

2013—Arbovirus Final Report

Summary of Human West Nile Virus and Other Arboviral Infections, Georgia 2013

West Nile virus (WNV) is a mosquito-borne disease of birds. Humans are occasionally infected with WNV through mosquito bites. Approximately 1 in 5 people infected with WNV develop symptoms of “West Nile Fever”, which is often characterized by fever, headache, fatigue, and muscle pain or weakness. Less than 1% of people infected with WNV develop neurologic disease such as meningitis, encephalitis, or flaccid paralysis.

West Nile virus was first recognized in Georgia in July 2001. That year, there were 6 human cases of WNV encephalitis reported in Georgia, including one death. Since then cases have been reported each year with varying numbers of human deaths.

To improve identification of Georgians infected with WNV, surveillance for WNV illness in humans was expanded for the 2003 transmission season to include all acute infections of WNV. In addition, routine screening of the nation’s blood supply began in 2003, resulting in the identification of persons infected with WNV prior to the development of symptoms, if symptoms developed at all.

For historical data on arboviral diseases in Georgia since 2010, see the end-of-year summaries posted at <http://dph.georgia.gov/documents/past-surveillance-summaries>. Summaries from 2002-2009 are available upon request.

In 2013, Georgia reported 10 cases of WNV, with 0 deaths. An



additional 7 cases were reported, but were lost to follow-up. Three positive viremic blood donors were also identified, but are not counted as any of the 17 cases. Four (23.5%) of the 17 cases experienced WNV neurologic illness (altered mental status, paralysis, encephalitis, and/or meningitis) and 6 (35.3%) were diagnosed with WNV fever. Seven (41.2%) had no additional data. The viremic blood donors remained asymptomatic. Table 1 shows the clinical syndrome for each case.

The average age of cases was 56 years (range 31-85). The average age of those with WNV neurologic illness was 64 years (range 38-80)(Table 3). Eight (47%) of the 17 cases were male. The majority of cases were reported in August, September, and October. Table 2 shows the counties of residence of each case.

Table 2: Cases by County, 2013

WNV Cases by County (includes asymptomatic cases*)	
County	Count
Brantley	2
Chatham	1
Clarke	1
Cobb	1
Columbia	1
DeKalb	1
Fulton	2
Gwinnett	2
Hall	1
Houston	1
Liberty	1
Lowndes	2
Muscogee	2
Richmond	1
White	1

Table 1: Clinical Syndromes, 2013

Arbovirus	Month of Onset	County of Residence	Clinical Syndrome	Fatality
CE (LAC)	November	Forsyth	Unknown	Unknown
DENGUE	March	Cobb	FEVER	No
	April	Gwinnett	FEVER	No
		Muscogee	Unknown	No
	May	Fulton	FEVER	No
		Henry	Unknown	Unknown
	June	Fulton	FEVER	No
		Gwinnett	FEVER	No
	July	Cobb	FEVER	No
		Fulton	FEVER	No
August	DeKalb	FEVER	No	
September	Cobb	FEVER	No	
November	Fulton	Unknown	Unknown	
EEE	June	Clinch	MENINGOENCEPHALITIS	No
WNV	May	Brantley	FEVER	No
	July	Cobb	MENINGOENCEPHALITIS	No
		Muscogee	FEVER	No
	August	Clarke	Unknown	Unknown
		Columbia	FEVER	No
		DeKalb	ASYMPTOMATIC	No
		Fulton	Unknown	Unknown
		Gwinnett	ASYMPTOMATIC	No
	September	Muscogee	Unknown	Unknown
		Gwinnett	ASYMPTOMATIC	No
		Hall	Acute Flaccid Paralysis	No
		Lowndes	FEVER	No
	October	Richmond	FEVER	No
		White	ENCEPHALITIS	No
		Brantley	ENCEPHALITIS	No
Chatham		Unknown	Unknown	
Fulton		Unknown	Unknown	
Houston	Unknown	Unknown		
Liberty	Unknown	No		
Lowndes	FEVER	No		

In addition to WNV, one case of Eastern Equine Encephalitis was reported from Clinch County in 2013 and one case of California Encephalitis (probably LAC) was reported from Forsyth County. Twelve internationally acquired cases of Dengue were also reported. There was also one case of Jamestown Canyon virus reported; the case is still being investigated.

If you have questions or comments, please contact Melissa Ivey, MPH, Human Arboviral Infections Surveillance Coordinator at the Georgia Department of Public Health, at 404-657-6442 or mlhall1@dhr.state.ga.us.

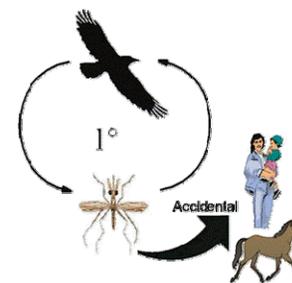
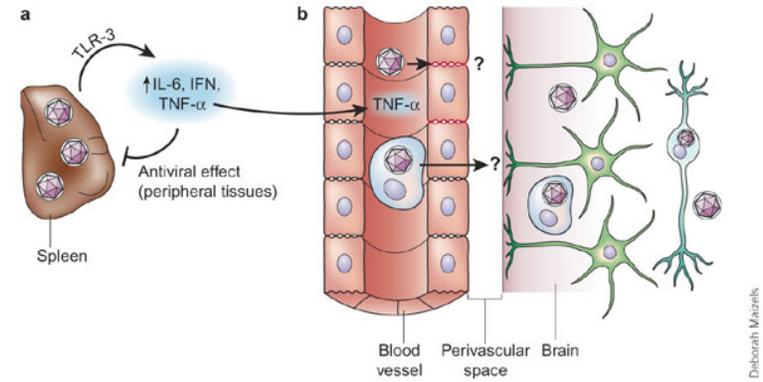
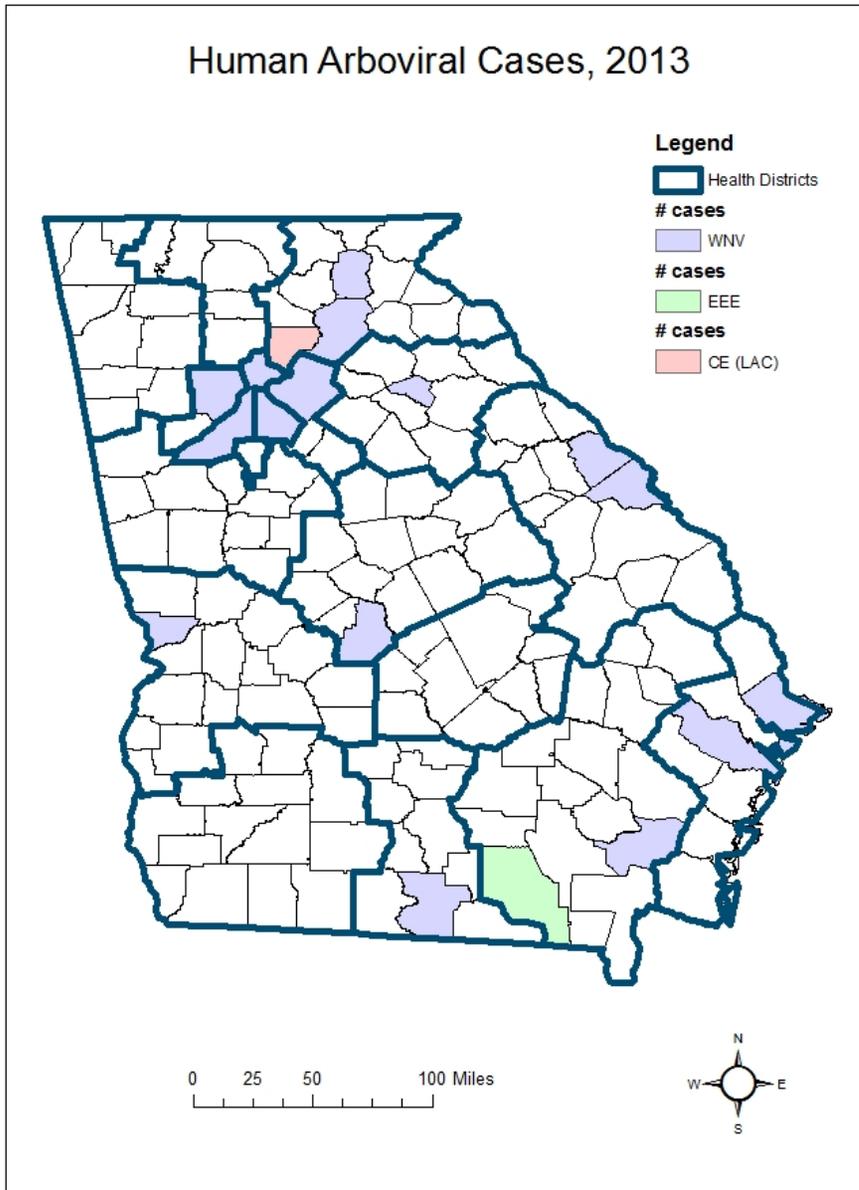


