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WCDH Data Brief

West Nile Virus: Control and Surveillance in Westchester County

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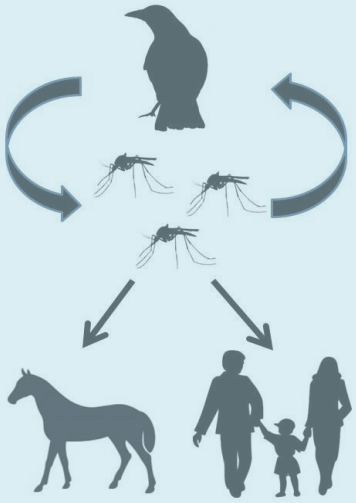
HIGHLIGHTS

- West Nile Virus (WNV) is a mosquito-borne disease.
- In the past 12 years, 31 people had West Nile Virus and one death was associated with the disease in Westchester County.
- Seniors and individuals with weakened immune systems are at highest risk for WNV infection.
- The Westchester County Department of Health has monitored and controlled WNV transmission through mosquito larvicide and surveillance since 1999.
- Each year since 2002, the health department has inspected and/or treated with larvicide an average of 50,000 to 70,000 catch basins.
- The health department has trapped an average of 23,000 mosquitoes each year since 2001. Of the 7,096 mosquito sample batches submitted to the state for testing since 2000, 236 batches tested positive for West Nile Virus. This is equivalent to an average positive rate of 3.33%.
- Human cases and WNV-positive mosquitoes have been found primarily in the southern half of Westchester County.

In late August 1999, an unusual cluster of encephalitis cases was detected in New York City, with additional cases identified in Westchester County and Nassau County. The cause of the disease was identified as West Nile Virus (WNV), an avian virus transmitted by infected mosquitoes[1,2]. Despite mosquito surveillance and control and public education, 14 people were confirmed to have West Nile Virus in the New York metropolitan area in 2000. Since then, West Nile Virus has emerged as a significant health concern in North America, Europe, and other areas[2,3 4].



West Nile Virus Life Cycle

West Nile virus is reproduced by a cycle of continuous transmission between adult mosquito blood-feeding and bird reservoir hosts.

Certain species of mosquitoes feed on both birds and mammals, and are the bridge vector for WNV transmission to humans[5 6].

Symptoms of West Nile Virus

Mild symptoms:

- Body aches
- Fever
- Fatigue
- Headache
- Mild rash
- Swollen lymph glands

Serious disease symptoms:

- High fever with rapid onset
- Headache and neck stiffness
- Disorientation
- Convulsions
- Paralysis
- Coma
- Death

West Nile Virus is a potentially serious illness. About 80% of people who are infected do not show any symptoms. About 20% will develop mild symptoms three to fourteen days after being bitten by an infected mosquito. Although the chance of serious disease is less than one percent, there is no treatment or vaccine. Serious symptoms may last for several weeks, can be life-threatening among people with a vulnerable immune system, and the neurological effects of the infection may be permanent[7].

The Westchester County Health Department has been working since 1999

to prevent the spread of West Nile Virus by controlling mosquito populations during their breeding season, trapping and monitoring adult mosquitoes to locate possible WNV clusters, and educating medical providers and the public[2] .

Mosquito Control

Eliminating Breeding Sites

Each spring, the health department collaborates with municipalities, voluntary agencies and the public to identify and eliminate standing water in empty lots and backyards. These intensive efforts to reduce potential mosquito breeding sites continue throughout the mosquito breeding season. The health department also investigates complaints of standing water received from residents.

Larvicide

Each May, the health department systematically evaluates the thousands of catch basins throughout the county and applies larvicide to those that hold standing water. The least toxic, most effective biological or biochemical agents are applied to these catch basins to prevent mosquito larvae from developing into adult disease vectors[2].

Adulticide

If the activity of disease-bearing mosquitoes ever becomes a threat to public health, the county would consider applying pesticides to reduce the mosquito population. The only time this occurred was in 2000.

