West Nile Virus Surveillance Overview of Activities
Winnebago County Health Department · Division of Environmental Health
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INTRODUCTION

West Nile virus (WNV) is an emerging disease first detected in the United States in 1999, in the state of Illinois in 2001, and in Winnebago County in 2002. In 2014, WNV activity was observed in 3 mosquito pools and in 3 American Crows in Winnebago County. Activity was present in zip codes 61107, 61111, 61114 and 61115. There were no human cases reported this season. It is reasonable to presume that some residents in Winnebago County did contract WNV with little to no symptoms which would not prompt a doctor's visit.

To date the statewide data shows a 52% decrease in human cases, a 36% decrease in positive mosquito pools, and a 40% in positive birds reported, compared to 2013. These reductions in activity likely reflect several outside factors including: above normal precipitation that damaged the Culex mosquito vector population during the peak of transmission season, cool summer temperatures that may have suppressed the amplification of the virus, increased awareness that control the mosquito vector, as well as a wider development of human and avian immunity to the disease. Though these numbers are encouraging, it is unlikely that WNV will ever be completely eradicated because it is a zoonotic disease that can reside overwinter and amplifies in wild birds. Other similar viruses could also pose a threat of an epidemic outbreak, as do possible mutations of the West Nile virus which could increase its virulence and lethality.

WEST NILE VIRUS HISTORY

2004	Earliest detection of WNVin bird carcass-5/25.
	First positive mosquito pool-8/6.
2005	Earliest detection of WNV in a bird carcass-7/28.
	First positive mosquito pool-8/4.
2006	Human Cases: 1st confirmed 8/8. 2nd confirmed 9/11.
	Earliest detection of WNV in a mosquito pool-6/5
	First positive bird carcass-6/28.
2007	Earliest detection of WNV in a crow carcass-8/15.
	First positive mosquito pool-8/23
	Human Cases: 1st confirmed 10/3. 2nd confirmed on 10/12.
2008	Earliest detection of WNV in a crow carcasses-6/24.
2009	Earliest detection of WNV in a crow carcass-9/30.
2010	Earliest detection of WNV in crow carcass-8/17.
2011	Earliest detection of WNV in a positive mosquito pool-8/24.
	1st positive bird carcass-9/23.
	One human case reported-9/20.
2012	1st positive bird 7/12.
	1st positive pool 8/8.
	Three human cases confirmed.
2013	1st positive bird 8/28
	1st positive pool 8/20

PARTNERSHIP & COLLABORATION

The WNV program successfully partnered with the Winnebago County Health Department's Neighborhoods Program. The program consists of three staff members, Vic Wilder, Cathie Heilman, and Maria Guadarrama, whose primary responsibility is to enforce the correction of housing code violations in Winnebago County. Because of their excessive presence in the field, the Neighborhood's staff was able to assist the WNV program with prevention education, larvicide applications and mosquito surveillance.

Furthermore, the WNV program collaborated with the Creating Lead Safe Rockford (CLSR) grant program regarding outreach opportunities. The CLSR program is a grant program funded by the Department of Housing and Urban Development currently available to identify and correct lead hazards in qualifying households. Their target demographics are low income families with children under the age of six. Being that West Nile virus is a mosquito-borne virus that can be particularly severe, even fatal for small children, it was only logical to collaborate with the CLSR program as a way to reach out to families with young children.

This presented many opportunities for the WNV program to reach out to families with young children and educate them on how to take appropriate precautions against WNV and how to reduce breeding habitats around their home. We were able to attend a total of 16 outreach events and personally reached out to approximately 1,026 residents concerning WNV prevention.

Senior citizens and individuals with compromised immune systems also have a higher risk for experiencing severe or even fatal symptoms from WNV. The Vector Control Specialist was only able to organize one PowerPoint presentation at the Grant Victorian. The Grand Victorian is an independent living facility for senior citizens forefront of creating fulfilling lifestyles that enrich seniors' lives today, and tomorrow.