Table 3: Age Ranges, WNV 2013

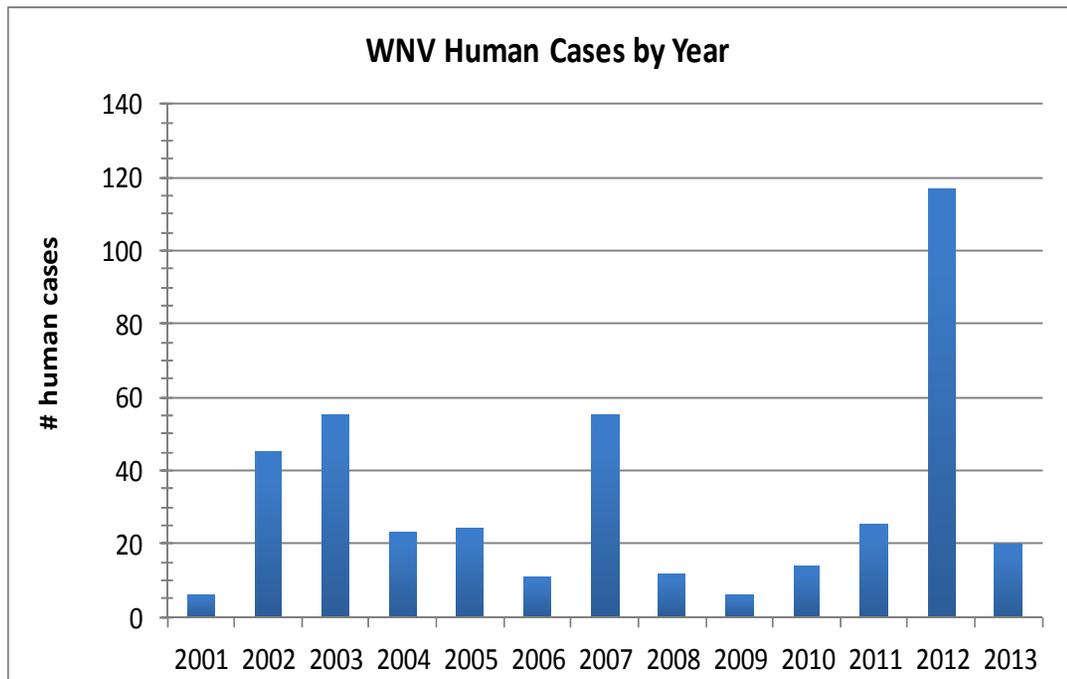
age range	WNND	WNF	other	asymptomatic	unknown
0-10					
11-20					
21-30				2	
31-40		1	1		2
41-50		1			4
51-60	1	1			
61-70				1	1
71-80	2	1			
>80		2			
TOTAL	3	6	1	3	7



Dengue - County of Origin

Virus	County of Origin	# cases	Month of Onset
DEN	Barbados	1	July
DEN	Cambodia	1	June
DEN	Costa Rica	1	March
DEN	Dominican Republic	1	June
DEN	Guatemala	1	August
DEN	India	2	July, September
DEN	Unknown	5	April (2), May (2), November

Diagnosis	Virus		
	CE (LAC)	EEE	WNV
Acute Flaccid Paralysis			1
ASYMPTOMATIC			3
ENCEPHALITIS			2
FEVER			6
MENINGOENCEPHALITIS		1	1
Unknown	1		7



Because several arboviral illnesses have a high inapparent-to-apparent infection ratio, the prevalence of arbovirus antibodies can be high some populations. A diagnosis of arboviral encephalitis requires that the patient have signs and symptoms compatible with neuroinvasive disease.

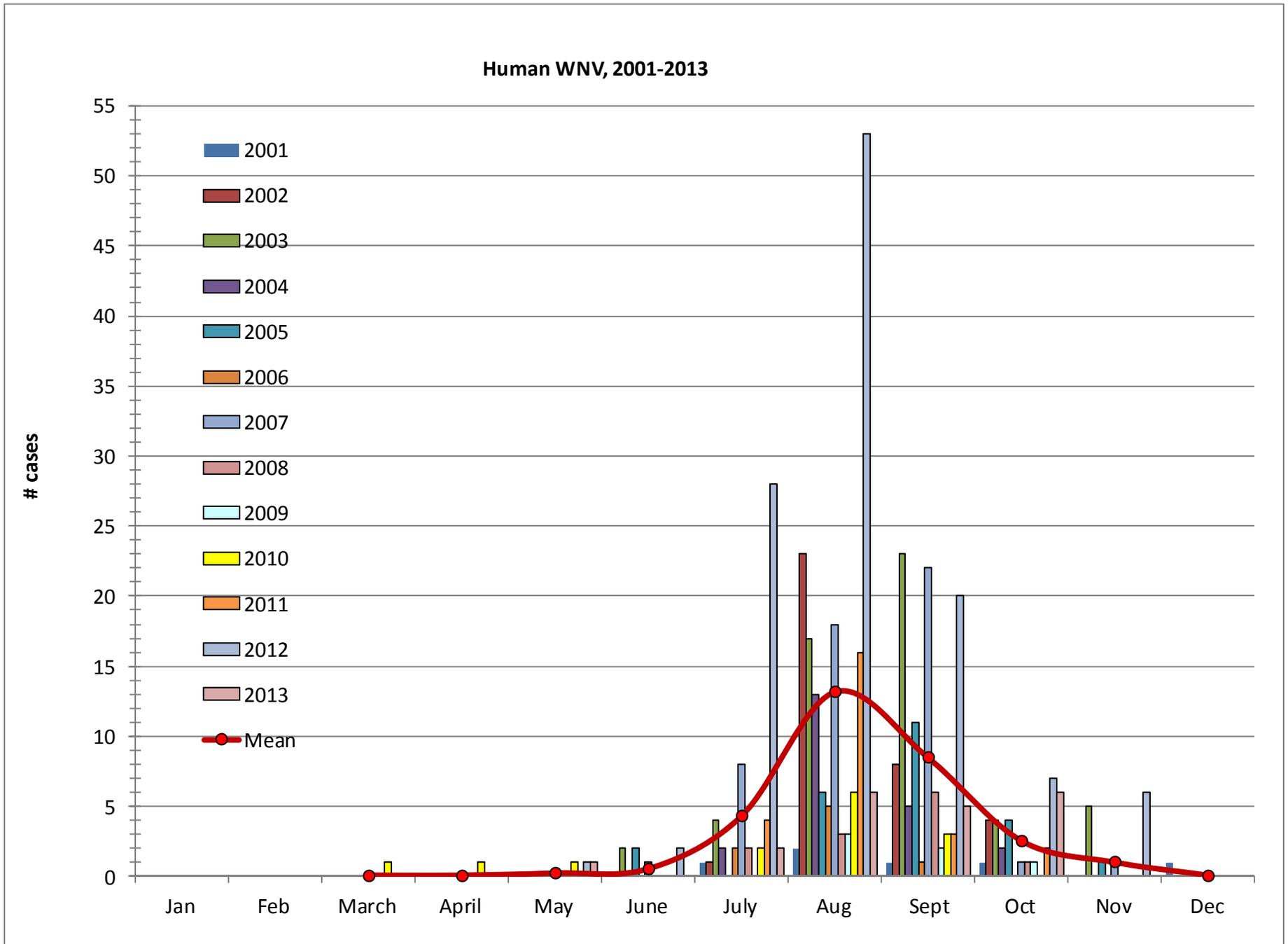
For reporting purposes, clinical data should be obtained to ensure that the patient meets the criteria for the surveillance case-definition. From patients with such signs and symptoms, physicians should obtain both acute phase (1-7 days post-onset) and convalescent phase (>14 days post-onset) serum and cerebrospinal fluid specimens.

http://www.cdc.gov/ncezid/dvbd/pdf/arboguid_508.pdf

WNV Cases by County

County	cases	viremic blood donors	unknown
Brantley	2		
Chatham			1
Clarke			1
Cobb	1		
Columbia	1		
DeKalb		1	
Fulton			2
Gwinnett		2	
Hall	1		
Houston			1
Liberty			1
Lowndes	2		
Muscogee	1		1
Richmond	1		
White	1		

