2016—Arbovirus Final Report

Summary of Human West Nile Virus and Other Arboviral Infections, Georgia 2016

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/mosquito-borne-viral-diseases. Summaries from 2002-2009 are available upon request.

In 2016, Georgia reported 7 cases of WNV and 6 WNV presumptive viremic blood donors (PVD), with no deaths. Five (%) of the 7 cases experienced WNV neurologic illness (altered mental status, paralysis, encephalitis, GBS and/or meningitis) and 2 (%) were diagnosed with WNV fever. The average age of cases was 69.4 years (range 34-85). The average age of those with WNV neurologic illness was 79.6 years (range 79-85). All (100%) of the 7 cases were male. The majority of cases were reported in August.

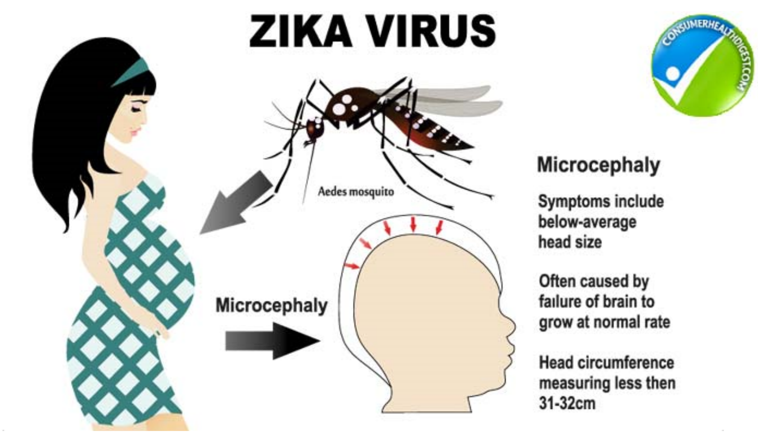
There was also one case of Eastern Equine Encephalitis (EEE) reported from south Georgia in July. No cases of LaCrosse Encephalitis (LAC) were reported in 2016.

The first travel-associated case of Zika was reported in Georgia in December 2015. In 2016, there were a total of 113 travel-associated cases confirmed in Georgia. To date there have been no locally transmitted (mosquito to human) cases of Zika. In 2016, the majority of Zika cases were reported in summer (June – August), which coincides with typical summer vacation travels.

Travel-associated Dengue and Chikungunya cases continue to be reported no locally-acquired cases were reported. Georgia’s first case of travel-associated Ross River virus was also reported in 2016.

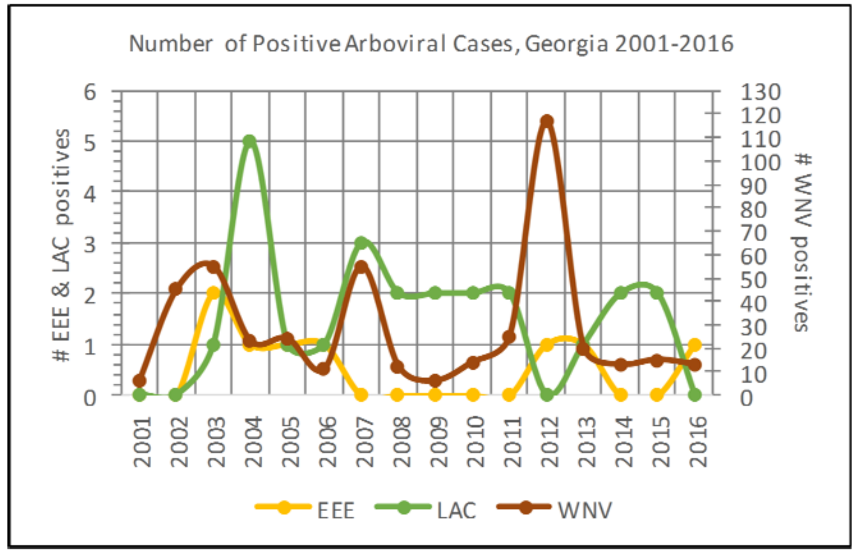
WNV & PVD Cases by County, 2016

County	**Count**
Burke	2
Clarke	1, 2 PVD
Cobb	2 PVD
Cook	1 PVD
DeKalb	1
Douglas	1
Fulton	1
Houston	1 PVD
Muscogee	1



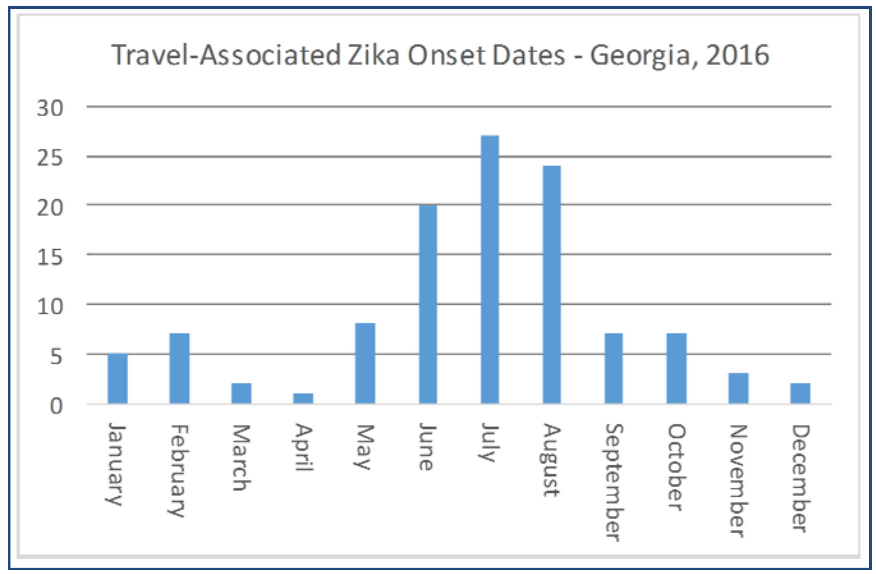
Age Ranges, WNV 2016

Age Range	PVD	Non-neuroinvasive	Neuroinvasive	total
0-10	0	0	0	0
11-20	1	0	0	1
21-30	3	0	0	3
31-40	0	1	0	1
41-50	0	0	0	0
51-60	0	1	0	1
61-70	2	0	1	3
71-80	0	0	3	3
>80	0	0	1	1
Total	6	2	5	13



Clinical Syndromes, Endemic Arboviruses, 2016

Arbovirus	Month of Onset	County of Residence	Clinical Syndrome	Fatality
Eastern Equine Encephalitis	July	Lowndes	Encephalitis	N
West Nile Virus	April	Cobb	Fever	N
	May	Cobb	Asymptomatic	N
	July	Clarke	Fever	N
	August	Clarke	Asymptomatic	N
		Clarke	Asymptomatic	N
		Cook	Asymptomatic	N
		Douglas	Meningitis	N
		Houston	Asymptomatic	N
	September	DeKalb	Encephalitis	N
		Muscogee	Other	N
	October	Burke	Encephalitis	N
		Burke	Encephalitis	N
	December	Fulton	Fever	N



Clinical Syndromes, Exotic Arboviruses, 2016				
Arbovirus	**Month of Onset**	**County of Residence**	**Clinical Syndrome**	**Fatality**
Chikungunya	April	Cobb	Fever	N
Dengue	January	Cobb	Fever	N
		Fulton	Fever	N
		Fulton	Fever	N
	February	Clayton	Asymptomatic	N
		Gwinnett	Asymptomatic	N
	March	Cobb	Asymptomatic	N
		Fulton	Fever	N
		Fulton	Fever	N
	April	Fulton	Fever	N
		Oconee	Fever	N
	May	Chatham	Fever	N
		Chatham	Fever	N
		Cobb	Fever	N
		Cobb	Fever	N
		Muscogee	Fever	N
	June	Gwinnett	Fever	N
		Tift	Asymptomatic	N
	July	Clayton	Fever	N
		Gwinnett	Fever	N
		Hall	Asymptomatic	N
	August	Coweta	Fever	N
		Forsyth	Fever	N
		Fulton	Asymptomatic	N
		Lowndes	Fever	N
	September	DeKalb	Fever	N
		DeKalb	Fever	N
		Fulton	Fever	N
	October	Gwinnett	Fever	N
Ross River	November	Fulton	Fever	N

Clinical Syndromes ZIKV, 2016	
Clinical Syndrome	**Count**
Asymptomatic	5
Congenital Infection	1
Febrile illness	69
Other Clinical	38

Travel-Associated Zika Onset Dates - Georgia, 2016	
January	5
February	7
March	2
April	1
May	8
June	20
July	27
August	24
September	7
October	7
November	3
December	2
*Note - all cases of Zika were travel associated.	

Zika virus was first discovered in 1947 and is named after the Zika Forest in Uganda. In 1952, the first human cases of Zika were detected. Before 2007, at least 14 cases of Zika had been documented, although other cases were likely to have occurred and were not reported. In May 2015, the Pan American Health Organization (PAHO) issued an alert regarding the first confirmed Zika virus infection in Brazil and on Feb 1, 2016, the World Health Organization (WHO) declared Zika virus a public health emergency of international concern (PHEIC). Since then, outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands.

Zika virus is transmitted to people primarily through the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*). These are the same mosquitoes that spread dengue and chikungunya viruses.

https://www.cdc.gov/zika/index.html

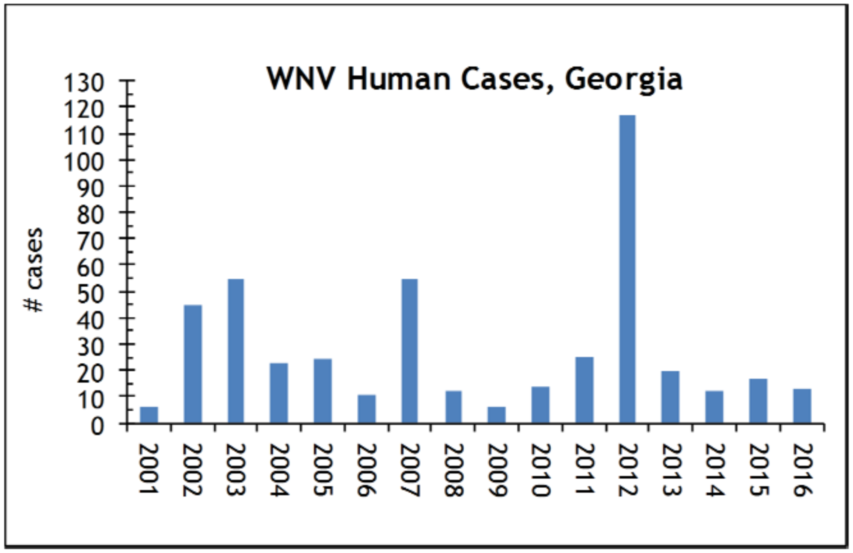
If you have questions or comments, please contact Amanda Feldpausch, MPH, Zika Epidemiology Team Lead/ZVBD Epidemiologist (404-657-2604 or Amanda.Feldpausch@dph.ga.gov) or Shawna Feinman, MPH, Human Arboviral Epidemiologist (404-657-6442 or Shawna.Feinman@dph.ga.gov) at the Georgia Department of Public Health.

