West Nile Virus Surveillance in Madison and Dane County – 2007
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Summary

- Bird surveillance in 2007 found West Nile virus (WNV) activity started in June and peaked first in early July.
- The total number of sick or dead crows and blue jays reported in 2007 (106 reported) was the lowest since the department started collecting reports in 2002 (541 reported).
- Anecdotal reports of declines in local crow populations have been received but local monitoring data is not yet available to support these reports.
- The Public Health Department continued partnerships with other City of Madison agencies, six neighboring communities, and the University of Wisconsin campus to implement mosquito larvae monitoring and control activities in the Madison metropolitan area.
- Mosquito larvae monitoring in 2007 determined that 8% of water sources in the Madison metropolitan area produced high numbers of *Culex* mosquitoes.
- Adult mosquito monitoring found normal mosquito activity in 2007 that was extended slightly by a large amount of rain in August. Viral testing was not performed on any of the mosquitoes captured in Madison.
- Two cases of WNV illness were reported among Dane County residents in 2007. One case involved non-fatal encephalitis and the other involved WNV fever.
- Department staff performed additional mosquito monitoring and provided public outreach assistance in the Carpenter – Ridgeway Neighborhood to investigate two cases of human WNV illness in the neighborhood in 2006. Data collected from this effort did not suggest a clear explanation for two cases of WNV in one neighborhood in the same year.

Bird Surveillance

In 2007, the Public Health Department cooperated with statewide efforts to collect and test dead crows and blue jays for West Nile virus (WNV). Table 1 provides a summary of the sick or dead bird surveillance data. Throughout Dane County, 2 crows were submitted for WNV testing from Madison and both were positive for WNV. The appearance of WNV infection in 2007 was first documented in mid-June.

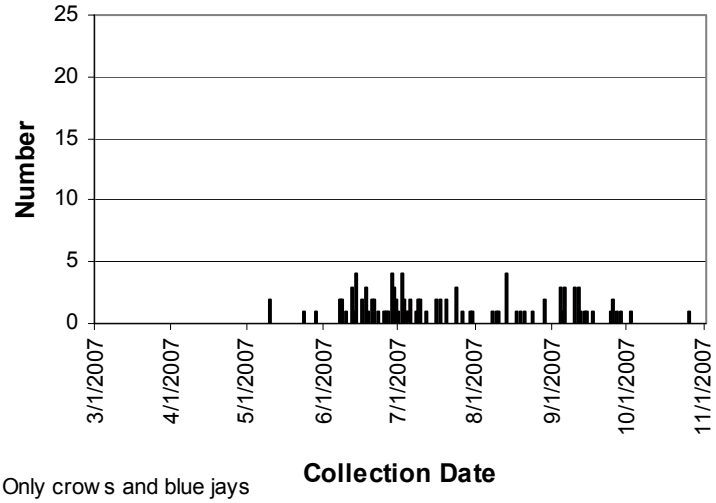
As in previous years, only a small percentage of the birds reported as sick or dead were collected for WNV analysis. In 2007, the Department changed procedures to focus on collecting sick birds. Prior to 2007, considerable effort was made to collect both sick and dead birds; however, we found that many dead birds reported for collection were not suitable for testing or clearly died from a cause other than WNV. Dead birds were still recorded for monitoring purposes. Also, after the state discontinued testing birds from Madison and Dane County in mid-August, the Department continued to record sick and dead bird reports. Figure 1 shows

Table 1. Results of sick/dead bird (crows and blue jays) surveillance in Dane County.

	2002	2003	2004	2005	2006	2007
Date first bird reported	May 21	Mar 19	Apr 27	Apr 23	May 3	May 10
Date first WNV positive bird collected	Jul 14	Jul 17	May 28	May 19	Jun 5	Jun 13
Date WNV testing discontinued for the year	Aug 3	Aug 4	Jun 9	Jun 7	Jun 19	Aug 21
Total # WNV positive birds	21	7	6	2	7	2
Total # birds collected	23	35	52	9	15	2
Total # of sick or dead birds reported	541	195	389	284	365	106
Peak weekly average of sick/dead bird reports	13.7	2.6	7.7	8.3	5.4	2.4
Date of peak	Sept 3	Sept 10	June 14	Aug 22	Aug 17	Jul 3

the number and date of occurrence for all crows and blue jays reported or collected in Dane County in 2007.

