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Annual Program Update

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Clarke Environmental Mosquito Management 2013 Annual Report

Introduction

The 2013 mosquito season was a study in contradictions. With the wettest April on record, a cooler-than-normal August and a late surge of West Nile activity, this year will be notable for a limited risk from West Nile virus and potential floodwater mosquito hatch-offs suppressed by cooler temperatures.

As always, mitigating the threat of mosquito-borne virus is at the heart of our programs and we have worked with the Village of Lombard to suppress West Nile infection rates. With the exception of 2012's widespread outbreak of West Nile in Illinois, this year's lower case count has been more in line with recent years.

Service Contracts

At Clarke, our mission is to help our partner communities maintain healthy communities and helping maintain quality of life for residents. Our strategy is to focus on proactively managing the environmental and social footprint of our operations, products and services to provide the greatest value to the communities we serve. To that effect, Clarke has created and implemented an integrated mosquito management program specifically designed for the Village of Lombard. This annual report provides context for the execution of your program, with detail on the weather, mosquito breeding habits and control efforts undertaken by Clarke in the area.

Clarke worked closely with the Village of Lombard to monitor changing mosquito populations and used industry-recognized standards to achieve the greatest control.

National Pollutant Discharge Elimination System (NPDES)

Clarke's mosquito control activities are in full NPDES compliance with all required licenses, permits and reporting requirements, and operates in Illinois under NPDES permit # IL870182.

Innovation, Community, Sustainability

Preserving our environment for today and future generations is the cornerstone of Clarke's work. With next-generation products and application delivery systems, Clarke is committed to innovation that maintains the health and comfort of residents with a greener approach. In 2012, Clarke was awarded the Illinois Governor's Sustainability Award as a model for environmental stewardship for communities and businesses throughout the state. Our vision is to work hand in hand with our clients to make communities more livable, safe and comfortable. To learn more about Clarke's initiatives we invite you to read our 2012 sustainability report, *Accelerating a Sustainable Clarke*, that can be found on the Clarke website at:

<http://clarke.com/images/pdf/reports/2012-sustainability-report.pdf>



Seasonal Overview

2nd Wettest Spring, Mild and Dry Summer

Mosquitoes are weather-dependent creatures; rainfall totals and area temperatures can significantly impact mosquito populations and the amplification of mosquito-borne disease.

Though April's heavy rains contributed to the second-wettest spring in the record books, cooler temperatures in May and June helped suppress floodwater mosquito hatch-offs, preventing a major population spike of *Aedes vexans*, the dominant annoyance species in northern Illinois. This cycle of flooding and cooler weather continued throughout the spring and early summer.

With very little rainfall in July (lowest July rainfall since 1944) and August and mild temperatures through August and September, late summer provided many opportunities to enjoy outdoor activities.

Some weather highlights:

- Wettest April on record, with 10.68 inches of rain reported at O'Hare.
- By June, precipitation totals for the year exceeded total rainfall for 2012.
- Rainfall in July and August were less than half the average.
- August temperatures averaged 3 degrees below normal.
- September temperatures were 2.6 degrees above average.



About West Nile Virus

West Nile virus is primarily a mosquito-borne disease, which can cause West Nile encephalitis (swelling of the brain) and West Nile fever in humans. Though the majority of humans infected will not show symptoms, those who develop West Nile virus risk debilitating effects and possibly death. While the most severe cases and the highest risk of West Nile occur traditionally in people over 50 years of age or with compromised immune systems, all people who spend time outside are at risk of contracting the virus. The disease also affects birds, horses and other animals, with higher mortality rates.

West Nile Virus has spread rapidly across North America since it was discovered in the Western hemisphere, reports the U.S. Geological Survey. West Nile Virus swept from the New York City region in 1999 to almost all of the continental U.S., seven Canadian provinces and throughout Mexico and parts of the Caribbean by 2004. Of those infected, one in five will develop symptoms.

