



Annual Arbovirus Report Rhode Island, 2022

The Rhode Island Department of Environmental Management (RIDEM) traps mosquitoes annually at various locations throughout Rhode Island from early June to October. Mosquito traps are placed strategically throughout the state based on the environmental conditions conducive to West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) Virus amplification in the mosquito population. Once traps are collected, the mosquitoes captured in each trap are sorted by species into “pools.” The Rhode Island Department of Health (RIDOH) Rhode Island State Health Laboratories tests each pool for the presence of WNV and EEE through PCR testing.

Human arboviral cases are investigated by the Center of Acute Infectious Disease Epidemiology at RIDOH to identify potential locations of exposure and verify that the [national arboviral case definition](#) is met. Suspected human cases are reported to RIDOH by health care providers. Additionally, positive human arboviral test results are received from hospital and commercial laboratories by fax or electronic laboratory reports. Confirmatory testing is performed by the Centers for Disease Control in Fort Collins, Colorado.

2022 Highlights:

- Mosquito traps were set weekly from June 13 through September 28, 2022.
- In 2022, 1,286 mosquito pools (15,931 individual mosquitos) were trapped and tested for the presence of WNV and EEEV, of which three pools tested positive for WNV and 1 pool tested positive for EEE. In 2021, there were six pools which tested positive for WNV, while no pools tested positive for EEEV.
- The WNV positive mosquito pools were collected in Westerly (two pools) and North Kingstown. The EEE-positive mosquito pool was collected in South Kingstown.
- In 2022, there were 2 human cases of Jamestown Canyon Virus and 1 human case of WNV. There were no human cases of EEE reported in 2022.
- There were no veterinary cases of arboviral disease in 2022.

2022 Rhode Island Arbovirus Surveillance

Total Number of Mosquito Pools Tested	1,286
WNV-Positive Mosquito Pools	3
EEE-Positive Mosquito Pools	1
Human WNV Cases	1
Human Jamestown Canyon Virus Cases	2
Human Powassan Virus Cases	0
Human EEE Virus Cases	0

During the summer months RIDEM issues a weekly mosquito advisory announcing the most recent mosquito pool test results with information on how Rhode Islanders can prevent mosquito bites.

Please refer to the [RIDEM website](#) for mosquito advisories, as well as information on mosquito control and prevention.