Figure 1. Number of sick or dead birds* reported in 2007

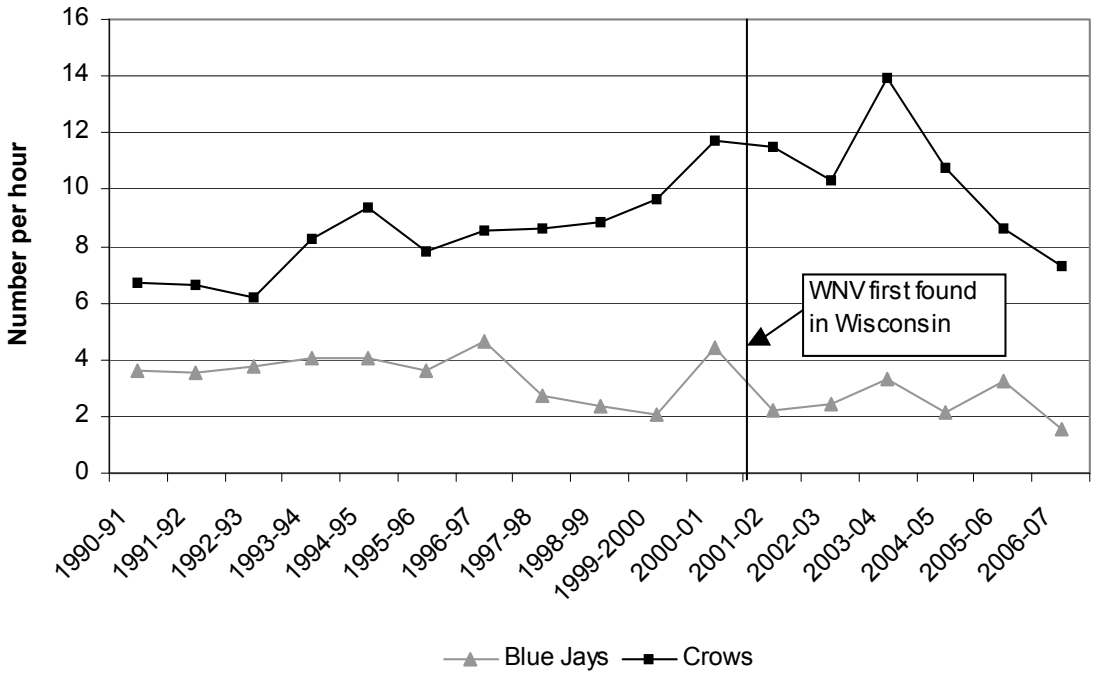


* Only crows and blue jays

Sick and dead bird (crows and blue jays) reporting in Dane County was the lowest it has been since the Department started tracking these numbers in 2002. It is unknown whether this decrease was a result of less WNV activity or decreased reporting by Dane County residents. About two thirds of the birds reported came from Madison. WNV infection was confirmed in birds in mid-June, which is a little later than previous years. According to bird reports, WNV activity was pretty low throughout the season with the largest surge of sick or dead bird reports occurring in early July. However, this peak of 2.4 reports per week was very small compared to all years except 2003.

Bird deaths related to WNV infections may be having an impact on local bird populations. Anecdotal reports of population decreases have been received by PHMDC and other agencies and organizations including the National Wildlife Health Center and the Audubon Society. A recent report published in the journal Nature (LaDeau et al., 2007) estimates that crow populations across North America have dropped 45% since WNV was first observed. Local data on bird populations is limited. According to the Audubon Society's Christmas Bird Count, Wisconsin counts of crows have dropped sharply in the last 3 years. However, it is not certain that this drop resulted from WNV infections. As shown in Figure 2, this decrease occurred several years after WNV was first seen in Wisconsin. Also, it is possible that winter bird counts, such as the Christmas Bird Count, are less indicative of the impacts of WNV that has its greatest

Figure 2. Number of crows and blue jays counted per hour in Wisconsin during the Audubon Society's Christmas Bird Count.



impact on the population in late spring and summer. Other data sets such as eBird.org and the Great Backyard Bird Count may be useful in monitoring local bird populations; however, these data are based on volunteer reports, which may bias their results. Systematic population monitoring such as the North American Breeding Bird Survey provides higher quality data but is best suited to measuring bird populations regionally and is not able to identify changes in population at the local level.