PUBLICITY

We utilized various media avenues for reaching out to the public. Some of the media avenues used this season were:

- ✓ One press release
- ✓ 2 newspaper articles
- ✓ 4 local news television broadcasts
- ✓ 1 aired radio interview
- ✓ Random Facebook and Twitter posts

We stress the "3 R's – reduce, repel and report" message because it is the best way for each and every one of us to fight West Nile Virus. It states:

1. Reduce areas of standing water around your home. Eave troughs, birdbaths, children's toys, swimming pools with and without covers, bottles, pails, jars, tires – anywhere that water is allowed to collect and become stagnant will become a breeding place for mosquitoes. If you need it, empty it and make sure it stays empty. If you don't need it, throw it away!

2. Repel – If you are planning to spend time outdoors, use a mosquito repellant before you go out. Use commercial repellant with a 20% to 30% mix of DEET (N,N Diethyl-meta toluamide) found in well-known brands such as Cutters, Off, etc. DEET-based repellants should not be used on infants. Children

ages 2 to 6 can tolerate no more than a 10% solution. Care must be taken to avoid the eyes when administering repellants.

Proper clothing can go a long way to providing protection. Make sure that you and your children were long sleeves and pants during the primary mosquito biting times from sunset to midnight. Also check your window and door screens. Have them repaired to keep you safe inside, while mosquitoes stay outside.

3. Report – Dead birds should be reported to Winnebago County Health Department dead bird hotline at (815) 720-4245. Also report any stagnant or standing water that you cannot remove yourself by calling (815) 720-4240.

Without the use of multiple media mechanisms we would not be able to educate as many people and keep them informed during the WNV seasons.

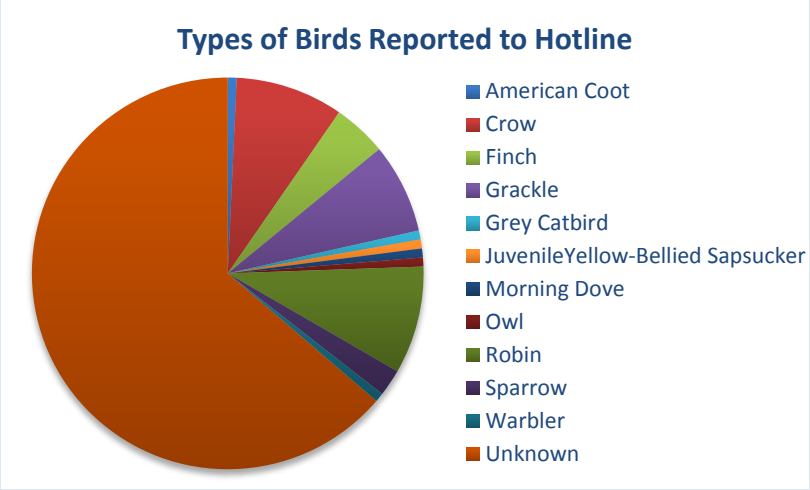
DEAD BIRD HOTLINE

Information about bird population was obtained by cumulative ecological data from all bird deaths reported by the public who phoned in to the WCHD's dead bird hotline. The recorded message for the dead bird hotline is very thorough, and describes all the conditions necessary for a bird to be suitable for testing. This tool is an immediate indicator of WNV activity. The hotline can indicate when there is an increase in WNV activity, particularly when a heave of Corvid reports occur within several days of each other.

Dead bird hotline calls are utilized in a variety of ways, for example, to:

1. Indicate locations to pick-up birds for WNV testing.
2. Determine if there are areas of high WNV activity or a surge in activity.
3. Identify potential placement of Gravid traps.
4. Detect new and former "hot spots" for surveillance.
5. Pin point the best media avenue when increasing public awareness of specific zip codes that have WNV activity.

This season, the dead bird hotline received a total of 135 calls this season as a result, 49 birds were retrieved and 36 of them were suitable for testing. The months of June and July had the highest call volumes, unfortunately, no birds tested positive during this period. The first positive bird carcass was found in late August.



It is also worth noting that residents often had difficulty identifying particular species of birds and occasionally misreported species (i.e. reporting grackles as crows). The WCHD website could benefit from a page on the identification of local bird species similar to that of the IDPH (www.idph.state.il.us/), perhaps supplemented with size ranges for each bird.