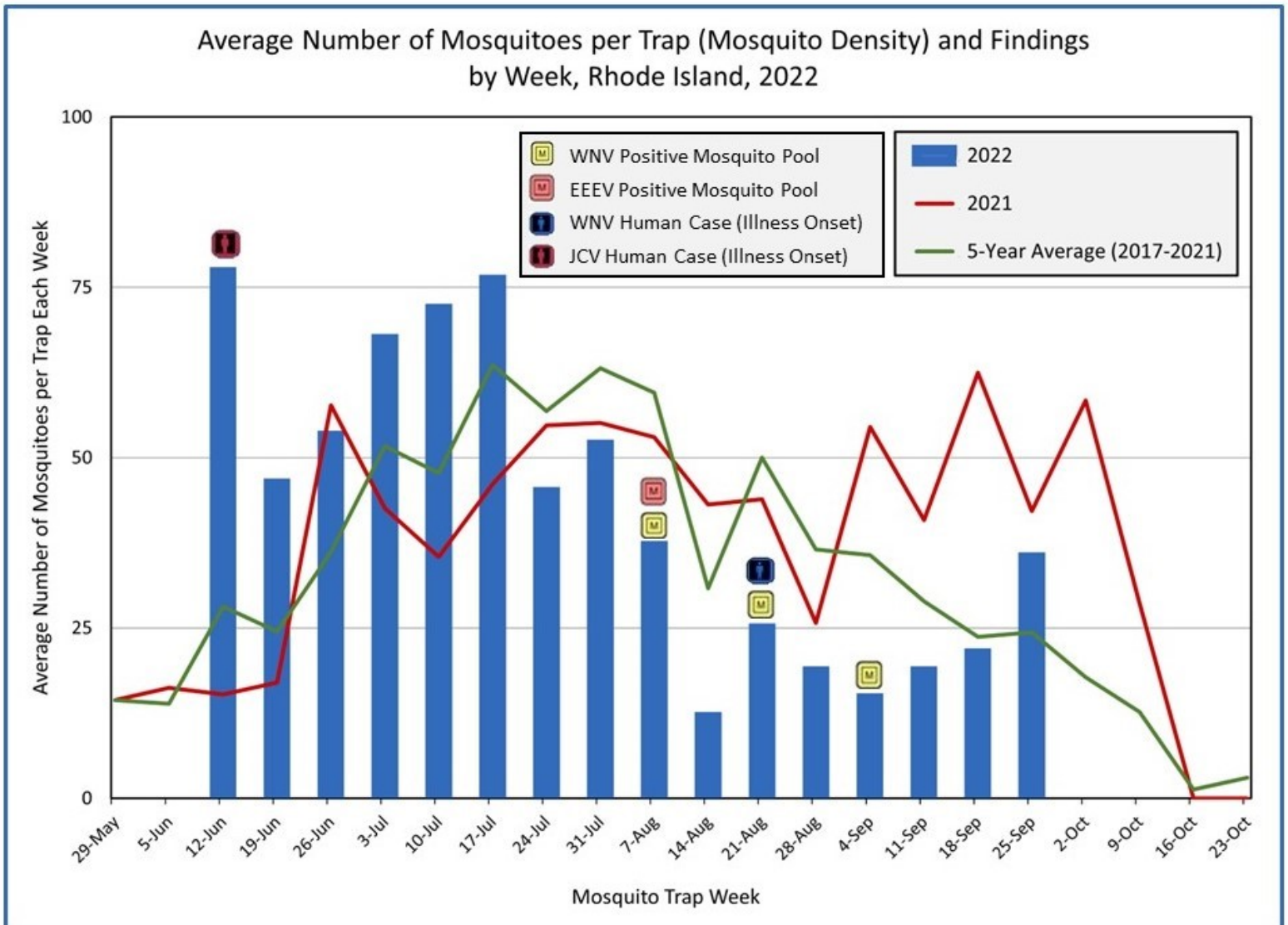
- Refer to the RIDOH website for more information on [mosquito control and prevention](#).
- [Healthcare Providers](#) and [Laboratorians](#) can refer to the RIDOH Website for information on specimen collection and submission.
- Additional information can be found on the CDC’s [WNV](#) website and the CDC’s [EEE](#) website.



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Figure 1. Average Mosquito Density per Trap by Week, Rhode Island, 2022

- The figure below demonstrates the weekly Rhode Island mosquito trap density (average number of mosquitoes per trap) from June to September 2022.
- Historically, Rhode Island’s overall mosquito trap densities peak in late July and early August and decline throughout the remainder of the summer and fall. This is illustrated by the 2017-2021 weekly average mosquito trap densities. Rhode Island’s 2021 arboviral season differed from past years as two mosquito trap density peaks occurred. The first peak that occurred was the traditional peak seen annually. This was followed by a second peak that occurred throughout September and early October 2021 and was driven by a steep increase in the population of *Aedes vexans*. This was most likely due to significant rainfall in Rhode Island during the summer months of 2021. For instance, the Providence weather station saw elevated rainfall in July (7.12 inches), August (4.83 inches), and September (5.18 inches), 2021.
- In contrast to historical trends, in 2022, Rhode Island’s weekly mosquito trap densities were above average through mid-July, but were below average from late July through late September. This was most likely associated with the severe drought Rhode experienced throughout the summer.



* One human case of Jamestown Canyon Virus had an illness onset occur prior to May 29, 2022.



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Table 1. Mosquito Surveillance: Pools by Species, Rhode Island, 2022

Between June 13, 2022 and September 28, 2022, the Rhode Island Department of Environmental Management trapped 1,286 mosquito pools, all of which were tested for the presence of WNV and EEE at the Rhode Island State Health Laboratories. The table below describes the mosquito species trapped monthly during the 2022 arboviral season. There were three species of mosquito which tested positive an arbovirus: *Aedes japonicus*, *Culex spp.*, and *Culiseta melanura*.

