

Mosquito Surveillance Analysis 2017-2020

Introduction and Methods:

Mosquito surveillance is an important tool in the control of zoonotic diseases such as West Nile Virus (WNV). Mosquito surveillance data can be used to prioritize geographic areas for prevention strategies such as larval control, adult mosquito control, source reduction and community education.

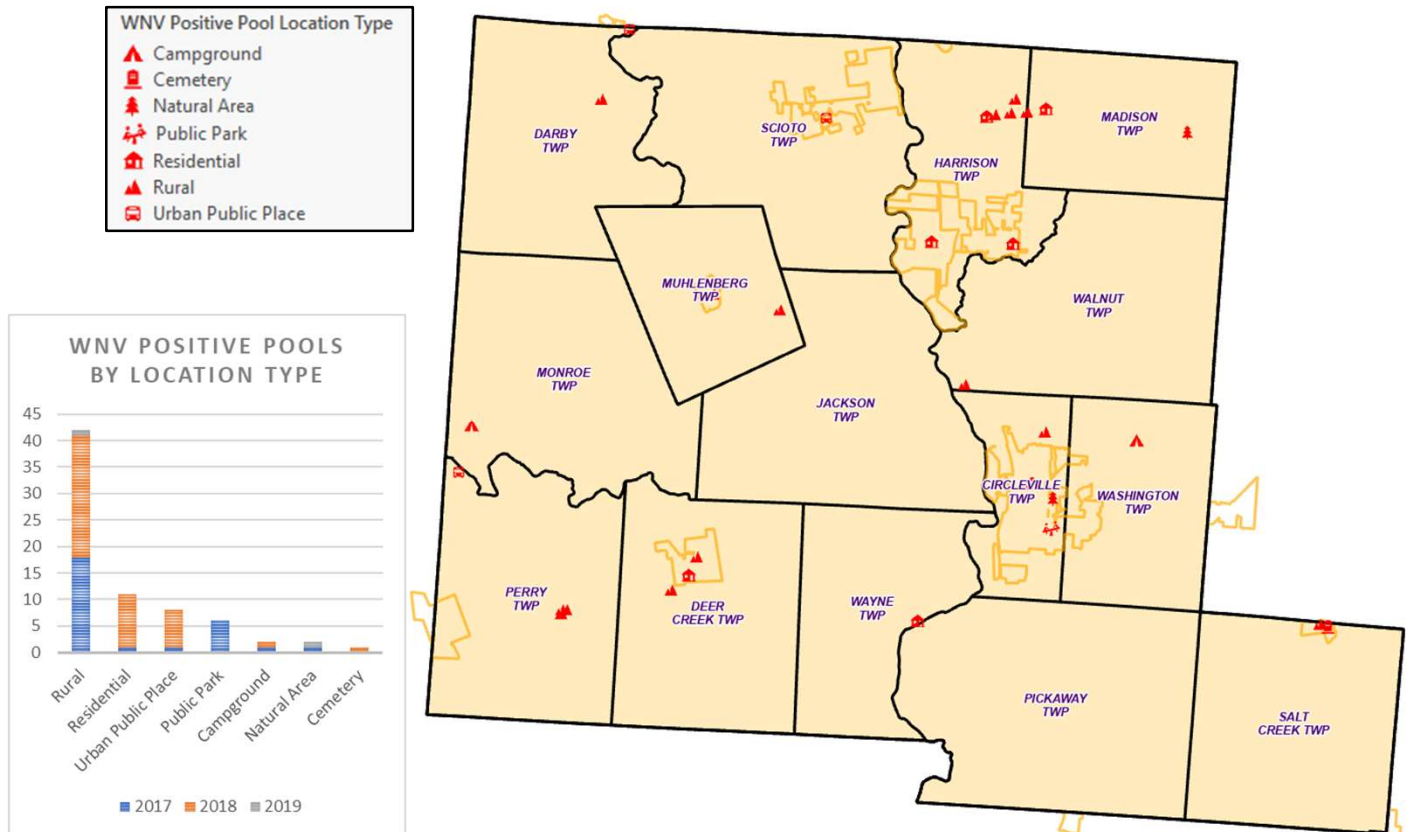
Annually, PCPH applies for, and has been fortunate to receive funding from the Ohio Environmental Protection Agency to conduct mosquito surveillance and prevention activities. Surveillance activities include trapping and testing mosquitos for the presence of WNV. Mosquitos are collected, frozen, sorted to eliminate other insects and debris, then shipped on ice to the Ohio Department of Health Laboratory. Mosquitos are tested for WNV by Polymerase Chain Reaction (PCR), and the results are reported back to PCPH. Data on all testing locations allows aggregate data analysis. Four years of mosquito

