West Nile Virus Surveillance in Madison and Dane County – 2008 and 2009
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Summary

- Bird surveillance in 2008 found positive evidence of West Nile virus (WNV) in August; no WNV positive birds were reported in 2009.
- A total of 55 sick or dead crows and blue jays were reported in 2008; a total of 17 were reported in 2009. This data represents a continuing decline in reported WNV activity in Dane county.
- 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 determined that 6% of water sources in the Madison metropolitan area produced high numbers of *Culex* mosquitoes in 2008; these percentage increased to 15% in 2009. An increase was also noted in the percentage of water sources reporting high numbers of *Aedes* larvae; approximately 3% in 2008 and 5% in 2009.
- Adult mosquito monitoring found abnormally high mosquito activity in 2008 primarily due to the large amount of rains and flooding experienced during that reporting year; mosquito activity in 2009 was notably reduced from 2008 monitoring data but still higher than previous years for the month of July and reduced in August and September. Viral testing was not performed on any of the mosquitoes captured in Madison.
- One case of non-fatal encephalitis WNV illness was reported among Dane County residents in 2009. No cases were reported in 2008.

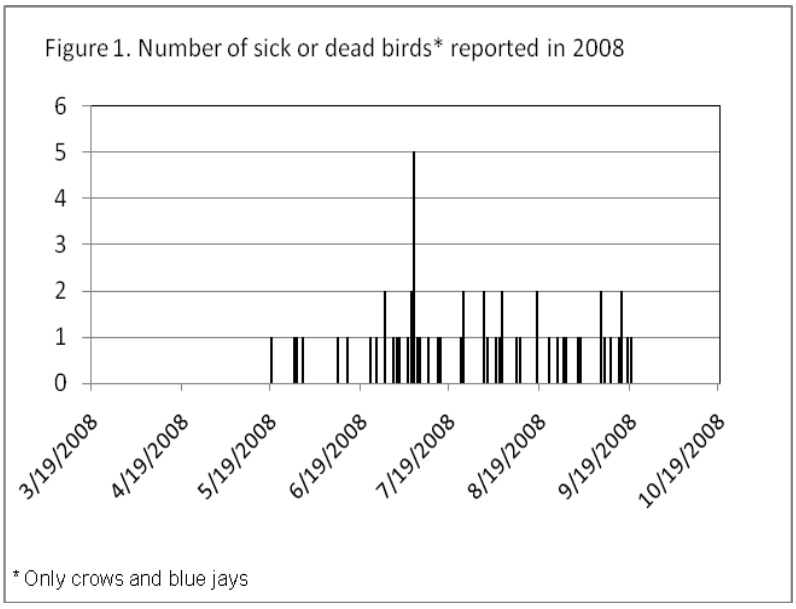
Bird Surveillance

In 2008-2009, Public Health Madison and Dane County (PHMDC) 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. In 2008, five crows were submitted for WNV testing and 2 were positive for WNV; the first sample reported with positive results was recorded on August 6th. In 2009, six birds were submitted for testing (2 crows and 4 blue jays); none were positive for WNV.

