

2018 Mosquito Surveillance Report

The Vermont Agency of Agriculture, Food & Markets (VAAFAM) conducted a statewide survey of mosquitoes from June 04 through October 12, looking for West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) presence in the state. Mosquitoes were collected from 102 permanent trap site locations in 83 towns across the state. Three types of traps were used: resting box traps, reduced CDC light traps, and gravid traps. Resting box traps (RBTs) target the main vector of EEE. Reduced CDC light traps were collocated with RBTs at wetland locations and were used as a sensing tool of the species present. Gravid traps were set at wastewater treatment facilities, targeting the main vector of WNV. Collections were made weekly and brought to the lab in Berlin. The collections were identified to species and the vector species were pooled into vials of 1 to 50 mosquitoes. The mosquito pool samples were sent to the Vermont Department of Health for arbovirus testing.

In addition to WNV and EEE surveillance, *Aedes albopictus* (the mosquito known to transmit the Zika virus) surveillance was conducted in two towns in southern Vermont. BG Sentinel traps were used. No *Aedes albopictus* was found.

2018 At-A-Glance Mosquito Arbovirus Data

- 157 mosquito pool samples were positive for West Nile Virus
- No Eastern Equine Encephalitis was found

2018 At-A-Glance Mosquito Surveillance Data

- Trapping season began June 04 and ended October 12
- Number of trap locations: 102
- All 14 counties in Vermont were surveyed (statewide coverage)
- Total towns trapped: 83
- CDC, Resting Box, and Gravid trap sites were surveyed for 19 weeks (CDC weeks 23 through 41)
- 2 BG Sentinel Trap sites were set up in southern Vermont for 19 weeks to survey for *Aedes albopictus*, the mosquito known to transmit the Zika virus; no *Ae albopictus* was found

2018 At-A-Glance Species Statistics

- Number of mosquitoes collected: 75,637
- Number of mosquitoes tested for arbovirus: 52,003
- Number of species collected: 30
- Number of species tested for arbovirus: 14

