Arbovirus Activity in Texas
2013 Surveillance Report

May 2014

Texas Department of State Health Services
Infectious Disease Control Unit
Zoonosis Control Branch

Overview

Viruses transmitted by mosquitoes are referred to as arthropod-borne viruses or arboviruses. Six major arbovirus groups that infect humans are endemic in or can be involved in local transmission in Texas, including West Nile virus (WNV), Saint Louis encephalitis virus (SLEV), Eastern equine encephalitis virus (EEEV), Western equine encephalitis virus (WEEV), California serogroup viruses (CAL), and dengue virus (DENV). In 2013, arbovirus activity in Texas was attributed to WNV (88%), DENV (11%), EEEV (<1%), and SLEV (<1%) (Table 1).

Table 1. Year-End Arbovirus Activity Summary, Texas, 2013

Virus	Mosquito	Avian	Equine	Human						TOTAL
				Fever	Neuroinvasive	Hemorrhagic Fever	Total (Human)	Deaths	Presumptive Viremic Blood Donors‡	
DENV				95			**95**			**95**
EEEV			4							**4**
SLEV	2				1		**1**			**3**
WNV	487	5	69	70	113		**183**	14	36	**744**
TOTAL	**489**	**5**	**73**	**165**	**114**	**0**	**279**	**14**		**846**

DENV – Dengue virus
EEEV – Eastern equine encephalitis virus
SLEV – Saint Louis encephalitis virus
WNV - West Nile Virus
‡Presumptive viremic blood donors (PVDs) are people who had no symptoms at the time of donating blood through a blood collection agency, but whose blood tested positive when screened for the presence of West Nile virus. Unless they meet the case reporting criteria, they are not counted as a case for official reporting purposes and are not included in the "total reports" column.

Dengue Virus

Dengue is a flavivirus that is maintained in a cycle between *Aedes aegypti* or *Ae. Albopictus* and human hosts. It is a re-emerging vector borne disease that is endemic throughout the tropics and subtropics, including northern Mexico. Human cases are most often imported to the United States (U.S.) as a result of travel to a dengue-endemic country, but locally acquired cases have been reported in Florida, Hawaii and Texas. From 2002-2013, Texas reported 154 cases of dengue (median=14 cases, range: 1-32 cases). During this time, 4 cases of locally-acquired dengue were reported: 3 in Cameron County and 1 in Hidalgo County.