Species	June	July	August	September	Total
<i>Aedes abserratus</i>	3				3
<i>Aedes albopictus</i>	2		5	9	16
<i>Aedes apparatus</i>	1				1
<i>Aedes aurifer</i>	7	4			11
<i>Aedes canadensis</i>	26	36	25	4	91
<i>Aedes cantator</i>		2	4	5	11
<i>Aedes cinereus</i>	1		1	1	3
<i>Aedes intrudens</i>	5		1	1	7
<i>Aedes japonicus</i>	14	20	27 1 EEE (+)	21	82 1.2% Positivity
<i>Aedes provocans</i>	6	7	4	6	23
<i>Aedes punctor</i>	1	2		4	7
<i>Aedes sollicitans</i>	3	1	3	1	8
<i>Aedes stimulans</i>	3		1		4
<i>Aedes taeniorhynchus</i>	2	5	12	1	20
<i>Aedes thibaulti</i>	1	1			2
<i>Aedes triseriatus</i>	18	21	10	4	53
<i>Aedes trivittatus</i>			1		1
<i>Aedes vexans</i>	24	35	26	45	130
<i>Anopheles crucians</i>	1	5	2	1	9
<i>Anopheles punctipennis</i>	22	32	29	14	97
<i>Anopheles quadrimaculatus</i>	4	14	18	5	41
<i>Anopheles walkeri</i>	9	12	10	6	37
<i>Coquilletidia perturbans</i>	51	95	62	6	214
<i>Culex spp.</i>	38	88	114 1 WNV (+)	51 1 WNV (+)	291 0.7% Positivity
<i>Culiseta melanura</i>	4	3	19 1 WNV (+)	16	42 2.4% Positivity
<i>Culiseta morsitans</i>	1	21	6	3	31
<i>Culisita impatiens</i>	1				1
<i>Culisita minasotea</i>		1			1
<i>Psorophora ferox</i>	1	3	1	3	8
<i>Uranotaenia sapphirina</i>		6	29	6	41
Total	249	414	410	213	1,286