TRAVEL-ASSOCIATED CASES

ZIKV - Country of Origin			
Virus	**Country of Origin**	**# cases**	**Month of Onset**
ZIKV	ANTIGUA AND BARBUDA	1	Nov
ZIKV	BAHAMAS	1	Oct
ZIKV	BARBADOS	2	Jan, Oct
ZIKV	BELIZE	1	Aug
ZIKV	BRAZIL	4	Jan, Feb, April, May
ZIKV	COLOMBIA	4	Jan, Feb, June
ZIKV	COSTA RICA	1	Aug
ZIKV	CURACAO	1	Dec
ZIKV	DOMINICA	1	July
ZIKV	DOMINICAN REPUBLIC	9	May, June, July, Aug, Sept
ZIKV	GRENADA	1	Aug
ZIKV	GUATEMALA	4	July, Aug, Sept
ZIKV	GUYANA	1	June
ZIKV	HAITI	5	Feb, May, July
ZIKV	HONDURAS	6	March, May, July, Aug
ZIKV	JAMAICA	21	June, July, Aug
ZIKV	MEXICO	13	March, June, July, Aug, Sept, Oct
ZIKV	NICARAGUA	3	July, Aug
ZIKV	PHILIPPINES	1	Aug
ZIKV	SAINT LUCIA	1	Sept
ZIKV	SAINT MARTIN (FRENCH PART)	1	Aug
ZIKV	SAINT VINCENT AND THE GRENADINES	1	June
ZIKV	SAINT VINCENT AND THE GRENADINES, BARBADOS	1	Aug
ZIKV	ST. MARTIN, ST. BARTHE-LEMY, ANTIGUILLA	1	May
ZIKV	TRINIDAD AND TOBAGO	6	July, Aug
ZIKV	VENEZUELA	2	Jan, June

Confirmed travel-related cases of Zika in Georgia, and the possibility of local, autochthonous transmission, demonstrate the need to develop a response plan with specific actions to keep Georgians safe by preventing or mitigating the transmission of Zika.

The Georgia Department of Public Health Zika Virus Preparedness and Response Concept of Operations Plan provides a comprehensive framework for preventing, protecting, and mitigating the local spread of Zika virus disease in Georgia. It addresses the roles and responsibilities of various government agencies and organizations as identified in the Georgia Emergency Operations Plan (http://www.gema.ga.gov/Plan%20Library/GEOP%20-%20Base%20Plan%20(2015).pdf) under ESF #8 (Public Health & Medical), and ensures consistency with current policy guidance such as the National Incident Management System (https://www.fema.gov/national-incident-management-system, NIMS), National Response Framework (https://www.fema.gov/national-response-framework, NRF) for response operations, and the utilization of the Comprehensive Preparedness Guide 101, Version 2 (https://www.fema.gov/media-library-data/20130726-1828-25045-0014/cpg_101_comprehensive_preparedness_guide_developing_and_maintaining_emergency_operations_plans_2010.pdf). The plan will continue to evolve, responding to lessons learned from actual experiences, ongoing planning efforts, training and exercise activities, and Federal guidance.



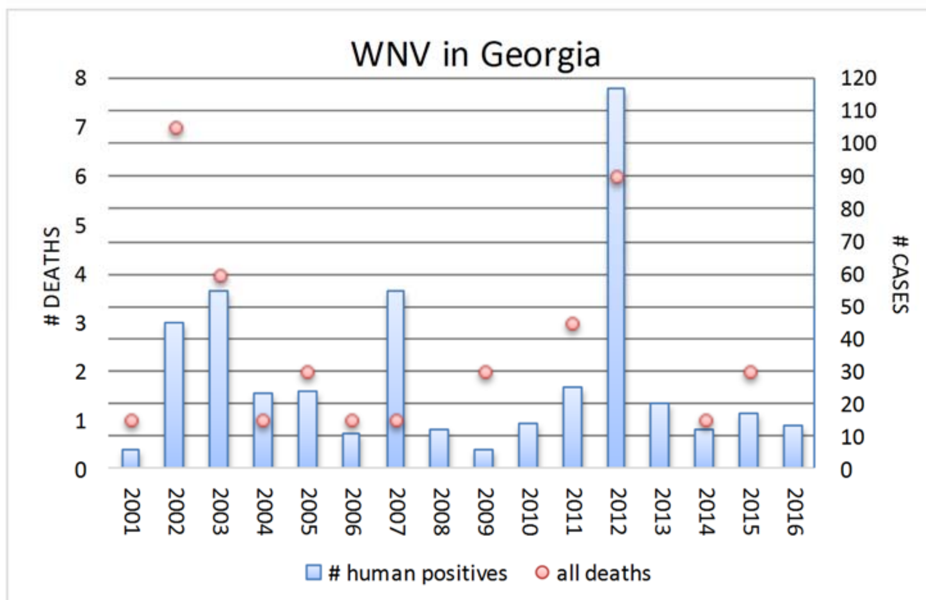
Year	EEE	LAC	WNV
2001			6
2002			45
2003	2	1	55
2004	1	5	23
2005	1	1	24
2006	1	1	11
2007		3	55
2008		2	12
2009		2	6
2010		2	14
2011		2	25
2012	1		117
2013	1	1	20
2014		2	12
2015		2	17
2016	1		13
Grand Total	**8**	**24**	**455**

Emerging & Reemerging Infectious Diseases

Two major categories of emerging infections—newly emerging and reemerging infectious diseases—can be defined, respectively, as diseases that are recognized in the human host for the first time; and diseases that historically have infected humans, but continue to appear in new locations or in drug-resistant forms, or that reappear after apparent control or elimination.

A high proportion of arboviruses associated with human and animal disease circulate in tropical, and subtropical regions, where mosquitoes, and other flying insects, tend to be abundant. However, many arboviruses also circulate amongst wildlife species in temperate regions of the world.

More than 100 species of arbovirus that cause human/animal or zoonotic diseases have been identified. Four virus families, *Togaviridae, Bunyaviridae, Flaviviridae,* and *Reoviridae*, contain most of the arboviruses that cause human/animal diseases. Many cause a large social and economic burden.



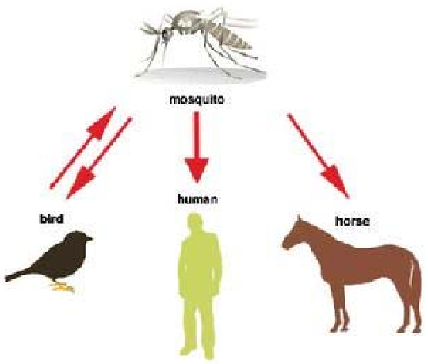
Veterinary Data

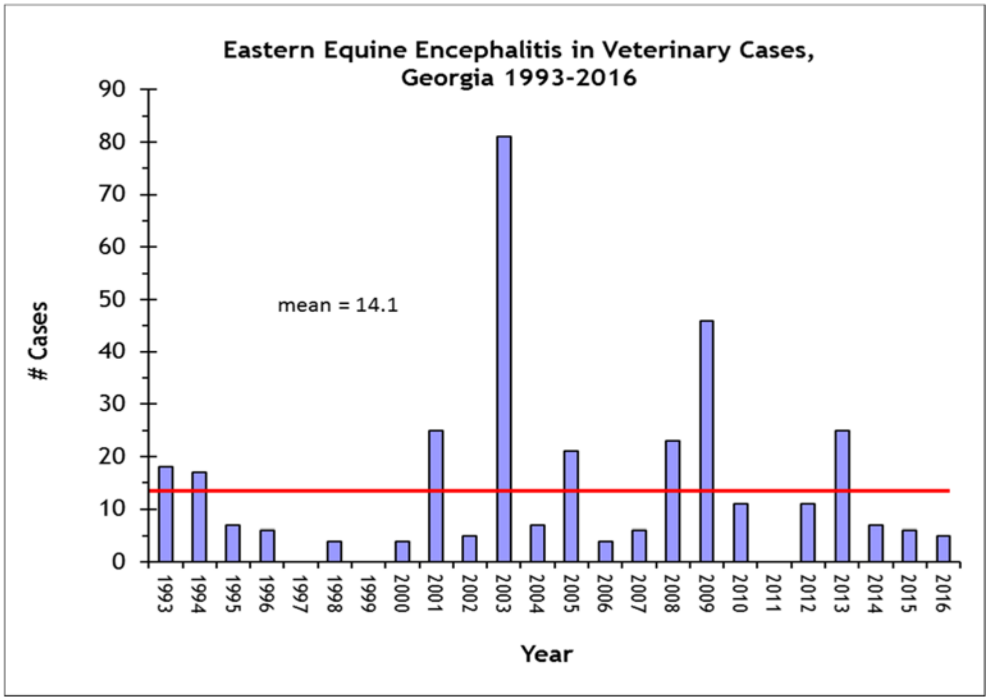
No horses tested positive for WNV in 2016. The number of reported cases of WNV in horses decreased rapidly after 2002, likely due to increased immunity, increased vaccination, and/or decreased testing, but had lately begun to increase again.

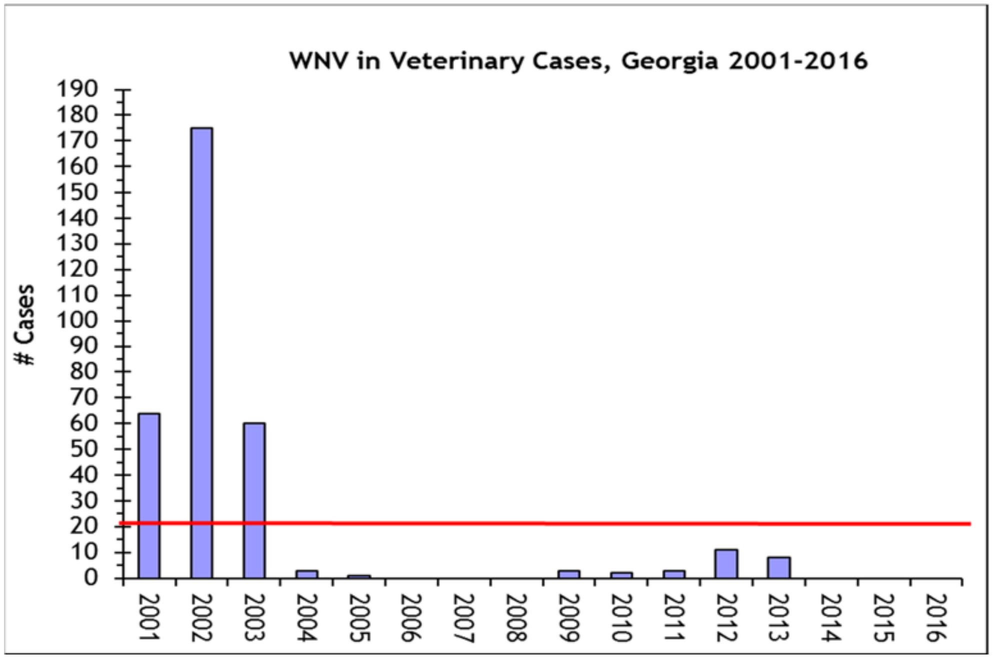
Five horses tested positive for EEE in 2016. Eastern equine encephalitis is endemic in the Coastal and Coastal Plains areas of Georgia. During an average year, four or five EEE+ horses are reported from these areas. The true number of horse cases is probably higher, and lack of reporting is due primarily to under-testing, although subclinical infections can occur with EEE.

