The Demise of Small Mosquito Control Programs
by Rosemarie Kelly

For the most part, small programs do a very limited amount of mosquito control. Their budgets don't allow aerial application of mosquito control products and usually don't include mosquito surveillance. And these are often the first programs to be cut when counties face budget shortfalls.

Does it matter?

The Georgia Division of Public Health's (GDPH) arboviral surveillance program, which began in 2000 when West Nile virus (WNV) was spreading south from New York, includes mosquito surveillance and testing components. Within this program, most of the surveillance is done in urban areas where the risk of WNV transmission is highest.

Clayton County is a small, densely populated county located just south of Atlanta; see Figure 1. Their mosquito control program evolved from a spray-only program, which started in 1988, to a scheduled adulticide program, and then to a complaint-driven adulticide and larvicide program.

When WNV arrived in Georgia in 2001, Clayton County was the only one of nine metro Atlanta counties with a county-funded mosquito control program in place. The mosquito control staff worked closely with the local public and environmental health departments to reduce the risk of West Nile fever/encephalitis in Clayton County. When arboviral surveillance began in the county in 2002, mosquito control responded to every report of increased *Culex* mosquitoes with both adulticiding and larviciding.

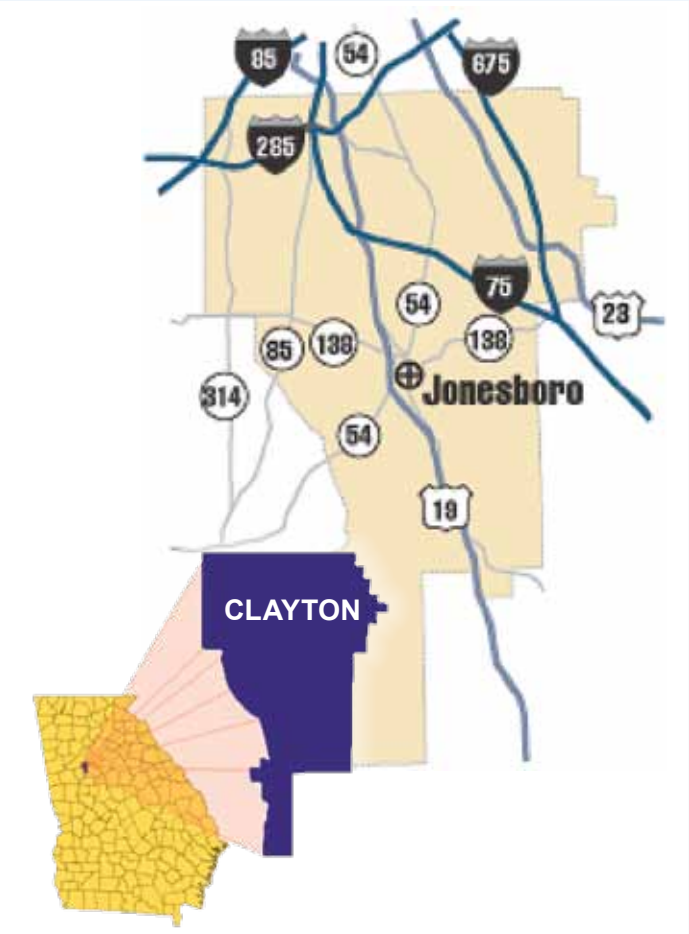

Figure 1: Clayton County, Georgia.