testing data was analyzed to determine high risk areas within Pickaway County for transmission of WNV. Some locations are perennial locations where trapping occurs every year, and others are a response to complaints. The highest risk timeframes within the mosquito breeding season was also analyzed. This analysis was conducted using ArcGIS and methods described by Brown (2021).

Results:

A total of 72 pools of mosquitos in Pickaway County tested positive for WNV from 2017-2020. The overwhelming majority of these pools were in rural areas of the County and on average 30 female mosquitos were collected per pool. At some locations, multiple pools were tested. Figure 1 illustrates the location of the positive pools and the description of the location's setting.

Figure 1: Positive Mosquito Pools and Settings

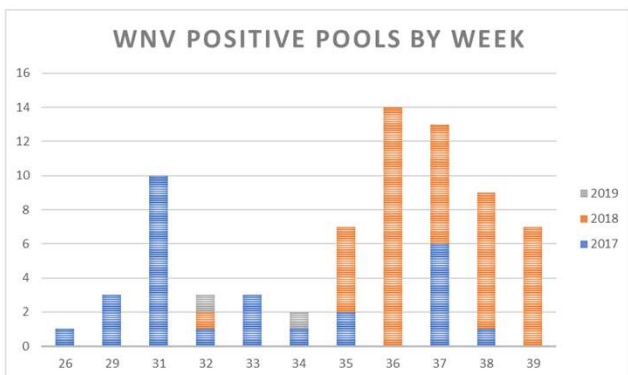
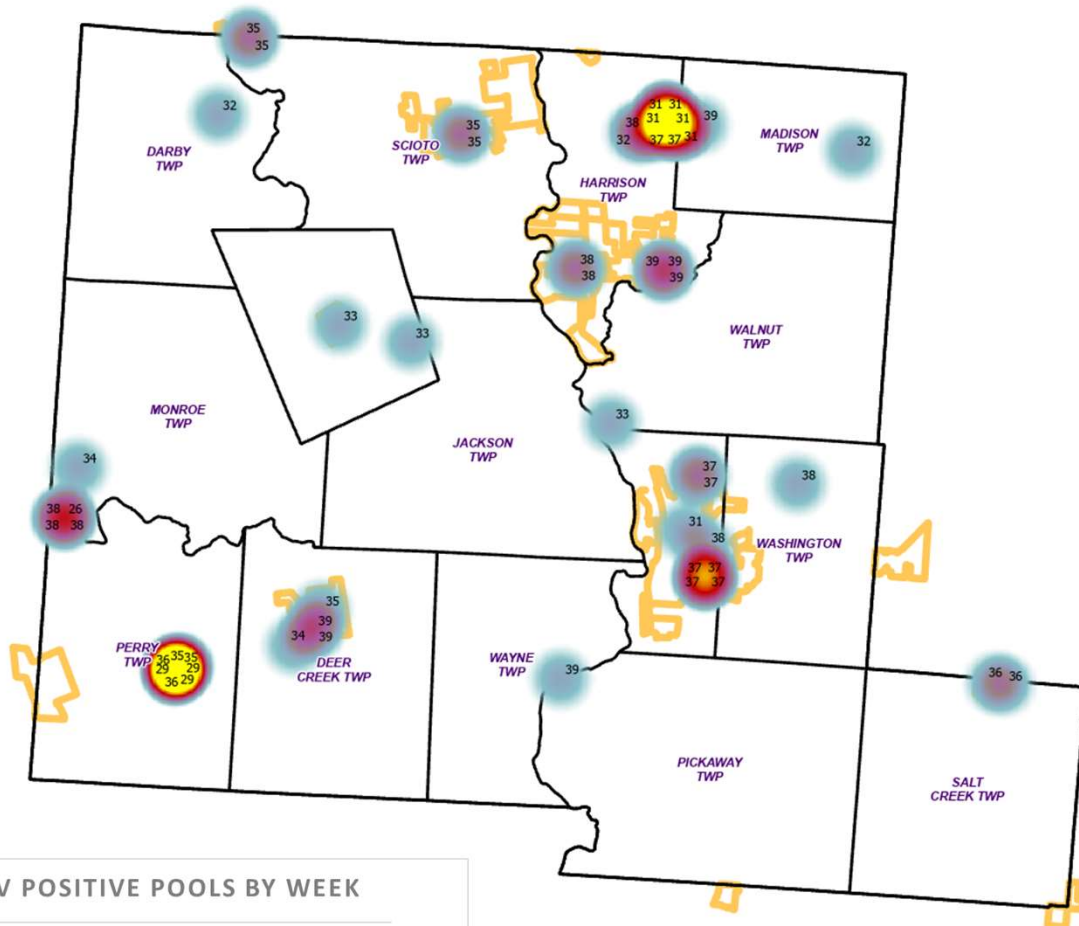