West Nile in the United States 2013

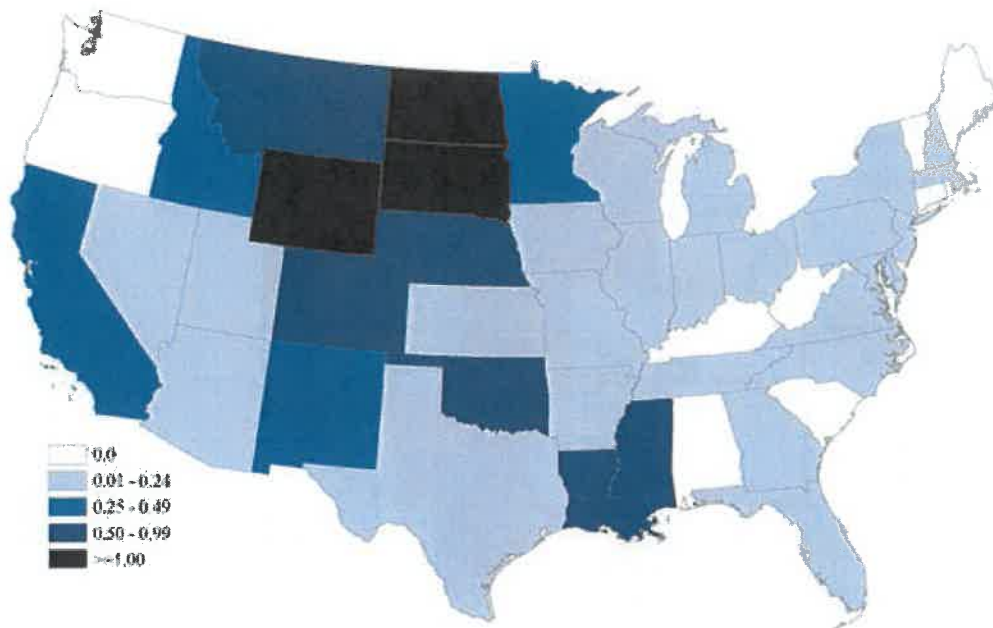
After the tremendous resurgence of West Nile in 2012, this year saw West Nile return to more normal numbers. National West Nile human cases numbered 1,135, down from 5,207 in 2012. In fact, the total number of cases throughout the US in 2013 was less than the total cases in Texas alone in 2012 (1,707 cases in 2012).

Illinois identified 98 human cases of West Nile in 2013.



West Nile in the United States 2013

West Nile virus (WNV) Neuroinvasive Disease Incidence reported to ArboNET, by state, United States, 2013 (as of September 24, 2013):



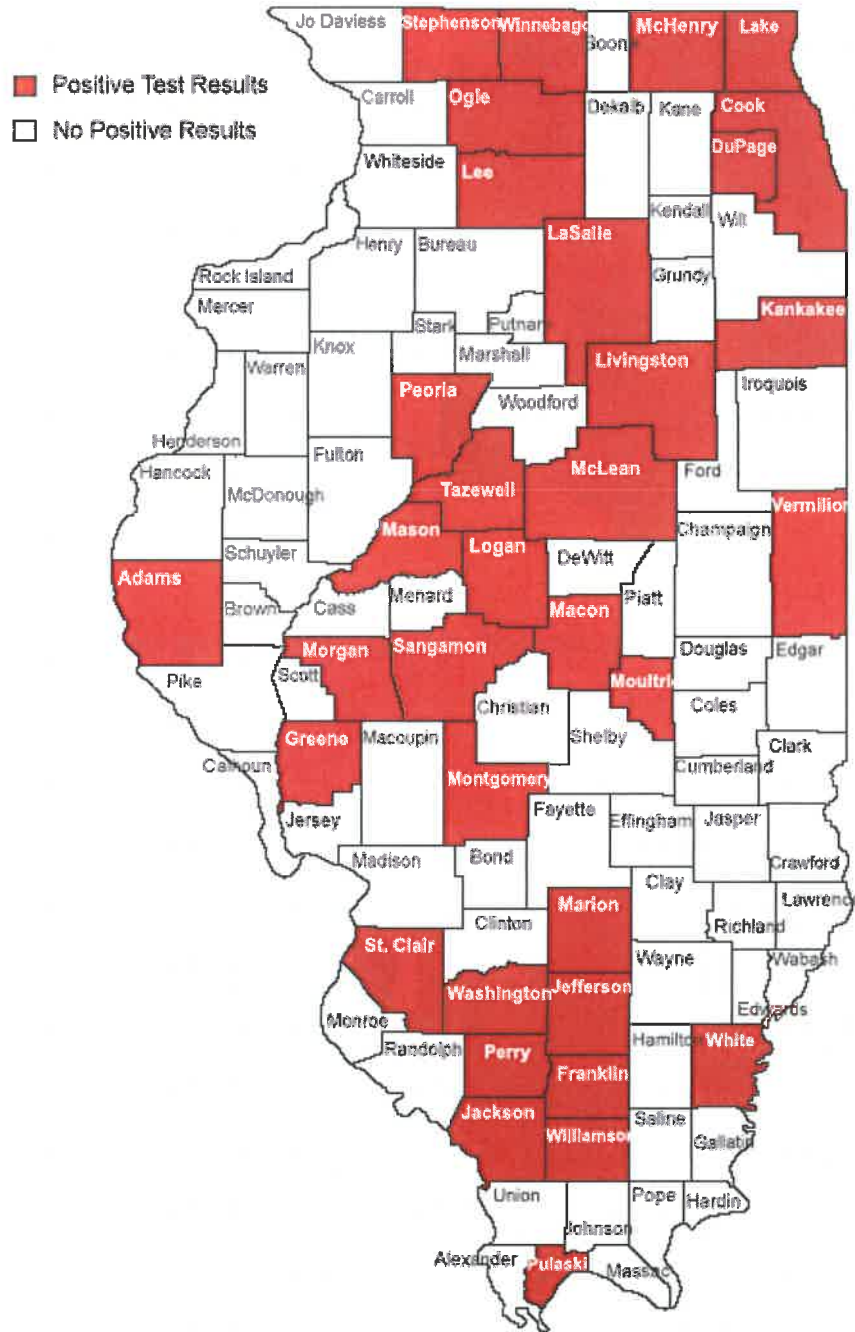
West Nile virus (WNV) activity reported to ArboNET, by state, United States, 2013 (as of September 24, 2013)