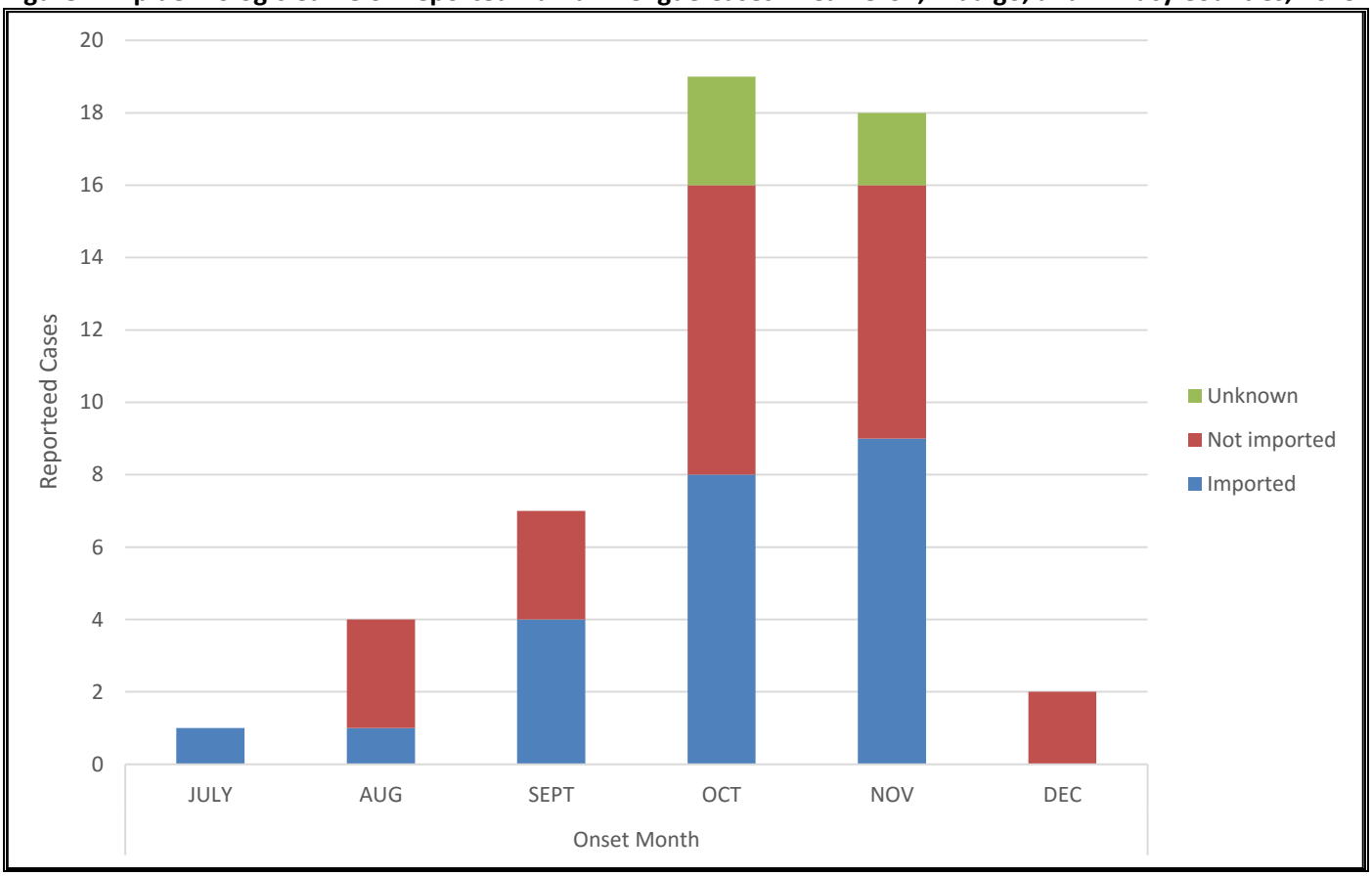
In 2013, Texas reported 95 human cases of dengue in 21 counties (Table 1). Seventy percent of reported cases were imported from another country, 24% were locally-acquired, and 5% were unsure of where the disease was acquired due to travel back and forth to Mexico. Autochthonous transmission occurred in three South Texas counties: Cameron, Hidalgo and Willacy. The majority of these locally acquired cases (87%) occurred in Cameron County.

In 2013, a dengue epidemic was identified in northern Mexico, including the Mexican state of Tamaulipas that borders Texas. Between July–December 2013, 51 dengue cases were identified in the South Texas counties of Cameron, Hidalgo, and Willacy, of which 23 (45%) were determined to be locally acquired. The majority of all of these cases (73%) had onset dates in October and November (Figure 1).

Table 1. Human Dengue Cases Reported by County, Texas, 2013

County	Imported Cases	Locally Acquired Cases	Unknown	TOTAL
Bell County	1			1
Bexar County	6			6
Cameron County	12	21	4	37
Collin County	4			4
Denton County	3			3
El Paso County	1			1
Fort Bend County	4			4
Galveston County	2			2
Harris County	5			5
Hidalgo County	11	1	1	13
Hunt County	1			1
Montgomery County	1			1
Nueces County	1			1
Scurry County	1			1
Tarrant County	5			5
Travis County	4			4
Val Verde County	1			1
Wichita County	1			1
Wilbarger County	1			1
Willacy County		1		1
Williamson County	2			2
TOTAL	**67**	**23**	**5**	**95**

Figure 1. Epidemiologic Curve of Reported Human Dengue Cases in Cameron, Hidalgo, and Willacy Counties, 2013



Eastern Equine Encephalitis Virus

EEEV is an alphavirus maintained in a cycle between *Culiseta melanura* mosquitoes and avian hosts in freshwater swamps. *Cs. Melanura* is not considered to be an important vector of EEEV to humans because it feeds almost exclusively on birds. Transmission to humans requires mosquito species capable of creating a "bridge" between infected birds and uninfected mammals such as some *Aedes, coquillettidia,* and *Culex* species. Eastern equine encephalitis (EEE) is a rare illness in humans and only a few cases are reported in the U.S. each year. Most cases of EEE have been reported from Florida, Georgia, Massachusetts, and New Jersey. The habitat in northeast Texas, bordering Louisiana, is suitable for EEEV transmission and EEEV-infected horses have been reported from this part of the state. During this same period, no human cases of EEE or EEEV-positive mosquito pools were reported. In 2013, four EEEV-infected horses were reported in Jasper, Titus, Jefferson and San Jacinto counties.