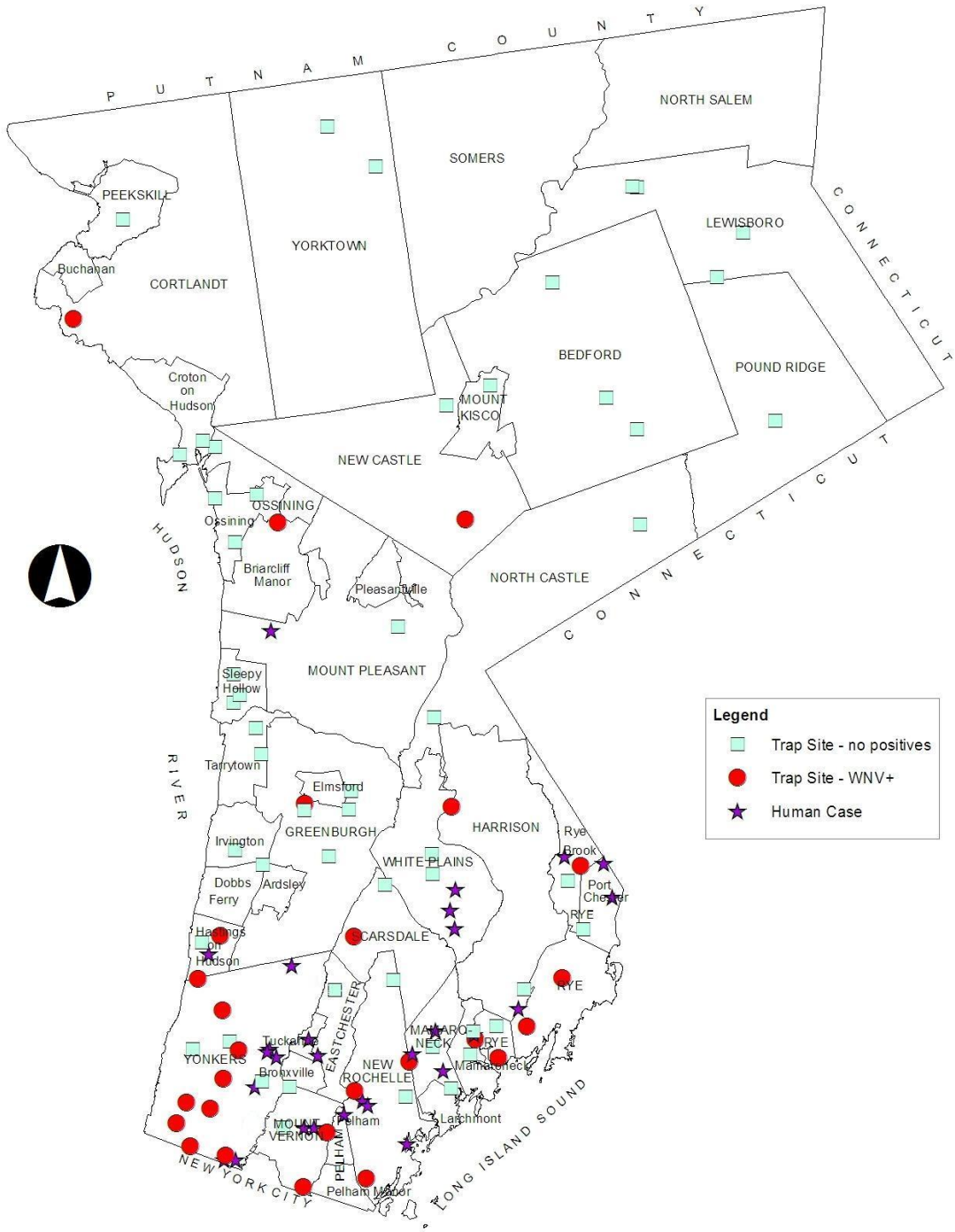
Mosquito Surveillance

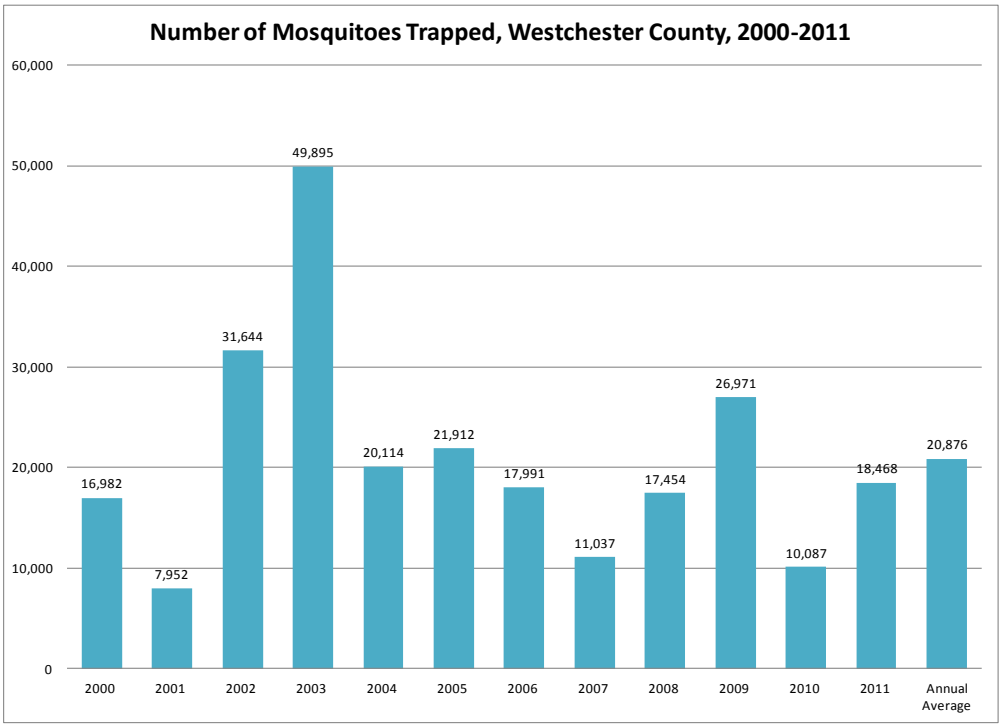
In 2000, the health department initiated annual mosquito surveillance. Each year since 2001, the health department has systematically set up multiple trap sites at various locations from May to October throughout Westchester County. This allows the health department to trap and track the variety of mosquito species and detect the presence of WNV and other arthropod-borne diseases.

Trap sites are selected based on population density, where positive mosquito pools have been identified in the past and where residents with confirmed cases of West Nile Virus reside. Over the years, trap locations