocester
Smithfield
Central Falls
North Providence
Johnston
Providence
Foster
Scituate
Cranston
Barrington
Warren
West Warwick
Warwick
Coventry
Bristol
West Greenwich
East Greenwich
Portsmouth
Exeter
North Kingstown
Jamestown
Middletown
Newport
Little Compton
Richmond
Hopkinton
Narragansett
Charlestown
Westerly
New Shoreham
N
W
E
S
0 1.75 3.5 7 10.5 14
Miles
Arboviral Transmission: Mosquito Pool Results by Town
1 Dot = 1
EEE
1 Dot = 1
WNV
1 Dot = 1
JCV
1 Dot = 1
HJV
* Dots represent the number of mosquito pools collected and tested within each town; they do NOT represent the exact location where they were collected.
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## Table 2: Mosquito Surveillance: Pools by Towns, Rhode Island, 2014*

| Town | Total Pools | Percentage of all Pools Collected | Positive Pools | Positivity Rate by Town |
|---|---|---|---|---|
| Westerly | 221 | 12.8% | 0 | 0.0% |
| Tiverton | 166 | 9.6% | 1 | 0.6% |
| Charlestown | 164 | 9.5% | 0 | 0.0% |
| East Providence | 164 | 9.5% | 0 | 0.0% |
| South Kingstown | 161 | 9.3% | 2 | 1.2% |
| Warren | 104 | 6.0% | 0 | 0.0% |
| New Shoreham | 92 | 5.3% | 1 | 1.1% |
| Warwick | 81 | 4.7% | 0 | 0.0% |
| Cranston | 80 | 4.6% | 0 | 0.0% |
| Portsmouth | 70 | 4.1% | 0 | 0.0% |
| North Kingstown | 69 | 4.0% | 0 | 0.0% |
| Exeter | 65 | 3.8% | 0 | 0.0% |
| Pawtucket | 65 | 3.8% | 0 | 0.0% |
| East Greenwich | 54 | 3.1% | 0 | 0.0% |
| Hopkinton | 53 | 3.1% | 0 | 0.0% |
| Bristol | 52 | 3.0% | 0 | 0.0% |
| Newport | 41 | 2.4% | 0 | 0.0% |
| Barrington | 22 | 1.3% | 0 | 0.0% |
| Unknown | 3 | 0.2% | 0 | 0.0% |
| **Total** | **1,727** | **100%** | **4** | **0.2%** |

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

## Table 3: Mosquito Surveillance: Summary Data, Rhode Island, 2001-2014

| Year | Number of pools tested | Number of positive counties | Total number of positive pools | Number of WNV positive pools | Earliest positive date for WNV | Number of EEE positive pools | Earliest positive 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 |

*For questions/comments on data/methods, please contact Michael Gosciminski at 401-222-6056.*
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