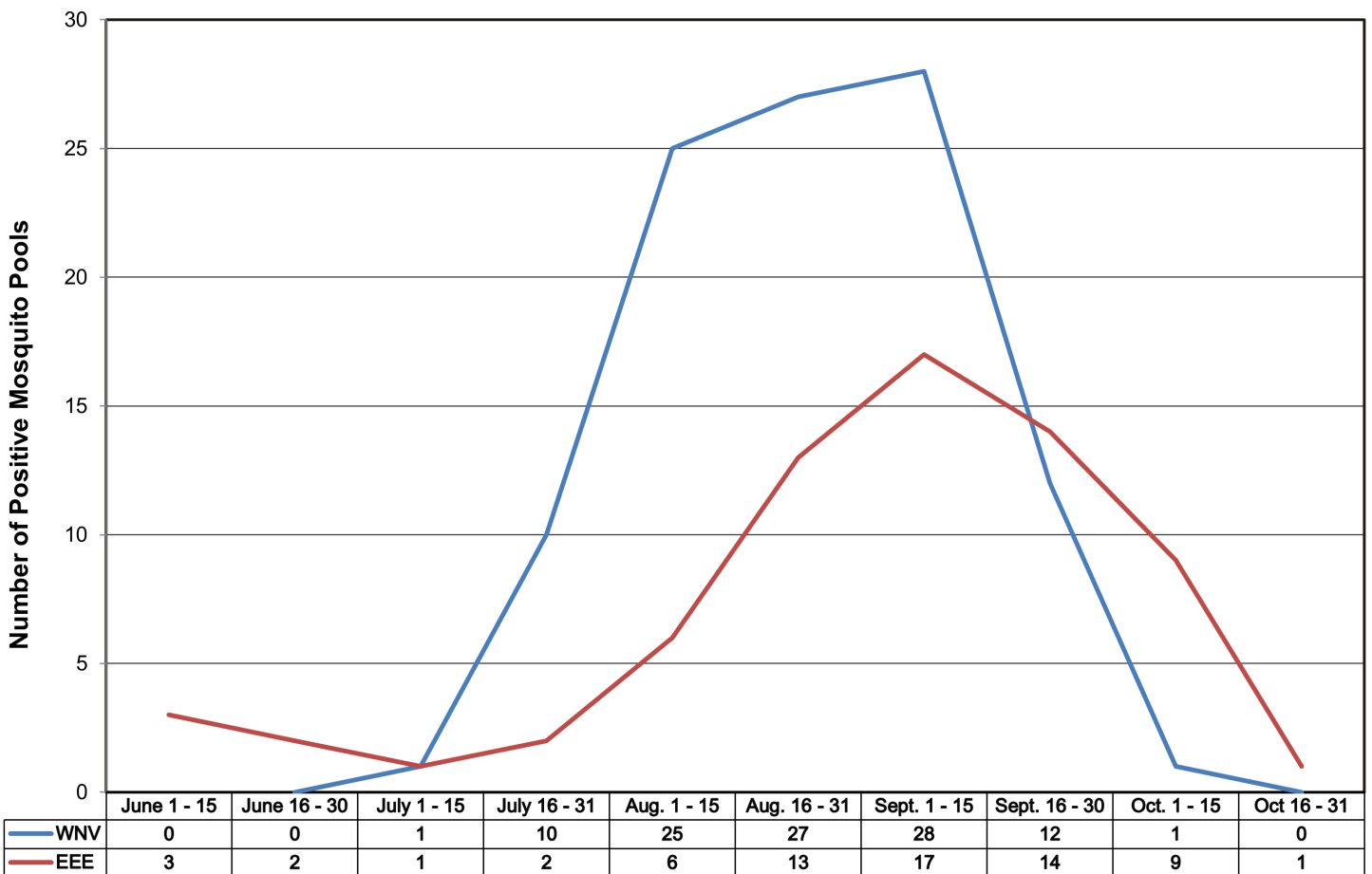


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Figure 2. Mosquito Pools Identified by Trap Night

- During the latter part of summer, mosquito populations decrease, but older mosquitoes are more likely to carry arboviruses, thus increasing the risk of human infection. This is illustrated in the Figure below. This figure describes the biweekly frequency of WNV and EEE positive mosquito pools for 2001-2022.
- As can be seen from the figure, the frequency of positive pools historically increases through the mid-summer months until it peaks in early September.

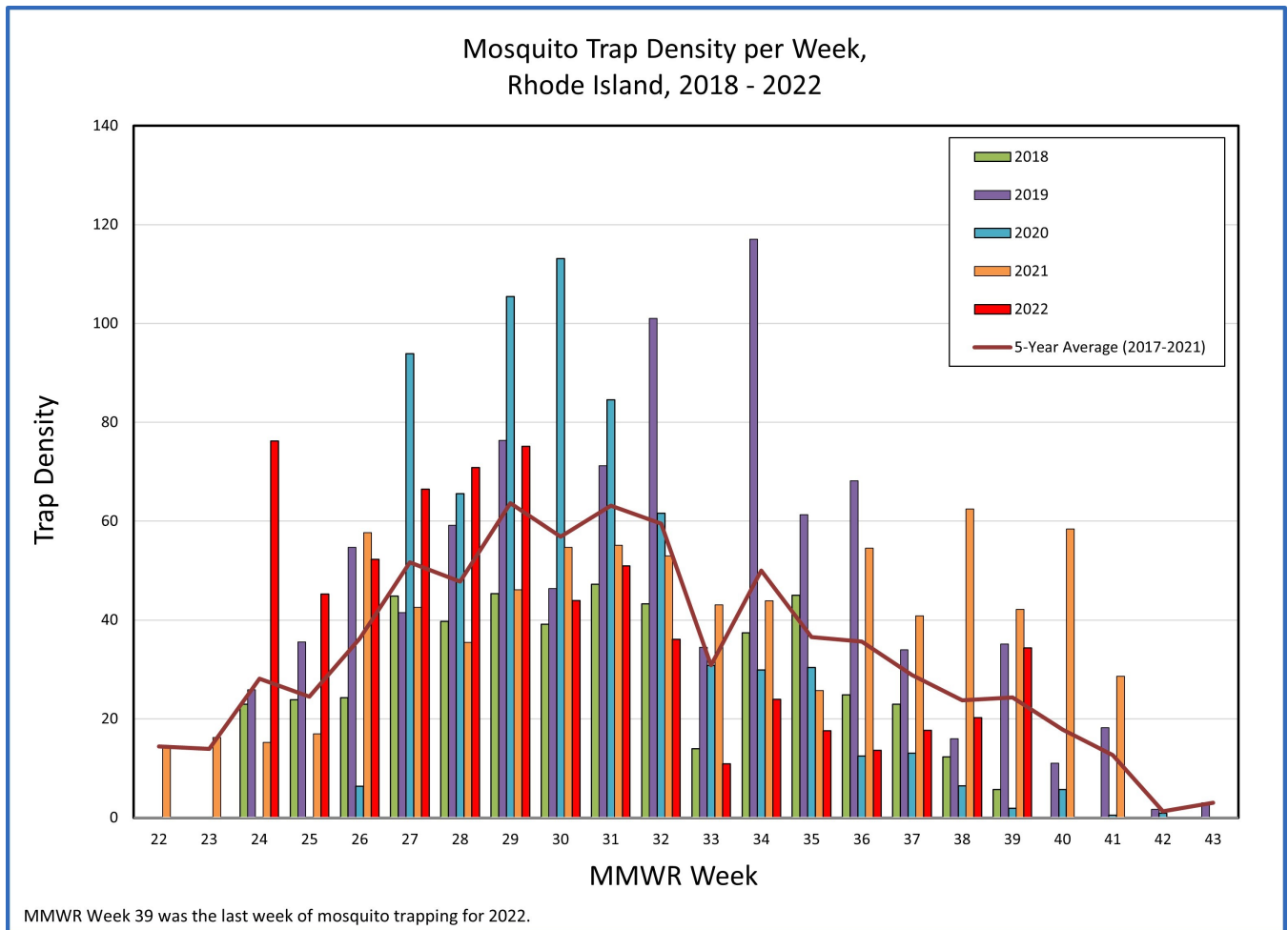
WNV and EEE Mosquito Pool Positivity by Trap Night, 2001 - 2022