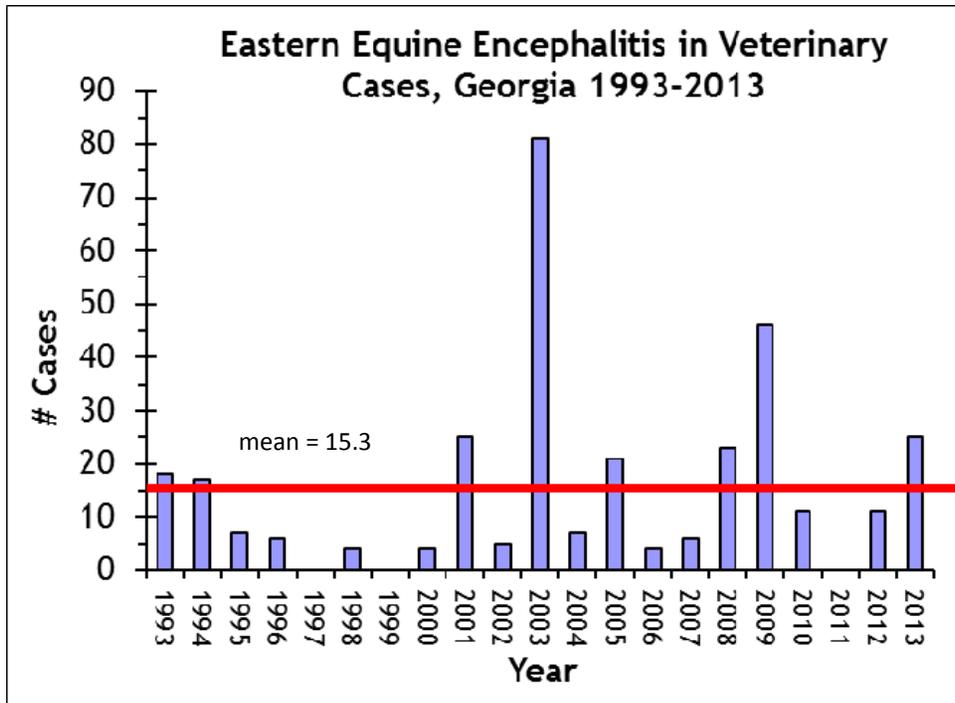
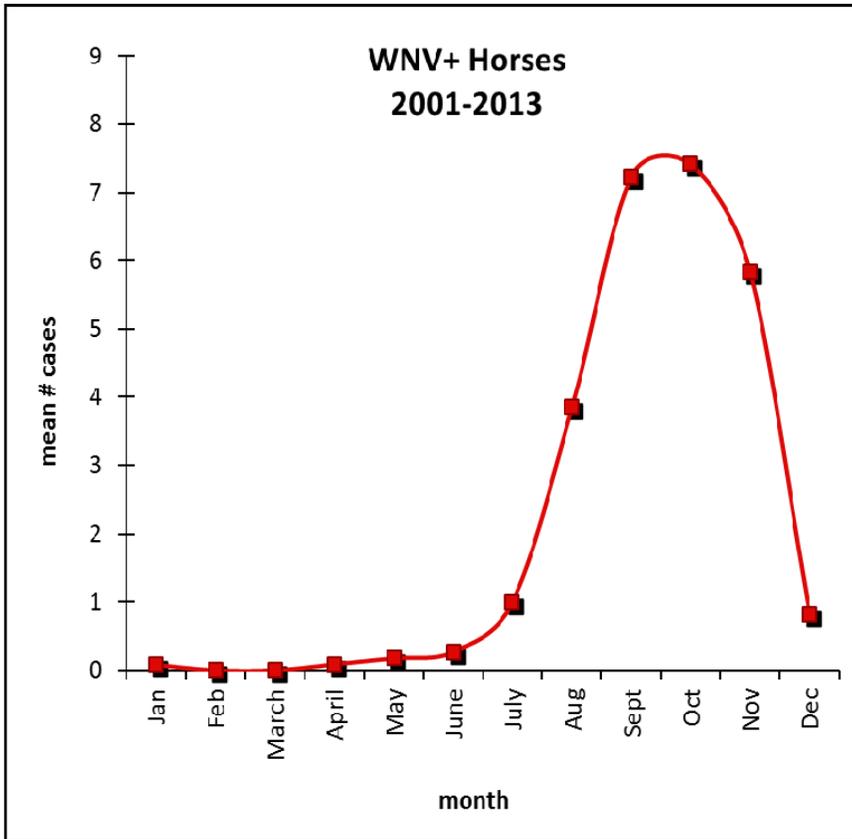
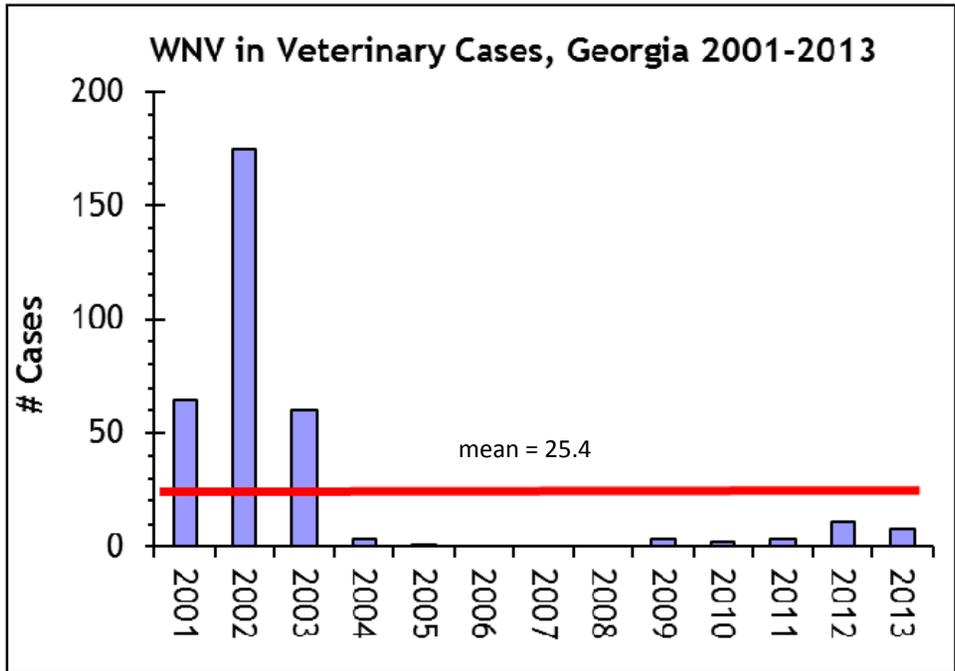
Year	EEE	LAC	WNV
2001			6
2002			45
2003	2	1	55
2004	1	5	23
2005	1	1	24
2006	1	1	11
2007		3	55
2008		2	12
2009		2	6
2010		2	14
2011		2	25
2012	1		117
2013	1	1	20
Grand Total	7	20	413



Veterinary Data

Eight horse tested positive for WNV in 2013. The number of reported cases of WNV in horses decreased rapidly after 2002, likely due to increased immunity, increased vaccination, and/or decreased testing, but has lately begun to increase again.

Twenty-five horses tested positive for EEE in 2013. Eastern equine encephalitis is endemic in the Coastal and Coastal Plains areas of Georgia. During an average year, four or five EEE+ horses are reported from these areas. The true number of horse cases is probably higher due primarily to under-testing, although subclinical infections can occur with EEE.



A horse with West Nile virus or EEE will display some of the following symptoms:

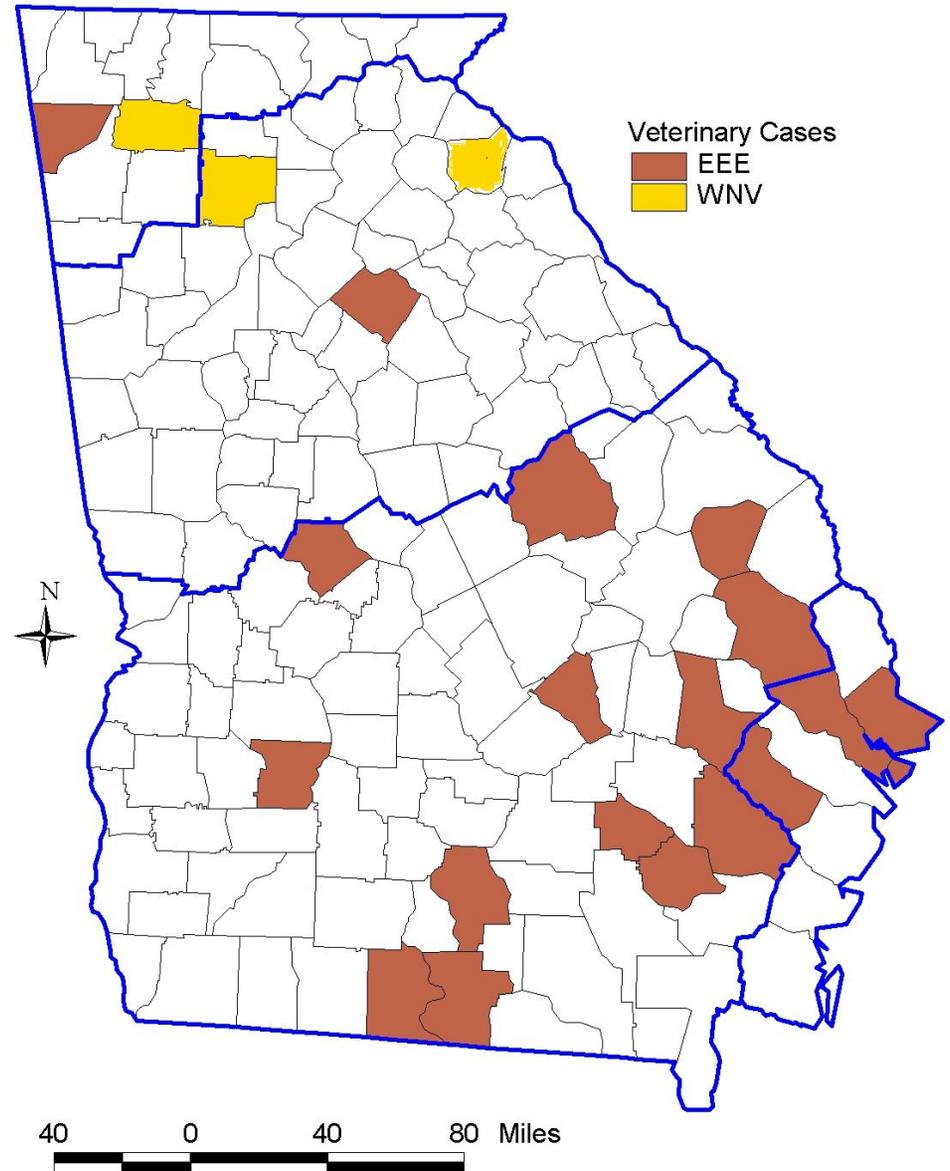
- General loss of appetite
- Hind limb weakness
- Fever
- Impaired vision
- Walking in circles
- Inability to swallow
- Coma

County	EEE	WNV
Bacon	1	
Berrien	2	
Brooks	2	
Bryan	1	1
Bulloch	2	
Chatham	1	
Chattooga	1	1
Cherokee		1
Crawford	1	
Franklin		1
Gordon		2
Jenkins	1	
Lee	2	
Long	1	
Lowndes	2	
Pierce	1	
Tattnall	1	
Walton	1	
Washington	1	
Wayne	3	2
Wheeler	1	
Grand Total	25	8

Mortality in horses with WNV is ~35%. However, sometimes a horse can be infected with West Nile virus and not show any symptoms.

Symptoms in horses with Eastern Equine Encephalitis begin with a fever that may reach as high as 106 ° F. Nervous signs appearing during the fever include sensitivity to sound, periods of excitement, and restlessness. Mortality rates among horses with EEE range from 70 to 90%.