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

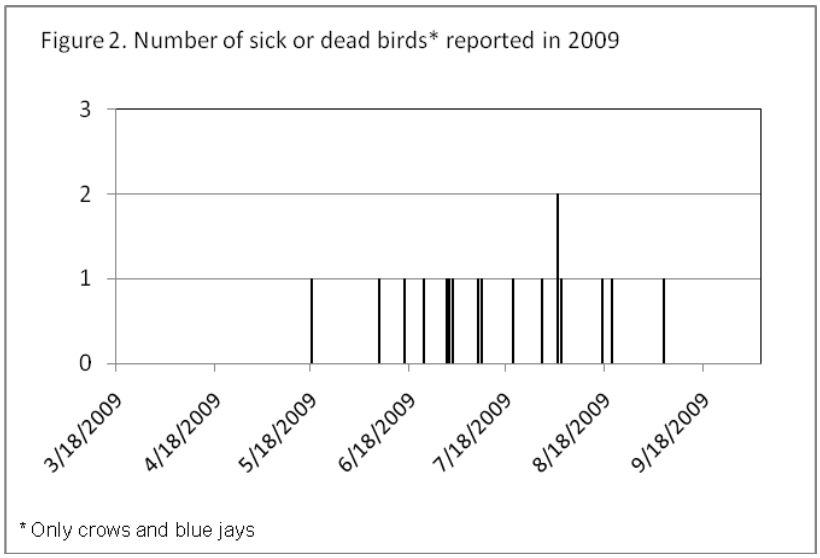
	2004	2005	2006	2007	2008	2009
Date first bird reported	Apr 27	Apr 23	May 3	May 10	May 19	May 18
Date first WNV positive bird collected	May 28	May 19	Jun 5	Jun 13	Aug 6	N/A
Date WNV testing discontinued for the year	Jun 9	Jun 7	Jun 19	Aug 21	Aug 28	Sep 5
Total # WNV positive birds	6	2	7	2	2	0
Total # birds collected	52	9	15	2	5	6
Total # of sick or dead birds reported	389	283	365	106	55	17
Peak weekly average of sick/dead bird reports	7.7	8.3	5.4	2.4	1.1	0.4
Date of sick/ dead bird report peak	June 14	Aug 22	Aug 17	Jul 3	Jul 7	Aug 3

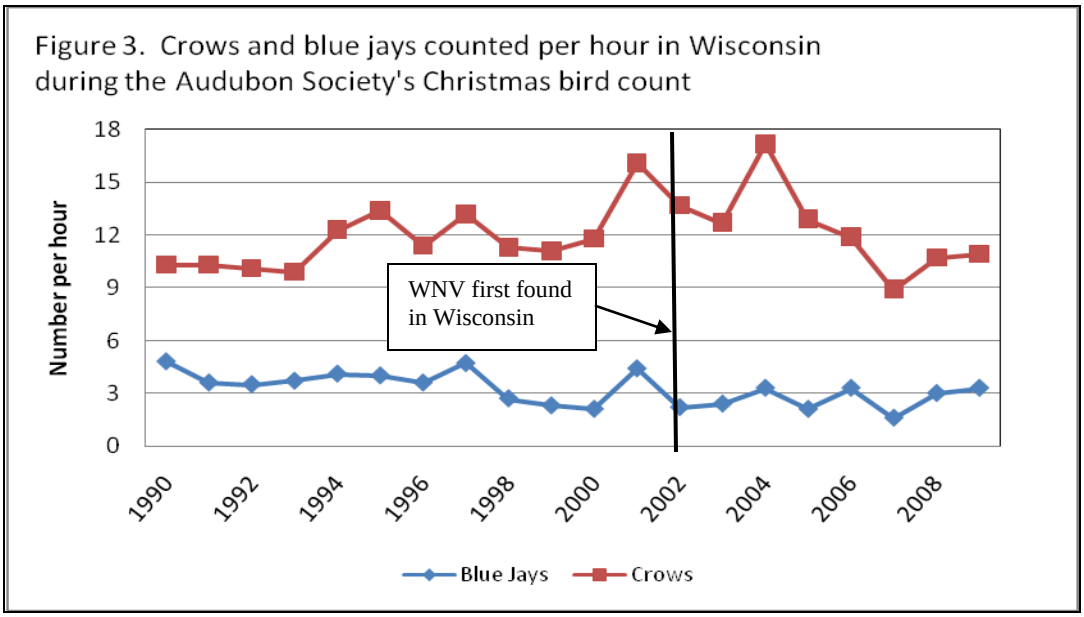
As in previous years, only a small percentage of the birds reported as sick or dead were collected for WNV analysis. In 2007, the Department changed procedures to focus on collecting sick birds. Prior to 2007, considerable effort was made to collect both sick and dead birds; however, we found that many dead birds reported for collection were not suitable for testing or clearly died from a cause other than WNV. Dead birds were still recorded during 2008 and 2009 for monitoring purposes. Figures 1 and 2 show the number and date of occurrence for all 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 continued decrease is 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 in 2009 and early August in 2009. However, the peak average reports per week during these years (1.1 and 0.4 reports, respectively) were very small to previous reports evaluating WNV activity in Dane County.