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Figure 3: Mosquito Trap Density of All Species by MMWR Week:

- The graph below compares five consecutive years (2018-2022) of mosquito trap densities for mosquitoes trapped throughout Rhode Island’s arboviral season, in addition to an overall five-year average. Many environmental factors such as temperature, rainfall, availability of breeding grounds, and human travel have the ability to affect mosquito densities throughout the season.
- In 2022, in general, mosquito densities were higher than average from mid-June through mid-July, but lower than average from late July through late September when compared to the 2017-2021 five-year average.
- The decreased mosquito trap densities were most likely attributable to the extreme drought that occurred in Rhode Island and much of New England during the summer of 2022. July 2022 was ranked as the second driest July on record (1893-2022) in Rhode Island with Providence only receiving 0.46 inch of rainfall (average 3.03 inches). At the peak of the drought severity in mid-August, 99% of Rhode Island was classified as being in extreme drought conditions by the U.S. Drought Monitor, with only New Shoreham classified as being abnormally dry.¹



¹ McCarthy, D.E., LeNoir, J.M., and Lombard, P.J., 2023, 2022 drought in New England: U.S. Geological Survey Scientific Investigations Report 2023–5016, 34 p., <https://doi.org/10.3133/sir20235016>.



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Table 2: Mosquito Surveillance: Mosquito Pools Collected by Town, Rhode Island, 2022

Town	Total Pools	Percentage of all Pools Collected	Positive Pools	Percent Positivity by Town
Barrington	40	3.1	0	0
Bristol	1	0.1	0	0
Central Falls	17	1.3	0	0
Charlestown	41	3.2	0	0
Cranston	81	6.3	0	0
East Providence	104	8.1	0	0
Exeter	64	5.0	0	0
Foster	17	1.3	0	0
Middletown	17	1.3	0	0
New Shoreham	78	6.1	0	0
Newport	11	0.8	0	0
North Kingstown	41	3.2	1 WNV	2.4
Pawtucket	20	1.6	0	0
Portsmouth	57	4.4	0	0
Providence	17	1.3	0	0
Richmond	38	3.0	0	0
Scituate	4	0.3	0	0
South Kingstown	109	8.5	1 EEE	0.9
Tiverton	122	9.5	0	0
Warren	49	3.8	0	0
Warwick	46	3.6	0	0
West Greenwich	4	0.3	0	0
West Warwick	29	2.3	0	0
Westerly	279	21.7	2 WNV	0.7
Total	1,286	100.0	3 WNV 1 EEE	0.3