Mosquito Surveillance

Table 2. Summary results of 2007 mosquito larvae inspections in the Madison metropolitan area.

	City of Madison	City of Middleton	City of Monona	City of Sun Prairie	Town of Madison	UW – Madison	Village of Maple Bluff	Village of Shorewood Hills	Metro Area
High *Culex*	37	3	0	2	0	0	1	0	43
High *Aedes*	14	4	0	3	0	1	0	0	22
Low larvae	20	4	0	5	2	2	1	0	34
No larvae	214	49	20	69	8	23	2	0	385
No larvae, visual	31	4	0	4	0	1	0	1	40
Total Accessible	316	64	20	83	10	27	4	1	523
% High *Culex*	12%	5%	0%	2%	0%	0%	25%	0%	8%
% High A*edes*	4%	6%	0%	5%	0%	4%	0%	0%	5%

In 2007, Public Health for Madison and Dane County (PHMDC) continued its partnership with the Town of Madison, Village of Maple Bluff, City of Middleton, City of Monona, the Village of Shorewood Hills, the City of Sun Prairie, and the University of Wisconsin to monitor and control the breeding activity of targeted mosquito species on public property. Mosquito surveillance consisted of adult mosquito trapping and larval mosquito sampling in water on public property. Mosquito control involved public outreach to promote removal of water sources (source reduction) and larvicide applications when water sources were found to produce high levels of target mosquito larvae. The following summarizes mosquito monitoring and control in 2007. For additional information on this effort, please refer to the full mosquito monitoring and control program report "Mosquito Monitoring and Control 2007 – Madison Metropolitan Area" at http://www.publichealthmdc.com/.

Table 2 summarizes the larval mosquito monitoring performed by the Department in 2007. Department staff made 1,608 inspections of 523 water sources in the metro area. These inspections were made at ditches (746 inspections), ponds (667 inspections), and other surface water sources (195 inspections). A small percentage (8%) of the sites inspected produced high numbers of *Culex* larvae at least once during the season (Table 3). Another 5% of the sites produced high numbers of *Aedes* larvae but not *Culex*. No other mosquito species were found in high numbers in the water sources monitored. Eighty-seven percent of the sites did not produce high numbers of mosquito larvae.

Based on data from light/CO2 traps, adult mosquito populations have varied widely in the last four years (Figure 2). Population trends in 2006 and 2007 were similar to the typical seasonal cycle where mosquito populations peaked in mid to late summer. In 2007, mosquito

Figure 2. Number of adult mosquitoes caught in light traps each night.