have been adjusted based on site availability, vandalism or the need for additional surveillance in response to heavy mosquito infestation.

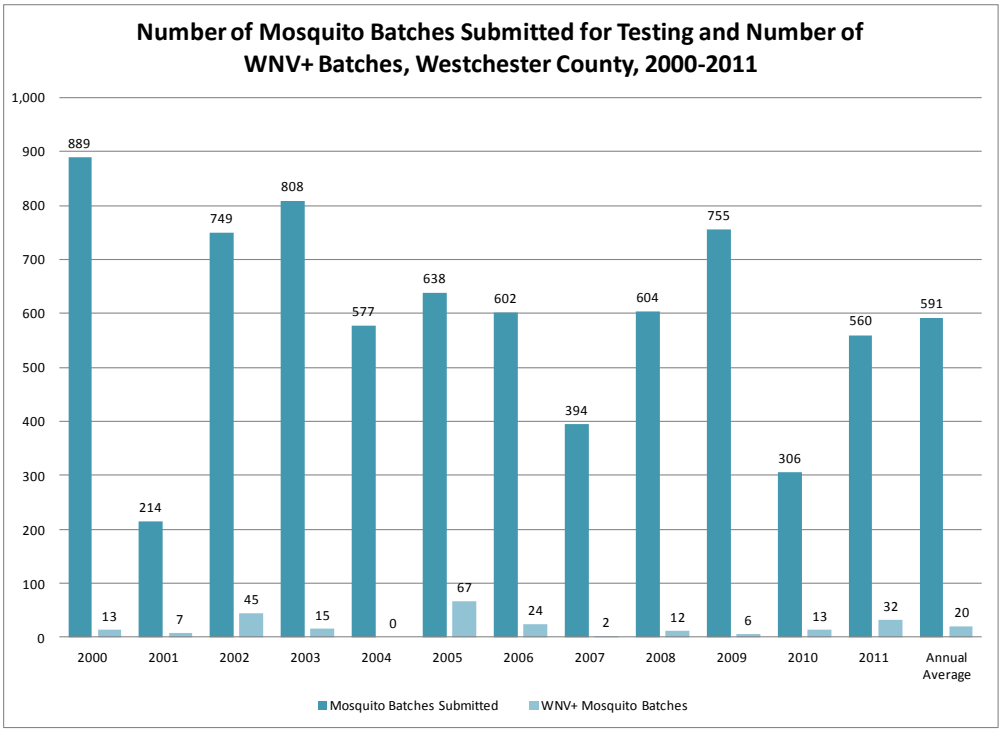
Two types of traps are set up at each site: CDC light traps and gravid traps, in order to capture mosquitoes at different stages in their life cycle. CDC light traps use a light and dry ice to attract adult mosquitoes seeking a blood meal; gravid traps use a liquid bait to attract gravid (egg-laying) mosquitoes. Health department staff collect the trapped mosquitoes three times a week, sort them by species and submit them in batches for arbovirus testing at the NYS Wadsworth Laboratory according to NYSDOH guidelines.