Vaccinating at the proper time of the year against Eastern equine encephalitis (EEE) is critical to protecting horses from the often-fatal mosquito-borne disease.

	Vaccination Status			
County	**unknown**	**unvaccinated**	**owner**	**Grand Total**
Colquitt	1			1
Effingham	1			1
Lowndes		1		1
Pierce			1	1
Worth		1		1
Grand Total	**2**	**2**	**1**	**5**



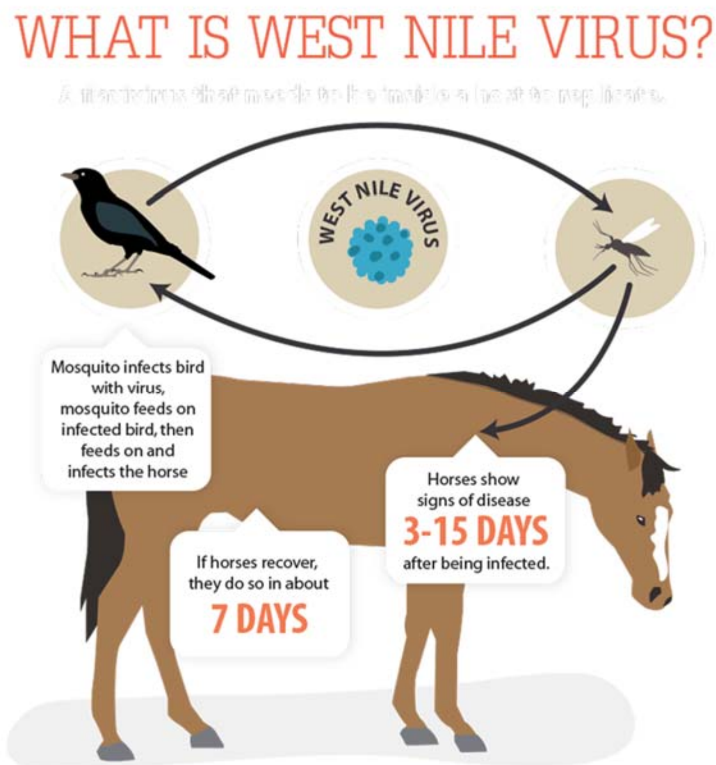




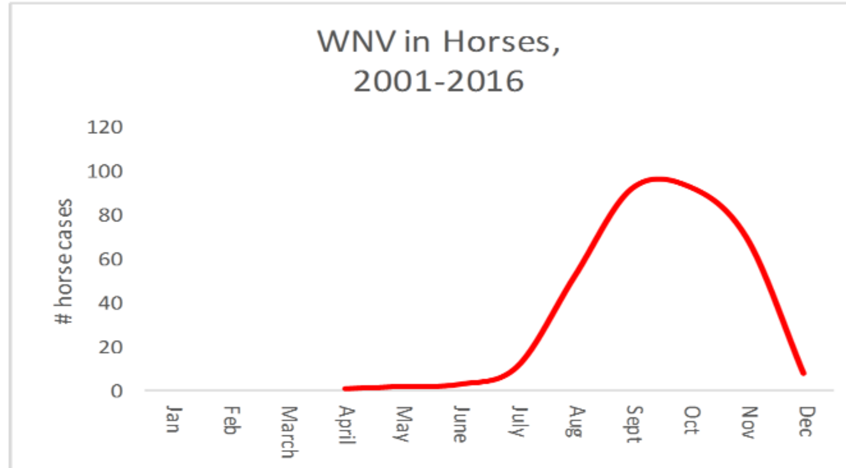
A horse with West Nile virus or EEE will display some of the following symptoms:

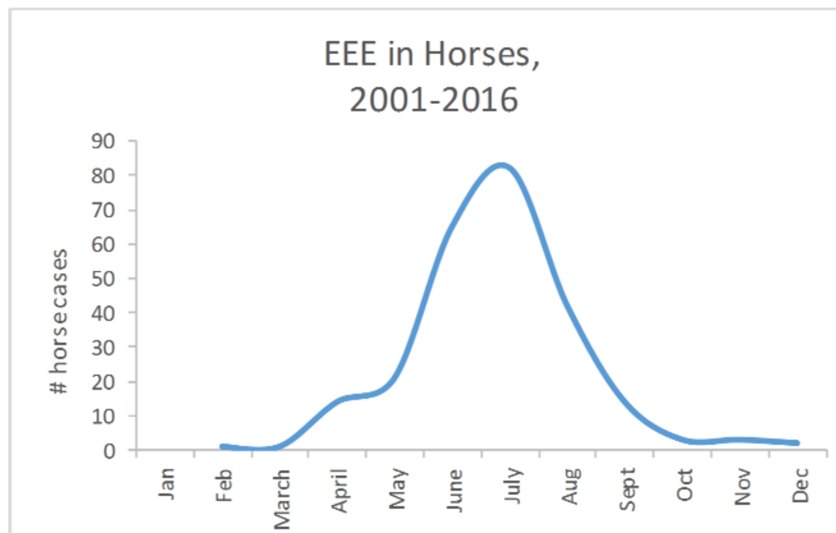
General loss of appetite
Hind limb weakness
Fever
Impaired vision
Walking in circles
Inability to swallow
Coma

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%.

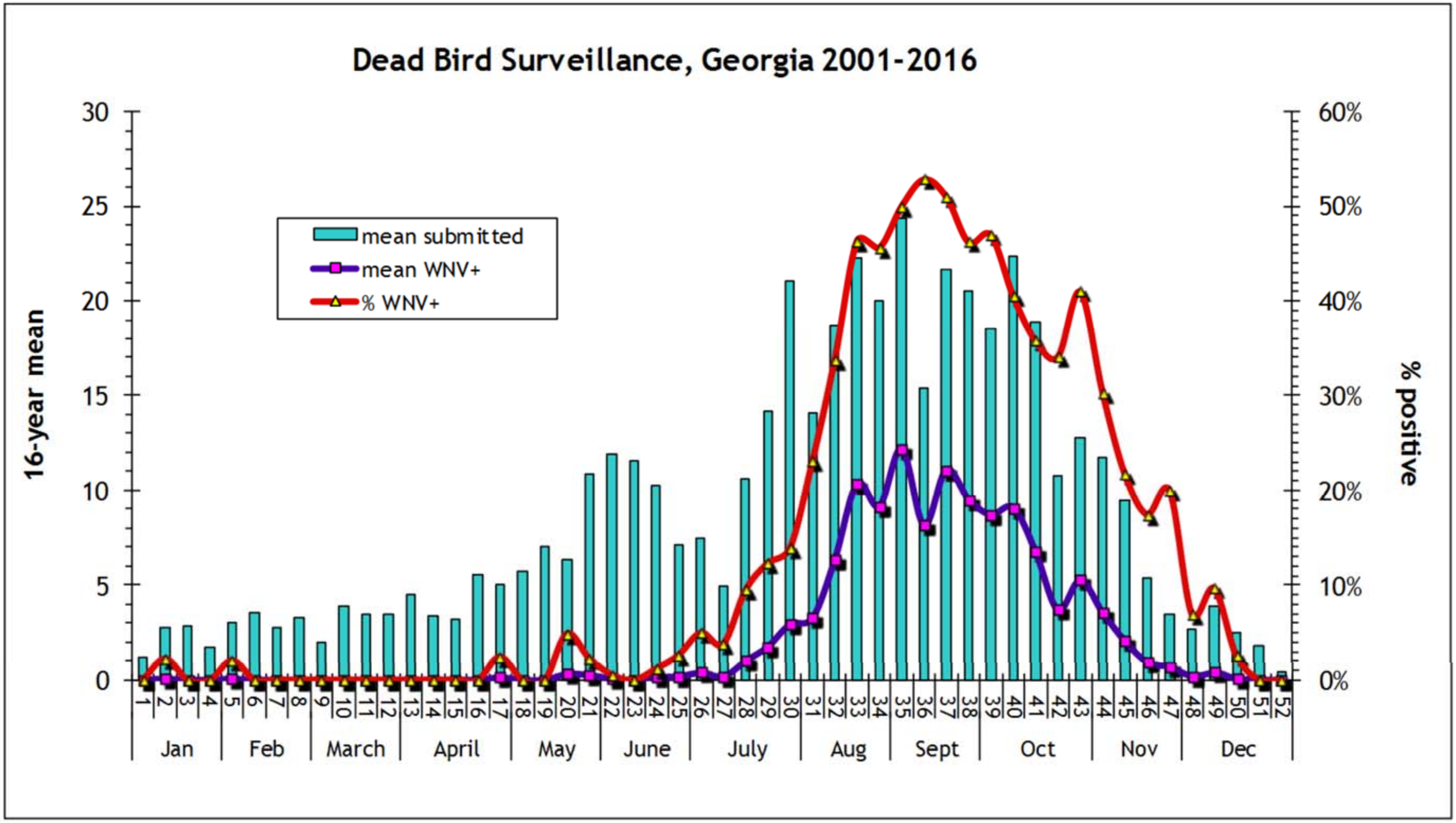




Dead Bird Surveillance

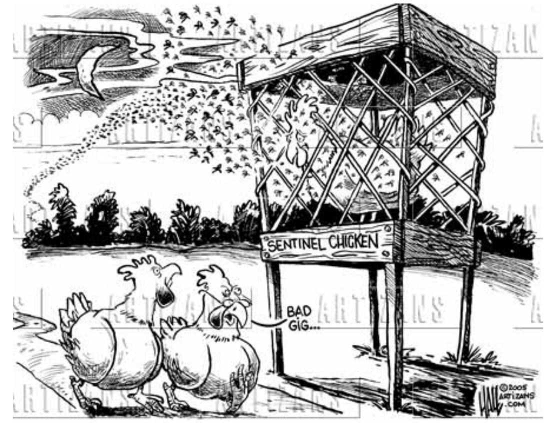
As of 2012, federal funding was no longer available to test birds, and no birds have been reported as submitted for testing since 2013.

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.



In addition to dead bird testing, the Chatham County Mosquito Control Program also sets out sentinel chickens for EEE surveillance.

This information is used by the program to focus mosquito control efforts on EEE risk reduction in the county.