2018 Arbovirus Surveillance Findings

Figure 1. 2018 Towns with West Nile Virus positive pool samples

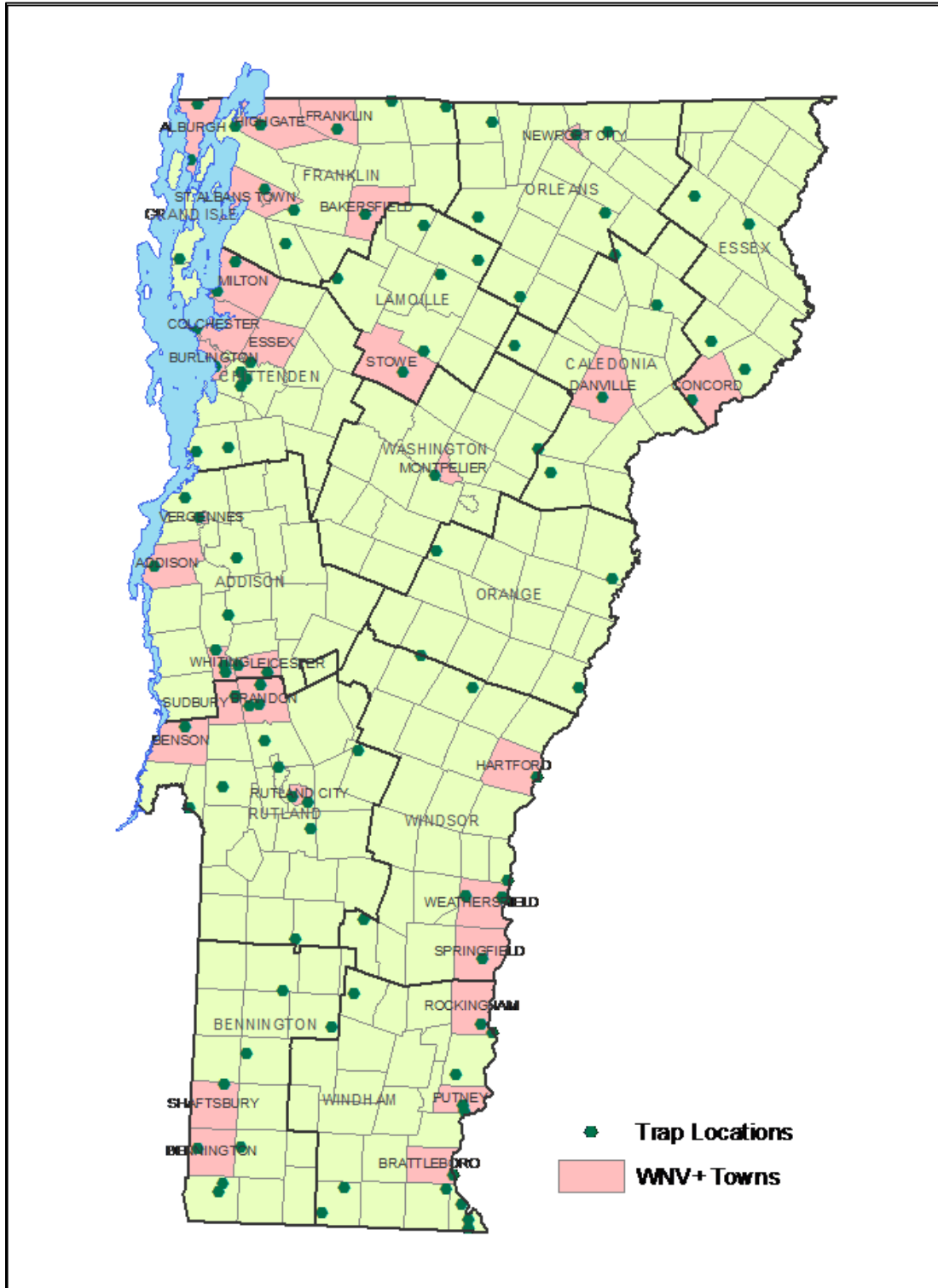


Table 1. 2018 Arbovirus testing results by CDC week number

| CDC Week # | Beginning Sunday | Batches Tested | EEE+ Samples | WNV+ Samples | Cumulative Batches |
|------------|------------------|----------------|--------------|--------------|--------------------|
| 23 | 3-Jun | 60 | 0 | 0 | 60 |
| 24 | 10-Jun | 95 | 0 | 0 | 155 |
| 25 | 17-Jun | 239 | 0 | 5 | 394 |
| 26 | 24-Jun | 199 | 0 | 0 | 593 |
| 27 | 1-Jul | 227 | 0 | 0 | 820 |
| 28 | 8-Jul | 208 | 0 | 3 | 1028 |
| 29 | 15-Jul | 229 | 0 | 17 | 1257 |
| 30 | 22-Jul | 200 | 0 | 5 | 1457 |
| 31 | 29-Jul | 219 | 0 | 14 | 1676 |
| 32 | 5-Aug | 157 | 0 | 22 | 1833 |
| 33 | 12-Aug | 188 | 0 | 14 | 2021 |
| 34 | 19-Aug | 147 | 0 | 10 | 2168 |
| 35 | 26-Aug | 212 | 0 | 19 | 2380 |
| 36 | 2-Sep | 170 | 0 | 18 | 2550 |
| 37 | 9-Sep | 149 | 0 | 13 | 2699 |
| 38 | 16-Sep | 120 | 0 | 11 | 2819 |
| 39 | 23-Sep | 92 | 0 | 2 | 2911 |
| 40 | 30-Sep | 38 | 0 | 4 | 2949 |
| 41 | 7-Oct | 48 | 0 | 0 | 2997 |

Eastern Equine Encephalitis

- Number of mosquitoes tested for EEE: 52,003
- Total number of mosquito pool samples tested: 2,997
- Number of species tested for EEE: 14
- No EEE-positive mosquito pools were identified in Vermont in 2018