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, the number of Wisconsin of crows have begun to rebound following a sharp drop observed since 2004. However, it is not certain that this drop resulted from WNV infections. As shown in Figure 3, 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 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

In 2008 and 2009, 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 during these reporting periods. For additional information on these efforts for 2008 and/or 2009, please refer to the full mosquito monitoring and control program reports for these years entitled "Mosquito Monitoring and Control – Madison Metropolitan Area"; a separate report is available for each year. These reports are available at: http://www.publichealthmdc.com/.

Tables 2 and 3 summarize the larval mosquito monitoring performed by the Department in 2008 and 2009. During 2008 (Table 2), department staff made 2.347 inspections of 550 water sources in the metro area. These inspections were made at ditches (232 sites), ponds (254 sites), and other surface water sources (64 sites). A small percentage (6%) of the sites inspected produced high numbers of *Culex* larvae at least once during the season (Table 3). Another 3% 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. Ninety-one percent of the monitored sites did not produce high numbers of mosquito larvae.

Table 2. Summary results of 2008 mosquito larvae inspections in the Madison metropolitan area.

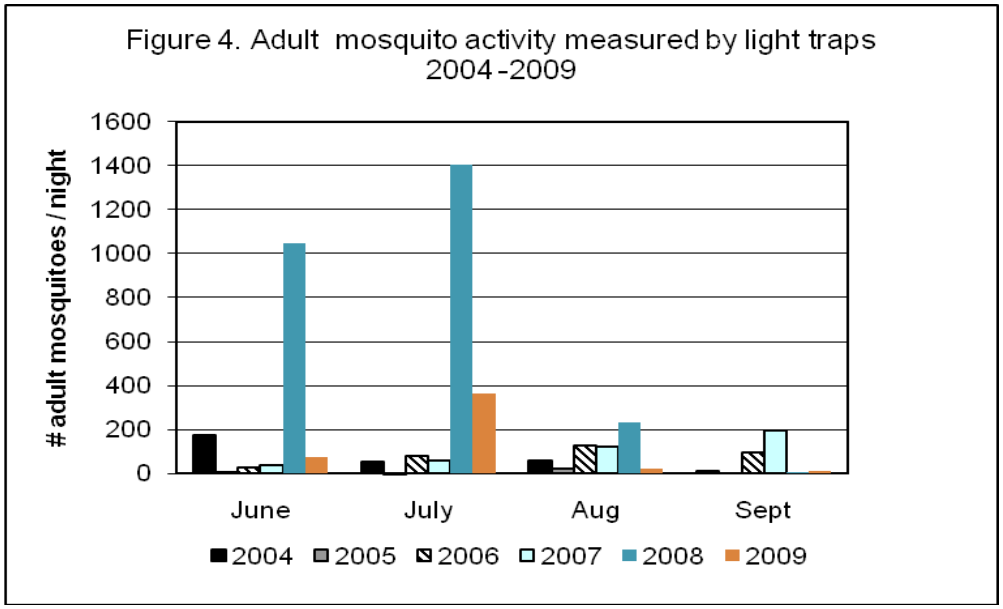
	City of Madison	City of Middleton	City of Monona	City of Sun Prairie	Town of Madison	UW – Madison	Village of Maple Bluff	Village of Shorewood Hills	Metro Area
High *Culex*	29	3	0	0	1	0	1	0	34
High *Aedes*	17	0	1	0	0	1	0	0	19
Low larvae	16	4	0	1	3	4	1	0	29
No larvae	272	57	18	88	6	24	2	1	468
Total Accessible	334	64	19	89	10	29	4	1	550
% High *Culex*	9%	5%	0%	0%	10%	0%	25%	0%	6%
% High A*edes*	5%	0%	5%	0%	0%	3%	0%	0%	3%