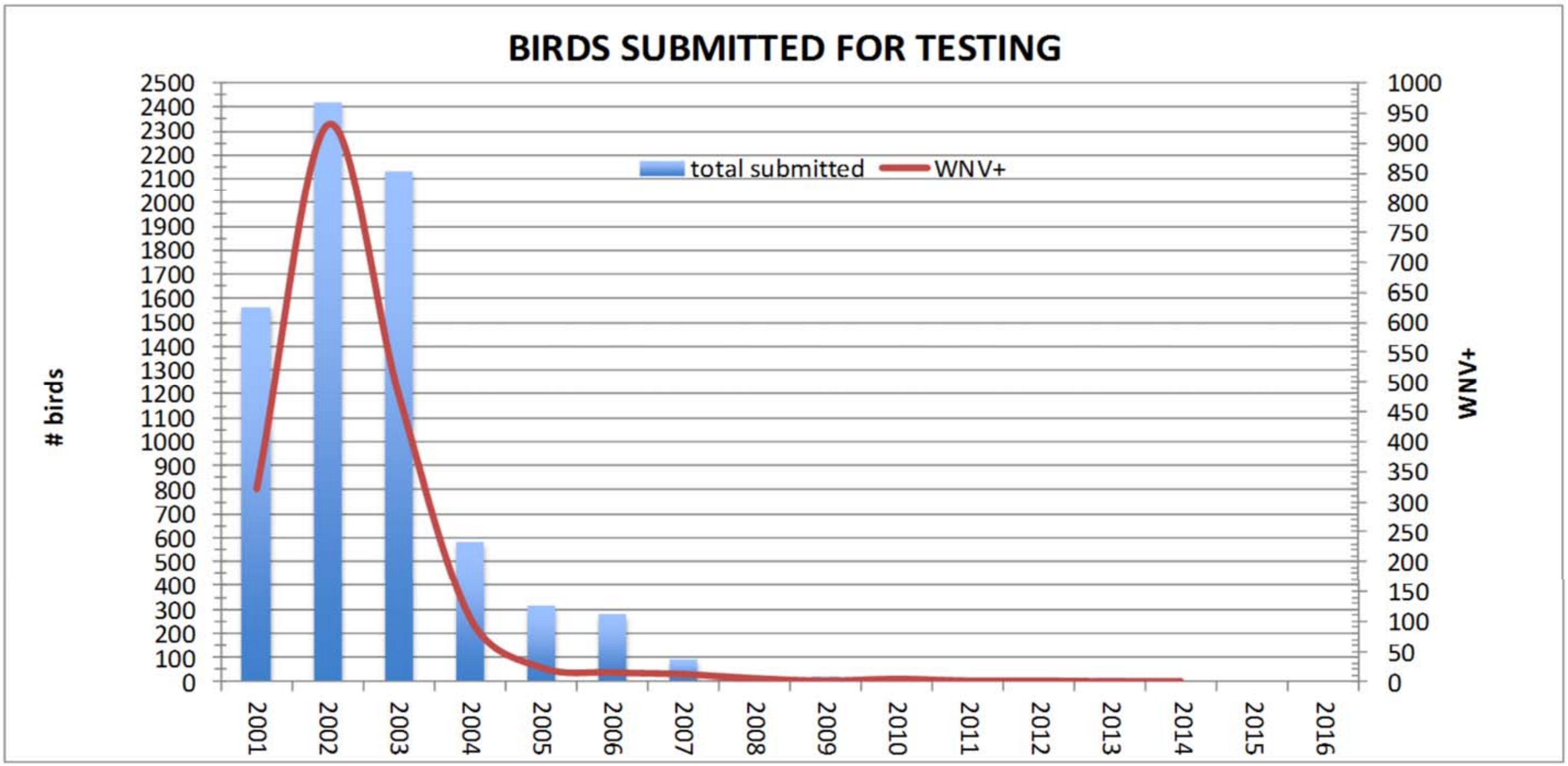
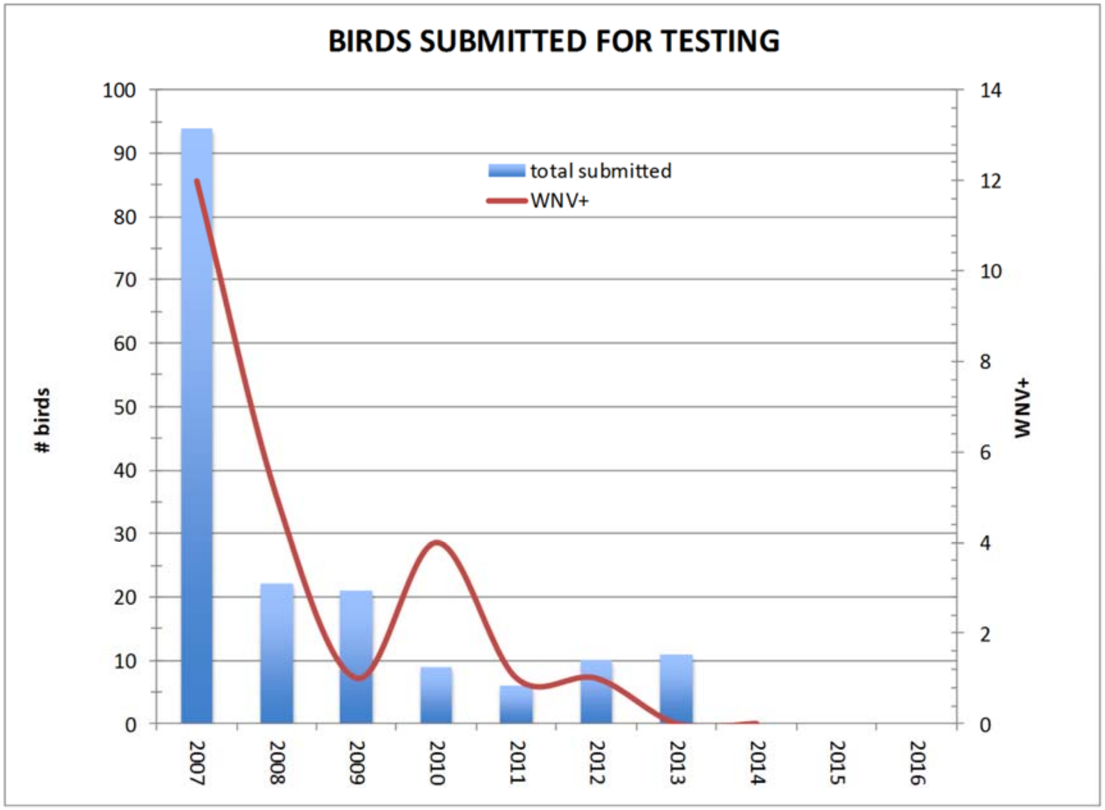
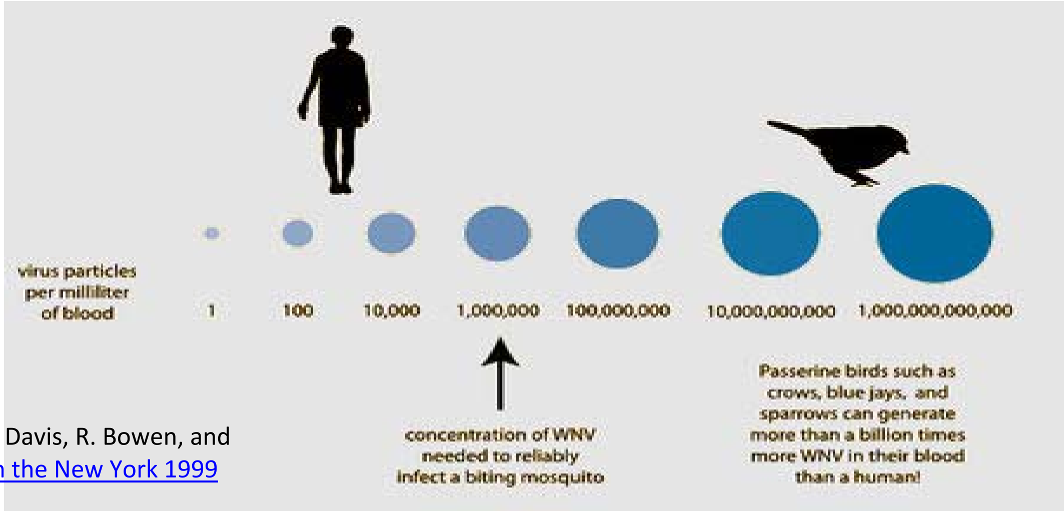


Table of West Nile Virus host competency of 23 species of birds. A larger index number correlates to higher amounts of viral load in concurrence with long durations of viremia. Data adapted from Komar et al. 2003.

Species	Reservoir Competence Index
Blue Jay	2.55
Common Grackle	2.04
House Finch	1.76
American Crow	1.62
House Sparrow	1.59
Ring-billed Gull	1.26
Black-billed Magpie	1.08
American Robin	1.08
Red-winged Blackbird	0.99
American Kestrel	0.93
Great Horned Owl	0.88
Killdeer	0.87
Fish Crow	0.73
Mallard	0.48
European Starling	0.22
Mourning Dove	0.19
Northern Flicker	0.06
Canada Goose	0.03
Rock Dove	0
American Coot	0
Ring-necked Pheasant	0
Monk Parakeet	0





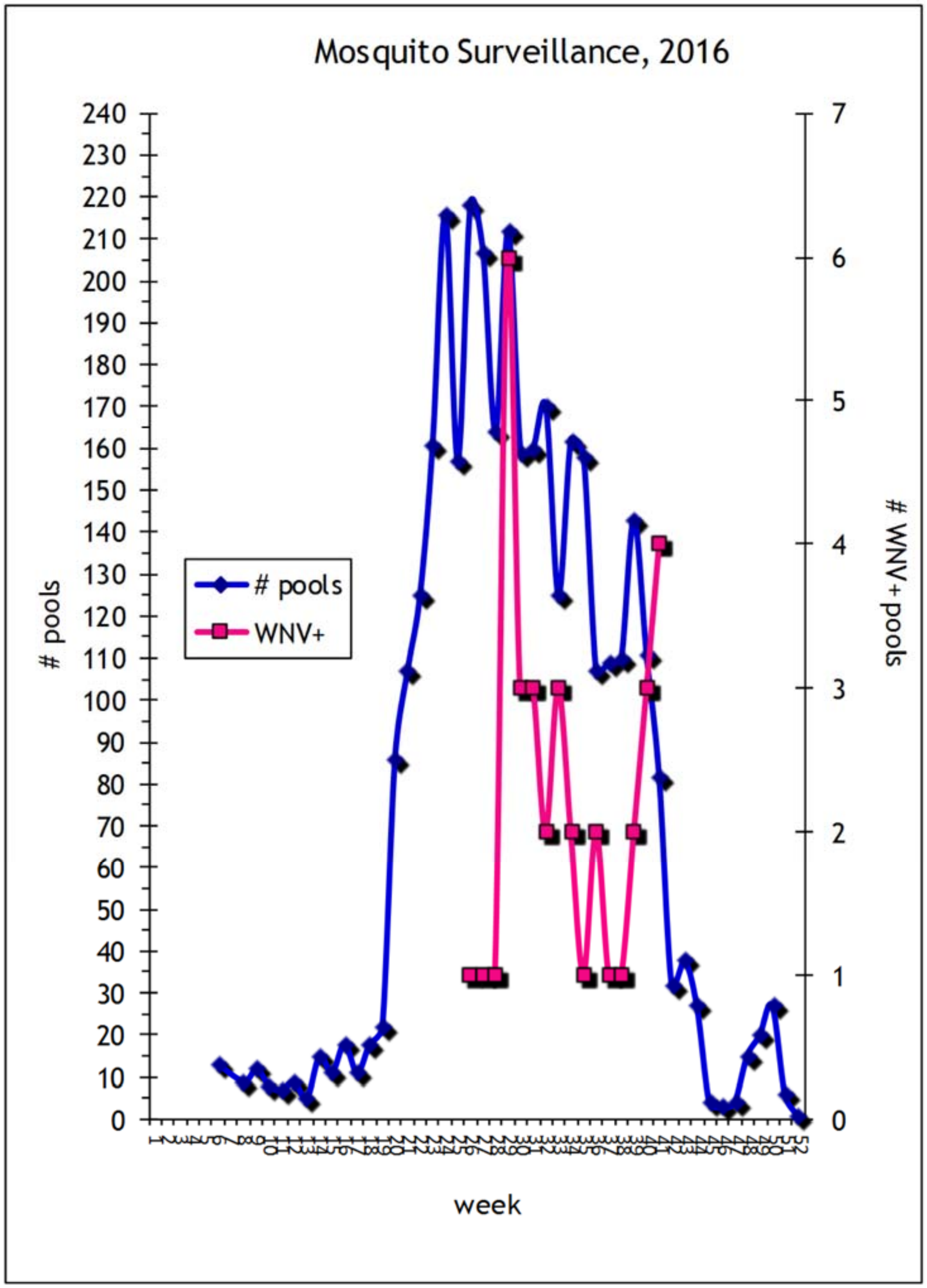
Komar, N., S. Langevin, S. Hinten, N. Nemeth, E. Edwards, D. Hettler, B. Davis, R. Bowen, and M. Bunning. 2003. Experimental Infection of North American Birds with the New York 1999 Strain of West Nile Virus. Emerging Infectious Diseases 9(3): 311-322.