West Nile Virus

- Number of mosquitoes tested for WNV: 52,003
- Total number of mosquito pool samples tested: 2,997
- Number of species tested for WNV: 14
- Number of WNV-positive mosquito pools: 157
- WNV-positive mosquito pools were found in 30 towns
- WNV was found in mosquito pool samples containing *Aedes cinereus*, *Aedes vexans*, *Anopheles punctipennis*, *Anopheles quadrimaculatus*, *Coquillettidia perturbans*, a mixture of *Culex pipiens/restuans*, *Culiseta melanura*, *Culiseta morsitans*, *Ochlerotatus canadensis*, *Ochlerotatus japonicus*, and *Ochlerotatus trivittatus*.
- The first WNV-positive mosquito pool sample was collected on 19 June

- The last WNV-positive mosquito pool sample was collected on 02 October
- Springfield had sustained WNV activity for 5 consecutive weeks. Essex and Rockingham had sustained WNV activity for 4 weeks. Hartford had sustained WNV activity for 3 weeks.

Rapid Response Mosquito Collections

In September, a WNV-related animal death prompted rapid response mosquito trapping at the site. Gravid traps and CDC light traps were set for 4 nights over two weeks. 78 mosquitoes were collected and separated into 26 pools for testing.

Table 2. 2018 West Nile Virus-positive statistics

| Date Collected | Genus species | Town | County |
|----------------|---------------------|---------------|------------|
| 19-Jun | Cx pipiens-restuans | Springfield | Windsor |
| 19-Jun | Cx pipiens-restuans | Springfield | Windsor |
| 19-Jun | Cx pipiens-restuans | Springfield | Windsor |
| 19-Jun | Cx pipiens-restuans | Springfield | Windsor |
| 19-Jun | Cx pipiens-restuans | Springfield | Windsor |
| 9-Jul | An quadrimaculatus | Sudbury | Rutland |
| 10-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 10-Jul | Oc japonicus | Springfield | Windsor |
| 16-Jul | Oc japonicus | Hartford | Windsor |
| 17-Jul | Cx pipiens-restuans | Rockingham | Windham |
| 17-Jul | Cx pipiens-restuans | Weathersfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Oc japonicus | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 17-Jul | Oc japonicus | Springfield | Windsor |
| 17-Jul | Cx pipiens-restuans | Danville | Caledonia |
| 18-Jul | Cs melanura | Milton | Chittenden |
| 18-Jul | Cs melanura | Colchester | Chittenden |
| 18-Jul | Cs melanura | Alburgh | Grand Isle |
| 18-Jul | An quadrimaculatus | Alburgh | Grand Isle |
| 19-Jul | Cs melanura | Franklin | Franklin |
| 23-Jul | Cx pipiens-restuans | Burlington | Chittenden |
| 24-Jul | Cx pipiens-restuans | Brattleboro | Windham |
| 24-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 24-Jul | Cx pipiens-restuans | Rockingham | Windham |
| 26-Jul | Cx pipiens-restuans | Essex | Chittenden |

| | | | |
|--------|---------------------|----------------|------------|
| 30-Jul | Cx pipiens-restuans | Montpelier | Washington |
| 30-Jul | Cx pipiens-restuans | Vergennes | Addison |
| 30-Jul | Cx pipiens-restuans | Burlington | Chittenden |
| 30-Jul | Cx pipiens-restuans | Brandon | Rutland |
| 31-Jul | Cx pipiens-restuans | Putney | Windham |
| 31-Jul | Cx pipiens-restuans | Springfield | Windsor |
| 31-Jul | Cx pipiens-restuans | Rutland | Rutland |
| 2-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 2-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 2-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 2-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 3-Aug | Cq perturbans | Shaftsbury | Bennington |
| 3-Aug | An punctipennis | Shaftsbury | Bennington |
| 3-Aug | Cq perturbans | Bennington | Bennington |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Rockingham | Windham |
| 7-Aug | Cx pipiens-restuans | Brattleboro | Windham |
| 7-Aug | Oc japonicus | Brattleboro | Windham |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 7-Aug | Oc japonicus | Springfield | Windsor |
| 7-Aug | Cx pipiens-restuans | Putney | Windham |
| 7-Aug | Cx pipiens-restuans | Putney | Windham |
| 7-Aug | Cx pipiens-restuans | Putney | Windham |
| 8-Aug | Cx pipiens-restuans | Rutland | Rutland |
| 8-Aug | Cx pipiens-restuans | Rutland | Rutland |
| 8-Aug | Oc japonicus | Rutland | Rutland |
| 8-Aug | Cx pipiens-restuans | Highgate | Franklin |
| 8-Aug | Cs melanura | Highgate | Franklin |
| 8-Aug | Cq perturbans | Benson | Rutland |
| 8-Aug | Cq perturbans | Benson | Rutland |
| 8-Aug | Cq perturbans | Benson | Rutland |
| 8-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 13-Aug | Cx pipiens-restuans | Hartford | Windsor |
| 13-Aug | Cx pipiens-restuans | Burlington | Chittenden |
| 14-Aug | Cx pipiens-restuans | Weathersfield | Windsor |
| 14-Aug | Cx pipiens-restuans | Rockingham | Windham |
| 15-Aug | Cx pipiens-restuans | Newport City | Orleans |
| 15-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 15-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 15-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 16-Aug | Ae vexans | Leicester | Addison |
| 16-Aug | Cq perturbans | Leicester | Addison |