A heat map showing the density of positive pools identifies areas within northern Pickaway County and in the southwest corner of the county that had the highest number of positive pools. WNV was identified as early as week 26 and as late as week 39. The majority of positive samples were collected between week 35 and 39 (Figure 2). In 2017, there was a peak in positive pools relatively early in the

season. In 2018, the infection rate slowly increased throughout the mosquito season and peaked in September and October. This is the expected pattern of infection rates as mosquito populations expand throughout the summer. The four years of combined data show that generally, the highest risk for WNV infection is during the later part of the summer and into early fall.

Figure 2 Density of WNV positive pools and week of collection.





Discussion and Recommendations:

Trap locations are determined by population density, geographic location, and response to complaints. While trapping should occur where people congregate since the risk to humans is the highest at these locations, it is also interesting to conduct surveillance in more rural areas to gain an understanding of where infected mosquitos reside in Pickaway County. Since figure 1 shows the majority of the positive pools are in rural areas, efforts to control mosquitos may need to be concentrated in those areas. Control efforts include surveillance, breeding source reduction, larviciding, and community education. Education coupled with breeding source reduction may be the most important in rural areas since larviciding is more difficult in rural areas.

Figure 2 shows that there is not an equal distribution of infected mosquitos across the entire season from June through October. While there is certainly year to year variation that may be caused by factors such as weather and human activity, it is apparent that the number of positive mosquitos builds though the season until September and October when it reaches its maximum.

When geographic data is coupled with timeframe data some possible control strategies emerge for rural and urban areas. In rural areas, education and breed source reduction in early and mid season may be effective, while late season, larviciding efforts should be considered. Larviciding should always be done, if possible, in response to any WNV positive pool of mosquitos. In more urban areas, the same applies, except larviciding may begin earlier since it is easier to impact mosquito populations in relatively smaller geographic locations.

There are some limitations to the data collected between 2017 and 2020 in Pickaway County. Mosquito trapping was limited in 2019 compared to the prior 2 years due to staffing changes. In 2020, the COVID-19 pandemic caused a realignment of priorities that also impacted trapping volumes.

References:

Brown, H. E., Sedda, L., Sumner, C., Stefanakos, E., Ruberto, I., & Roach, M. (2021). Understanding Mosquito Surveillance Data for Analytic Efforts: A Case Study. *Journal of medical entomology*