West Nile in Illinois 2013

Historically, mild summers like 2013 suppress West Nile virus outbreaks, but the widespread infection rates in 2012 have had a lingering effect this year. In fact, West Nile was reported (in humans, birds and mosquitoes) in a larger geographic footprint than last year, despite a reduction in human cases.





West Nile Virus in Illinois 2013

Weather conditions in 2013 were not as conducive to amplification of West Nile virus as last year, but the virus still secured a foothold in Illinois. In fact, more counties reported West Nile activity than last year, an increase of 40 percent.

This year's statistics to-date are:

- 105 human cases (down from 249 in 2012)
- 9 fatalities (down from 10 in 2012)
- 74 counties reporting West Nile activity (up from 54 in 2012)
- 88 positive birds (down from 108 in 2012)
- 2,709 positive mosquito batches (down from 3,948 in 2012)
- 16 positive horses (up from 7 in 2012)

Below are the specific county West Nile virus statistics as of November 13, 2013 according to the Illinois Department of Public Health¹

2013 Positive Birds, Mosquitoes, Horses, Human Cases and Human Fatalities

County	American Crow	Blue Jay	Other Birds	Mosquito Batches	Horse	Human Cases
Adams	0	1	1	0	0	1
Alexander	0	0	0	3	0	0
Bond	0	0	0	9	1	0
Boone	1	0	0	6	0	0
Bureau	1	0	0	3	1	0
Calhoun	0	0	0	1	0	0
Carroll	0	0	0	1	0	0
Champaign	3	0	0	58	0	0
Clay	0	0	0	7	0	0
Clinton	0	0	0	6	0	0
Cook	2	1	7	1826	0	54
DeKalb	0	0	0	7	0	0
Douglas	1	0	0	0	3	0
DuPage	0	0	0	166	0	4
Edwards	0	0	0	0	1	0
Effingham	0	0	1	0	0	0
Fayette	0	1	0	1	0	0
Ford	0	1	1	0	0	0
Franklin	0	0	0	4	0	2
Fulton	0	0	0	1	1	0
Gallatin	0	0	0	7	0	0
Greene	0	0	1	6	2	1
Grundy	1	1	0	24	0	0

¹ Illinois Department of Public Health, November 13, 2013



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2013 Positive Birds, Mosquitoes, Horses, Human Cases and Human Fatalities, cont

