West Nile virus surveillance

State of Iowa

<table>
<thead>
<tr>
<th>Total mosquitoes collected:</th>
<th>165,782</th>
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<tbody>
<tr>
<td>Total mosquitoes tested for WNV (specimens):</td>
<td>9,421</td>
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<tr>
<td>Total mosquitoes tested for WNV (pools):</td>
<td>1,024</td>
</tr>
<tr>
<td>West Nile virus positive pools:</td>
<td>43</td>
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</tbody>
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Trapping Summary

New Jersey light traps (NJLTs) were used to monitor mosquito population dynamics in the state of Iowa. A total of 2,095 trap events occurred from May 3 to October 4. Traps were placed in the counties of Black Hawk, Polk, Scott, and Woodbury (Siouxland District) and in the cities of Ames, Des Moines, and Council Bluffs. A total of 155,109 mosquitoes were collected by NJLTs in Iowa, which averaged 74 mosquitoes collected per trapping event.

Mosquito activity peaked early in 2016 (week 21 – late May) after a wet April. The statewide average mosquito activity did not reach those proportions again for the rest of the year. However, activity did meet and exceed those levels at specific localities. For instance, Des Moines sites, like Beaverdale, experienced extremely high mosquito densities in mid-summer (week 30 – late July) after sustained intense rainfall in the previous 3 weeks. Polk County sites also showed population booms at the same time. Eastern (Scott County) and western (Siouxland) trapping sites peaked a month later at week 35 (late August) after more rains in August. Although mosquito activity typically declines through September into the fall, this year was different in that many trapping sites showed a steady rise in mosquito numbers by the time that trapping ended in late September/early October. This was due to a wet September and high summer temperatures that were sustained into the fall.

The observed population dynamics are mostly the result in changes in the abundance of *Aedes vexans*, the notorious floodwater mosquito. It accounted for 87% of the total NJLT catch. It deposits its eggs on low-lying land so that those eggs hatch upon further rainfall. Because of its great abundance, its human biting tendencies make it a severe summer pest throughout Iowa. Another significant human pest and floodwater mosquito, *Ae. trivittatus*, was also common but much less abundant (2%). *Culex pipiens* group (CPG) mosquitoes, which are primary vectors of West Nile virus (WNV), were very common and constituted 6% of all mosquitoes collected. They include *Cx. pipiens*, *Cx. restuans*, and *Cx. salinarius*; when a specimen of this group cannot be identified to species, it is identified as CPG. Another WNV vector, *Cx. tarsalis*, accounted for 1% of the total catch. It is worth noting that no *Aedes aegypti* or *Ae. albopictus* were found through these trapping efforts. Although the data suggest that these mosquito species are not present in Iowa, it is not certain.

Gravid traps target CPG mosquitoes and were thus used to collect mosquitoes for WNV testing. Traps were placed at the same sites that harbored NJLTs. A total of 1,626 gravid trap events occurred from May 9 to October 3. A total of 10,673 mosquitoes were collected, which averaged 7 mosquitoes per trapping event. As expected, 83% of the gravid trap yield was comprised of CPG. The next two most common species were container-breeding *Aedes – Ae. triseriatus* (8%) and *Ae. japonicus* (8%). These species also serve as vectors of LaCrosse virus (both species) and WNV (*Ae. japonicus*). The WNV vector, *Cx. tarsalis*, was collected very rarely from these gravid trapping efforts, implying the need to employ CDC traps in future to collect this pivotal species.