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, or other labs, for testing continued doing mosquito surveillance and shared some of the test results with the GDPH; 4 counties sent mosquitoes to SCWDS for testing in 2016. Fulton County had their mosquito pools tested at the Fairfax County Health Department laboratory in Virginia. Glynn County also sent mosquitoes to an outside lab. Unfortunately, data submitted to the GDPH are likely to be incomplete, making data analysis difficult and results suspect.

A total of 5620 pools of mosquitoes (113376 individuals) were sent for testing with results reported to the GDPH. Two species were found to be WNV+, *Culex quinquefasciatus* (35 pools) and *Aedes albopictus* (1 pool). No other viruses were reported from mosquito pools in 2016.

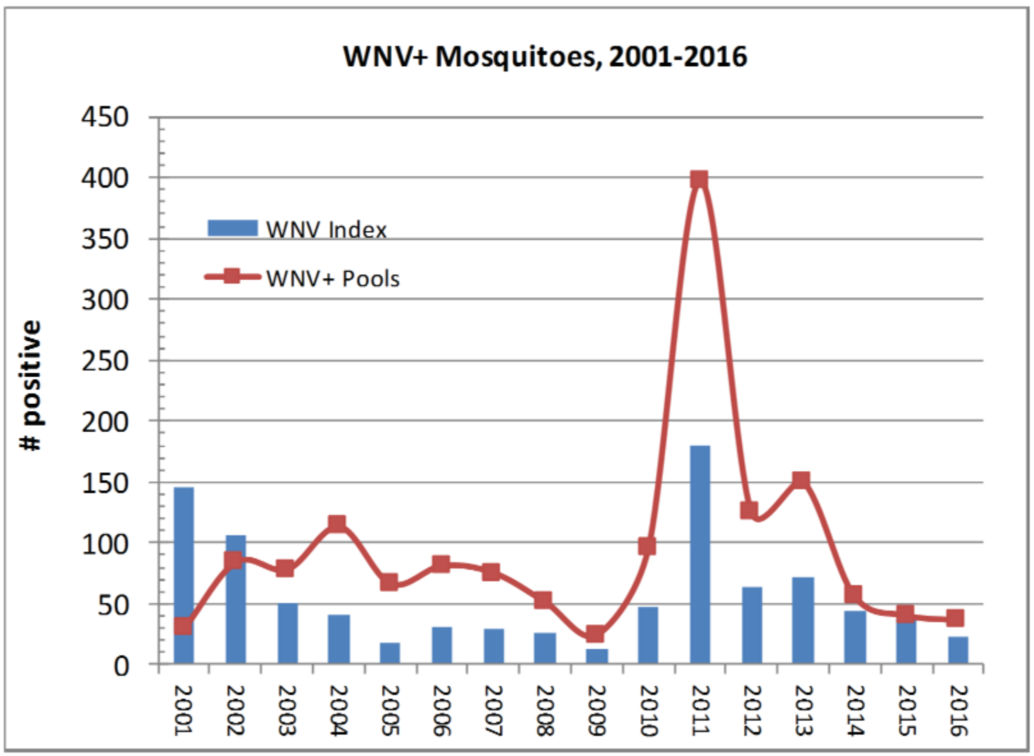
County	# mosquitoes submitted	# WNV+ pools	MIR
Chatham	53005		
DeKalb	9847	31	3.15
Fulton	2931	5	1.71
Glynn	22439		
Lowndes	24944		
Richmond	210		



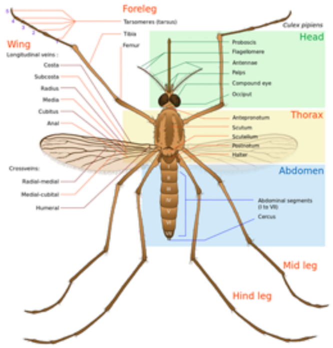
The first WNV+ mosquitoes were detected in DeKalb County in late June. The last WNV+ pools were collected in DeKalb and Fulton counties in early October. Peaks in numbers of WNV+ pools occurred in July and August. All but one of the WNV+ mosquitoes were caught in gravid traps.

The Minimum Infection Rate or MIR = (# WNV+ Pools/Total # Mosquitoes Tested) X 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 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 monthly MIR for Georgia in 2016 ranged from 0.76 to 12.1, with an average of 6.2.

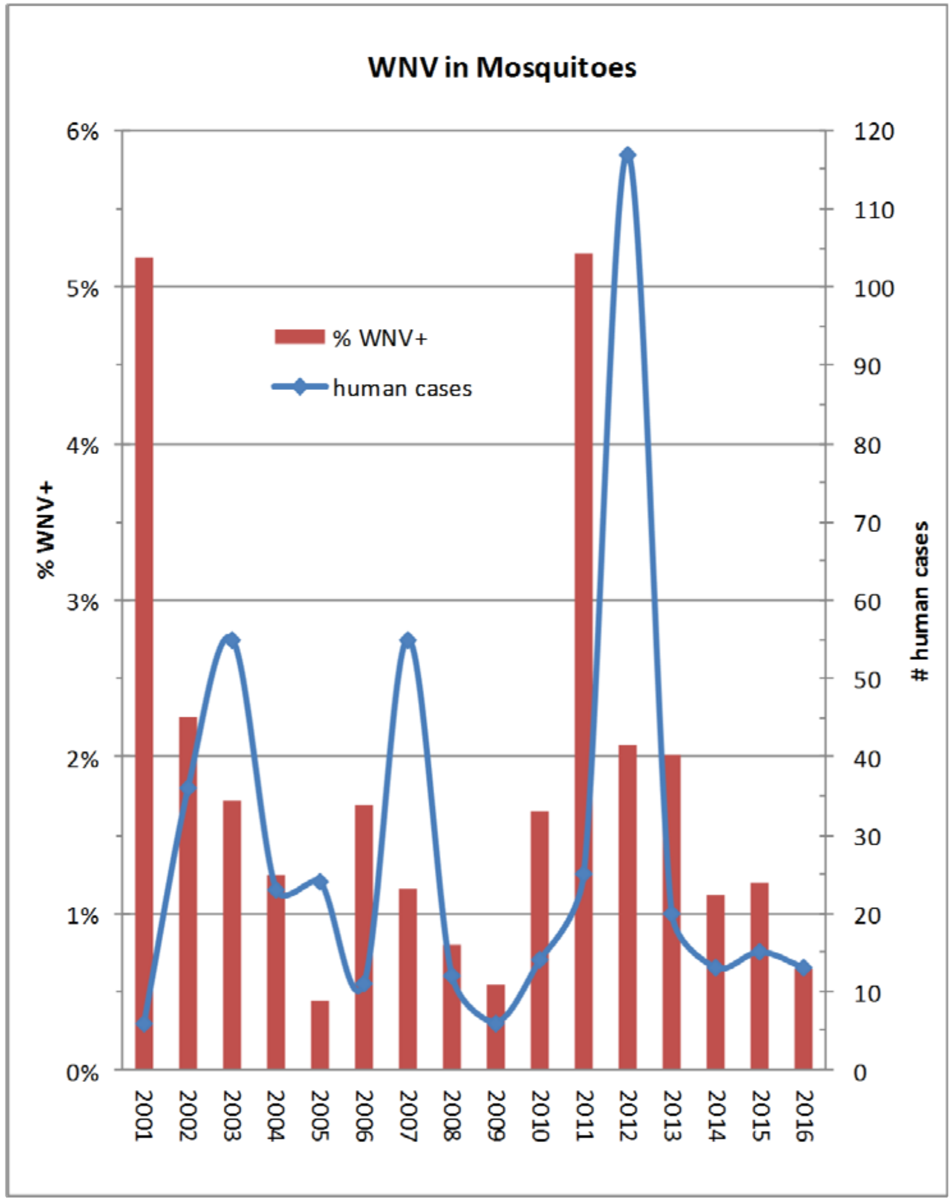


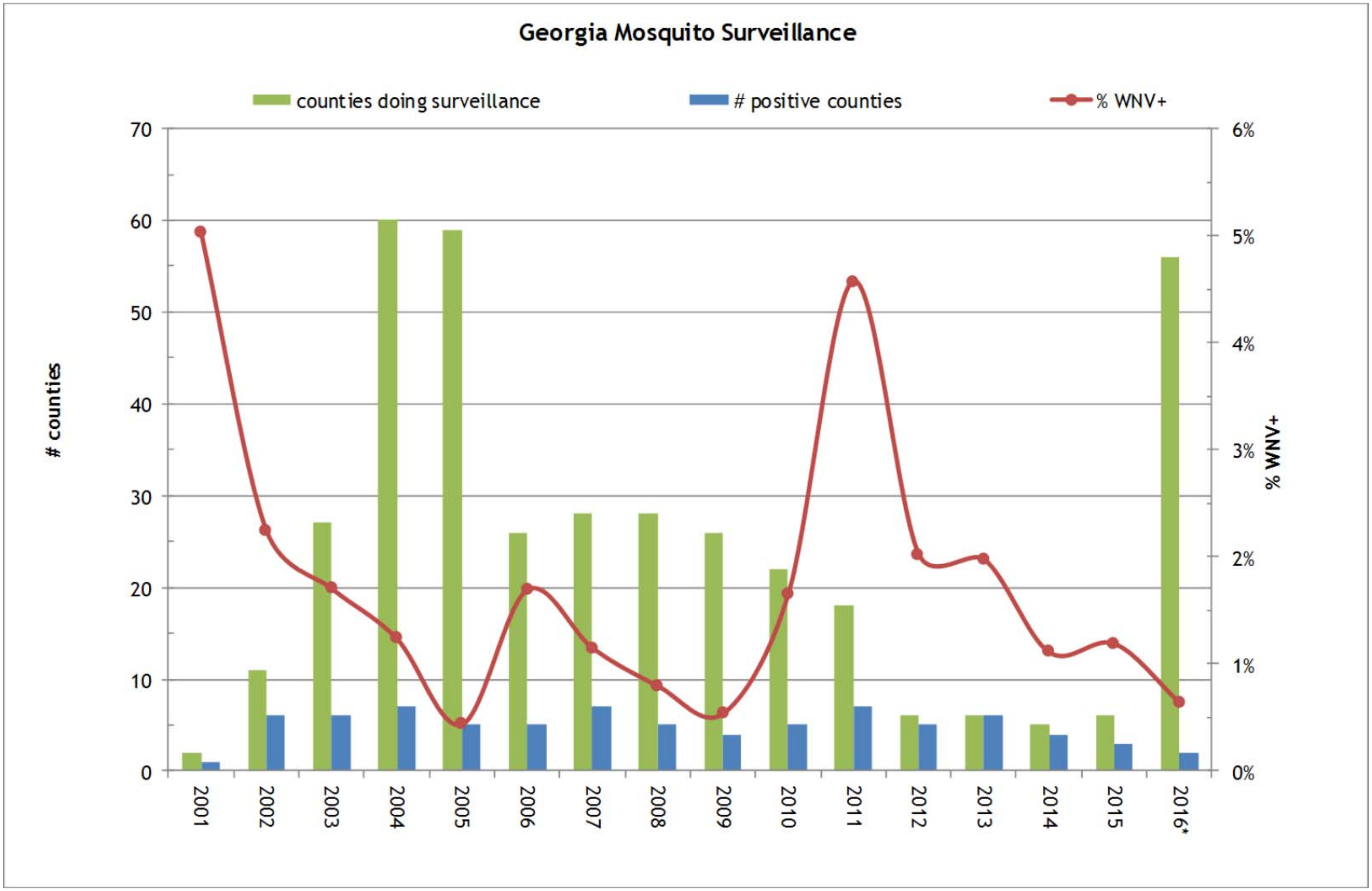
year	WNV Index	WNV+ Pools	human cases
2001	146.3	30	6
2002	106.6	84	36
2003	50.7	78	55
2004	40.7	113	22
2005	17.7	66	24
2006	31.5	81	8
2007	29.9	75	55
2008	25.3	51	12
2009	13.7	24	6
2010	47.7	95	13
2011	179.6	397	25
2012	64.3	125	117
2013	72.0	150	20
2014	43.6	56	13
2015	37.00	40	15
2016	22.80	36	13