Mosquito Trap Sites Ever Used, Trap Sites with WNV+ Mosquitoes, and Human Cases
Westchester County, 2001-2011





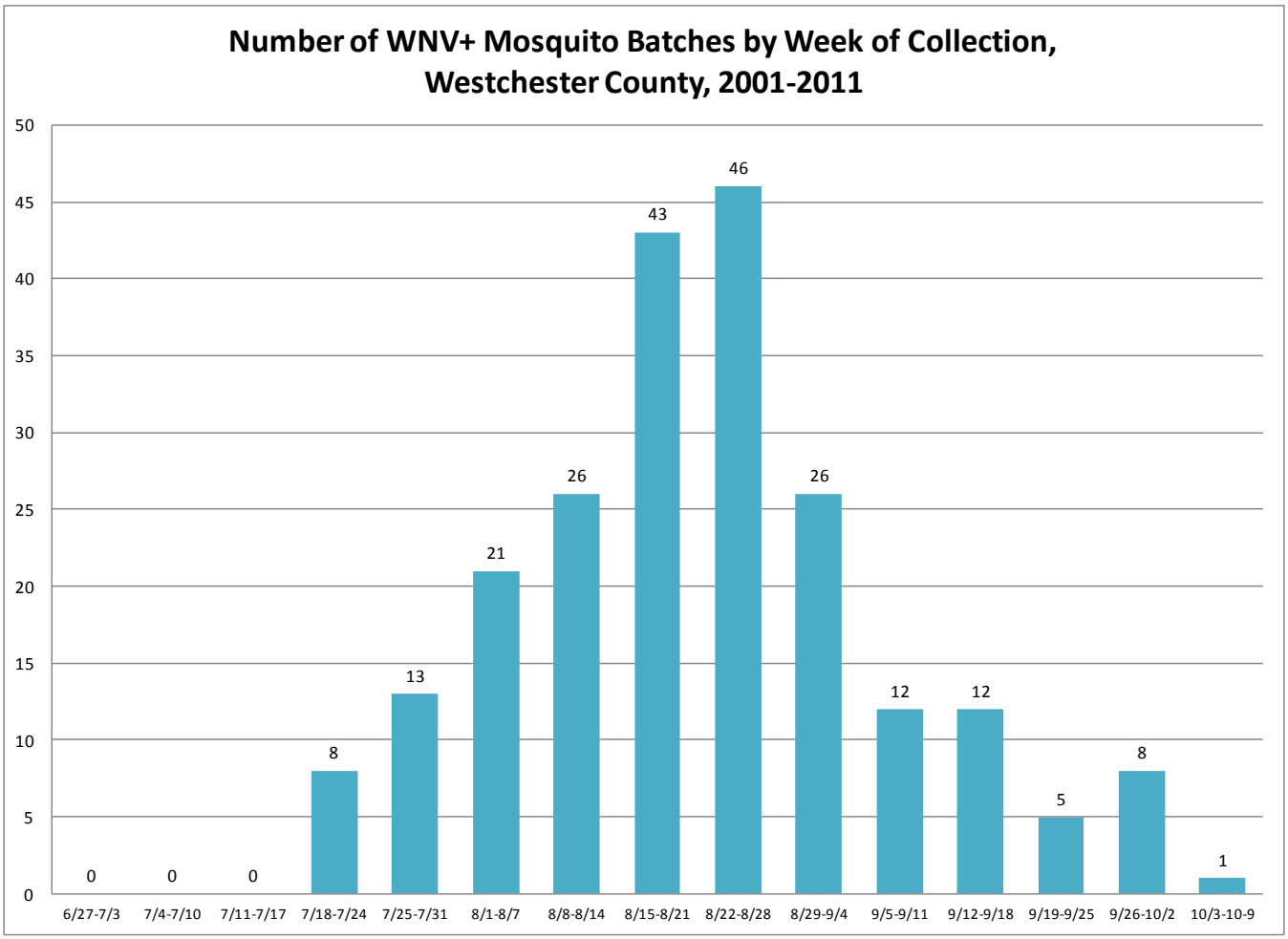
The number of mosquitoes trapped and submitted to New York State Department of Health laboratories for WNV testing and number of positive mosquito batches varied greatly over time.



Since 2000, a total of 7,096 mosquito sample batches have been submitted to NYS for testing. Each batch contained 20 or more mosquitoes. Overall, 236 batches tested positive for WNV. The average positive rate is 3.33%.