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Table 3: Mosquito Surveillance: Summary Data, Rhode Island, 2001-2022

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	26	14	7/16/2001	6	8/27/2001
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	8/19/2009	0	NA
2009	1138	2	14	3	9/8/2009	4	8/24/2009
2010	1621	3	8	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	8/6/2012
2013	2311	4	17	8	7/29/2013	4	8/26/2013
2014	1727	2	4	2	8/4/2014	0	NA
2015	2117	3	5	4	8/12/2015	0	NA
2016	1969	3	4	1	7/25/2016	2	8/1/2016
2017	1533	3	5	3	8/7/2017	2	6/26/2017
2018	1967	5	14	10	7/30/2018	4	6/11/2018
2019	2501	4	13	4	8/26/2019	9	8/5/2019
2020	1681	1	1	0	NA	1	8/11/2020
2021	2598	2	6	6	7/29/2021	0	NA
2022	1286	1	4	3	8/9/2022	1	8/9/2022

Table 4: Human Arboviral Cases, Rhode Island, 2018-2022

Date	2018	2019	2020	2021	2022	5-Year Total
Eastern Equine Encephalitis Virus (Neuroinvasive)	0	3	0	0	0	3
Jamestown Canyon Virus (Neuroinvasive)	0	0	0	1	2	3
Powassan Virus (Neuroinvasive)	0	1	0	1	0	2
West Nile Virus	1	0	0	2	1	4
Neuroinvasive	0	0	0	1	1	2
Non-neuroinvasive	1	0	0	1	0	2
Travel Associated Arboviral Cases						
Chikungunya	0	1	0	0	0	1
Dengue	1	8	1	1	3	14
La Crosse Virus (Neuroinvasive)	1	1	0	0	0	2
Zika Virus	0	0	0	0	0	0
Zika Virus Disease, Non-congenital	0	0	0	0	0	0
Zika Virus Infection, Non-congenital	0	0	0	0	0	0
Zika Virus Infection, Congenital	0	0	0	0	0	0



Preventing Mosquito Bites

Mosquitoes are carriers (vectors) for many diseases, including West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE). The species of mosquitoes that carry WNV and EEE are found in Rhode Island and bite until the first heavy frost (usually the end of October). Everyone who participates in outdoor activities should take actions to protect themselves from mosquito bites.



WEST NILE VIRUS

Severe West Nile Virus symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness, and paralysis. Milder symptoms can include fever, headache, body aches, nausea, vomiting, swollen lymph glands, or rash on the chest, stomach, and back.



EASTERN EQUINE ENCEPHALITIS

EEE symptoms include an abrupt onset of chills, fever, generally unhealthy feeling, joint pain, and muscle pain. Signs and symptoms in patients with encephalitis (brain inflammation) are fever, headache, irritability, restlessness, drowsiness, loss of appetite, vomiting, diarrhea, bluish discoloration, convulsions, and coma.

WHAT YOU SHOULD DO

PROTECT YOURSELF



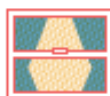
NETTING

Put insect netting over strollers and playpens.



CLOTHING

When spending time outside during warm weather, wear long-sleeved shirts/pants whenever possible, especially if outside during dawn or dusk.



SCREENS

Put screens on windows and doors. Fix screens that have holes.



BUG SPRAY

Use EPA-approved bug spray with one of the following active ingredients: DEET (20-30% strength), picaridin, IR3535, and oil of lemon eucalyptus or paramenthane-diol. Do not use DEET on infants.

GET RID OF MOSQUITO BREEDING GROUNDS



CLEAN GUTTERS

Remove anything around your house and yard that collects water. Clean gutters and downspouts to ensure proper drainage.



DUMP STANDING WATER

Remove any water from unused swimming pools, wading pools, boats, planters, trash and recycling bins, tires, and anything else that collects water, and cover them.

PRACTICE SMART SCHEDULING



Avoid scheduling outdoor activities between dusk and dawn.

TIP: Try to end outdoor activities ½ hour before sunset.

For more information, visit the Rhode Island Department of Health's website www.health.ri.gov/mosquito or the Centers for Disease Control and Prevention Website: www.cdc.gov/eee