Saint Louis Encephalitis Virus

SLEV is a flavivirus maintained in a cycle between *Culex* species mosquitoes and birds. The geographic range of Saint Louis encephalitis (SLE) extends from North to South America, but the majority of cases have occurred in eastern and central U.S., where periodic epidemics have occurred since the 1930s. In Texas and states with milder climates, SLE can occur year round. From 2002-2013, Texas reported 52 cases of human SLE disease (median=2 cases, range: 0-18 cases). In 2013, 2 SLEV-positive mosquito pools were identified in Nueces County and 1 human neuroinvasive disease case was identified in Willacy County.

West Nile Virus

WNV is a flavivirus maintained in a cycle between mosquitoes (primarily *Culex* species) and birds. WNV is found in Africa, India, Australia, the Middle East, Europe, and most recently, North America. Before 1999, WNV had not been documented in the Western Hemisphere. In 1999, human disease associated with WNV infection was identified in New York City. By the end of October 1999, WNV infections had been confirmed in multiple native species of birds as well as horses from New York City and areas within a 200-mile radius of the city. Since 1999, WNV infections in humans, birds, equines, other animals, and mosquitoes have been reported throughout the U.S.

The Texas Department of State Health Services (DSHS) has conducted surveillance for WNV since its arrival in Texas in 2002. The first big surge in the number of human cases of WNV disease occurred in 2003 with nearly 750 cases reported. In the years to follow, reported cases of human WNV disease decreased but remained stable. In 2011, Texas reported the lowest number of human WNV disease cases and in 2012 a record high number of cases was reported (Figure 2). From 2002-2013, 4,253 cases of WNV disease were reported in Texas (mean=354 cases, range: 27-1868 cases).

In 2013, some evidence of WNV activity (human, horse, bird or mosquito) was reported in 103 (41%) of Texas counties (Figure 3). Sixteen counties (6%) reported WNV-positive mosquito pools, 68 (27%) reported human WNV disease cases, 52 (20%) reported WNV-infected horses, and only 1 county (<1%) reported WNV-positive birds*.