County	American Crow	Blue Jay	Other Birds	Mosquito Batches	Horse	Human Cases
Hamilton	0	0	0	1	0	0
Hancock	1	1	0	0	1	0
Henry	0	0	1	0	0	0
Iroquois	1	0	0	0	0	0
Jackson	0	0	0	10	0	1
Jefferson	0	0	0	3	0	1
Jo Daviess	1	0	0	0	0	0
Kane	3	0	1	30	0	0
Kankakee	2	0	1	27	0	1
Kendall	0	0	0	8	0	0
Knox	2	0	0	1	0	0
Lake	1	0	1	38	0	6
LaSalle	0	0	0	3	0	1
Lee	0	0	0	5	0	1
Livingston	2	0	1	3	0	1
Logan	1	0	0	1	0	1
Macon	0	1	0	145	0	1
Macoupin	0	0	0	6	0	0
Madison	3	0	0	38	0	0
Marion	0	0	1	2	0	1
Mason	0	0	0	0	0	1
Massac	0	0	0	1	0	0
McDonough	1	0	0	0	0	0
McHenry	4	1	4	30	0	2
Mclean	2	0	0	8	0	2
Menard	0	0	0	3	0	0
Monroe	0	0	1	9	0	0
Montgomery	1	0	0	2	0	1
Morgan	0	0	0	0	0	1
Moultrie	0	0	0	0	2	1
Ogle	1	0	0	0	0	1
Peoria	0	0	0	1	0	1
Perry	0	0	0	8	1	1
Pike	0	0	0	0	1	0
Pulaski	0	0	0	0	0	1
Putnam	0	0	0	1	0	0
Rock Island	0	0	0	0	1	0
Saint Clair	0	0	0	46	0	5
Sangamon	0	0	0	15	0	1
Stephenson	4	0	0	0	0	1
Tazewell	2	3	1	6	0	1
Union	0	0	0	5	0	0
Vermilion	0	0	0	0	0	2
Warren	0	0	0	2	0	0



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2013 Positive Birds, Mosquitoes, Horses, Human Cases and Human Fatalities, cont

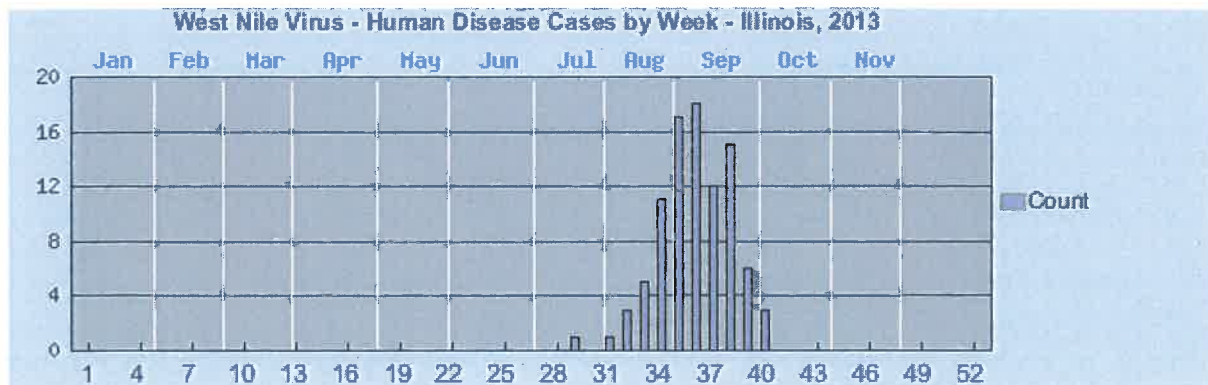
County	American Crow	Blue Jay	Other Birds	Mosquito Batches	Horse	Human Cases
Washington	0	0	0	5	0	1
White	0	0	0	6	0	1
Whiteside	0	0	0	4	0	0
Will	1	0	0	84	1	0
Williamson	0	0	0	3	0	3
Winnebago	9	0	0	13	0	1
Woodford	2	1	0	0	0	0
Total	53	12	23	2709	16	105

West Nile in Illinois 2013

Illinois first identified West Nile virus this year on May 21, with a positive mosquito batches identified in Cook County.

On August 21, the first human case of West Nile virus was reported in McHenry County. In 2012, the first human case was reported a full month earlier.

2013 West Nile Virus Illinois Human Disease Cases By Week (Reported to CDC as of October 29, 2013)





Climatology and Mosquito Overview

Special attention should be paid to weather conditions as weather has a huge impact on mosquito populations – with floodwater mosquitoes, rainfall determines if mosquito eggs will hatch, fierce storm can wash away egg rafts and variations in temperature can affect mosquito activity and larval development. In periods of hot, dry weather, water sources dwindle for vector species, and virus transmission can amplify, creating a greater percentage of infected mosquitoes.