Arboviral Surveillance, 2013

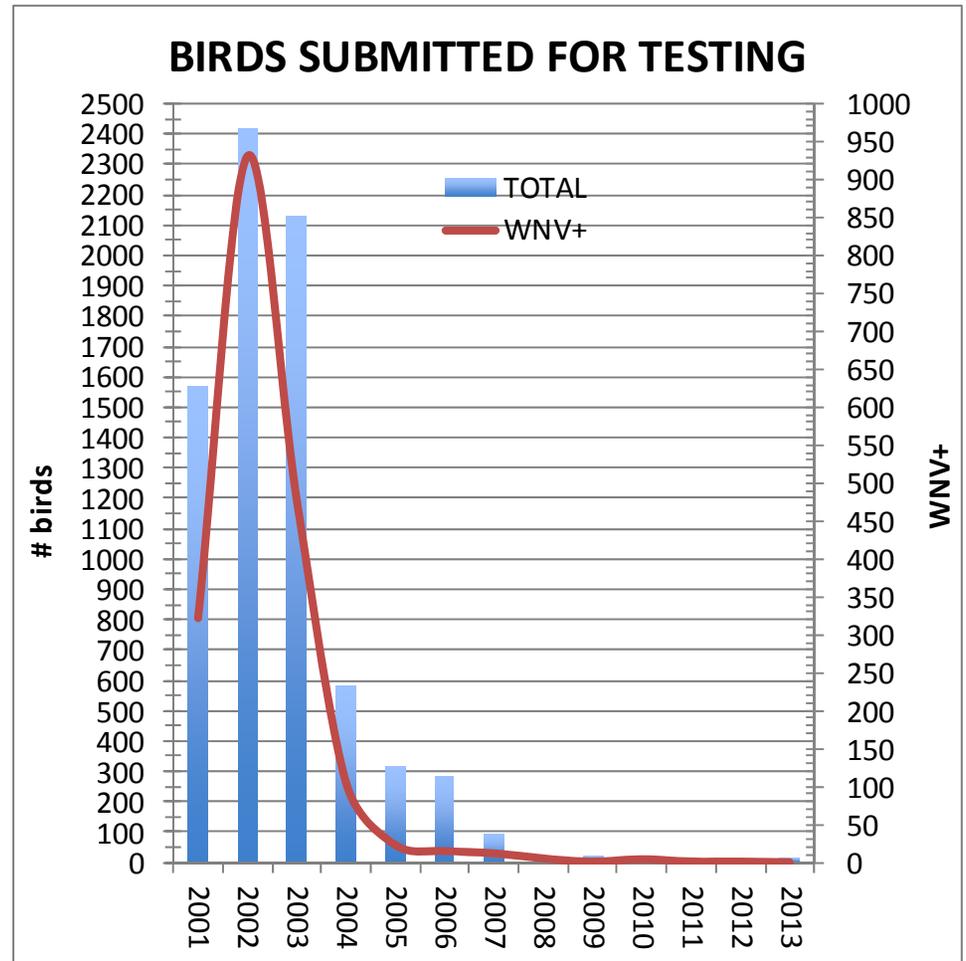
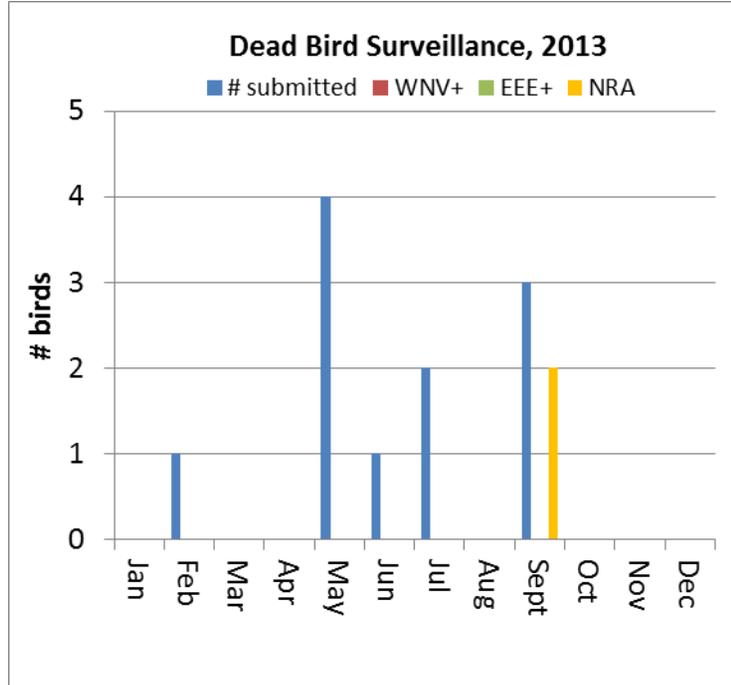


Dead Bird Surveillance

As of 2012, federal funding was no longer available to test birds. However, a total of 12 birds were submitted for testing in 2013 from counties with sufficient funding to maintain some level of arboviral surveillance and testing. The first bird was submitted for testing at the end of Feb. Subsequent birds were submitted in May, June, July, and September. WNV was not detected in the nine birds for which results are available; results for 2 birds are still pending.

Dead bird surveillance continues to lose ground as a surveillance tool, and even more so now when no funding is available at the State level to support testing; most counties do not have the resources to pick up and ship birds for testing in any case. Bird testing does continue to have some utility, esp where mosquito surveillance data are not available. In addition, positive dead bird reports can be used to trigger public education messages

reminding people to wear repellent and to dump out standing water.



County	# Birds Submitted	WNV+	EEE+	NRA
Chatham	3			
DeKalb	8			2

NRA—no results available

Species	NEG	NRA
American Robin	2	
Blue Grosbeak	1	
Brown Thrasher	1	
Coopers Hawk	1	
Eastern Towhee	1	
Gray Catbird		2
Mourning Dove	1	
Red-tailed Hawk	1	
Rock Dove	1	
TOTAL	9	2



**CORVIDS-
CROW or RAVEN**

Description:

- 17 to 21 inches
- Completely black... including the bill and feet
- Purplish gleam in sunlight
- Tail is fan shaped



BLUE JAYS

Description:

- Overall length of 12 inches
- Prominent Chest
- Adorned with a black collar and necklace
- Wings and tails are marked with white
- Blue on upper body and grayish white

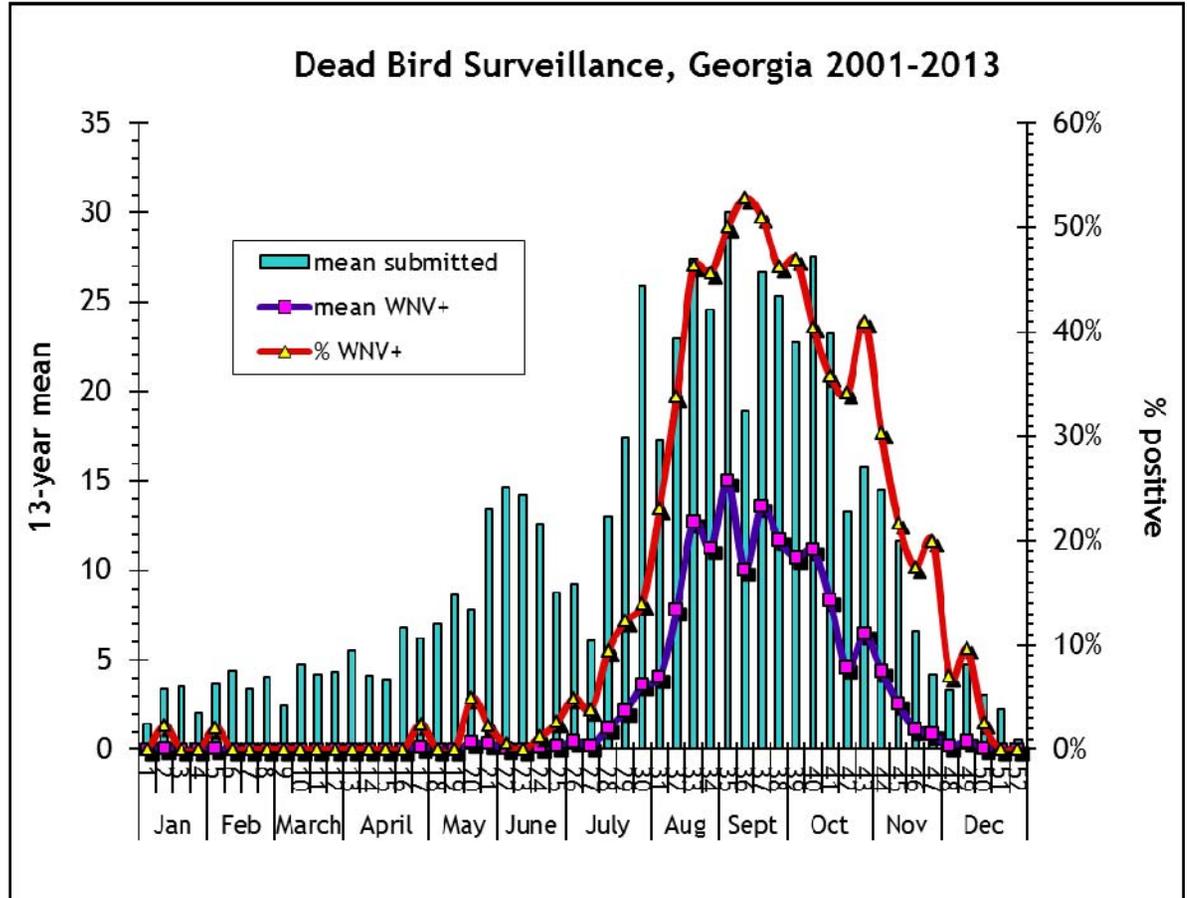


RAPTORs (Eagles, Hawks, Owls, Falcons, Buzzards)

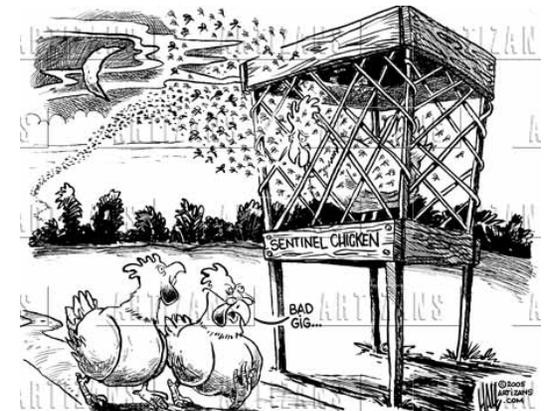
HAWK

Description:

- Extremely sharp hooked claws
- Large highly developed eyes
- Strong hooked bill
- Small rounded head



In addition to dead bird testing, the Chatham County Mosquito Control Program also sets out sentinel chickens for EEE surveillance. In 2013, there were a total of 5 confirmed EEE+ sentinel chickens from 3 sites. This information is used by the program to focus mosquito control efforts on EEE risk reduction for the county.



<http://hss-prod.hss.aol.com/hss/storage/patch/255845f19f190cc562ecfafc30d25be0>

Mosquito Surveillance

In 2012, due to funding cuts, mosquito testing was no longer supported by the State Department of Public Health. Counties holding independent contracts with SCWDS for testing continued doing mosquito surveillance and shared some of the test results with the GDPH; 5 counties sent mosquitoes to SCWDS for testing in 2013. Fulton County had their mosquito pools tested at the Fairfax County Health Department laboratory in Virginia. No pool data or test results were supplied to the GDPH after the end of September, with the exception of a few additional WNV+ pools. Although a total of 166 pools tested positive for WNV, all calculations are based on the 150 WNV+ pools with complete data provided.