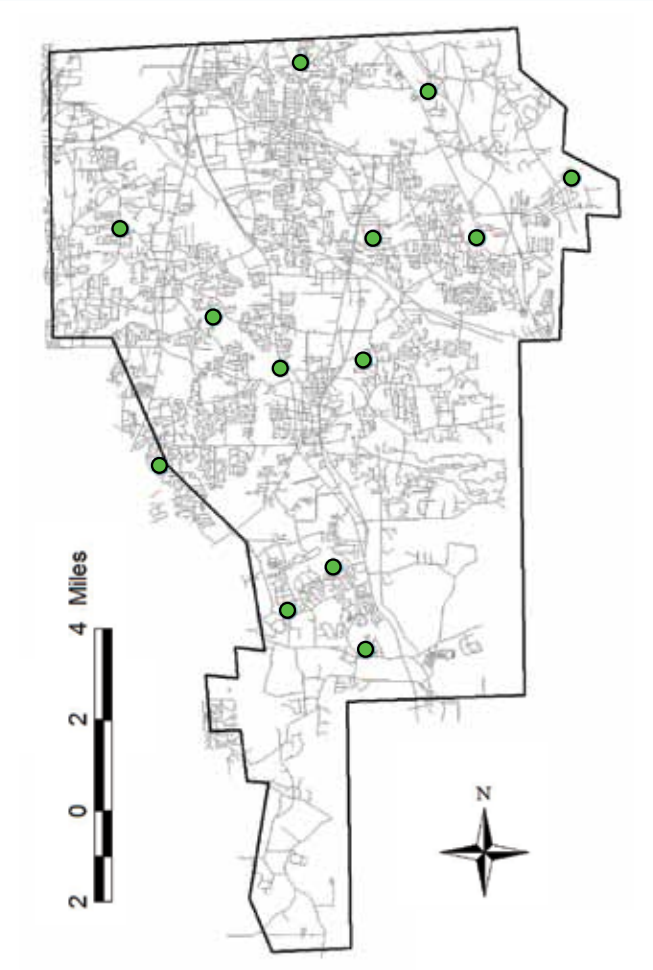

Figure 2: Clayton County surveillance sites.

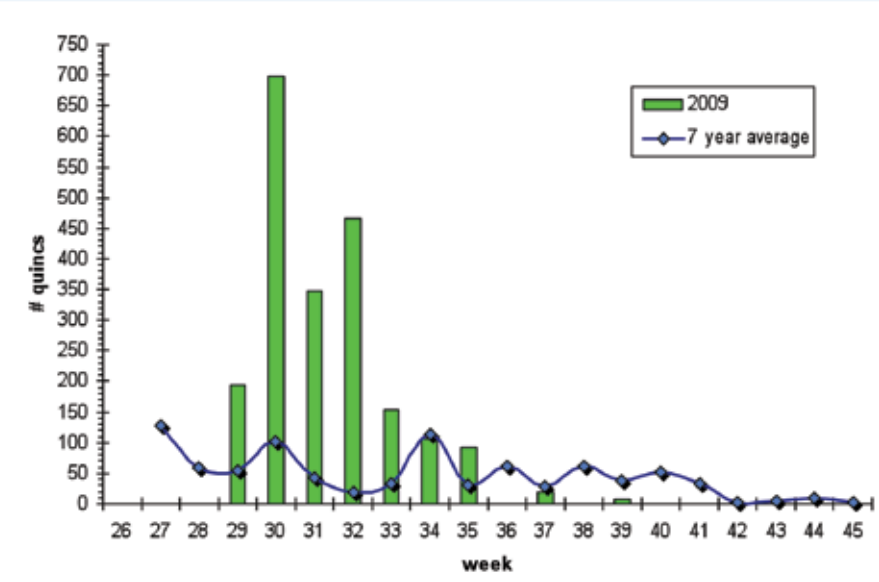

Figure 3: 2009 Clayton County *Culex quinquefasciatus* surveillance data.

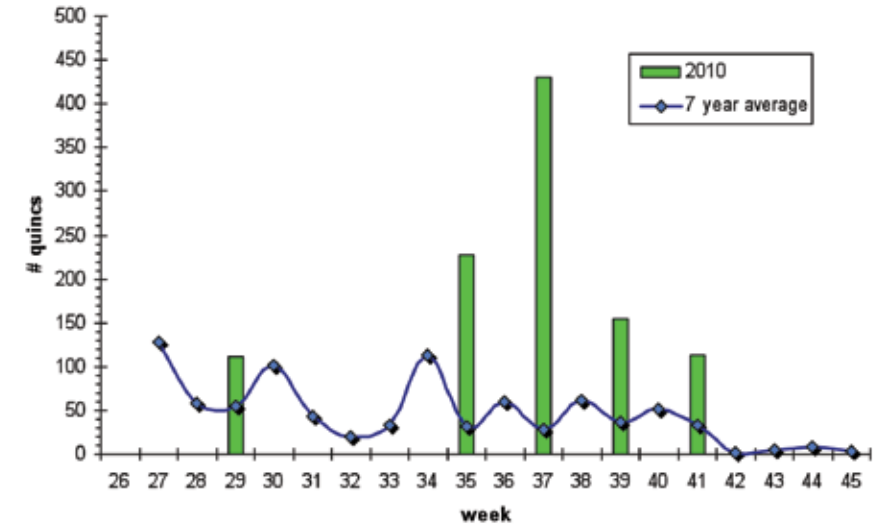

Figure 4: 2010 Clayton County *Culex quinquefasciatus* surveillance data.