2013 weather highlights:

- April – Heavy rains, flooding
- May -- Mild weather, above average rain
- June -- Cool temperatures, additional precipitation
- July: Dry and mild temperatures
- August: Dry, very few 90+ temps
- September: Warmest weather of the season

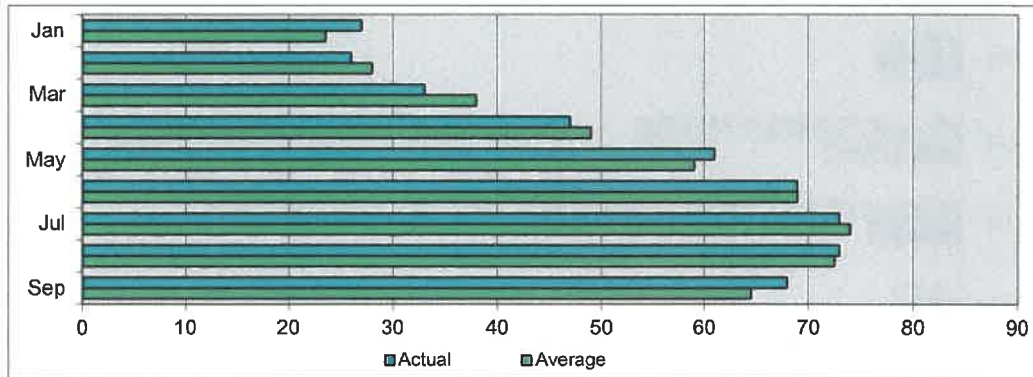


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2013 O'Hare International Airport (Chicago) Weather Survey

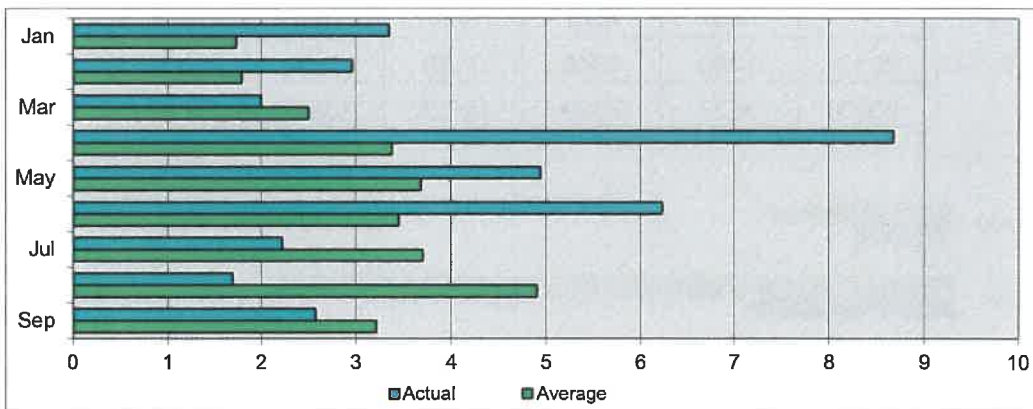
Temperature (degrees Fahrenheit)

	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
Actual	68	73	73	69	61	47	33	26	27
Average	64.5	72.5	74	69	59	49	38	28	23.5



Precipitation (inches)

	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
Actual	2.57	1.69	2.22	6.23	4.94	8.68	2	2.96	3.35
Average	3.21	4.9	3.7	3.45	3.68	3.38	2.5	1.87	1.73



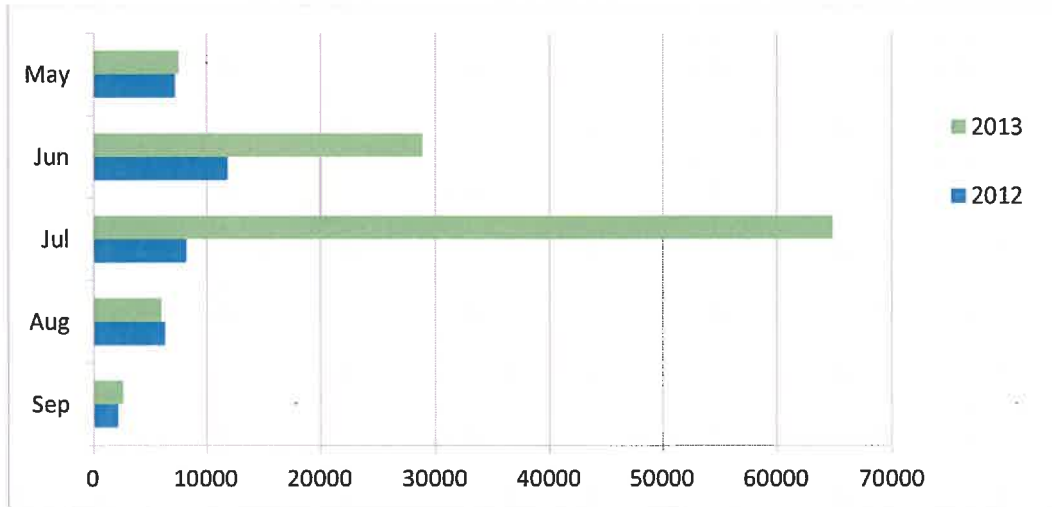


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2013 Mosquito Light Trap Network Target Species Comparison