*Harris County is the only Texas County currently testing dead birds for WNV

Figure 2. Reported Human WNV Disease Cases Reported in Texas, 2002-2013

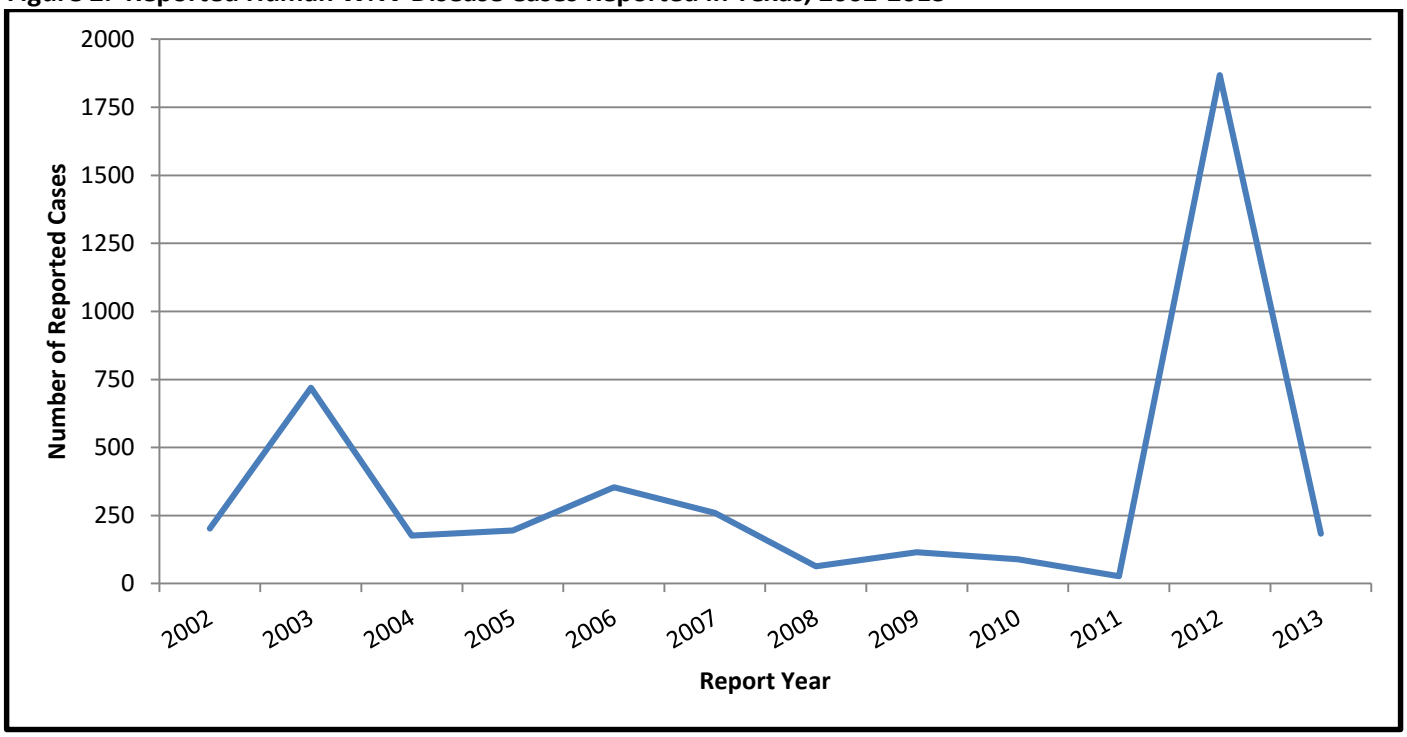
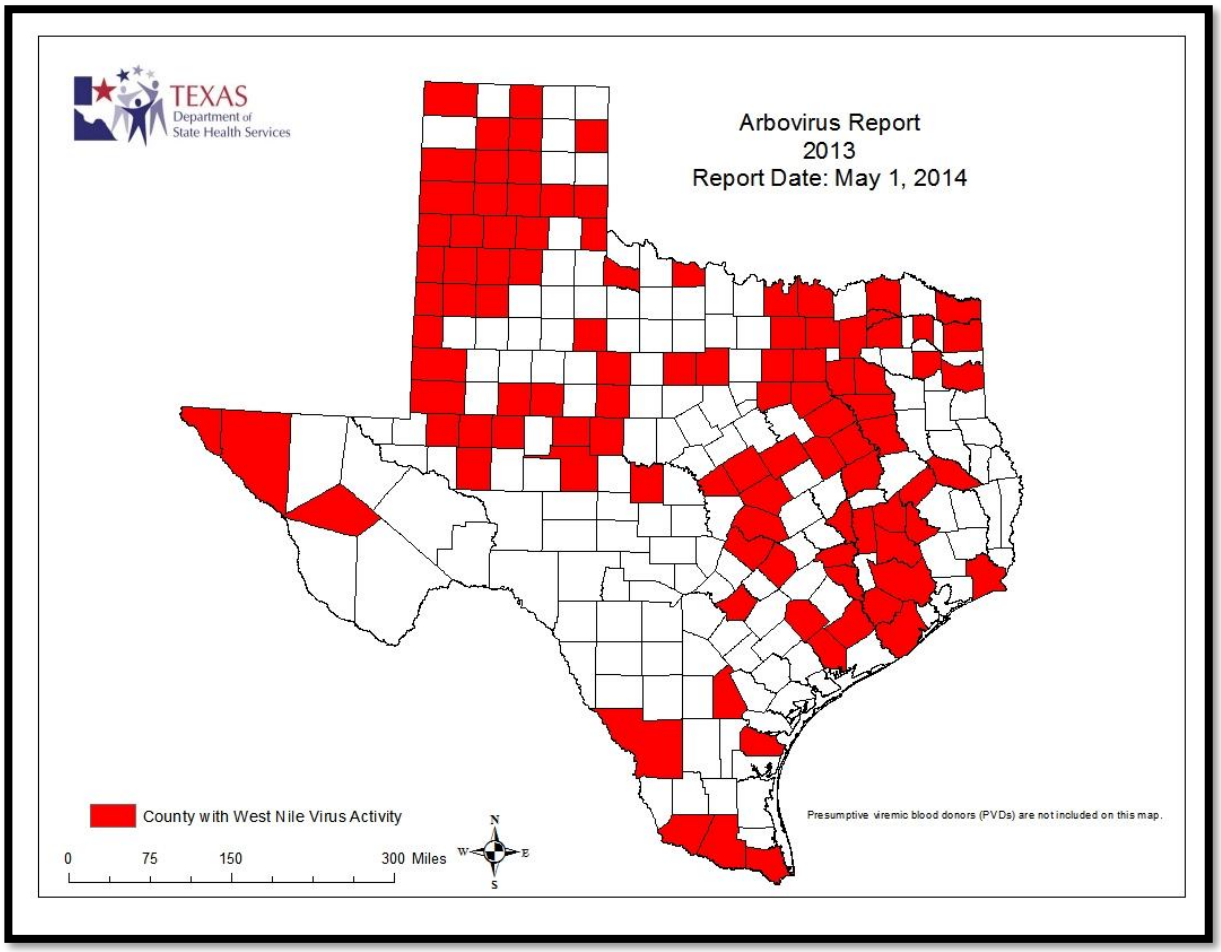