Next season we anticipate creating a circular that will consist of pictures of birds that are most susceptible to WNV, which would be provided through the Neighborhood's Program information packets.

TESTING METHODS

The WCHD utilized a couple of different testing methods to verify the presence of the WNV. The primary testing that was utilized this year was Rapid Analyte Measurement Platform (RAMP) assay. The RAMP test is a highly sensitive pre-screening test used for identifying WNV in mosquitoes and corvids. This type of testing was used because it is easy to operate, results are easy to interpret and there is no calibration or maintenance required.

The other type of testing used was reverse transcription polymerase chain reaction (RT-PCR). This type testing is more time consuming and expensive, and could only be performed at IDPH laboratories as a confirmatory test on birds which had already tested positive via RAMP testing.

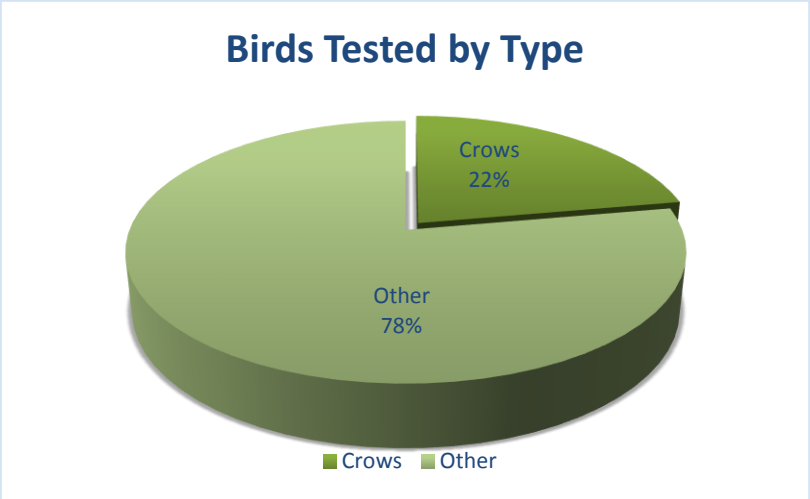
AVIAN SURVEILLANCE DATA

This season the majority of birds picked up were of non-crow specie and they all tested negative. Out of the eight crows that were retrieved, eight were suitable for testing with three testing positive via RAMP testing.

Bird Species - Data Reported to IDPH

Following protocol, the Vector Control Specialist shipped a total of 3 birds to the Illinois Department of Agriculture Laboratory in Galesburg, Illinois for confirmatory testing. The first two birds, a Finch and a Robin, were sent in early August and tested negative. An American Crow was shipped to IDPH in early September for confirmatory testing and tested positive. It is worth noting that the Finch and Robin that were sent to IDPH tested negative via preliminary RAMP testing and the American Crow tested positive via preliminary RAMP testing.

Out of all the birds tested, 78% were non-Corvids and are categorized "other" in the graph below. This group consisted of Finches, Grackles, Warblers, Grey Catbirds, Yellow-Bellied Sapsuckers, Mourning Doves, Hawks, Robins and Sparrows. No Blue Jays were tested this season. Only 22% of birds suitable for testing were American Crows (*Corvus brachyrhynchos*).



ARC GIS Mapping System/Hot Spots

Data from all bird carcasses that tested positive for WNV were collected and entered into the ARC GIS mapping system. This mapping system provides a geographical overview and means of statistical analysis for the identification of "**hot spots**". Hot spots can be defined as areas within a square mile of each other where two or more bird carcasses have tested positive for WNV. This prompts the Vector Control Specialist to set a gravid trap in the area and/or pass out precautionary information door to door.

MOSQUITO SURVEILLANCE DATA

The Culex Mosquito

WNV is most likely to spread during the warm weather months when mosquitoes are most active. The season usually begins in the spring and continues until there are several consecutive mornings with hard frost.