| | | | |
|--------|---------------------|----------------|------------|
| 16-Aug | Ae cinereus | Leicester | Addison |
| 16-Aug | Oc trivittatus | Leicester | Addison |
| 16-Aug | Ae vexans | Leicester | Addison |
| 16-Aug | Cx pipiens-restuans | Leicester | Addison |
| 20-Aug | Cx pipiens-restuans | Addison | Addison |
| 20-Aug | Cx pipiens-restuans | Vergennes | Addison |
| 20-Aug | Cx pipiens-restuans | Hartford | Windsor |
| 20-Aug | Oc japonicus | Hartford | Windsor |
| 20-Aug | Cs melanura | Leicester | Addison |
| 21-Aug | Cx pipiens-restuans | Putney | Windham |
| 21-Aug | Cx pipiens-restuans | Weathersfield | Windsor |
| 23-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 23-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 24-Aug | Cx pipiens-restuans | Stowe | Lamoille |
| 27-Aug | Cx pipiens-restuans | Hartford | Windsor |
| 27-Aug | Cx pipiens-restuans | Vergennes | Addison |
| 27-Aug | Cx pipiens-restuans | Burlington | Chittenden |
| 27-Aug | Cx pipiens-restuans | Burlington | Chittenden |
| 27-Aug | Cs morsitans | Whiting | Addison |
| 28-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 28-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 28-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 28-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 28-Aug | Cx pipiens-restuans | Springfield | Windsor |
| 28-Aug | Cx pipiens-restuans | Rockingham | Windham |
| 28-Aug | Cx pipiens-restuans | Rutland | Rutland |
| 28-Aug | Cx pipiens-restuans | Rutland | Rutland |
| 29-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 29-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 29-Aug | Cx pipiens-restuans | Essex | Chittenden |
| 29-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 29-Aug | Cx pipiens-restuans | St Albans City | Franklin |
| 29-Aug | Oc japonicus | St Albans City | Franklin |
| 4-Sep | Cx pipiens-restuans | Burlington | Chittenden |
| 4-Sep | Cx pipiens-restuans | Weathersfield | Windsor |
| 4-Sep | Cx pipiens-restuans | Springfield | Windsor |
| 4-Sep | Cx pipiens-restuans | Rutland | Rutland |
| 4-Sep | Cx pipiens-restuans | Rutland | Rutland |
| 4-Sep | Cx pipiens-restuans | Rockingham | Windham |
| 4-Sep | Cx pipiens-restuans | Putney | Windham |
| 4-Sep | Cx pipiens-restuans | Brandon | Rutland |
| 4-Sep | Oc canadensis | Brandon | Rutland |
| 4-Sep | Cx pipiens-restuans | Springfield | Windsor |
| 4-Sep | Cx pipiens-restuans | Montpelier | Washington |
| 6-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 6-Sep | Cx pipiens-restuans | Essex | Chittenden |