Figure 3. Texas Counties Reporting Any WNV Activity, 2013**



**Counties showing no WNV Activity may be due to absence of an active surveillance program

In 2013, 487 WNV-positive mosquito pools, 5 birds, 69 horses and 183 human WNV disease cases were reported (Table 2). Counties reporting the greatest number of WNV-infected horses included McClellan, Cooke and Coryell. A total of 36 presumptive viremic blood donors (PVD) were identified by blood collection agencies, 1 donor developed symptoms and was reclassified as a case of human WNV disease.

Table 2. WNV Activity Reported by County, Texas, 2013

County	WNV						
	M	A	E	H			
				WNF	WNND	PVD‡	TOTAL - Human
Anderson	0	0	2	0	1	0	1
Andrews	0	0	1	0	1	0	1
Angelina	0	0	1	0	1	0	1
Armstrong	0	0	2	0	0	1	0
Austin	0	0	1	0	0	0	0
Bailey	0	0	1	1	1	0	2
Bastrop	0	0	1	0	0	0	0
Baylor	0	0	0	0	0	1	0
Bell	0	0	1	0	0	0	0
Bexar	0	0	0	0	0	1	0
Bowie	0	0	1	0	0	0	0
Brazoria	2	0	0	0	0	0	0
Brazos	0	0	2	0	0	0	0
Briscoe	0	0	0	1	0	0	1
Cameron	0	0	0	0	1	0	1
Carson	0	0	0	1	0	1	1
Cass	0	0	2	0	0	0	0
Castro	0	0	0	1	1	1	2
Childress	0	0	0	0	1	0	1
Cochran	0	0	0	1	1	0	2
Coke	0	0	0	0	1	0	1
Collin	10	0	1	7	3	0	10
Collingsworth	0	0	0	1	0	0	1
Cooke	0	0	3	0	1	0	1
Coryell	0	0	3	0	0	0	0
Dallam	0	0	0	1	1	0	2
Dallas	216	0	1	5	11	0	16
Deaf Smith	0	0	0	2	3	1	5
Delta	0	0	1	0	0	0	0
Denton	14	0	1	5	4	0	9
Donley	0	0	1	1	0	0	1
Ector	0	0	0	0	1	0	1
Ellis	3	0	1	0	0	0	0
El Paso	35	0	0	1	15	6	16
Fisher	0	0	0	0	0	1	0
Floyd	0	0	0	1	1	0	2
Foard	0	0	1	0	1	0	1