A total of 7413 pools of mosquitoes (121909 individuals) were sent for testing with results reported to the GDPH. Mosquitoes found WNV+ (150 pools) were *Aedes albopictus*, *Culex quinquefasciatus*, *Cx nigripalpus*, *Cx restuans*, and *Ochlerotatus triseriatus*, as well as unidentified *Culex spp*; the mosquito species most commonly found positive (82.7%) was *Cx quinquefasciatus*. In addition to WNV, 1 pool was found to be positive with an un-specified bunyavirus, 1 pool was found to be EEE+ (Lowndes County), 1 pool was found to be HJV+, 152 pools were Flanders+, and 16 pools were

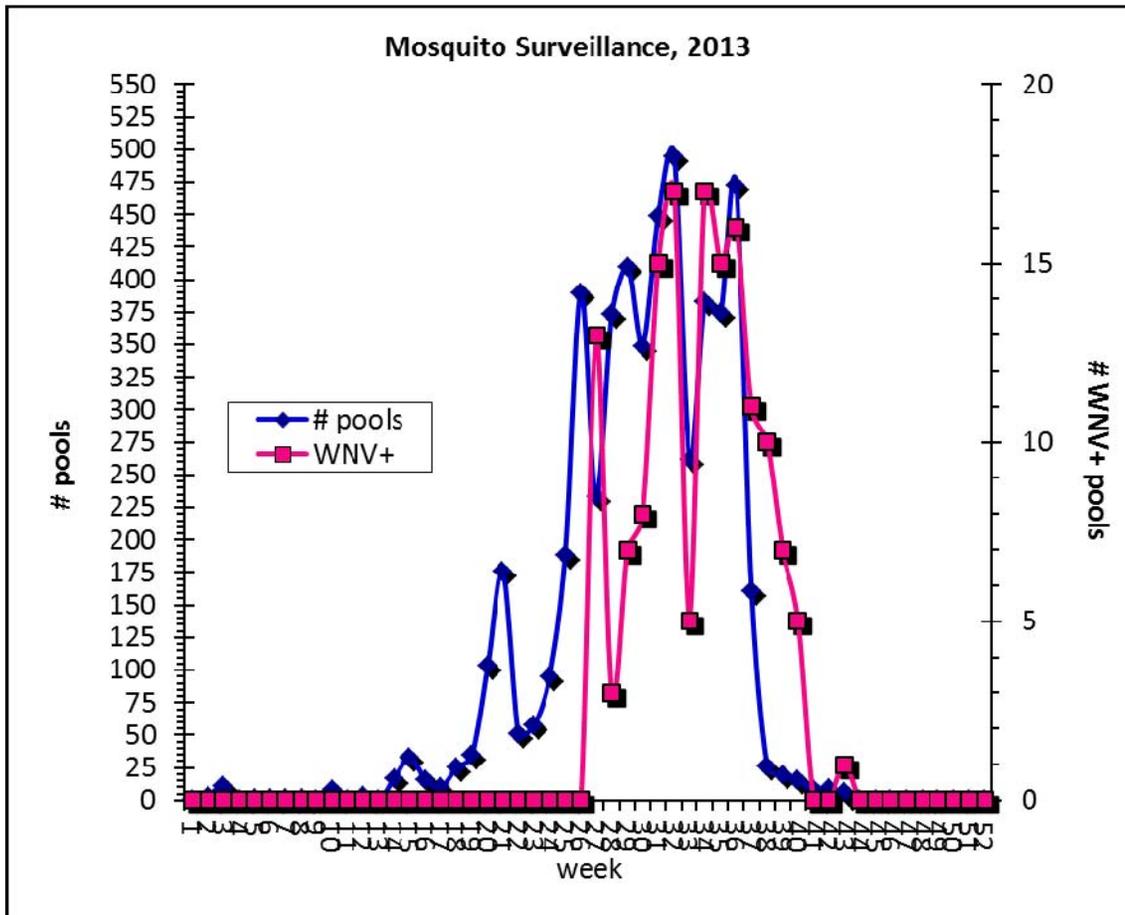
positive with a variant of the Flanders virus. Bunyaviridae are vector-borne viruses. They are a family of negative-stranded, enveloped RNA viruses. Though generally found in arthropods or rodents, certain viruses in this family occasionally infect humans. Some of them also infect plants.

county	# pools	WNV+ pools	WNV+ pools (no data provided)	total WNV+ pools
Chatham	3963	94	14	108
DeKalb	389	16		16
Fulton	261	9		9
Glynn	429	5		5
Liberty	29	1	1	2
Lowndes	1371	25	1	26

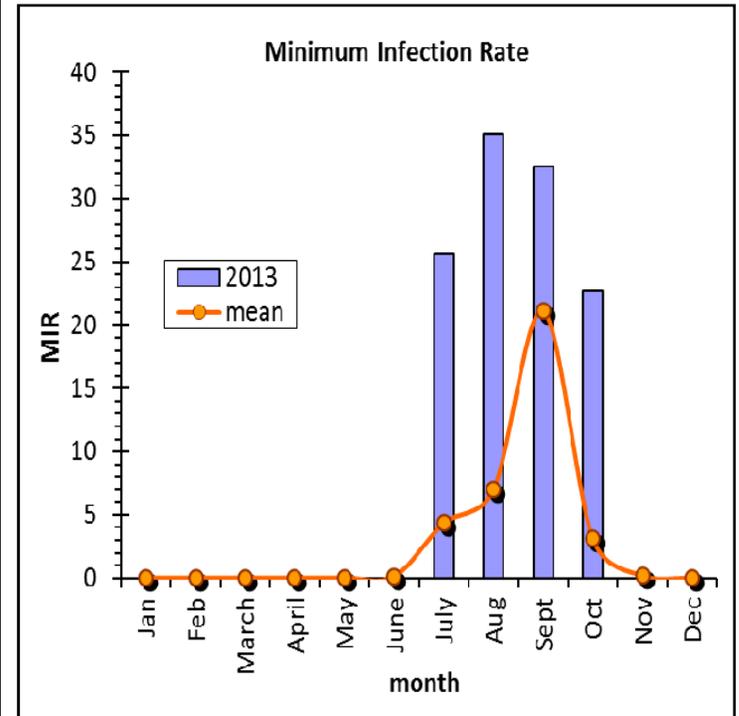
Species	# WNV+ pools	% positive
<i>Ae albopictus</i>	1	0.7%
<i>Culex spp</i>	17	11.3%
<i>Cx. nigripalpus</i>	6	4.0%
<i>Cx quinquefasciatus</i>	124	82.7%
<i>Cx restuans</i>	1	0.7%
<i>Oc triseriatus</i>	1	0.7%



species	Bunyavirus	EEE+	Flanders+	Flanders (variant)+	HJV	WNV+
<i>Ae. albopictus</i>						1
<i>Cs. melanura</i>		1		1	1	
<i>Culex spp.</i>			23			17
<i>Cx. erraticus</i>			1			
<i>Cx. nigripalpus</i>						6
<i>Cx. quinquefasciatus</i>			124	14		124
<i>Cx. restuans</i>			4	1		1
<i>Oc. infirmatus</i>	1					
<i>Oc. triseriatus</i>						1
	1	1	152	16	1	150



vigilance and testing are needed. An MIR of 4.0 or above means that a high level of viral activity is present, human infections are imminent (if not already present), and prompt action is required.



The first WNV+ mosquitoes were detected in Chatham and Lowndes counties in early July. The last WNV+ pool was collected in Fulton County at the end of October. Peaks in numbers of WNV+ pools occurred in August. All of the WNV+ mosquitoes were caught in gravid traps.

The Minimum Infection Rate or $MIR = (\# \text{ WNV+ Pools} / \text{Total} \# \text{ Mosquitoes Tested}) \times 1000$. The WNV Index is the MIR multiplied by the number of mosquitoes per trap night. An MIR of 0 suggests that there is no viral activity in the area. An MIR of 0.1 to 3.9 indicates that some viral activity is present, and increased

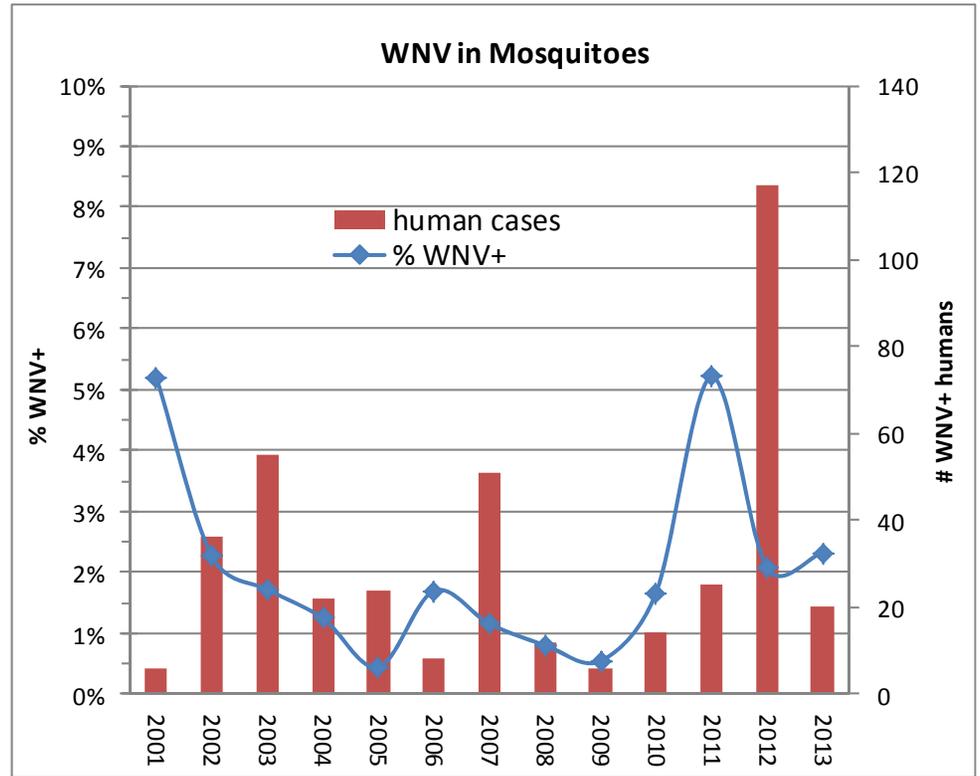
Virus	trap types			
	CDC	CDC/UV	Exit	Gravid
Bunyavirus	1			
EEE	1			
Flanders	1			151
Flanders (variant)	1			15
HJV				1
NEG	1191	3	70	4857
Pending	207		22	742
WNV				150

It is likely that, even though MIRs were very high in 2013, the lack of WNV+ mosquitoes early in the season led to the low-level of transmission of WNV to humans.