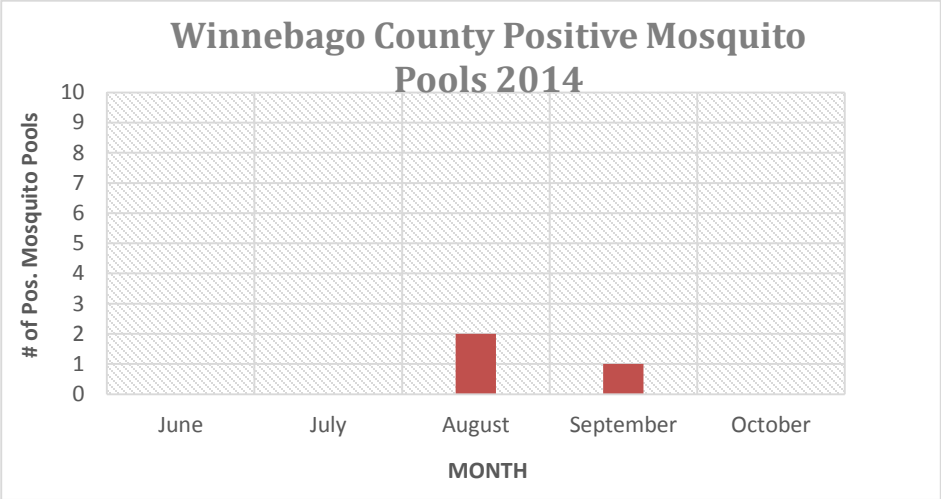
In all local mosquito species, both the male and female adults acquire nutrition from nectar for energy. However, only the females need the blood meal for egg maturation. For this reason, adult female mosquitoes are most likely to carry the West Nile Virus. In order to maximize the number of adult females in our pools, we collected mosquitoes using as many as 11 gravid traps in the field at a time (traps specifically targeted to capture Culex female mosquitoes).

Gravid Trap

- Water prepared with alfalfa pellets and other organic materials in container.
- Attracts female Culex mosquitoes.
- Fan transports mosquitoes into the net.
- Nets collected every 2-3 days.

Positive Data for Mosquito Pools

As stated earlier, the Neighborhoods Program assisted with mosquito surveillance. They helped in collecting 121 pools of mosquitoes with approximately 18,498 individual mosquitoes tested, with an average of 153 mosquitoes per pool. Three pools tested positive this season.



Locations

Mosquito samples were taken from locations throughout the county determined to be high risk areas. These areas were selected by the following criteria:

1. Location had a positive pool during previous WNV seasons.
2. Location had a higher than average density of dead bird reports.
3. Location is in a high density urban area.
4. Location was likely to be an excellent habitat for mosquitoes and birds, and frequented by humans (parks, forest preserves, etc…).

Information about each pool collected such as, the location, mosquito count and test results for each pool were promptly entered in the IDPH database. Entering this information in a timely fashion allowed for statewide data to be compiled in real-time as the season progressed, rather than in a bulk report after the season had ended. This information is crucial for determining the potential risk to humans during an active season.

Weather Conditions 2014

One possible reason for the decrease in positive mosquito pools could be attributed to the surplus of rain along with inconsistent temperatures this season. The Culex mosquito typically dominates in drier weather but with an overall surplus of rain, it is likely that the Culex population of eggs and larvae were frequently wiped out throughout the season.

June

The month of June was the 8th wettest June on record in Rockford with 8.06 inches of rainfall (Channel 13 Weather Authority, 2014). While there were approximately 23 days where the temperature was within the 80˚F range, the surplus of rain may have disturbed mosquito breeding habitats therefore, disturbing the amplification of the virus.

July

For the month of July, the Channel 13 Local Weather Authority reported that July was the 3rd coolest on record (Channel 13 Weather Authority, 2014). Even though there was a 1.49″ deficit from the normal amount of rainfall, the below average temperatures could have very well affected the amplification of the virus in mosquitoes.

August

In August there was a 1.17″ surplus of rain with an average temperature of 72.2˚F (Channel 13 Weather Authority, 2014). Towards the end of August, one Crow and two mosquito pools tested positive. This is possibly due to more consistent temperatures which enabled WNV to amplify amongst the mosquito population.