County	WNV						
	M	A	E	H			
				WNF	WNND	PVD‡	TOTAL - Human
Fort Bend	0	0	0	0	1	0	1
Freestone	0	0	1	0	0	0	0
Galveston	0	0	0	0	0	0	0
Gaines	0	0	1	2	1	0	3
Garza	0	0	0	0	0	1	0
Glasscock	0	0	0	0	2	0	2
Grayson	0	0	1	0	0	0	0
Grimes	0	0	1	0	0	0	0
Guadalupe	0	0	0	0	1	0	1
Hale	0	0	0	3	1	1	4
Hansford	0	0	0	0	1	0	1
Harris	147	5	0	3	6	1	9
Harrison	0	0	1	0	0	0	0
Hemphill	0	0	1	1	0	0	1
Henderson	0	0	1	0	0	0	0
Hidalgo	0	0	0	0	1	0	1
Hockley	0	0	0	1	2	2	3
Hopkins	0	0	2	0	0	0	0
Howard	1	0	0	2	3	0	5
Hudspeth	0	0	0	0	1	0	1
Hunt	0	0	0	1	0	0	1
Hutchinson	0	0	0	0	1	1	1
Jackson	0	0	0	0	1	0	1
Jasper	0	0	0	0	0	0	0
Jeff Davis	0	0	1	0	0	0	0
Jefferson	0	0	2	1	0	1	1
Johnson	0	0	0	1	1	0	2
Jones	0	0	0	1	0	0	1
Kaufman	0	0	1	2	0	0	2
Lamar	0	0	2	0	0	0	0
Lamb	0	0	0	1	0	0	1
Lampasas	0	0	1	0	0	0	0
Lavaca	0	0	0	1	0	0	1
Leon	0	0	1	0	0	0	0
Limestone	0	0	1	0	0	0	0
Live Oak	0	0	1	0	0	0	0
Lubbock	8	0	0	7	4	4	11
Matagorda	0	0	0	0	0	1	0
McCulloch	0	0	1	0	0	0	0
McLennan	0	0	4	0	0	0	0
Midland	0	0	0	1	4	0	5
Mitchell	0	0	0	0	1	0	1
Montgomery	1	0	1	0	3	1	3
Moore	0	0	0	0	1	0	1

County	WNV						
	M	A	E	H			
				WNF	WNND	PVD‡	TOTAL - Human
Navarro	0	0	1	0	0	0	0
Nueces	0	0	0	1	1	0	2
Ochiltree	0	0	0	0	0	1	0
Oldham	0	0	0	1	0	1	1
Palo Pinto	0	0	1	0	0	0	0
Parmer	0	0	0	1	0	1	1
Potter	0	0	1	1	3	1	4
Randall	0	0	1	2	6	0	8
Runnels	0	0	1	0	1	0	1
San Jacinto	0	0	1	0	0	0	0
Scurry	0	0	0	0	0	1	0
Starr	0	0	0	0	1	0	1
Stephens	0	0	0	0	1	0	1
Stonewall	0	0	0	1	0	0	1
Swisher	0	0	0	2	0	1	2
Tarrant	37	0	0	3	5	1	8
Taylor	7	0	0	0	1	0	1
Titus	0	0	0	0	2	0	2
Tom Green	0	0	1	0	1	0	1
Travis	1	0	0	0	0	0	0
Trinity	0	0	2	0	0	0	0
Upshur	0	0	1	0	0	0	0
Upton	0	0	1	0	0	0	0
Val Verde	0	0	0	0	0	0	0
Van Zandt	0	0	2	0	0	1	0
Walker	0	0	0	0	1	1	1
Washington	0	0	1	0	0	0	0
Webb	0	0	0	0	1	0	1
Wharton	0	0	0	0	1	0	1
Wichita	3	0	2	0	2	0	2
Willacy	0	0	0	0	0	0	0
Willbarger	0	0	0	0	0	0	0
Williamson	2	0	0	0	0	0	0
Yoakum	0	0	0	1	0	0	1
Young	0	0	0	0	0	1	0
TOTAL	**487**	**5**	**69**	**70**	**113**	**36**	**183**

M – Mosquito, A - Avian, E – Equine, H – Human

WNV - West Nile Virus

WNF - West Nile fever

WNND – West Nile Neuroinvasive Disease

‡PVD - Presumptive viremic blood donors are people who had no symptoms at the time of donating blood through a blood collection agency, but whose blood tested positive when screened for the presence of WNV. Unless they meet the case reporting criteria, they are not counted as a case for official reporting purposes and are not included in the "total reports" column.