To test mosquitoes for WNV, relevant species were pooled into groups of less than 100 mosquitoes that came from the same trap site and week-of-the-year. Of the 1,024 mosquito pools tested, 43 tested positive. Positive pools came from all municipalities except for Black Hawk County and Scott County, which may reflect the quantity and quality of specimens received at ISU from those collaborators. The first infection was detected in early June, and two more came from the first week in July. Positive pools were then detected for every week between weeks 29 and 38, which was late June through late September. The time of most frequent WNV isolations was late August through early September, which reinforces our understanding of the timing of peak WNV transmission in Iowa. It is noteworthy that this was the first year in which WNV was detected in *Ae. japonicus*. 
West Nile virus surveillance
Southern Iowa

In an effort to better understand mosquito species distributions throughout Iowa, the Iowa State University Medical Entomology Lab expanded trapping efforts in summer 2016 to new locations in Southern Iowa where mosquito populations have largely been unexplored in past trapping efforts. With a particular interest in the existence of vector species *Aedes aegypti* and *Ae. albopictus*, which have established ranges in the southern U.S., traps were placed in 9 southern Iowa counties in July and operated by local public health personnel. From West to East, these counties are: Fremont, Page, Ringgold, Decatur, Wayne, Appanoose, Davis, Van Buren, and Lee. In August, Ringgold, Decatur, and Wayne Counties discontinued all trapping, and Page County discontinued use of CDC traps.

No *Ae. aegypti* or *Ae. albopictus* were collected in the year’s trapping efforts. Although the data suggest that these species are not present at the chosen trapping sites, it is possible for established populations to exist elsewhere in Iowa.

Two carbon dioxide-baited CDC traps were used in each county. These traps emit both light and carbon dioxide, which makes them very effective at luring mosquitoes and serves as an effective way to assess the mosquito species richness of a given area. They typically result in very high mosquito yields, but on average, CDC traps in southern Iowa collected relatively low numbers of mosquitoes in 2016 (average – 10 mosquitoes per trap night). The unexpectedly low yield was probably due to inexperience and logistical hardships, such as the continual demands for batteries and dry ice. A total of 4,542 mosquitoes were collected from 437 CDC trapping events, which occurred from 29 June to 31 August.

Despite these challenges, valuable information was still garnered from these trapping efforts. For example, the mosquito yields were not dominated by the ever-present nuisance mosquito, *Ae. vexans*. Although still plentiful (16% of the total CDC trap catch), *Ae. vexans* were exceeded in abundance by the LaCrosse virus vector, *Ae. triseriatus* (20%), and surprisingly, *Culex erraticus* (28%), which is a common mosquito species but does not seem to be abundant elsewhere in the state. This last species was particularly abundant at sites in Van Buren County, yielding a West Nile virus (WNV)-positive pool of *Cx. erraticus*, another rare event in Iowa. In addition, CDC trapping efforts similarly demonstrated that mosquito species previously considered rare in Iowa (*Psorophora cyanescens*, *Ps. discolor*, and *Ps. howardi*) are more common than previously thought.

A BG-Sentinel trap was also deployed in each county due to their strong affinity to capture *Ae. aegypti* and *Ae. albopictus*. A total of 5,379 mosquitoes were collected from 295 trapping events, which occurred from 29 June to 1 September. By comparison, the BG-Sentinel traps were the more attractive trap type (average – 18 mosquitoes per trapping event) and seemed to target a different array of species, mainly the container-breeding vectors (*Ae. atropalpus*, *Ae. japonicus*, *Ae. triseriatus*) and *Culex pipiens* group (CPG) species (including *Cx. pipiens*, *Cx. quinquefasciatus*, *Cx. restuans*, and *Cx. salinarius*). One novel finding was the widespread collection of *Ae. atropalpus*, which does not seem to be as common in the rest of the state and may be a previously unexplored introduction event. The trapping efforts were also informative on the ranges of *Cx. tarsalis*, a pivotal vector of WNV in Iowa that needs further study, and *Ae. japonicus*, an invasive mosquito that tested positive for WNV for the first time in Iowa this year.

An additional 225 mosquitoes were collected from Fremont and Appanoose Counties without trapping info due to labels that detached during shipping.

To test mosquitoes for WNV, relevant species were pooled into groups of 100 or less mosquitoes that came from the same trap site and week-of-the-year. Of the 312 mosquito pools tested, 3 tested positive. They were collected in mid- and late August, when WNV transmission is on the rise. They were collected in Fremont County (1 pool – *Cx. pipiens*) and Van Buren County (2 pools – *Cx. restuans* and *Cx. erraticus*).