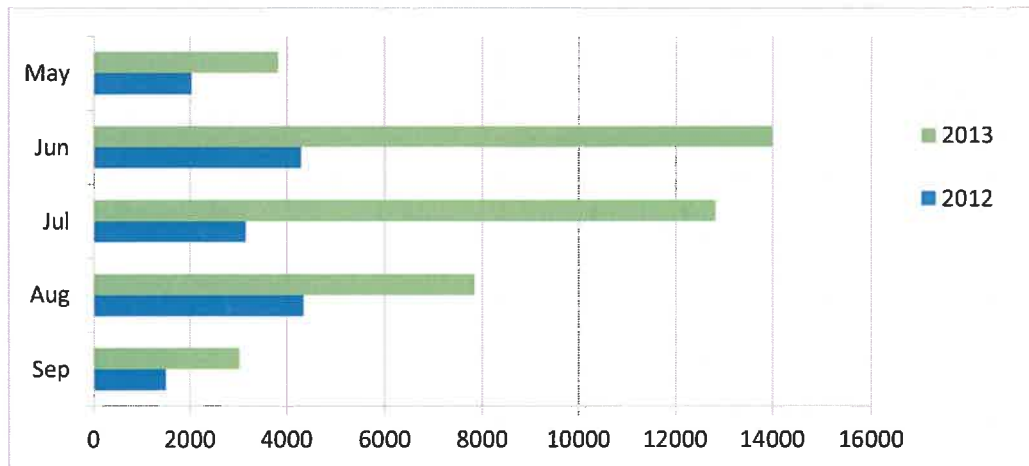
Aedes vexans

	Sep	Aug	Jul	Jun	May
2012	2135	6301	8196	11838	7196
2013	2587	5977	64851	28883	7536



Culex pipiens and Culex restuans

	Sep	Aug	Jul	Jun	May
2012	1490	4349	3159	4298	2031
2013	3023	7839	12828	13990	3821





Surveillance Network

New Jersey Light Trap Network



An important supplement to any mosquito control program is a New Jersey Light Trap.

Developed in the 1930s, the trap helps determine species diversity and monitors mosquito populations. These traps are located in residential areas and are operated between dusk and dawn (the peak activity period for many species) and should be maintained each year to identify historic and habitual mosquito sites.

A 25-watt bulb in the trap attracts mosquitoes, which are drawn into the trap via an electric fan. Data generated by the trap catches serve several purposes: it confirms the arrival of predicted floodwater mosquito migrations, reflects the effectiveness of mosquito control efforts and identifies fluctuations in adult mosquito populations.

West Nile Virus Surveillance Trap

A vital tool in adult mosquito and arbovirus surveillance is the West Nile virus, or gravid, trap. Developed by the Centers for Disease Control and Surveillance, the trap primarily collects gravid (*Culex*) mosquitoes (principal vectors of West Nile virus), which makes it particularly effective in tracking the disease. A gravid female mosquito has taken a blood meal and is ready to lay her eggs. Typically, (*Culex*) mosquitoes search for water rich in organic material to lay their eggs. If they've obtained their blood meal from an infected animal, they can transmit the virus to their eggs. The mosquitoes are captured live, which allows us to test them for arboviruses and get an early indicator that the virus is present in the area.



Centers for Disease Control and Prevention (CDC) Trap



Mosquitoes looking for a blood meal are mainly attracted by carbon dioxide, exhaled by humans and animals. The CDC trap provides carbon dioxide as bait, though dry ice (frozen carbon dioxide), and a light source to attract female mosquitoes. This trap is set out at prime activity hours for the species targeted. A fan draws mosquitoes into a net and the live mosquitoes are trapped for arbovirus testing. CDC traps often show a very high species diversity and large overall mosquito numbers, indicating the presence of a mosquito-borne virus and relative indices of adult mosquito species.



Light Trap Species Summary

The following table summarizes the species composition from the light trap network operating in Northern Illinois.