Table 3. Characteristics of Reported Human WNV Disease Cases, Texas, 2013

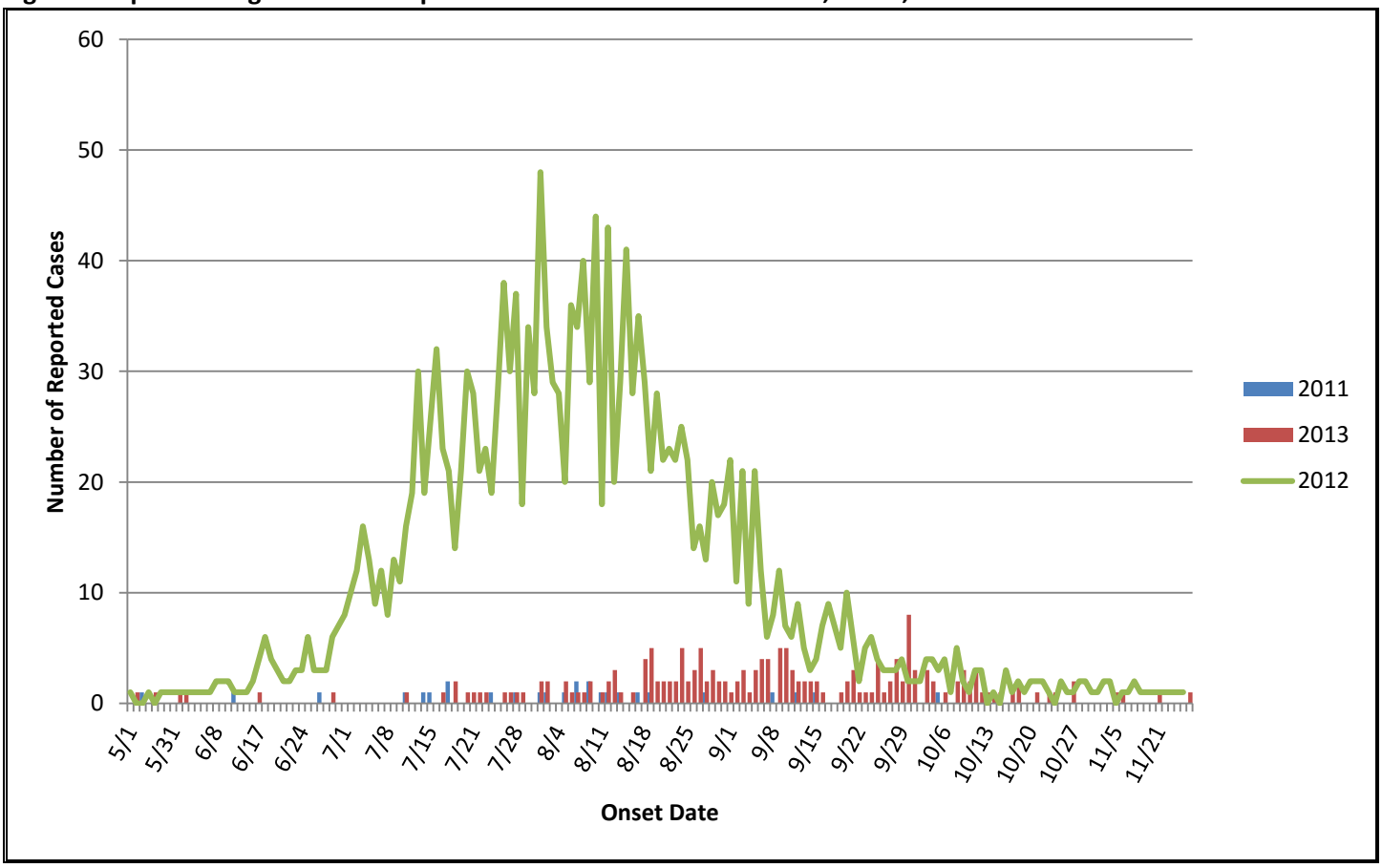
Characteristic	WNND (N=113)		WNF (N= 70)	
	Number	%	Number	%
Gender				
Male	69	61	37	53
Female	44	39	33	47
Age				
<1-09	3	3	3	4
10-19	3	3	4	6
20-29	5	4	3	4
30-39	12	11	15	21
40-49	12	11	12	17
50-59	21	19	13	19
60-69	25	22	15	21
70-79	17	15	3	4
80+	15	13	2	3
Race/Ethnicity				
Non-Hispanic White	56	50	54	77
Hispanic	27	24	4	6
Asian/Pacific Islander	1	1	1	1
Black	4	4	3	4
American Indian/Alaska Native	0	0	0	0
Unknown	25	22	8	11
Clinical Syndrome				
Encephalitis - Including Meningoencephalitis	79	70	0	0
Meningitis	34	30	0	0
Uncomplicated Fever	0	0	70	100
Symptoms				
Fever	113	100	70	100
Mean Reported Temperature in °F	101.7	-	102.1	-
Headache	74	65	62	89
Rash	24	21	30	43
Nausea or Vomiting	74	65	41	59
Diarrhea	33	29	28	40
Myalgia	49	43	37	53
Arthralgia	26	23	36	51
Paresis	6	5	1	1
Stiff Neck	40	35	22	31
Altered Mental Status	65	58	10	14
Seizures	7	6	2	3
Ataxia	20	18	9	13
Coma	5	4	1	1
Renal	25	22	12	17
Clinical Course				
Hospitalized	113	100	22	31
Median Length of Stay	6	-	4	-
Death	13	12	1	1