Rainfall, temperature, humidity and differences in the behavior of mosquito species are factors that influence both mosquito population size and virus amplification and transmission. For example, low rainfall and high temperatures in drought conditions concentrate birds around the remaining water sources and foster arbovirus amplification. Heavy rainfall helps to increase survival of mosquitoes by creating additional breeding sites, and high humidity allows mosquitoes to fly greater distances.

During the past eleven years of mosquito surveillance, the greatest number of WNV-positive mosquitoes were found in mid-August. No positive WNV mosquito batches have been identified prior to July each year.



Culex ,*Ochlerotatus,* and *Aedes* genera were the most common mosquito species in Westchester County over the past eleven years. Of these species, *Culex* is a known bridge vector of WNV between avian hosts and mammals, while *Aedes* and *Ochlerotatus* are aggressive human pests, and the invasive species *Aedes albopictus* is a known vector of other arboviral diseases.

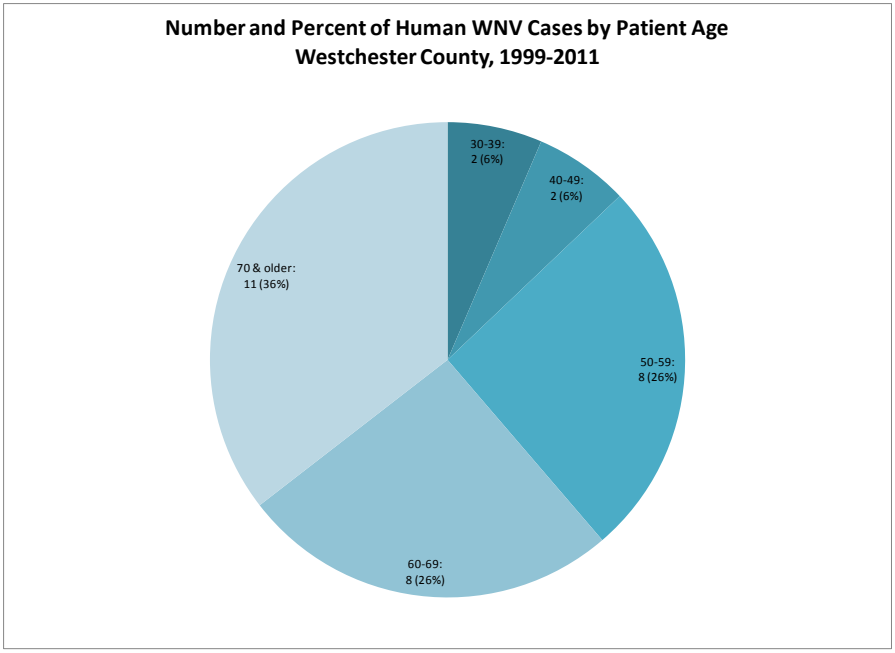
WNV Vector Mosquito Species

- *Aedes vexans*
- *Anopheles punctipennis*
- *Culex pipiens/restuans*
- *Culex salinarius*
- *Ochlerotatus canadensis*
- *Ochlerotatus japonicus*
- *Ochlerotatus triseriatus*
- *Ocherlotatus trivittatus*
- *Stegomyia (Aedes) albopictus*

WNV Disease Surveillance

The health department monitors West Nile viral encephalitis and other mosquito-borne diseases. From May 1 to October 1, the health department provides all county hospitals and infectious disease specialists with educational materials, criteria for case reporting and submission of laboratory specimens, and updates on arbovirus activity. Health department staff visit the homes and surrounding neighborhood of every person who is confirmed to have West Nile Virus to identify and eliminate any mosquito breeding areas. When appropriate, the health department provides targeted mosquito control measures in these areas, such as additional larvicide and mosquito traps to prevent further transmission[2].

Since 1999, 31 Westchester residents have been confirmed to have had West Nile Virus and one death was reported in Westchester County. Of the 31, 15 were women and 16 were men. Almost half (19, 48.7%) were among people ages 60 and older. Only four were younger than 50 (10.3%), and 8 were between the ages of 50 and 59. With the exception of one, all Westchester residents who had West Nile Virus lived in southern Westchester.



How to Minimize Your Risk for West Nile Virus

✔ **West Nile Virus (WNV)** is a disease carried by infected mosquitoes. WNV is a seasonal epidemic in the United States that emerges in the summer and continues into autumn. The best way to avoid infection with WNV is to prevent mosquito bites.