September

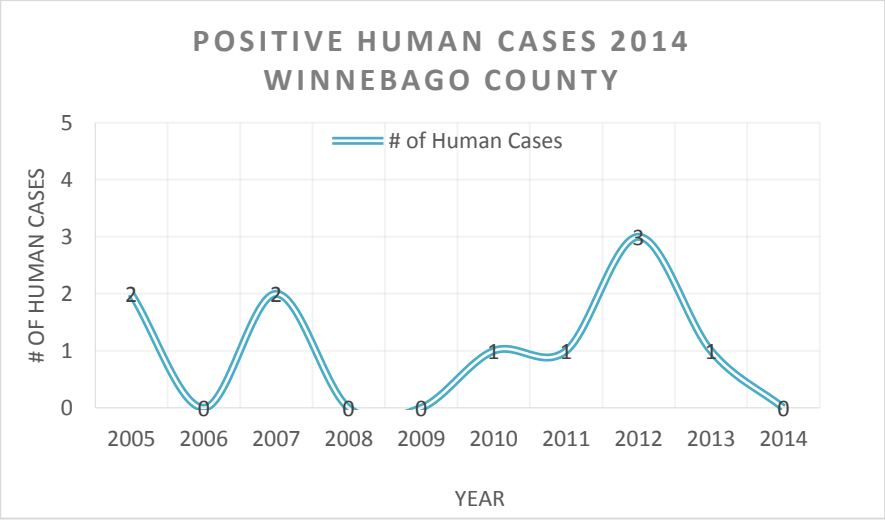
For the month of September there was a 1.35″ deficit of rain with an average temperature of 62.6˚F. Two birds and one mosquito pool tested positive towards the beginning of the month. This could be a result of the amplification of the virus during more favorable conditions in August.

Overall, cool summer temperatures and a surplus of rain this season are factors that may have suppressed the amplification of the virus.

HUMAN CASES

As of October 28, 2014, the Center for Disease Control confirmed that there are 43 states, including the District of Columbia that reported having West Nile virus infections in people. As of October 29, 2014, there have been a total of 1,668 human cases of West Nile virus disease in people nationwide, with the State of Illinois reportedly having 36 human cases. Presently, human cases are down from 2013 by 53% for the State of Illinois.

There were no confirmed human cases that was reported in Winnebago County. Since 2001, there have been between 0-3 human cases per year.



Only about 1 in 5 persons infected with WNV will develop even mild symptoms and of these, typically only half will seek medical treatment. On average, the disease will progress to serious neurologic symptoms in about

1 in 150 persons, though this ratio increases dramatically with age. Currently, the only treatments for WNV are supportive. While little progress has been made in the treatments for West Nile infections which have progressed to encephalitis or meningitis, there have been promising advancements in passive immunization against the disease. This could be especially helpful for people at high risk of developing West Nile, as well as those over 50 years of age, who have a greatly increased risk of developing serious symptoms.

VECTOR CONTROL

The WCHD not only meticulously monitored WNV through mosquito and bird sampling; it also took an active role in managing the mosquito population. Here at WCHD, larvicide was used to treat areas of standing water that had the potential to contain mosquito larvae. This ensures that mosquito larvae will not progress to the adult stage of their life cycle.

The Vector Control Specialist along with three Neighborhoods' Program staff were trained in the application of Altosid XR Larvicide this year. All larvicide training was conducted per the Illinois Pesticide Act (415 ILCS 60) by the WCHD Environmental Health Director, Todd Marshall. This additional training provided much needed assistance in targeting **against** the larval life stage of mosquitoes.

WCHD extended larvicide training and larvicide to local municipalities, but unfortunately no one took advantage of the opportunity.