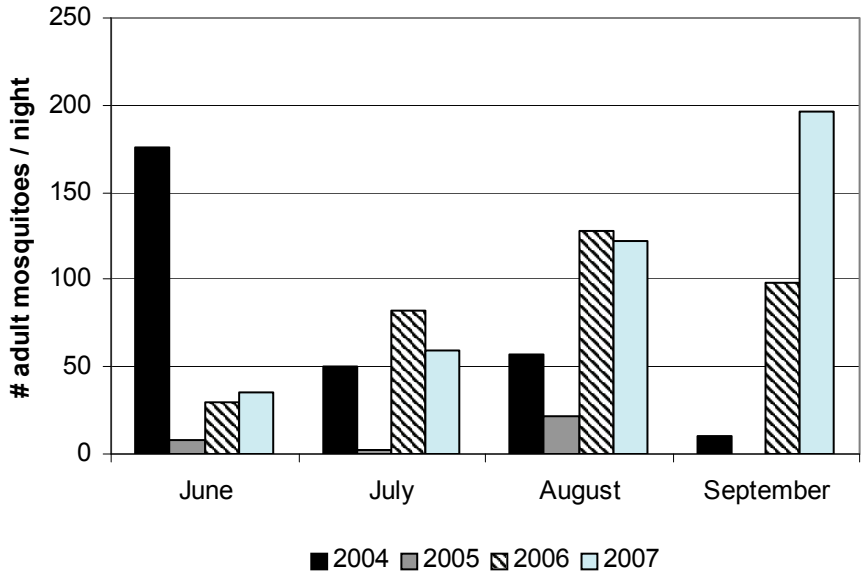
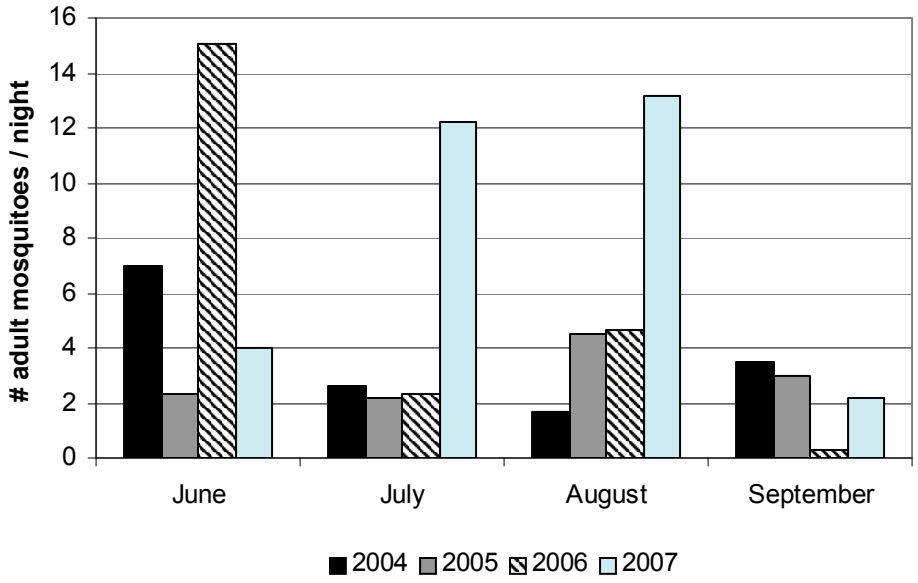


Figure 3. Number of adult mosquitoes caught in gravid traps each night.



populations peaked in September after receiving nearly 15 inches of rain in August. Mosquito populations in 2005 and 2006 peaked in August. The numbers of mosquitoes captured in 2005 was abnormally low due to below normal rainfall for most of the season. Numbers of mosquitoes captured in 2006 and 2007 were more typical for this area. The mosquito population trend in 2004 was most peculiar due to heavy May rains resulting in very large numbers of mosquitoes in June. A subsequent dry spell for much of the remainder of the season caused mosquito numbers to drop.

Population trends as shown by gravid traps (Figure 3) were very different from the trends observed in light/CO2 traps. In 2007, the number of adult mosquitoes captured increased after June, remained steady for July and August, and then dropped in September. The number of adult mosquitoes also dropped in September of 2005 and 2006, although less dramatically.

A total of 30 mosquito species were captured in 2007 among the three types of adult mosquito trapping performed by UW-Madison students and PHMDC staff. *Aedes vexans* was the most commonly captured species by light traps (69%) and during human landing catches (65%). *Ochlerotatus trivittatus* was the second most frequently captured mosquito accounting for 15% of the mosquitoes in light traps and 10% of the mosquitoes landing on UW students. Gravid traps, which are designed to capture container-breeding mosquitoes, captured primarily *Culex* species (91%). The most common of these mosquitoes was *Culex restuans* but also included *Culex pipiens*, *Culex erraticus*, and *Culex tarsalis*.

Human Surveillance

Most humans (~80%) infected with West Nile virus experience no adverse symptoms and less than 1% will have serious encephalitis or meningitis result from infection. As of January 8, 2008,

109 deaths were attributed to WNV in the United States in 2007. This is 3% of all reported cases and 9% of those with neuroinvasive disease. West Nile virus infection is a reportable illness in Wisconsin. The Department conducted passive surveillance for human cases of WNV infection. Area providers were also encouraged to participate in Wisconsin's Enhanced Arbovirus Surveillance program, which tested serum and cerebrospinal fluid of patients who met specific clinical criteria. In 2007, one case of WNV encephalitis and one case of WNV fever were identified in Dane County. Since 2002, surveillance has recorded 13 cases of human WNV infection in Dane Co. A breakdown of these cases is given in Table 3.