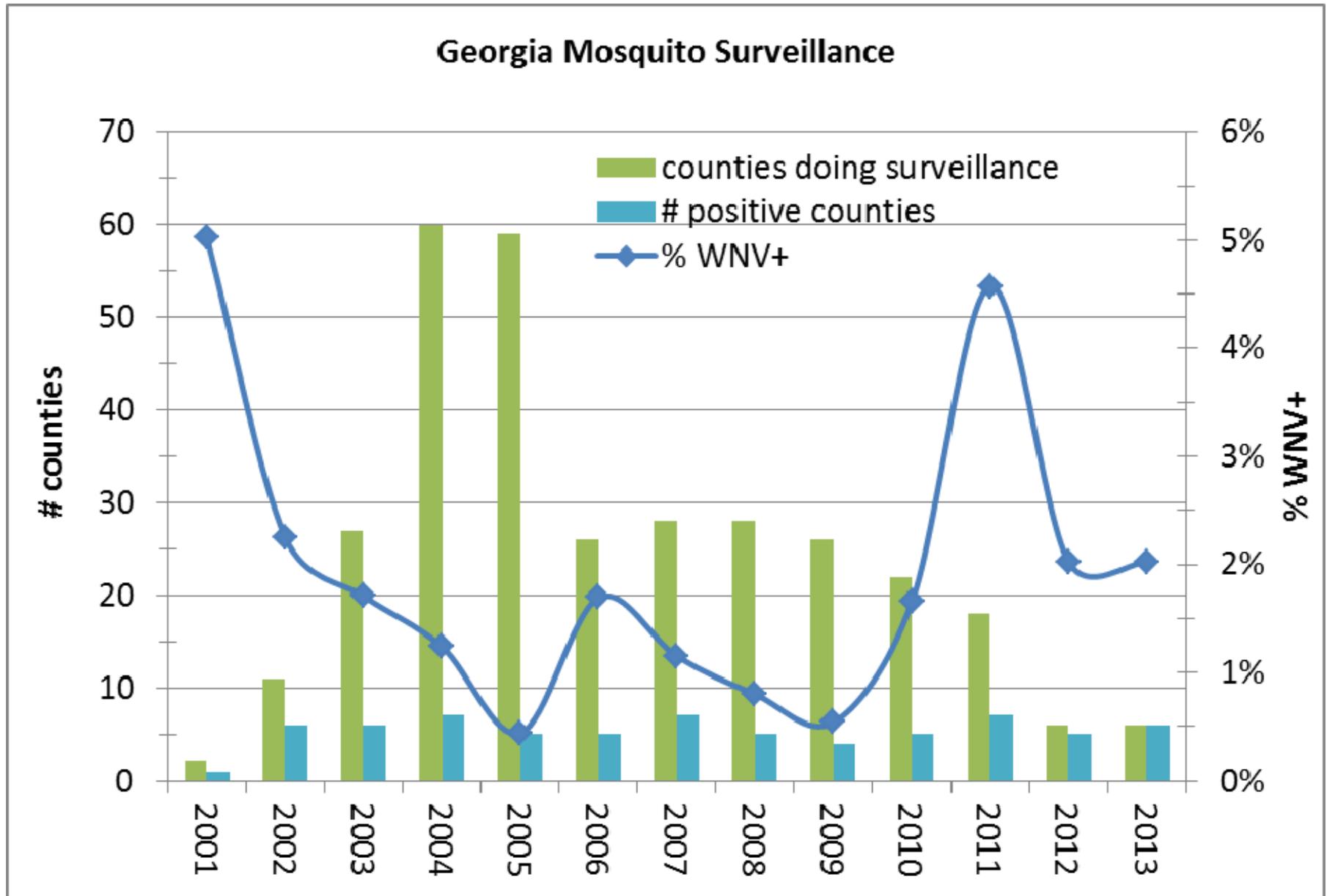
2001-2013	human cases	veterinary case	mosquito pool	positive bird
total	413	1543	330	1896
mean	31.8	118.7	25.4	145.8

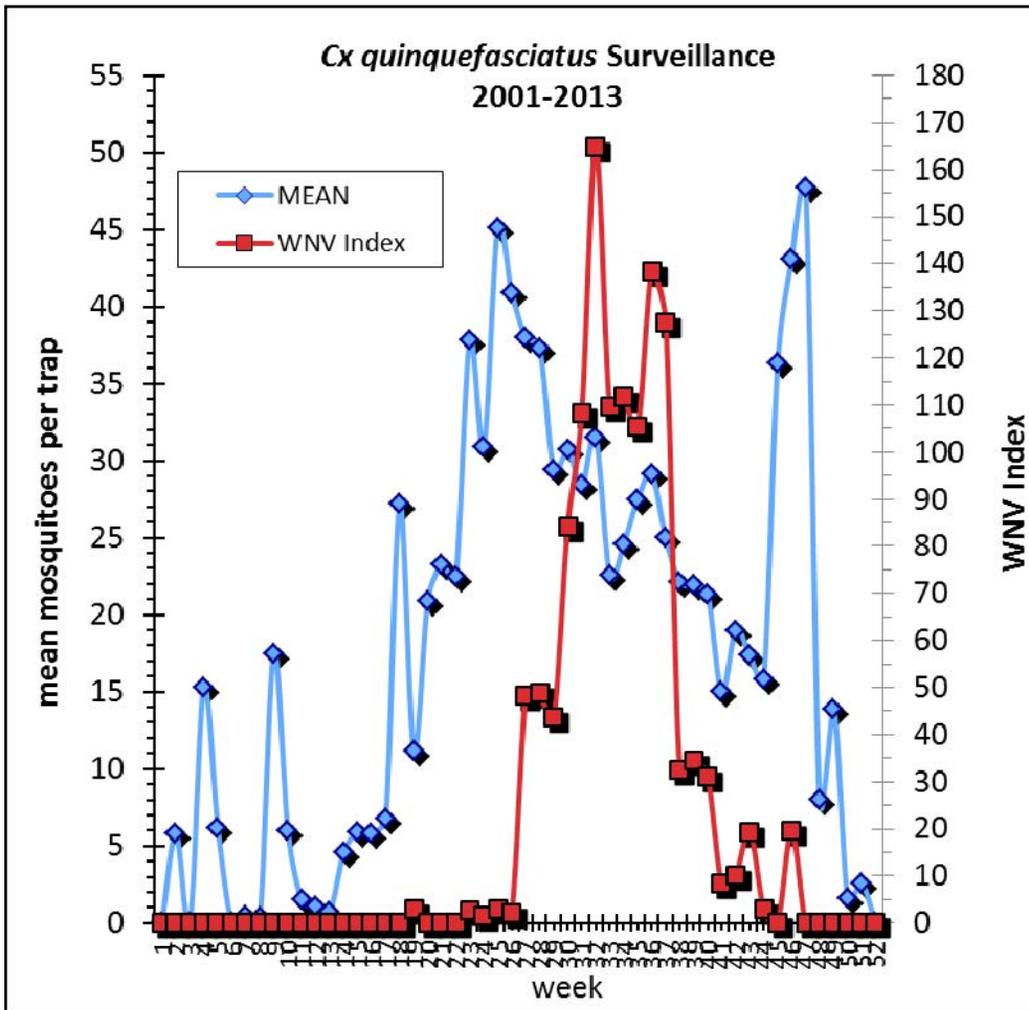
Not all of the mosquito pool results were reported to the GPH. Below are information about these pools.

Species	# NRA pools
<i>Ae. albopictus</i>	1
<i>An. quadrimaculatus</i>	1
<i>Cq. perturbans</i>	31
<i>Cs. melanura</i>	21
<i>Culex spp.</i>	101
<i>Cx. coronator</i>	2
<i>Cx. erraticus</i>	19
<i>Cx. nigripalpus</i>	166
<i>Cx. quinquefasciatus</i>	575
<i>Cx. restuans</i>	16
<i>Cx. salinarius</i>	17
<i>Oc. atlanticus</i>	9
<i>Oc. infirmatus</i>	3
<i>Oc. japonicus</i>	3
<i>Oc. taeniorhynchus</i>	2
<i>Oc. triseriatus</i>	4
Grand Total	971



County	# NRA pools
Chatham	523
DeKalb	44
Glynn	158
Liberty	39
Lowndes	207
No Results Available	
Month	# NRA pools
July	4
Aug	2
Sept	856
Oct	109



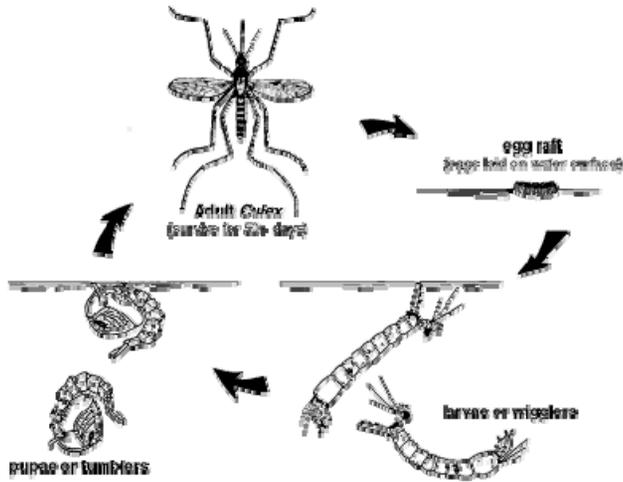


GA Arboviruses 2001-2013					
Virus	trap type				Total
	Unknown	CDC	Other	Gravid	
Bunyavirus		1			1
Cache Valley	6				6
EEE	1	13	1	4	19
Flanders	16	16		1157	1189
Flanders (variant)		2		45	47
HJV		5		4	9
HP				1	1
Keystone	2	1			3
LAC	1				1
Orbivirus			1		1
Potosi	2	3			5
South River virus	2				2
TENV		1			1
Unknown				1	1
WNV	227	20		1297	1544
Total	257	62	2	2509	2830