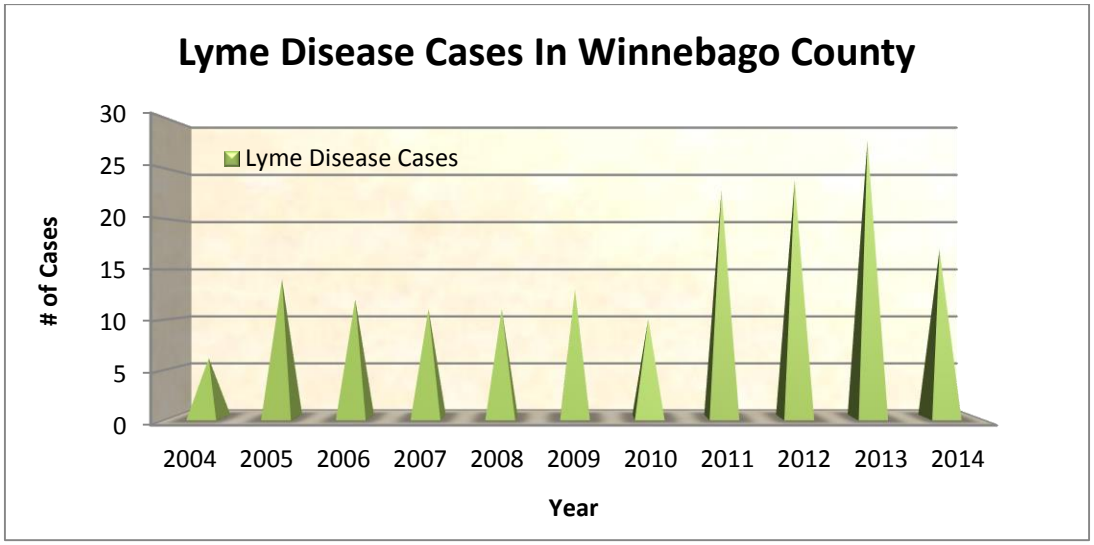
All together, the WCHD distributed approximately 17.7 pounds of the 150-day Altosid-XR extended residual briquets. Larvicide was applied to 25 sites, including but not limited to, abandoned properties with unmaintained pools, exposed outdoor containers, tires, and public locations that were accumulating standing water and producing possible breeding locations for mosquitoes. The application of larvicide in pools is used as an interim control until a pool is drained or brought up to operational standards.

In addition to using larvicide, the Vector Control Specialist along with the help of the Neighborhood's Program staff, had the opportunity to educate people about mosquito breeding sites in the field. Many people were not aware that bird baths, flower pots and other decorative containers that house water are great places for female Culex mosquitoes to lay their eggs. With a resident's permission, we were able to dump containers and empty bird baths holding water, which immediately decreased the attraction of female Culex mosquitoes.

WCHD strongly recommends that all standing water, even small amounts that people may deem trivial be eliminated. This greatly decreases the favorable conditions for female Culex mosquitoes to lay their eggs, however, it is understood that it is not always possible to clear an area of standing water (such as floodwaters, small ponds, etc…). In this case, the WCHD advocates the use of commercially available larvicide for the maintenance of problematic standing water as the best alternative.

LYME DISEASE SURVEILLANCE

This year, as of October 31, 2014, 17 Lyme disease cases were documented in Winnebago County. However, the results are preliminary and have been submitted to IDPH in order to be confirmed.



CONCLUSION

West Nile virus continues to emerge in Winnebago County and it is unlikely it will ever be eradicated. Efforts to monitor the virus and its vectors should be continued at least until a predictable baseline level is reached for several years. Because the number of positive mosquito pools correlates so strongly to the number of human cases expected to occur, this surveillance tool serves an important and concrete purpose.

Because West Nile Virus is a potentially life threatening infection, it is important to continue public awareness campaigns about prevention. Wearing insect repellant containing DEET, avoiding the outdoors during dusk and dawn, and eliminating standing water from around properties are the most effective ways for people to protect themselves from contracting WNV. This combination of public education and epidemiological surveillance provides the best chance of minimizing human costs associated with the West Nile Virus.

WORKS CITED

Channel 13 Weather Authority Blog. (2014, August 2). Retrieved September 13, 2014, from http://addins.wrex.com/blogs/weather/2014/07.

West Nile Virus Maps - Human - USA. (2014, October 29). Retrieved November 5, 2014, from http://diseasemaps.usgs.gov/wnv_us_human.html.

WCHD Winnebago County Health Department