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|--------|---------------------|----------------|------------|
| 6-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 6-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 6-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 6-Sep | Oc japonicus | Essex | Chittenden |
| 7-Sep | Cs morsitans | Bakersfield | Franklin |
| 9-Sep | Ae vexans | Whiting | Addison |
| 9-Sep | Oc trivittatus | Leicester | Addison |
| 9-Sep | Cs morsitans | Leicester | Addison |
| 10-Sep | Cx pipiens-restuans | Vergennes | Addison |
| 12-Sep | Cx pipiens-restuans | St Albans City | Franklin |
| 12-Sep | Cx pipiens-restuans | St Albans City | Franklin |
| 12-Sep | Cx pipiens-restuans | St Albans City | Franklin |
| 12-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 12-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 12-Sep | Cx pipiens-restuans | Essex | Chittenden |
| 12-Sep | Oc canadensis | Concord | Essex |
| 12-Sep | Cx pipiens-restuans | Newport City | Orleans |
| 14-Sep | Cs melanura | Franklin | Franklin |
| 17-Sep | Cx pipiens-restuans | Hartford | Windsor |
| 17-Sep | Oc japonicus | Hartford | Windsor |
| 17-Sep | Cx pipiens-restuans | Burlington | Chittenden |
| 17-Sep | Cx pipiens-restuans | Burlington | Chittenden |
| 17-Sep | Cx pipiens-restuans | Vergennes | Addison |
| 18-Sep | Cx pipiens-restuans | Putney | Windham |
| 18-Sep | Cx pipiens-restuans | Springfield | Windsor |
| 18-Sep | Cx pipiens-restuans | Rockingham | Windham |
| 18-Sep | Cx pipiens-restuans | Brattleboro | Windham |
| 18-Sep | Oc japonicus | Brattleboro | Windham |
| 19-Sep | Cx pipiens-restuans | St Albans City | Franklin |
| 28-Sep | Cx pipiens-restuans | Bennington | Bennington |
| 28-Sep | Oc japonicus | Bennington | Bennington |
| 2-Oct | Oc japonicus | Springfield | Windsor |
| 2-Oct | Cx pipiens-restuans | Springfield | Windsor |
| 2-Oct | Cx pipiens-restuans | Springfield | Windsor |
| 2-Oct | Cx pipiens-restuans | Rockingham | Windham |

*Cx pipiens-restuans: mix of Culex pipiens and Culex restuans

2018 Mosquito Surveillance Locations

Table 3. 2018 Towns trapped (n=83)

| Town | County | Town | County | Town | County |
|-------------|---------------|--------------|---------------|------------------|---------------|
| Addison | Addison | Fairfax | Franklin | Randolph | Orange |
| Alburgh | Grand Isle | Fairfield | Franklin | Richford | Franklin |
| Bakersfield | Franklin | Ferdinand | Essex | Rockingham | Windham |
| Barton | Orleans | Ferrisburgh | Addison | Royalton | Windsor |
| Belvidere | Lamoille | Grand Isle | Grand Isle | Rutland | Rutland |
| Bennington | Bennington | Groton | Caledonia | Shaftsbury | Bennington |
| Benson | Rutland | Hardwick | Caledonia | Shrewsbury | Rutland |
| Berkshire | Franklin | Hartford | Windsor | South Burlington | Chittenden |
| Brandon | Rutland | Highgate | Franklin | Springfield | Windsor |
| Brattleboro | Windham | Hyde Park | Lamoille | St. Albans City | Franklin |
| Brighton | Essex | Jay | Orleans | Stowe | Lamoille |
| Brookfield | Orange | Killington | Rutland | Stratton | Windham |
| Burke | Caledonia | Leicester | Addison | Sudbury | Rutland |
| Burlington | Chittenden | Londonderry | Windham | Sunderland | Bennington |
| Cambridge | Lamoille | Lowell | Orleans | Sutton | Caledonia |
| Castleton | Rutland | Lunenburg | Essex | Swanton | Franklin |
| Charlotte | Chittenden | Manchester | Bennington | Thetford | Orange |
| Colchester | Chittenden | Marshfield | Washington | Vergennes | Addison |
| Concord | Essex | Milton | Chittenden | Vernon | Windham |
| Cornwall | Addison | Montpelier | Washington | Victory | Essex |
| Craftsbury | Orleans | Morrisville | Lamoille | Weathersfield | Windsor |
| Danby | Rutland | New Haven | Addison | Westminster | Windham |
| Danville | Caledonia | Newbury | Orange | Weston | Windsor |
| Derby | Orleans | Newport City | Orleans | Whiting | Addison |
| Eden | Lamoille | Pittsford | Rutland | Whitingham | Windham |
| Enosburg | Franklin | Pownal | Bennington | Williston | Chittenden |
| Essex | Chittenden | Proctor | Rutland | Windsor | Windsor |
| Fair Haven | Rutland | Putney | Windham | | |