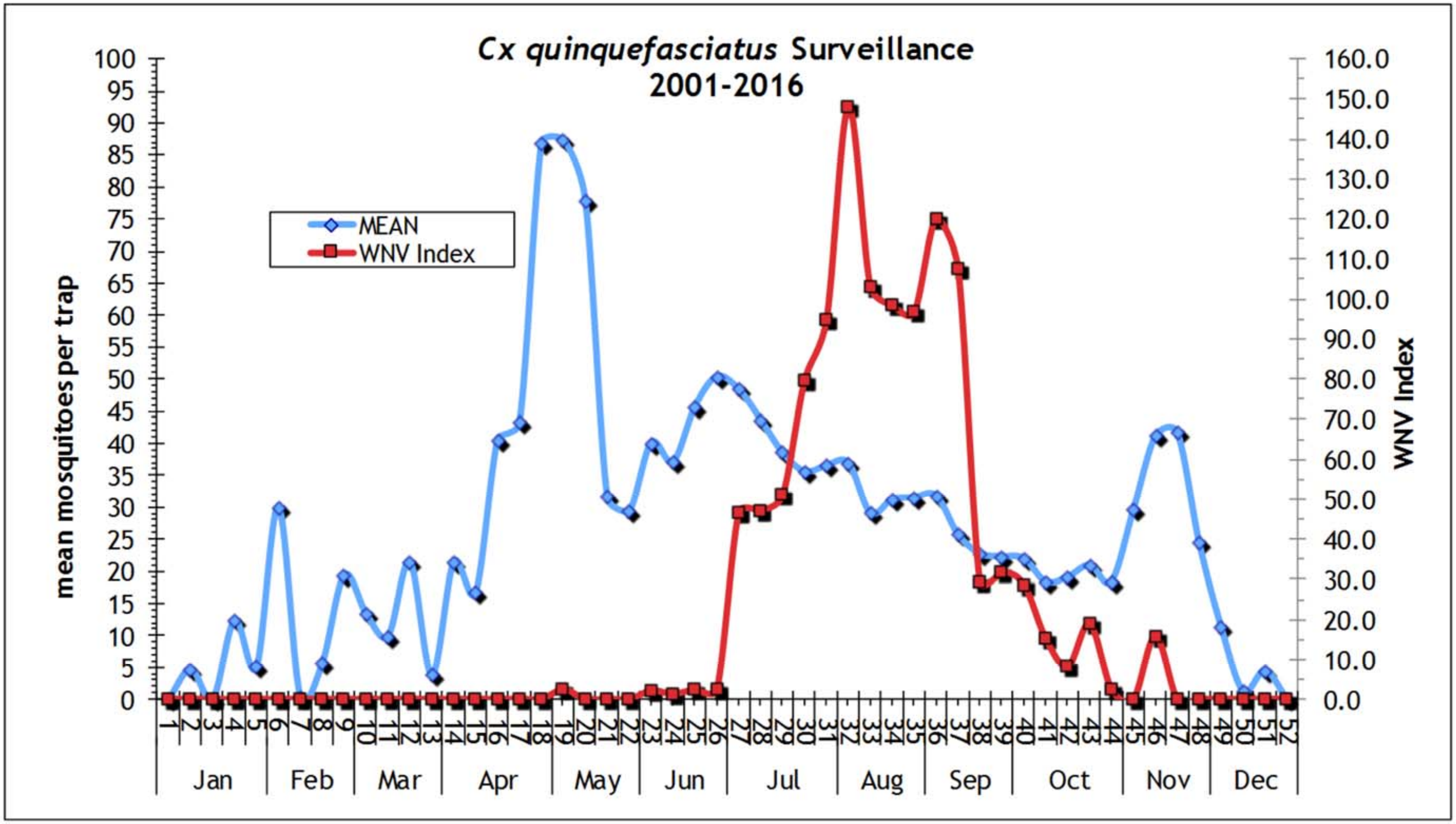
2001-2016	human cases	WNV+ mosquito pool	veterinary case	positive bird
total	454	1675	330	1896
mean	28.4	104.7	20.6	118.5

year	total pools	WNV+	% WNV+	human cases
2001	597	31	5.2%	6
2002	4032	91	2.3%	36
2003	6177	106	1.7%	55
2004	10161	126	1.2%	23
2005	15248	67	0.4%	24
2006	4785	81	1.7%	11
2007	6513	75	1.2%	55
2008	6383	51	0.8%	12
2009	4446	24	0.5%	6
2010	5990	99	1.7%	14
2011	7622	397	5.2%	25
2012	6042	125	2.1%	117
2013	7453	150	2.0%	20
2014	5038	56	1.1%	13
2015	3366	40	1.2%	15
2016	5620	36	0.6%	13
MEAN	6217.1	97.2	1.6%	27.8
TOTAL	99473	1555	26%	445





*6 counties doing testing



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.

Untested Mosquitoes

Species	Total
Ae. aegypti	26
Ae. albopictus	3470
Ae. cinereus	4
Ae. japonicus	1
Ae. vexans	3142
An. barberi	1
An. crucians	1870
An. punctipennis	399
An. quadrimaculatus	257
Cq. perturbans	2424
Cs. inornata	9
Cs. melanura	20
Cx. coronator	584
Cx. erraticus	1096
Cx. nigripalpus	1238
Cx. peccator	12
Cx. quinquefasciatus	8021
Cx. restuans	52
Cx. salinarius	2565
Cx. territans	33

Species	Total
Ma. titillans	1
Oc. atlanticus	38
Oc. canadensis	117
Oc. fulvus pallens	1
Oc. infirmatus	7
Oc. japonicus	31
Oc. mitchellae	9
Oc. sticticus	30
Oc. triseriatus	53
Oc. trivittatus	7
Or. signifera	23
Ps. ciliata	25
Ps. columbiae	332
Ps. cyanescens	30
Ps. ferox	104
Ps. howardii	34
Tx. rutilus	51
Ur. lowii	13
Ur. sapphirina	116
Grand Total	**34708**

Mosquito Surveillance: Untested Mosquitoes

Due to loss of funding, mosquitoes collected during surveillance by the GDPH are no longer sent for testing. These mosquitoes are identified and the data are shared with the county mosquito control agency to assist with control efforts.

County	# months doing surveillance	County	# months doing surveillance
Bacon	1	Gordon	2
Baldwin	1	Gwinnett	5
Barrow	1	Hall	2
Bartow	2	Haralson	1
Bibb	1	Harris	1
Bleckely	1	Henry	2
Bulloch	4	Houston	1
Butts	1	Johnson	2
Candler	1	Laurens	4
Catoosa	1	Murray	4
Chattooga	1	Muscogee	2
Cherokee	6	Newton	1
Clarke	3	Oconee	1
Clayton	4	Paulding	1
Cobb	5	Pickens	5
Coffee	1	Polk	3
Coweta	1	Pulaski	1
Crawford	1	Richmond	12
Dade	2	Rockdale	2
Dougherty	2	Talbot	1
Douglas	1	Toombs	1
Evans	2	Troup	2
Fannin	4	Walker	3
Fayette	2	Walton	2
Floyd	2	Ware	1
Fulton	5	Whitfield	4
Gilmer	3		

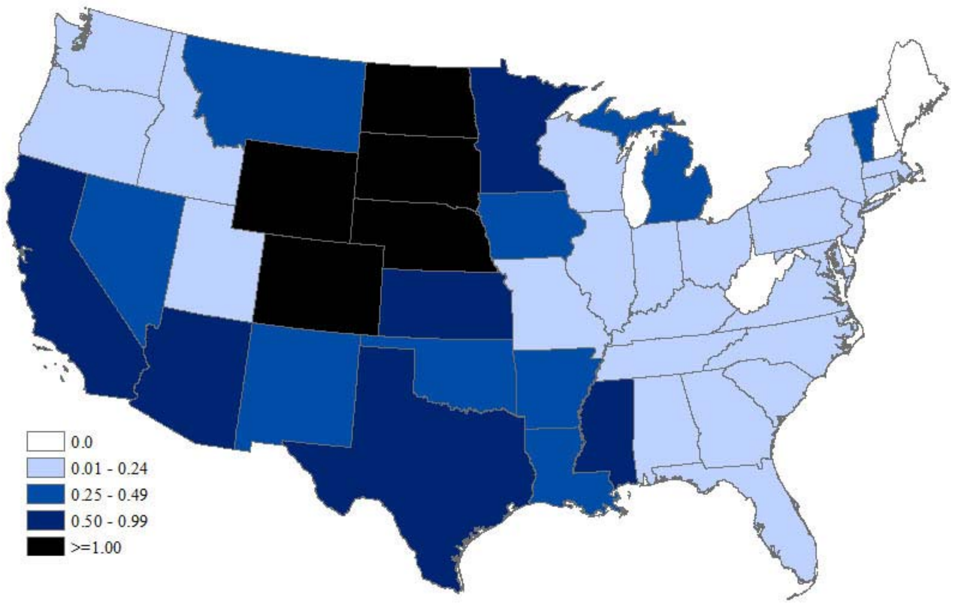
ZIKV Surveillance

Species	Bulloch	Clayton	Cobb	Gwinnett	Hall	Muscogee	Rockdale	Walton	Oconee	Grand Total
Ae. albopictus		8	2	72	89	7	11	1		**190**
Ae. vexans	11	1		7			1			**20**
An. crucians				2				2		**4**
An. punctipennis		1		8				3		**12**
Cs. inornata				1					1	**2**
Cx. coronator				1				1		**2**
Cx. erraticus		18		22		1	2	1		**44**
Cx. quinquefasciatus				99		13		4	1	**117**
Cx. salinarius				1						**1**
Cx. territans	9									**9**
Oc. japonicus				1				7		**8**
Oc. triseriatus				1			3			**4**
Ur. sapphirina								1		**1**
Grand Total	**20**	**28**	**2**	**215**	**89**	**21**	**17**	**20**	**2**	**414**

Vector Surveillance Coordinators

Vector Surveillance Coordinators (VSC) are State DPH employees working at the regional level. This position has the primary responsibility to conduct and improve mosquito surveillance for arboviral diseases such as West Nile Virus, Eastern Equine Encephalitis, Lacrosse Encephalitis, Zika and others. Duties include establishing surveillance locations throughout the PH Districts, setting up traps and collecting mosquitoes, mosquito identification, complaint response, community assessments, and community education programs. When necessary, the VSC will coordinate mosquito control activities with existing city/county/contracted mosquito control agencies and assist with localized control efforts. In addition, this position supports the EH Team by assisting with surveillance for other public health pests of concern, including agents of bioterrorism (BT), tickborne diseases, rabies, bedbugs, and participates in outbreak detection and response activities.