✔ **Use insect repellent** and insect-repellent clothing when outdoors. Mosquitoes are most active at dusk and dawn; consider wearing long sleeves and long pants during these times. Keep s**creens on windows and doors** in good repair to keep mosquitoes out.

✔ **Remove standing water** around your home where mosquitoes can breed. Empty standing water from flower pots, buckets, rain barrels, wading pools, play equipment, old tires, tree holes, clogged gutters, and bird baths.

✔ **People age 50 years and over** are at elevated risk to develop serious disease. **People with compromised immune systems,** such as transplant patients, are also at high risk. Pregnancy and nursing do not increase the risk of infection with WNV, although transmission through breast milk is still being evaluated; talk to your doctor if you have concerns.

To report sources of standing water, call the Westchester County Department of Health at (914) 813-5000.

West Nile Virus Control and Surveillance Activities: Westchester County Department of Health, 1999-2011

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Annual Average
Mosquito Control[*1]															
Number of Catch Basins Evaluated	..	..	..	63,969	65,758	65,151	62,740	65,151	67,228	66,818	69,286	69,252	53,479	648,832	64,883
Number of Catch Basins Treated	..	..	..	57,778	57,742	53,857	51,507	53,857	56,137	54,756	57,207	52,886	37,556	533,283	53,328
Mosquito Vector Surveillance[*2]															
Number of Nights Out for Trapping	..	56	51	71	78	60	67	55	52	62	63	56	52	723	60
Number of Trap Sites	..	21	37	31	11	11	15	12	10	13	11	12	10	194	16
Number of Trap Nights	..	1,142	1,075	2,545	1,299	1,061	1,426	1,147	802	1,200	1,121	1,134	622	14,574	1,215
Number of Mosquitoes Trapped	..	16,982	7,952	31,644	49,895	20,114	21,912	17,991	11,037	17,454	26,971	10,087	18,468	250,507	20,876
Number of Mosquito Batches Submitted	..	889	214	749	808	577	638	602	394	604	755	306	560	7,096	591
Number of WNV+ Mosquito Batches	..	13	7	45	15	0	67	24	2	12	6	13	32	236	20
% of WNV+ Mosquito Batches	..	1.46	3.27	6.01	1.86	0.00	10.50	3.99	0.51	1.99	0.79	4.25	5.71	3.33	3.33
WNV Disease Surveillance															
Number of Human Cases[*3]	9	0	0	2	4	1	3	2	1	2	0	4	3	31	2.38
Number of Human Deaths[*4]	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.08

[*1.] Effective in 2011, WCDH ceased evaluating and treating catch basins under the jurisdiction of Department of Transportation (DOT).

[*2.] WCDH internal database and New York State Department of Health, http://www.health.state.ny.us/nysdoh/westnile/update/update.htm. Data incomplete for 2011.

[*3.] WCDH internal database.

[*4.] New York State Department of Health, http://www.health.state.ny.us/nysdoh/westnile/update/update.htm.

References

1. Centers for Disease Control and Prevention. “Outbreak of West Nile-Like Viral Encephalitis, New York, 1999.” MMWR Vol. 48(38); 845-9. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4838a1.htm.

2. WCDH. “Operation Mosquito S.T.I.N.G. (Stop The Insects’ Next Generation): Comprehensive Mosquito-Borne Disease Surveillance and Control Plan”. Available at: http://health.westchestergov.com/images/stories/pdfs/wnv_comprehensivemosquitoborneplan.pdf

3. Centers for Disease Control and Prevention. “West Nile virus is a risk you can do something about” Brochure, available at http://www.cdc.gov/ncidod/dvbid/westnile/resources/wnv_flyer.pdf.

4. http://www.cfsph.iastate.edu/Factsheets/pdfs/west_nile_fever.pdf

5. Centers for Disease Control and Prevention. “Vertebrate Ecology” Available at: http://www.cdc.gov/ncidod/dvbid/westnile/birds&mammals.htm

6. Lucacik, G, Anand, M et al. “West Nile Virus Surveillance in Mosquitoes in New York State, 2000-2004”. Journal of the Mosquito Control Association, 2006, Vol. 22 (2) 264-271. Abstract available at: http://dx.doi.org/10.2987/8756-971X(2006)22[264:WNVSIM]2.0.CO;2

7. Centers for Disease Control and Prevention. “WNV Fact Sheet” Web page, available at: http://www.cdc.gov/ncidod/dvbid/westnile/resources/WNV_factsheet.pdf

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