2018 Mosquito Species Statistics

Table 4. 2018 Mosquitoes species collected and tested for West Nile Virus and Eastern Equine Encephalitis Virus

| Species | Collected (No.) | Collected (% of total) | Tested for WNV and EEE (No.) | Tested for WNV and EEE (% of total) |
|----------------------------------|-----------------|------------------------|------------------------------|-------------------------------------|
| <i>Coquilletidia perturbans</i> | 24,923 | 32.95% | 16,324 | 31.39% |
| <i>Culex pipiens-restuans</i> | 23,374 | 30.90% | 19,264 | 37.04% |
| <i>Anopheles quadrimaculatus</i> | 3,756 | 4.97% | 3,104 | 5.97% |
| <i>Anopheles punctipennis</i> | 3,071 | 4.06% | 1,670 | 3.21% |
| <i>Culiseta melanura</i> | 2,666 | 3.52% | 2,666 | 5.13% |
| <i>Ochlerotatus sticticus</i> | 2,522 | 3.33% | 0 | 0.00% |
| <i>Ochlerotatus japonicus</i> | 2,442 | 3.23% | 2,164 | 4.16% |
| <i>Ochlerotatus canadensis</i> | 2,159 | 2.85% | 2,159 | 4.15% |
| <i>Anopheles walkeri</i> | 1,774 | 2.35% | 0 | 0.00% |
| <i>Ochlerotatus trivittatus</i> | 1,750 | 2.31% | 1,547 | 2.97% |
| <i>Aedes cinereus</i> | 1,616 | 2.14% | 1,239 | 2.38% |
| <i>Culex territans</i> | 1,329 | 1.76% | 555 | 1.07% |
| <i>Ochlerotatus stimulans</i> | 965 | 1.28% | 0 | 0.00% |
| <i>Culiseta morsitans</i> | 724 | 0.96% | 724 | 1.39% |
| <i>Aedes vexans</i> | 687 | 0.91% | 530 | 1.02% |
| <i>Ochlerotatus fitchii</i> | 466 | 0.62% | 0 | 0.00% |
| <i>Psorophora ferox</i> | 393 | 0.52% | 0 | 0.00% |
| <i>Ochlerotatus provocans</i> | 230 | 0.30% | 0 | 0.00% |
| <i>Ochlerotatus triseriatus</i> | 192 | 0.25% | 51 | 0.10% |
| <i>Ochlerotatus aurifer</i> | 184 | 0.24% | 0 | 0.00% |
| <i>Ochlerotatus excrucians</i> | 118 | 0.16% | 0 | 0.00% |
| <i>Uranotaenia sapphirina</i> | 87 | 0.12% | 1 | 0.00% |
| <i>Anopheles earlei</i> | 65 | 0.09% | 0 | 0.00% |
| <i>Culex salinarius</i> | 65 | 0.09% | 5 | 0.01% |
| <i>Ochlerotatus communis</i> | 57 | 0.08% | 0 | 0.00% |
| <i>Ochlerotatus species</i> | 13 | 0.02% | 0 | 0.00% |
| <i>Ochlerotatus abserratus</i> | 3 | 0.00% | 0 | 0.00% |
| <i>Ochlerotatus atropalpus</i> | 3 | 0.00% | 0 | 0.00% |
| <i>Ochlerotatus diantaeus</i> | 1 | 0.00% | 0 | 0.00% |
| <i>Ochlerotatus intrudens</i> | 1 | 0.00% | 0 | 0.00% |
| <i>Ochlerotatus punctor</i> | 1 | 0.00% | 0 | 0.00% |
| Total | 75,637 | | 52,003 | |