During 2009 (Table 3), department staff made 1,966 inspections of 568 water sources in the metro area. These inspections were made at ditches (241 sites), ponds (256 sites), and other surface water sources (71 sites). An moderate increase from 2008 was observed in the number of inspected sites that produced high numbers of *Culex* larvae at least once during the season; approximately 15% in 2009 compared to 6% in the previous year. Approximately 5% of the sites produced high numbers of *Aedes* larvae but not *Culex*; data consistent with previous annual rates. No other mosquito species were found in high numbers in the water sources monitored. Eighty percent of the monitored sites did not produce high numbers of mosquito larvae; a notable reduction compared to 2008.

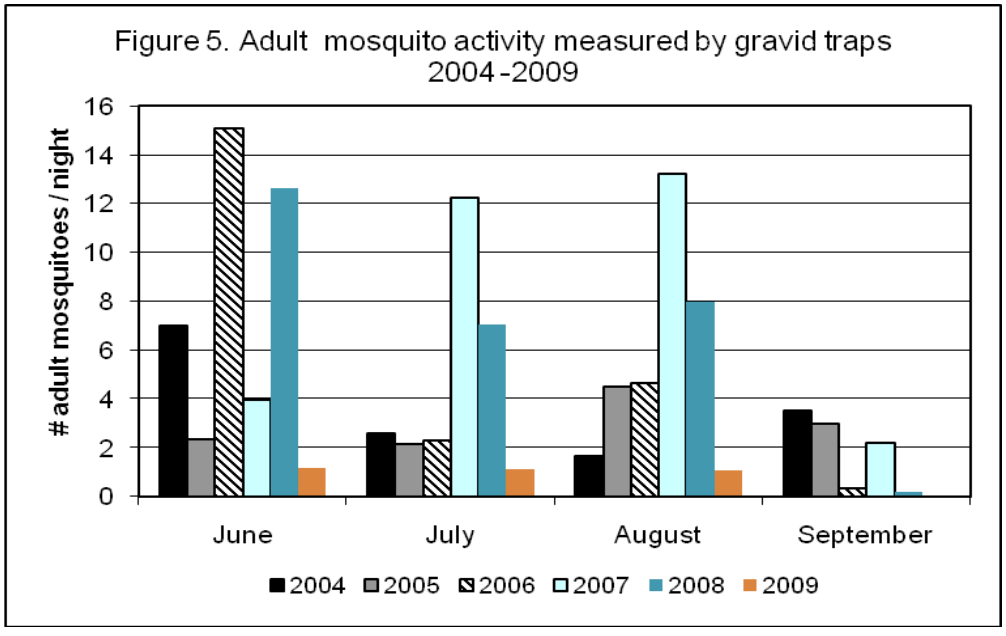
Table 3. Summary results of 2009 mosquito larvae inspections in the Madison metropolitan area.

	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*	58	8	2	8	2	3	2	0	83
High *Aedes*	18	6	0	2	3	0	0	0	29
Low larvae	74	9	1	28	2	9	0	0	123
No larvae	195	37	16	61	4	17	2	1	333
Total Accessible	345	60	19	99	11	29	4	1	568
% High *Culex*	17%	13%	10%	8%	20%	10%	50%	0%	15%
% High A*edes*	5%	10%	0%	2%	27%	0%	0%	0%	5%