Mosquito surveillance based on gravid traps has continued in Clayton County since 2002. Low human case numbers are due in part to educational efforts by the local health departments and by the efforts of mosquito control. Initially, surveillance was done at 18 sites. Additional surveillance was done in 2004 in response to an increase in human disease in areas where no surveillance was being done. Since the local mosquito control staff did not have resources that allowed for routine, in-house surveillance, they depended on complaints and on the arboviral surveillance provided by the GDPH to target areas of higher West Nile fever/encephalitis risk.

In 2005, a sentinel surveillance program was set up in Clayton County; see Figure 2. There were yearly meetings between mosquito control, local public and environmental health departments, and the GDPH entomologist. Mosquito Control remained responsive to all potential WNV problem areas. The Mosquito Control director worked hard to keep Clayton County's program as up-to-date as possible given their limited resources. Surveillance continued, as did the relationship between Mosquito Control, the GDPH, and the local public and environmental health departments. Clayton County had a good mosquito control program that used Integrated Mosquito Management (IMM) techniques to help reduce both nuisance and vector mosquito species.

Everything changed in 2009 when the mosquito control program was discontinued in Clayton County. Although there were no human cases of West Nile fever/encephalitis that year, the number of vector mosquitoes collected was high. Without recourse for mosquito control efforts, the worry was that this would increase the risk of human disease in 2010.

In 2009 there was a considerable increase in the numbers of *Culex quinquefasciatus* over the previous 7 years when mosquito control was available; see Figure 3. In late March of 2010, Clayton County became the first county in the US to have a West Nile fever/encephalitis case reported.

Culex quinquefasciatus numbers remained higher than normal in the county throughout 2010; see Figure 4. Without mosquito control, the local health departments were able to provide only outreach and limited larviciding. Larviciding efforts were limited because resources for larger scale larviciding were simply not available. Additionally, because of resource limitations, education and control measures were only done following a report of human disease.

A number of published reports suggest that mosquito control programs, and especially those using Integrated Mosquito Management techniques, are needed to reduce the risk of arboviral transmission at the local level.

A study from Michigan indicated that people in communities with no mosquito control program had a tenfold greater risk of West Nile fever/encephalitis than those in areas where mosquitoes were controlled (http://www.cdc.gov/ncidod/dvbid/westnile/conf/pdf/Walker_6_04.pdf).

A Chicago area study suggested that mosquito control programs made a difference in WNV infection rates. The Des Plaines Valley District, with an intensive program to kill mosquito larvae, had four West Nile fever/encephalitis cases per 100,000 people, while the North Shore District, with a less ambitious program, had 51 cases per 100,000. This study showed that the program with the most mosquito surveillance and best documented larviciding and adulticiding operations had the fewest number of West Nile fever/encephalitis cases (Tedesco, Ruiz and McLafferty 2010).

This is not new information. The efficacy of aerial insecticide applications to reduce the transmission of Saint Louis Encephalitis (SLE) virus was shown during an epidemic in Dallas, TX in 1966. This study presented evidence that infection rate is reduced as a consequence of anti-mosquito measures. Before aerial spraying there was an SLE virus infection rate of 1 in 167 mosquitoes tested. After aerial control operations the SLE virus infection rate was 1 in 28,639 mosquitoes (Hopkins et al. 1975)

So, are small programs important?

There was a documented increase in vector populations after the demise of Clayton County's mosquito control program. Concurrently, there was an apparent increase in the risk of West Nile fever/encephalitis based on the presence of increased numbers of vector species and the detection of an early human case of West Nile fever/encephalitis in 2010. There was also a suspected increase in nuisance species and mosquito complaints, although these data were not collected.

Since the size of mosquito populations is crucial to disease transmission, it is important to reduce these populations below transmission thresholds. Even small programs can provide a reduction in vector populations and reduce the risk of vector-borne disease transmission.

REFERENCES CITED

Hopkins, CC et al. 1975. The epidemiology of St Louis encephalitis in Dallas, Texas in 1966. Am J Epidemiol 102: 1-15.

Tedesco C, Ruiz M, and McLafferty S. 2010. Mosquito politics: Local vector control policies and the spread of West Nile Virus in the Chicago region. Health & Place, 16 (6): 1188-1195.

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