Light Trap Species Summary				
<i>Species</i>	<i>Females</i>	<i>Percent</i>	<i>Males</i>	<i>Percent</i>
<i>Ae cinereus</i>	741	0.39%	672	1.15%
<i>Ae vexans</i>	109834	57.11%	16654	28.46%
<i>Ae misc</i>	1805	0.94%	842	1.44%
<i>An punctipennis</i>	3020	1.57%	400	0.68%
<i>An quadrimaculatus</i>	11791	6.13%	797	1.36%
<i>An species</i>	812	0.42%	293	0.50%
<i>Cq perturbans</i>	1003	0.52%	166	0.28%
<i>Cx erraticus</i>	450	0.23%	79	0.14%
<i>Cx pipiens</i>	7721	4.01%	1034	1.77%
<i>Cx restuans</i>	7420	3.86%	383	0.65%
<i>Cx salinarius</i>	362	0.19%	0	0.00%
<i>Cx species</i>	26364	13.71%	34537	59.03%
<i>Cx tarsalis</i>	107	0.06%	19	0.03%
<i>Cx territans</i>	2190	1.14%	255	0.44%
<i>Cs inornata</i>	397	0.21%	68	0.12%
<i>Cs species</i>	18	0.01%	93	0.16%
<i>Mosquito, Misc.</i>	1846	0.96%	284	0.49%
<i>Oc ftichii</i>	181	0.09%	8	0.01%
<i>Oc excrucians</i>	2	0.00%	0	0.00%
<i>Oc dorsalis</i>	1	0.00%	0	0.00%
<i>Oc japonicus</i>	182	0.09%	134	0.23%
<i>Oc canadensis</i>	30	0.02%	11	0.02%
<i>Oc stimulans</i>	8	0.00%	0	0.00%
<i>Oc triseriatus</i>	735	0.38%	156	0.27%
<i>Oc trivittatus</i>	12448	6.47%	355	0.61%
<i>Oc. species</i>	1176	0.61%	440	0.75%
<i>Or signifera</i>	60	0.03%	13	0.02%
<i>Ps ciliata</i>	35	0.02%	3	0.01%
<i>Ps ferox</i>	356	0.19%	20	0.03%
<i>Ps misc</i>	6	0.00%	7	0.01%
<i>Ur sapphirina</i>	1211	0.63%	788	1.35%
Total	192,312	100.00%	58,511	100.00%