WNV Activity Map



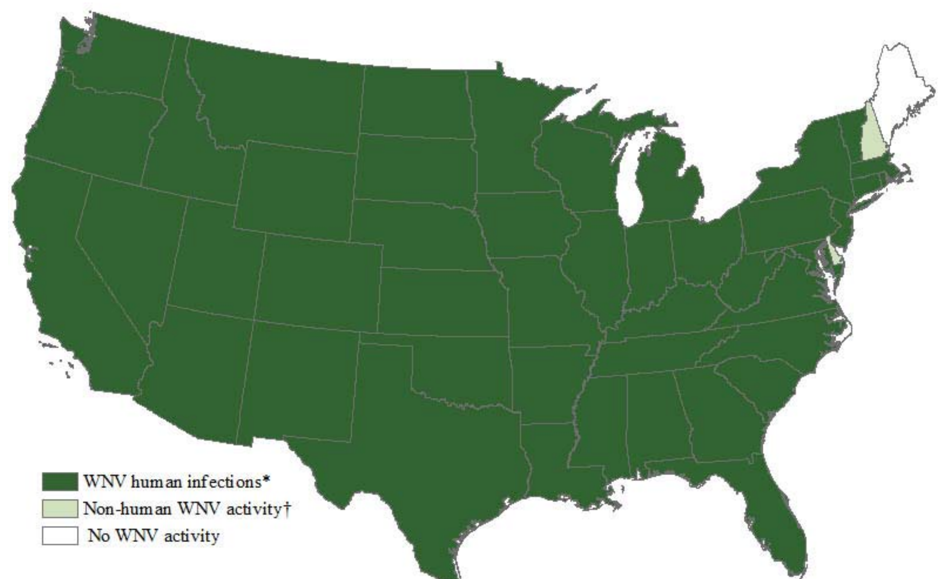
West Nile Virus Neuroinvasive Disease Incidence by State – United States, 2016 (as of January 17, 2017)

This map shows the incidence of human West Nile virus neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2016 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.

https://www.cdc.gov/westnile/statsmaps/preliminarymapsdata/index.html

*WNV human disease cases or presumptive viremic blood donors. Presumptive viremic blood donors have a positive screening test which has not necessarily been confirmed.

†WNV veterinary disease cases, or infections in mosquitoes, birds, or sentinel animals.



West Nile Virus Activity by State – United States, 2016 (as of January 17, 2017)

ZIKV Activity Map

Pregnant Women with Any Lab Evidence of Zika Virus Infection*
US States and DC: 1,455
US Territories: 3,156
*Source: Pregnancy Registries as of February 7, 2017
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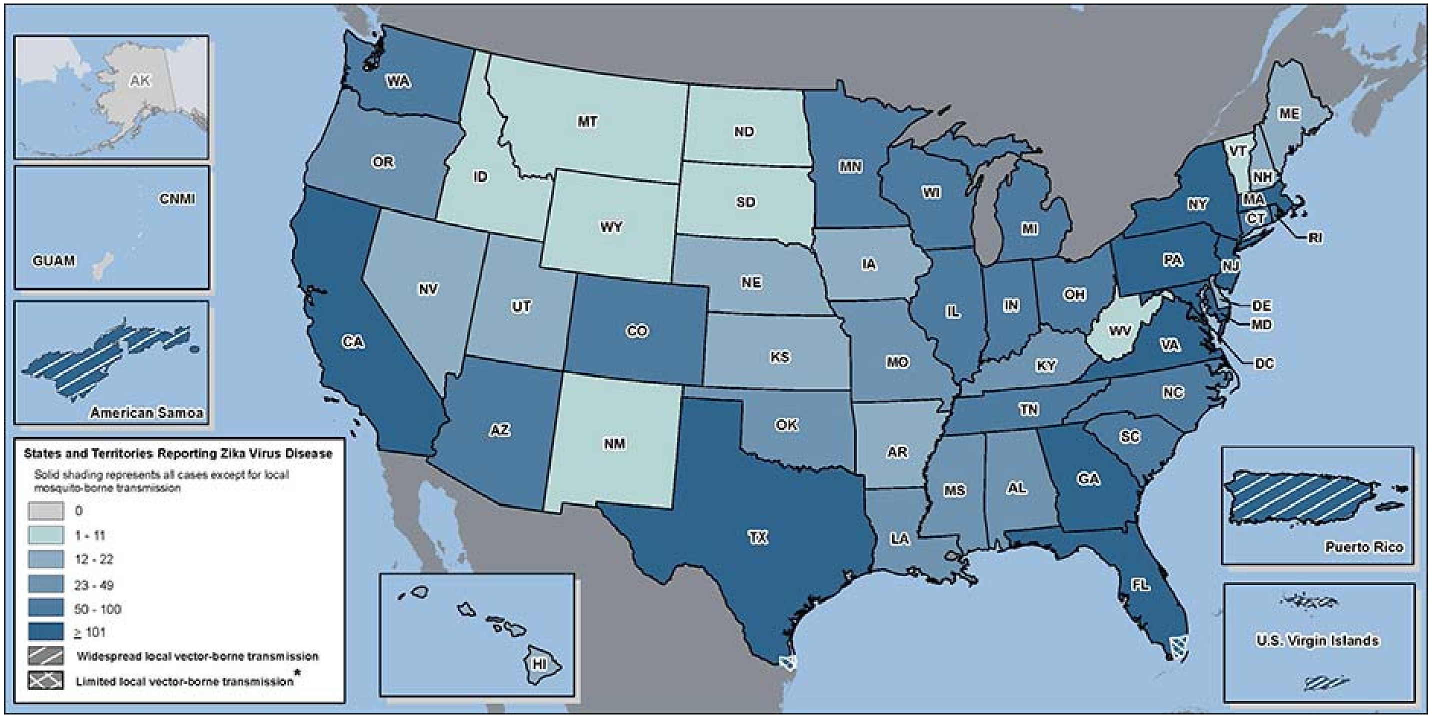
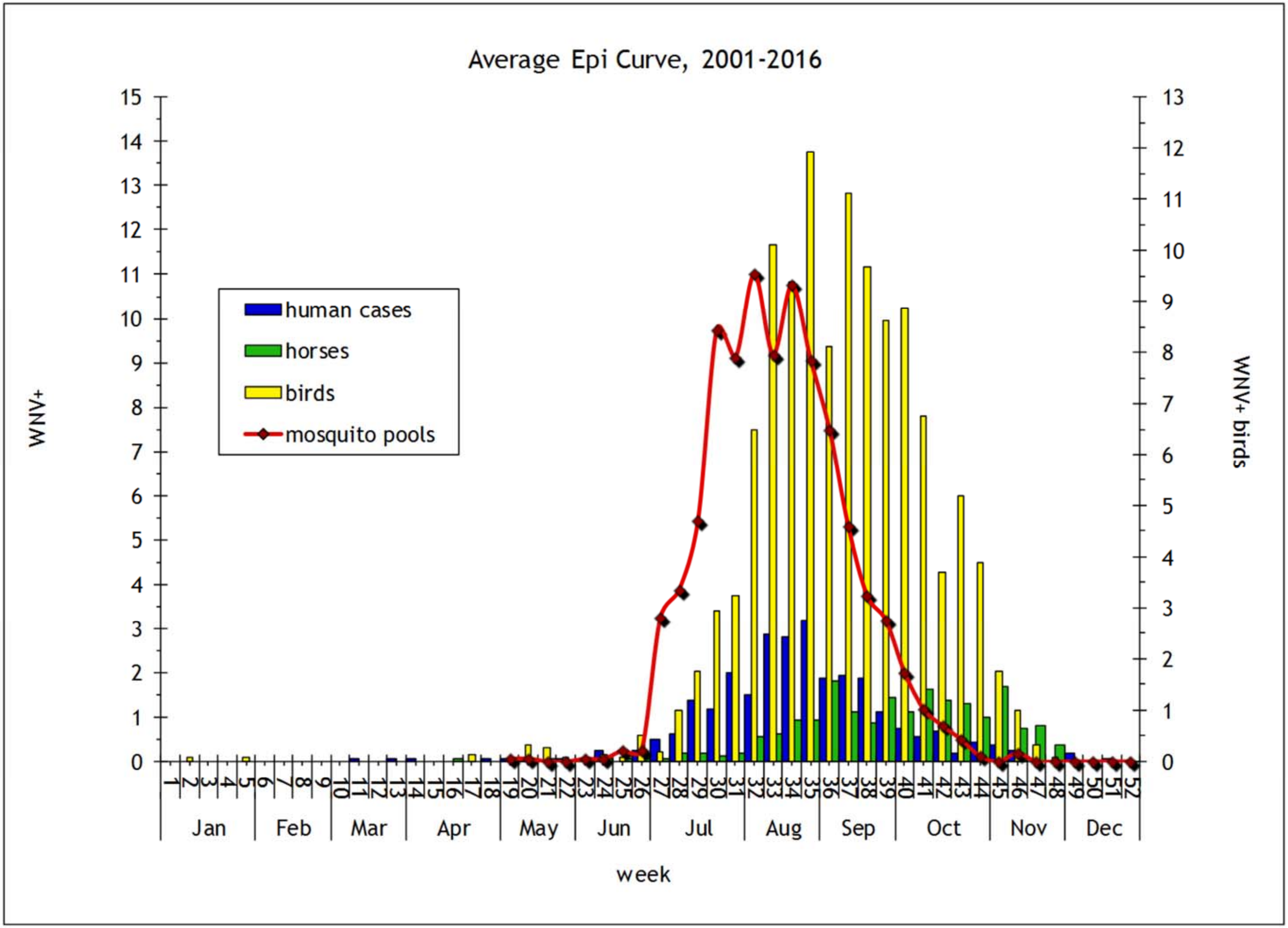
Zika Virus Disease Cases Reported to ArboNET*
US States and DC: 5,041
US Territories: 37,447
*Source: ArboNET as of February 22, 2017