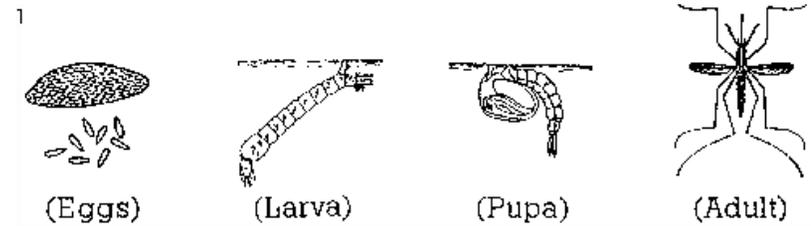
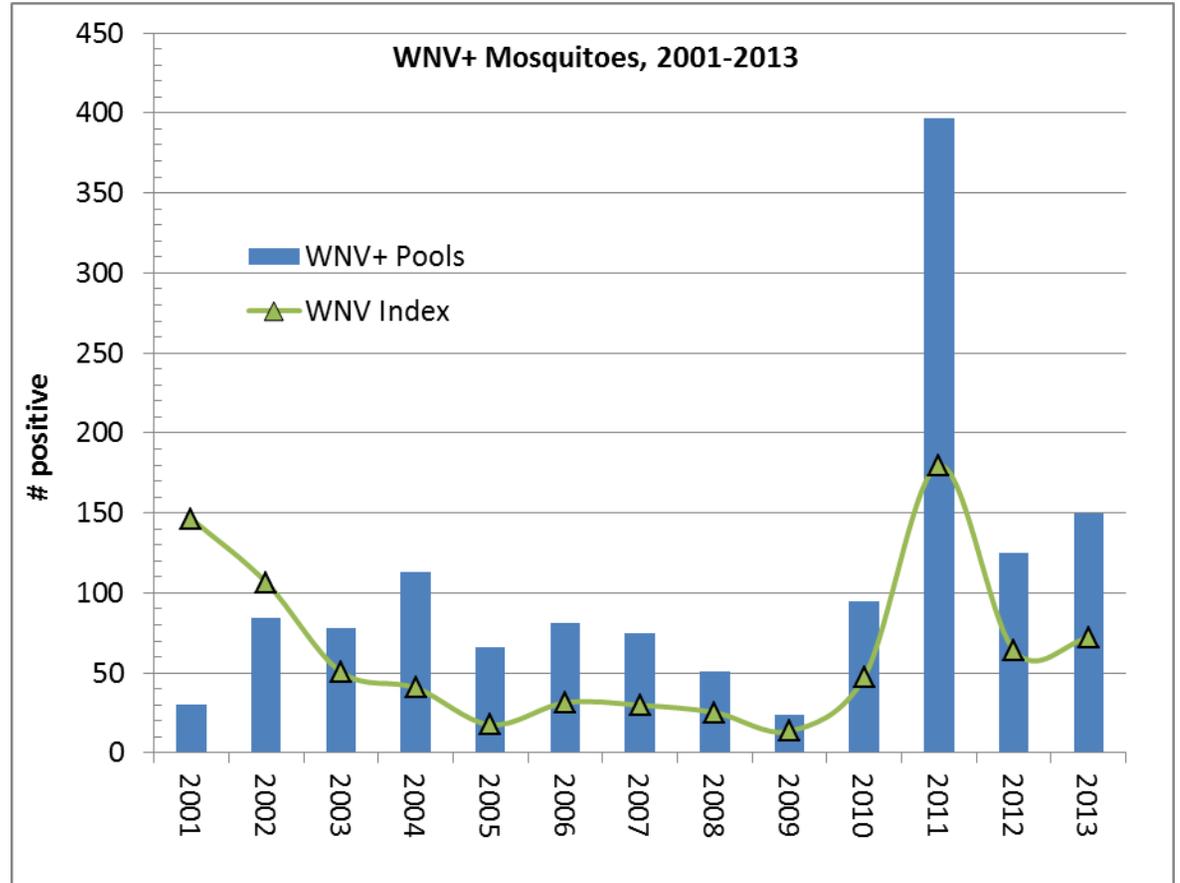
The Vector Index (VI) equals the MIR times the number of vectors per trap night . It is a Measure of infectivity that takes into account the following information:

- **Vector species composition** – Key species carrying West Nile virus in our region.
- **Vector species population density** – Vector abundance relative to trapping effort (vectors per trap night).
- **Vector species infection rate** – Proportion of vector population infected with WNV (MIR).

The VI is an objective method of following trends in mosquito infection rates, adjusted for mosquito abundance in the area.



year	WNV Index	WNV+ Pools
2001	146.3	30
2002	106.6	84
2003	50.7	78
2004	40.7	113
2005	17.7	66
2006	31.5	81
2007	29.9	75
2008	25.3	51
2009	13.7	24
2010	47.7	95
2011	179.6	397
2012	64.3	125
2013	72.0	150

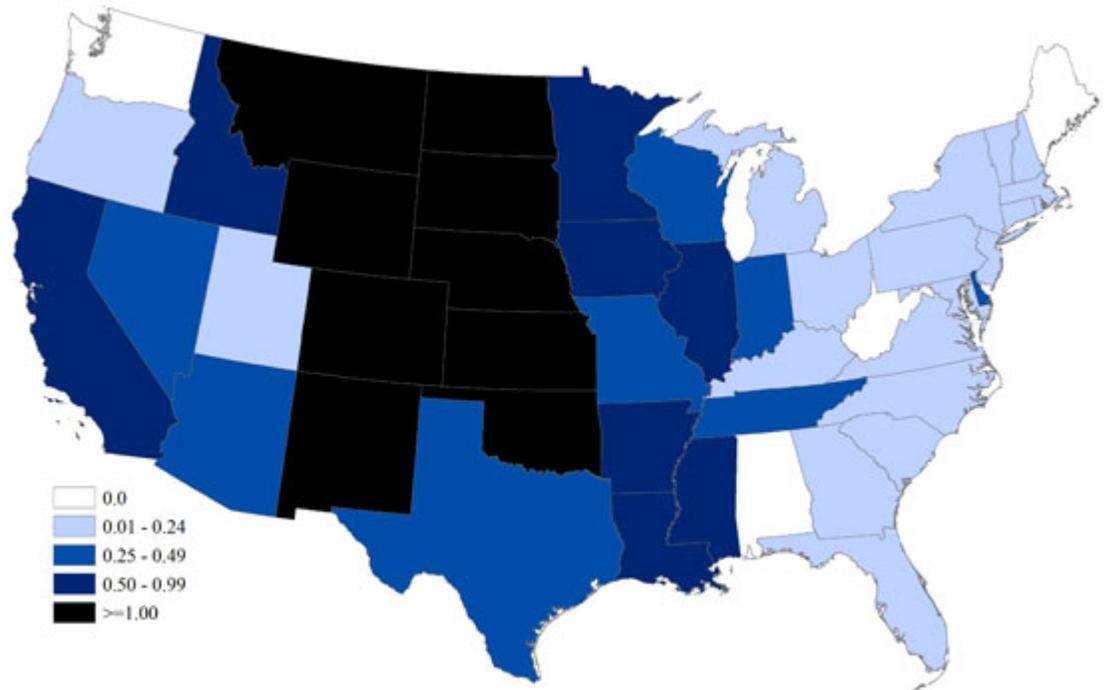


WNV Activity Map

This map shows the incidence of human West Nile virus neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2013 with shading ranging from 0.01–0.24, 0.25–0.49, 0.50–0.99, and greater than 1.00 per 100,000 population.

Neuroinvasive disease cases have been reported to ArboNET from the following states for 2013: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Wisconsin and Wyoming.

West Nile Virus Neuroinvasive Disease Incidence by State – United States, 2013 (as of January 7, 2014)



WNV activity (WNV human disease cases, presumptive viremic blood donors, veterinary disease cases, or infections in mosquitoes, birds, or sentinel animals) was reported from all states in the contiguous United States in 2013.

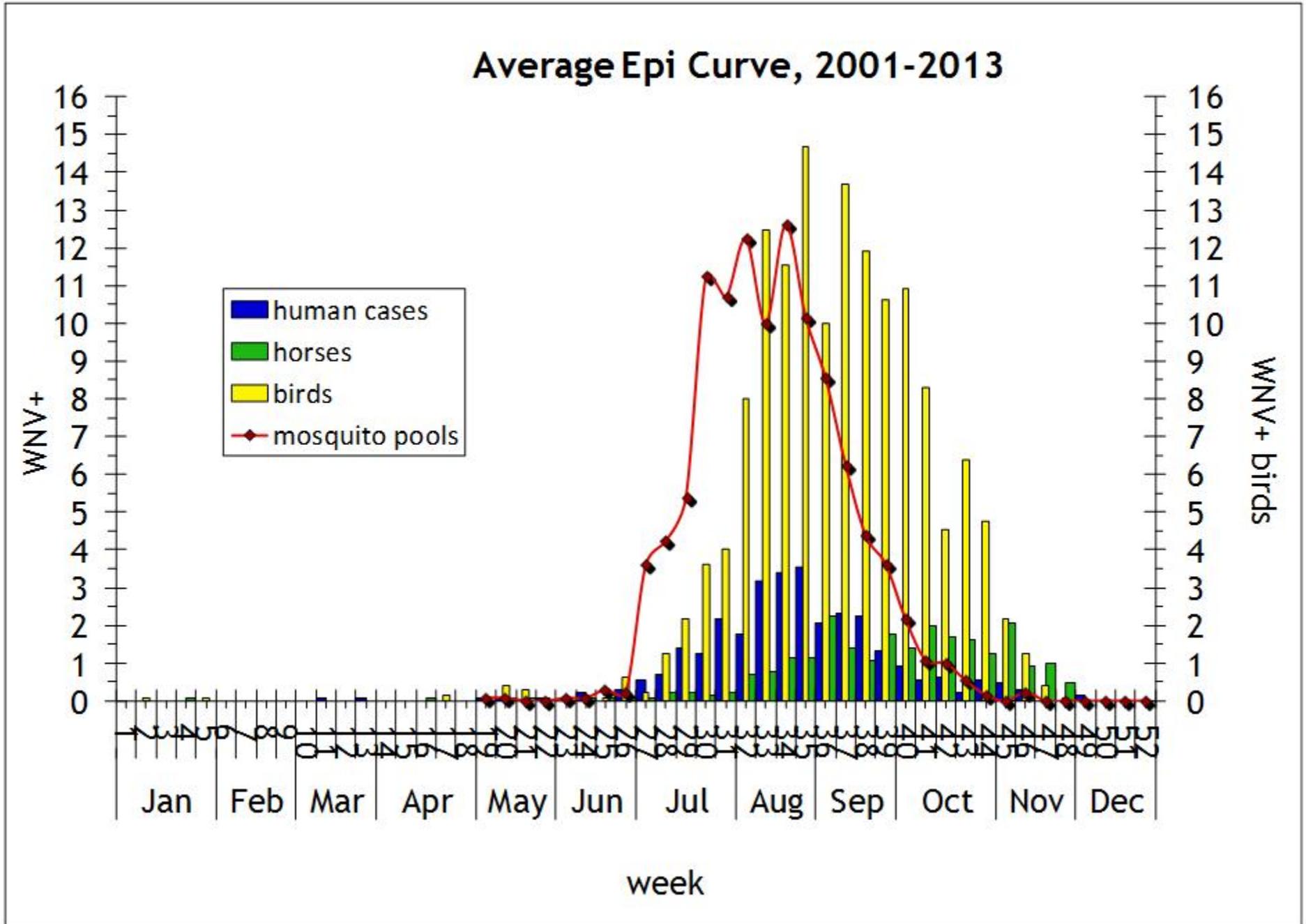
<http://www.cdc.gov/westnile/statsMaps/preliminaryMapsData/index.html>