Total Number of Trap: 107

Average Number of Females/Trap Night: 18.34

Total Number of Trap Nights: 98

Number of Trap Malfunctions: 35

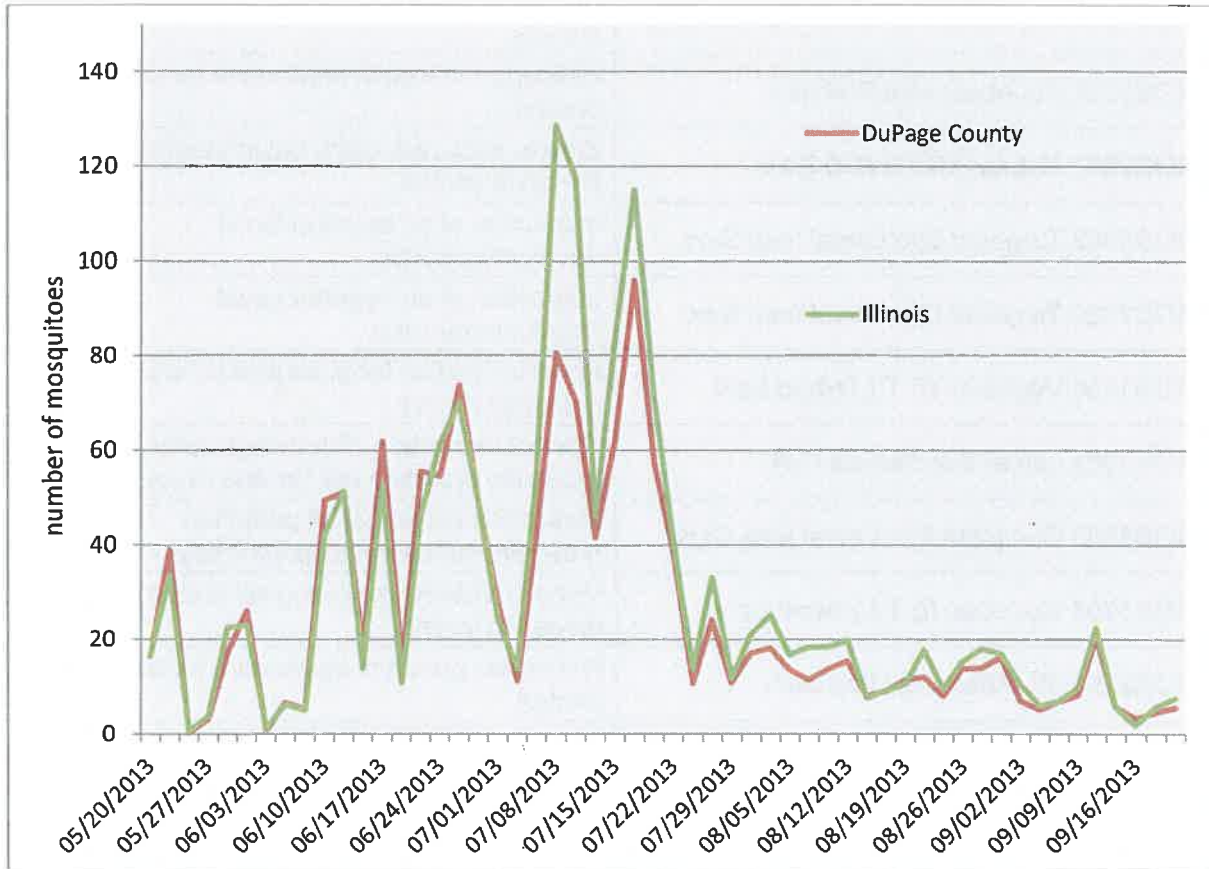
Total Number of Mosquitoes: 250,823



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Light Trap Counts by State, County and Community

Light Trap Comparison Chart





Annual Program Update

Services Performed Year-to-Date

Service Item	Service Description	Start Date
ROS1652 5% Abate PG-Ground Larviciding	Backpack treatment for residual larval control.	04/30/2013
ROS2202 5% Abate Heli Prehatch	Helicopter prehatch application for larval control.	05/06/2013
ROS2010 Natular XRT BYCB Bike	Bicycle backyard catch basin treatment for larval control.	05/07/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	05/15/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	05/28/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	05/28/2013
ROS1352 Larval Site Service Call	Special inspection of standing water for mosquito breeding per hot line request.	05/30/2013
ROS1252 Complete Site Larval Insp Serv	Inspection service of all potential mosquito larvae development sites.	06/06/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	06/06/2013
ROS2202 5% Abate Heli Prehatch	Helicopter prehatch application for larval control.	06/10/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	06/17/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	06/17/2013
ROS2006 Natular T30 CB Bike	Bicycle catch basin treatment for larval control.	06/21/2013
ROS1252 Complete Site Larval Insp Serv	Inspection service of all potential mosquito larvae development sites.	06/27/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	06/27/2013
ROS1752 Vectobac (B.T.I.) BP Larv	Backpack larviciding for biological control of mosquito larvae sites.	07/02/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	07/15/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	07/15/2013
ROS2006 Natular T30 CB Bike	Bicycle catch basin treatment for larval control.	07/17/2013



Annual Program Update

Services Performed Year-to-Date Continued

Service Item	Service Description	Start Date
ROS2202 5% Abate Heli Prehatch	Helicopter prehatch application for larval control.	07/18/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	07/22/2013
ROS1252 Complete Site Larval Insp Serv	Inspection service of all potential mosquito larvae development sites.	07/31/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	07/31/2013
ROS2006 Natular T30 CB Bike	Bicycle catch basin treatment for larval control.	08/14/2013
ROS1302 Targeted Site Larval Insp Serv	Inspection of all targeted larval development sites.	08/19/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	08/19/2013
ROS1305 Culex Site Inspection Service	Inspection of culex mosquito larval development sites.	08/28/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	08/28/2013
ROS2006 Natular T30 CB Bike	Bicycle catch basin treatment for larval control.	09/09/2013
ROS1305 Culex Site Inspection Service	Inspection of culex mosquito larval development sites.	09/10/2013
ROS1754 Vectobac (B.T.I.) Hand Larv	Hand larviciding for biological control of mosquito larvae.	09/10/2013
ROS1305 Culex Site Inspection Service	Inspection of culex mosquito larval development sites.	09/13/2013

Services Invoiced Per Contract:

Services Invoiced Year-to-Date: \$88,710.00