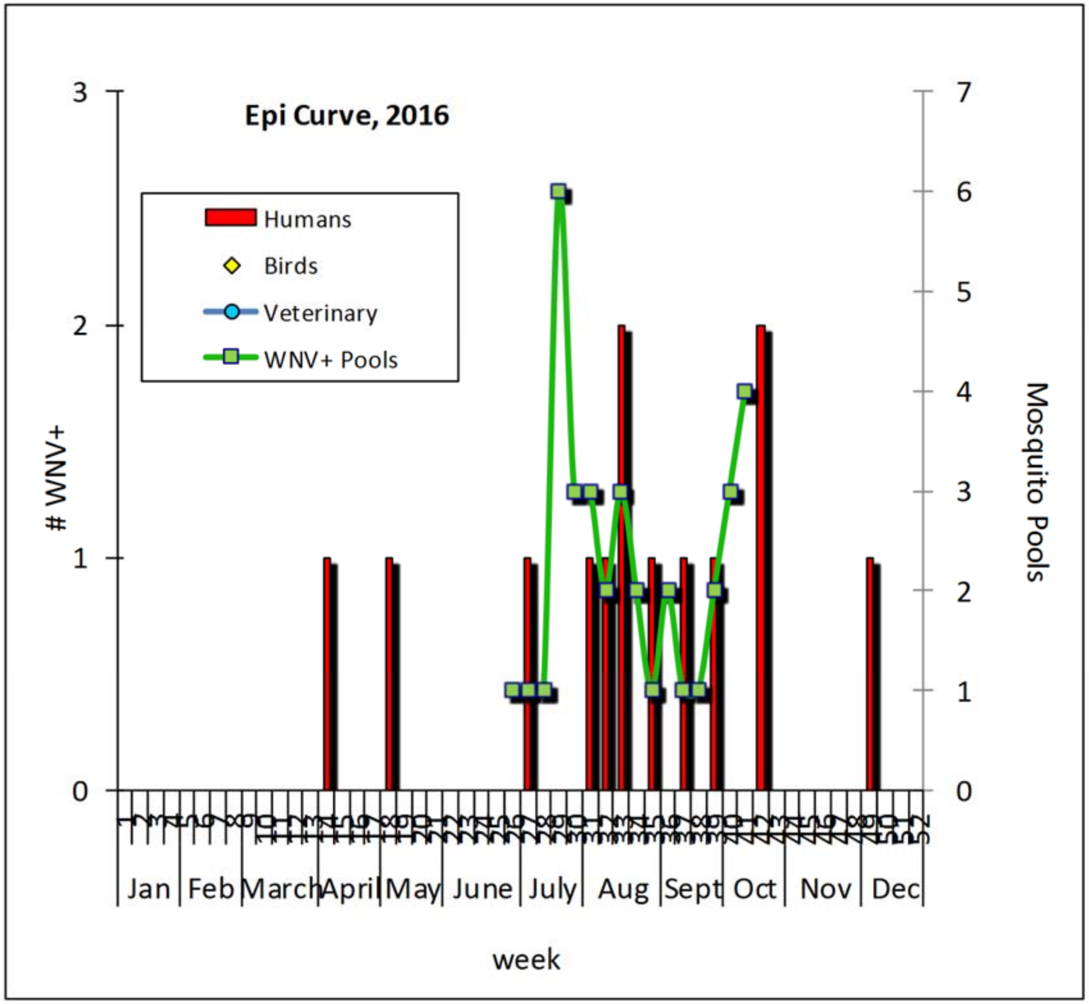
Zika Cases Reported in the United States

Laboratory-confirmed Zika virus disease cases reported to ArboNET by state or territory (as of February 22, 2017)





Average Epi Curve, 2001-2016
WNV+
WNV+ birds
human cases
horses
birds
mosquito pools
week
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec



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.

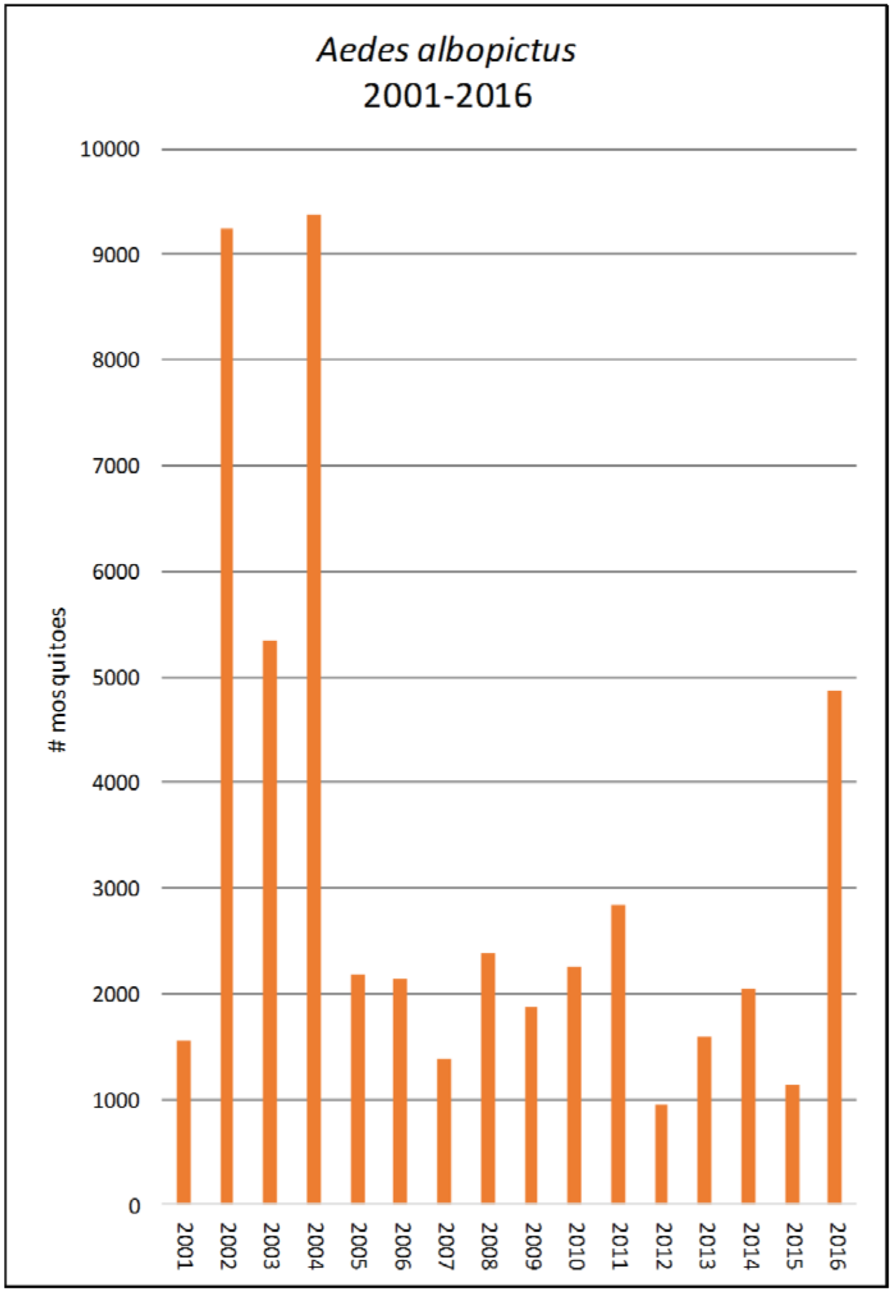
<u>The GDPH Vector-Borne & Zoonotic Diseases Team</u>

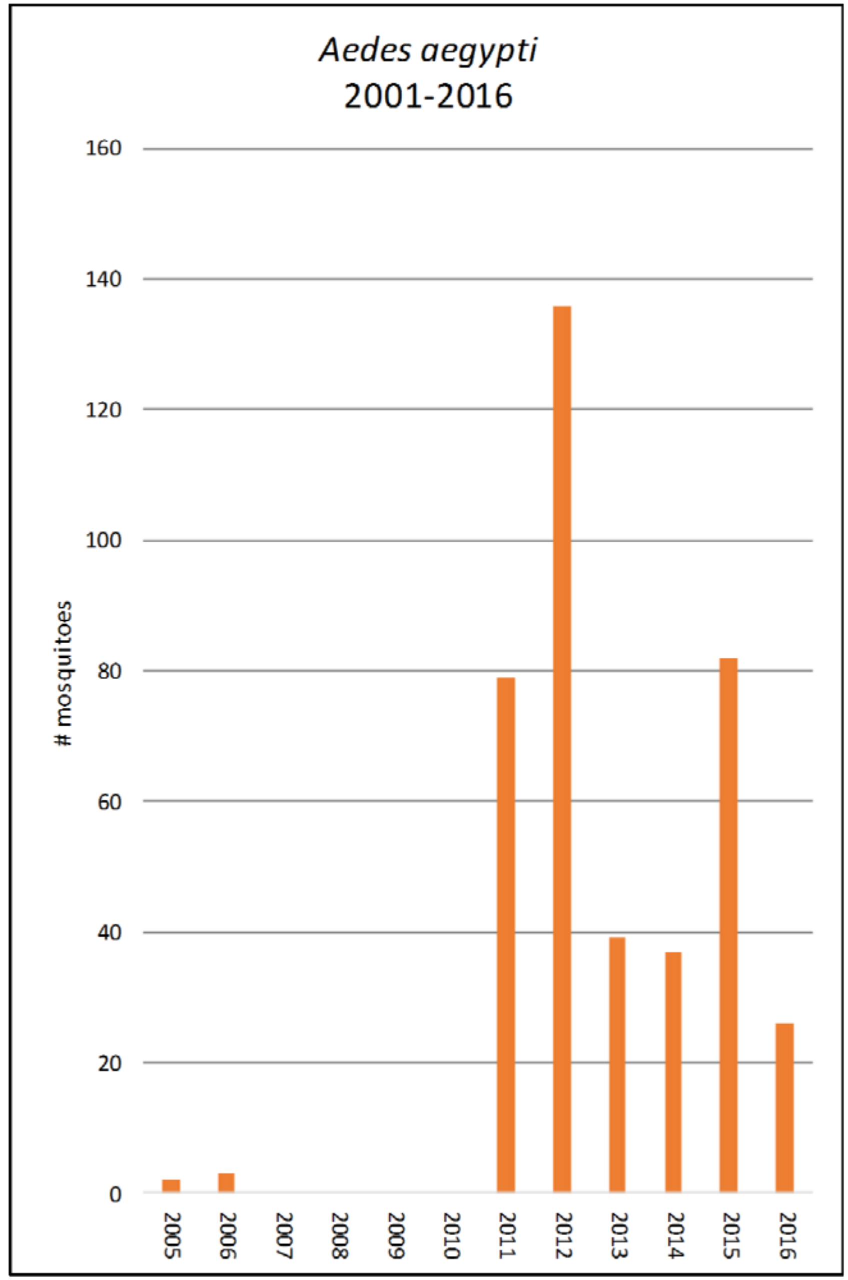
- Julie Gabel, DVM
- Amanda Feldpausch (epidemiologist)
- Shawna Feinman (epidemiologist)
- Rosmarie Kelly, PhD (entomologist)

ZIKV Staff

- Hanje Woodson (VSC)
- Kathleen Schmidt (VSC)
- Tremayne Mitchell (VSC)
- Napoleon Butler (VSC)
- Skyler Brennan (epidemiologist)
- Ashton Johnson (Epidemiologist)

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.


Aedes albopictus
2001-2016
mosquitoes
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016


Aedes aegypti
2001-2016
mosquitoes
160
140
120
100
80
60
40
20
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016