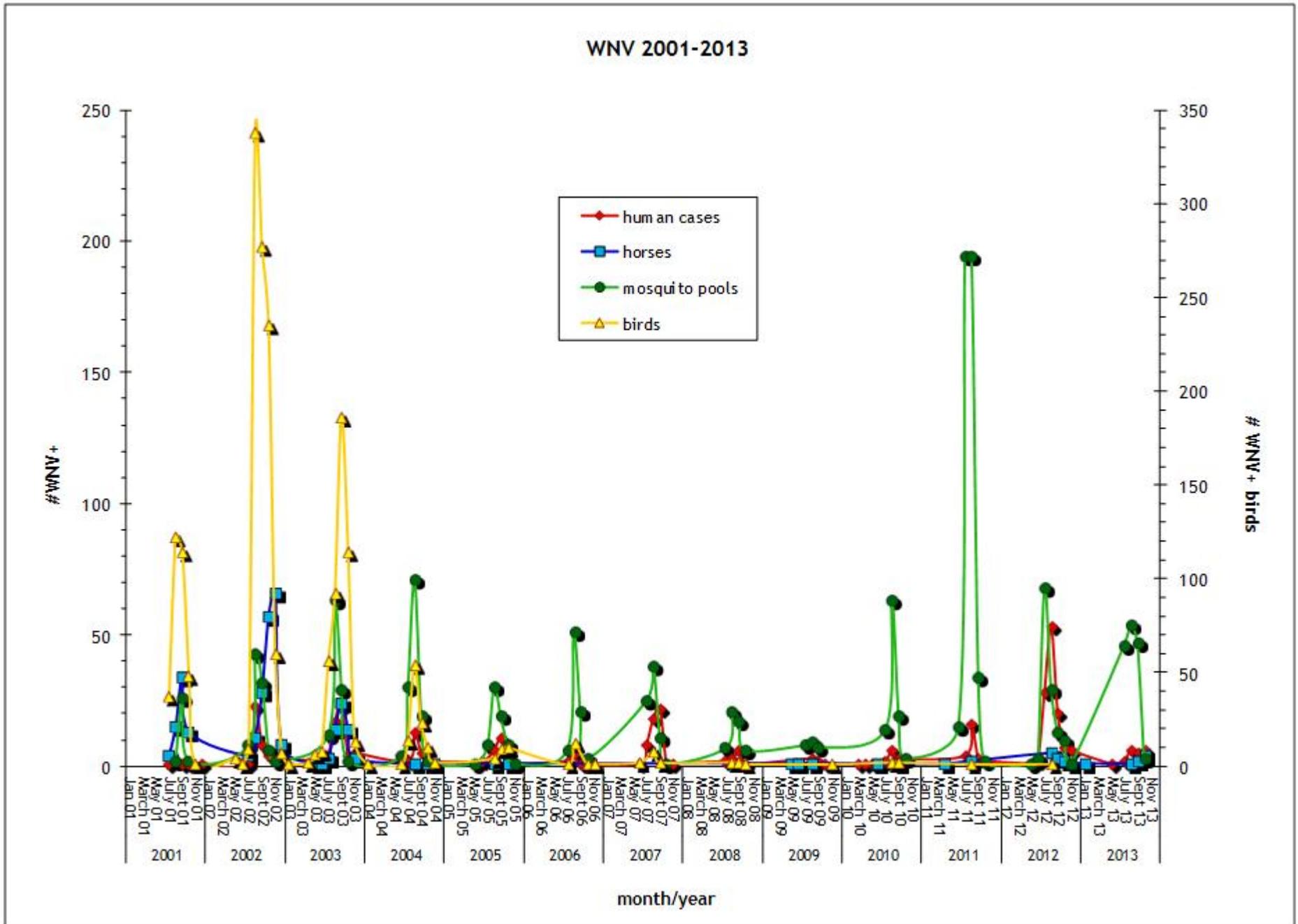


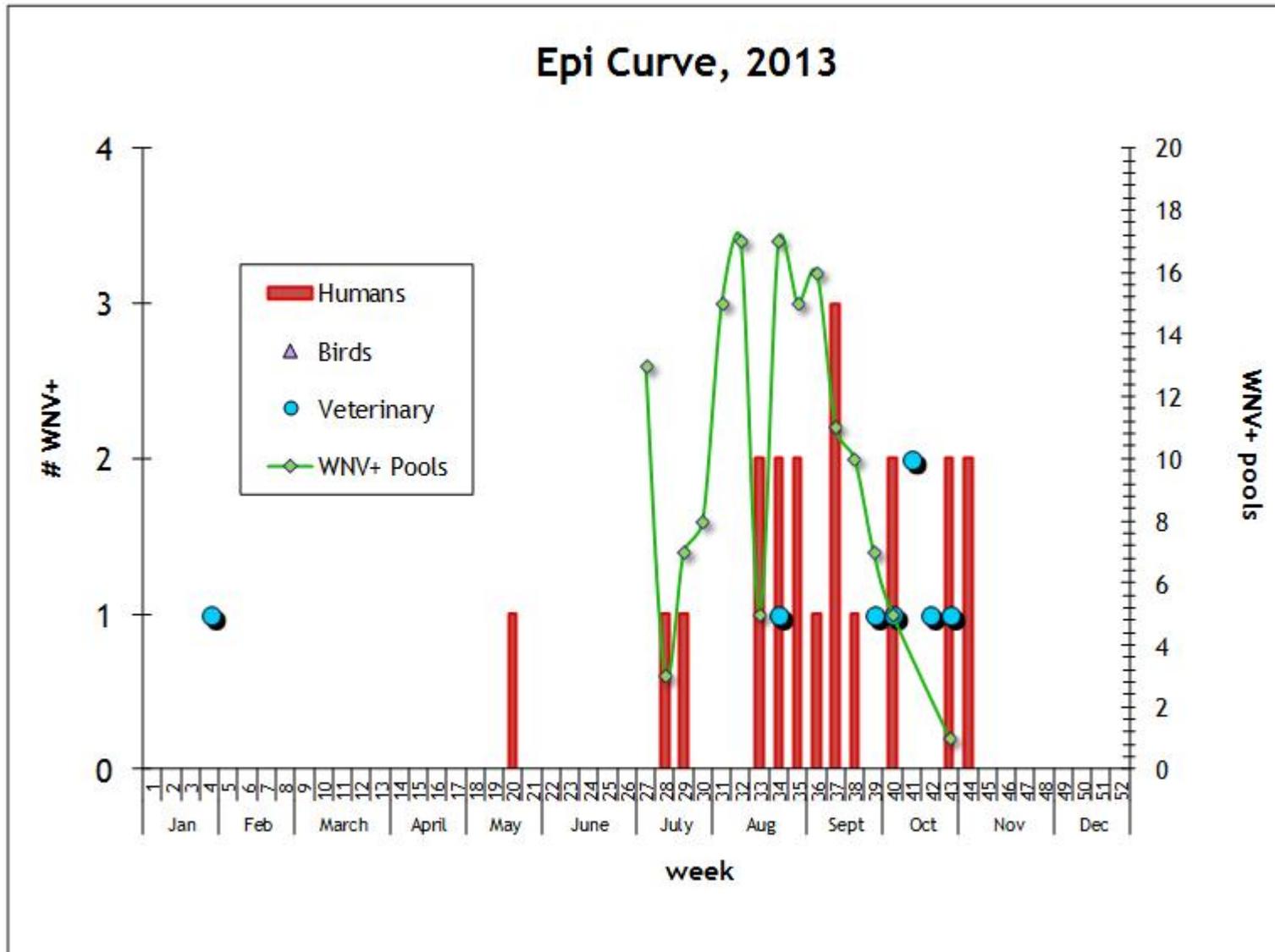
HELLO, COUNTY HEALTH DEPARTMENT?
I WANT TO REPORT ADVERSE
HEALTH EFFECTS FROM
THE MOSQUITO
SPRAYING.

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www.MeatstersNot.com







The epidemic curve (epi curve) shows the progression of an outbreak over time.

THANK YOU to the district and county public and environmental health employees, mosquito control workers, veterinarians, and healthcare providers who collected much of the data summarized in this document.

The GDPH Vector-Borne & Zoonotic Diseases Team

Julie Gabel, DVM
 Melissa Ivey
 (epidemiologist)
 Rosmarie Kelly
 (entomologist)

Constructing epidemic curves is a common and very important practice in epidemiology. Epidemic curves are used to monitor disease occurrence, to detect outbreaks, to generate hypotheses about the cause of an outbreak, to monitor the impact of intervention efforts, and to predict the course of an epidemic.