Based on data from light/CO2 traps, adult mosquito populations have varied widely in the last several years (Figure 4). Population trends in 2008 far exceeded average adult mosquito activity in June and July than previous years reported; however, reported mosquito numbers where typical for August but abnormally low for September. Heavy rains and flooding during June of that year is believed responsible for this reported spike in the mosquito population count. The data trends observed in 2009 were more consistent to previously reported annual trends. Mosquito populations in both 2008 and 2009 peaked in July. With the exception of 2004, mosquito population reported in previous years peaked later in the summer; populations in 2005 and 2006 peaked in August and 2007 peaked in September. The numbers of mosquitoes captured in 2005 was abnormally low due to below normal rainfall for most of the season. The mosquito population trend in 2004 was most peculiar due to heavy May rains followed by a dry spell lasting for much of the remainder of the season caused mosquito numbers to drop.



Population trends as shown by gravid traps (Figure 5) were very different from the trends observed in light/CO2 traps during 2008 and 2009. Adult mosquito activity measured by light/CO2 traps indicated the peak mosquito activity for both years occurred in July and were significantly reduced in August and September. Data collected from gravid traps indicated that peak activity occurred in June with a gradual decline reported in July and August before a significant reduction in September in 2008. No such pattern was reported in 2009, mosquito activity remained study throughout the summer months before a dramatic reduction in September.



In 2008, a total of 25 mosquito species were captured among the methods of adult mosquito trapping performed by UW-Madison and PHMDC staff. *Aedes vexans* was the most commonly captured species by light traps (53%); *Ochlerotatus trivittatus* was the second most frequently captured mosquito accounting for 43% of the mosquitoes in light traps. Gravid traps, which are designed to capture container-breeding mosquitoes, captured primarily *Ochlerotatus trivittatus* (60%); *Culex pipiens/ restuans* (25%) were the second most common mosquito captured by this method.

Fewer species of mosquito were captured and identified in 2009 compared to the 2008 reporting period; only 20 unique species were captured by mosquito trapping. Unlike the previous year, *Ochlerotatus trivittatus* was the most commonly captured species by light traps (47%) followed closely by *Aedes vexans* (45%). The results reported for mosquito capture by gravid traps indicated that the *Culex* species (91%) was primarily captured (46%) compared to other species. The most common of these mosquitoes was *Culex restuans* but also included *Culex pipiens* and *Culex erraticus* were captured and identified.

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 April 10, 2009, 44 deaths were attributed to WNV in the United States in 2008; composing approximately 3% of all reported cases during that year and 13% of those with neuroinvasive disease. In 2009, there were 30 reported deaths as of December 8, 2009; approximately 4% of reported cases and 9% of individuals with neuroinvasive disease.

West Nile virus infection is a reportable illness in Wisconsin. PHMDC continues to conduct passive surveillance for human cases of WNV infection. Area providers are also encouraged to participate in Wisconsin's Enhanced Arbovirus Surveillance program, which tests serum and cerebrospinal fluid of patients who met specific clinical criteria. In 2009, one case of WNV encephalitis was identified in Dane County; no cases were reported in 2008. Since 2002, surveillance has recorded 14 cases of human WNV infection in Dane Co. A breakdown of these cases is given in Table 4 below.

Table 4. Number of human WNV cases in Dane County.

	Cases Identified		
	2008	2009	Total since 2002
WNV Fever	0	0	8
WNV Encephalitis (non-fatal)	0	1	4
WNV Encephalitis (fatal)	0	0	2
Total	0	1	14

Public Outreach

At the beginning of each of the seasons reported above, a press release was issued that provided a written briefing to educate the media. In addition, PHMDC staff continued efforts to provide information to the public including the risks of WNV illness, mosquito bite prevention, the reduction of mosquito-breeding areas, and an annual report of WNV and mosquito activity in the county. This and additional information is available on the PHMDC website (http://www.publichealthmdc.com/disease/westNile/).

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 in 2008 and humans in 2009. 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 also continues to be an important tool for measuring overall mosquito activity.

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 2010 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 an 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.
- Human illness surveillance detects when WNV activity has moved from bird populations to humans.