Table 3. Number of human WNV cases in Dane County.

	Cases Identified	
	2007	Total since 2002
WNV Fever	1	8
WNV Encephalitis (non-fatal)	1	3
WNV Encephalitis (fatal)	0	2
Total	2	13

In June 2007, representatives of the Carpenter – Ridgeway Neighborhood in the City of Madison reported elevated concerns about WNV infection among neighborhood residents. This concern was based on the occurrence of two confirmed cases of human WNV infection in 2006 and a reported case in 2007. In response Department staff performed additional monitoring in and around the neighborhood. These activities involved surveying the area for new water sources on public or private property, inspecting catch basins, and inspecting water sources located on the nearby private golf course. University of Wisconsin Medical Entomology students also set light traps in the area to measure the adult mosquito population in the area. These efforts identified one pond on the golf course and one catch basin in the neighborhood with high numbers of *Culex* larvae. A third location, a portion of Starkweather Creek that had been blocked by fallen trees and debris, had high numbers of *Aedes* larvae. Staff treated the catch basin and the creek with a microbial larvicide, VectoLex CG, and monitored the areas through the remainder of the season. The golf course pond was not treated because the mosquito species found, *Culex territans*, is not a likely WNV vector. Adult mosquito traps identified large numbers of *Aedes* mosquitoes and students reported very high biting pressure while setting and retrieving traps.

Public Outreach

Department staff continued efforts to provide information to the public on the risks of WNV illness, preventing mosquito bites, reducing the presence of mosquito-breeding areas. At the beginning of the season, the Department issued a press release and provided a written briefing to educate the media. Staff also updated the Department's WNV webpage (www.ci.madison.wi.us/health/envhealth/westnilevirus.html), which includes a video of a

backyard tour of mosquito breeding sites. Department staff continued to distribute the informational flier (in English and Spanish) produced in 2003.

In response to public concern in the Carpenter – Ridgeway Neighborhood, staff provided information packets to the neighborhood that were delivered by neighborhood block captains to all residents. The packets included the mosquito prevention brochure and a 1/3rd page insert describing the issues of WNV, and asking residents to report water sources that might contribute to higher numbers of mosquitoes. Distribution of the materials resulted in a small number of calls to the Department for further information but did not identify any private water sources that were of concern.

Conclusion

West Nile virus surveillance activities continue to indicate that WNV risk for humans in Madison and Dane County is low. Evidence of WNV activity was found in dead birds and humans in 2007. Localized concern about WNV in the Carpenter – Ridgeway Neighborhood resulted in the Department taking action to provide accurate information and more thoroughly investigate water sources in the neighborhood. However, this effort did not suggest a clear explanation for the presence of two cases occurring in the neighborhood in 2006.

Due to low numbers of mosquitoes and humans with WNV infection, collection of sick and dead bird reports continues to be the Department's best measure of WNV activity in the area. Adult mosquito surveillance continues to be important for measuring overall mosquito activity. The Department was able to partner this year with faculty and staff from the UW Medical Entomology Program to collect a significant amount of adult mosquito data from the metropolitan area in 2007.

Based on these data, we can expect at least a low level of WNV infection in mosquitoes, birds, and humans in the future. Continued surveillance efforts are necessary to assess the intensity of this illness in our communities and provide recommendations on addressing the threat of illness. Program efforts planned for 2008 will include:

- Dead and sick bird surveillance and testing identifies when the virus is active in the community and provides a measure of severity between years.
- Mosquito larvae monitoring and control detects standing water that may provide breeding opportunity for WNV competent mosquitoes and provides a mechanism for responding to sites on public property shown to produce high numbers of mosquitoes. This also provides and example for area residents to follow in preventing water sources on their property from producing mosquitoes.
- Adult mosquito surveillance provides information on the level of mosquito activity and WNV infection.
- Human illness surveillance detects when WNV activity has moved from bird populations to humans.