Of the 183 human WNV disease cases reported in 2013, 113 (62%) had neuroinvasive disease (WNND) and 70 (38%) had non-neuroinvasive (WNF) disease (Table 3). Of the cases with WNND, 70% presented with encephalitis, including meningoencephalitis, and 30% presented with meningitis only. The median age of onset was 55 years (range: 1-89 years) for all cases. Cases with WNND tended to be older (median=60 years, range: 6-89), while case patients with WNF were younger (median= 45 years, range: 1-81). The majority (60%) of all WNV disease cases were non-Hispanic whites (Table 3), followed by Hispanics (28%).

The most common symptoms reported by WNND cases were fever (100%), headache (65%), nausea or vomiting (65%), and altered mental status (58%). The most common symptoms reported by WNF cases were fever (100%), headache (89%), nausea or vomiting (59%) and myalgia (53%). All of the WNND cases were hospitalized compared to 31% of WNF cases. WNND cases also reported a longer median length of hospital stay (6 days) compared to WNF cases (4 days). Fourteen (7%) of all reported human WNV disease cases died, including 13 WNND cases.

In 2013, dates of symptom onset for all WNV cases ranged from May 8 to December 31 (Figure 4). The median date of onset for 2013 (September 6) was a month later than in previous years (August 7 in 2012 and August 2 in 2011). This shift in the median date of onset from previous years is likely due to a shift in the case burden from the Dallas-Fort Worth metroplex to the Texas Panhandle.

Figure 4. Epidemiologic Curve of Reported Human WNV Disease Cases, Texas, 2011-2013



In 2013, the statewide incidence of all WNV disease cases was 0.7 cases per 100,000 population. The statewide incidence for WNND was 0.4 cases per 100,000 population (Table 4). Deaf Smith County (25.8 cases per 100,000 population) and Howard County (14.3 cases per 100,000 population) reported the highest overall WNV disease incidence rates. Randall County (5.0 cases per 100,000 population) and El Paso County (1.0 case per 100,000 population) reported the highest WNND incidence rates.

Table 4. Reported Human WNV Disease Cases and Incidence Rates in Texas by County, 2013

County	Population*	Total Cases		Neuroinvasive	
		Case Count	Incidence Rate (per 100,000)**	Case Count	Incidence Rate (per 100,000)*
Anderson	58,458	1		1	
Andrews	14,786	1		1	
Angelina	86,771	1		1	
Bailey	7,165	2		1	
Briscoe	1,637	1		0	
Cameron	406,220	1		1	
Carson	6,182	1		0	
Castro	8,062	2		1	
Childress	7,041	1		1	
Cochran	3,127	2		1	
Coke	3,320	1		1	
Collin	782,341	10	1.3	3	
Collingsworth	3,057	1		0	
Cooke	38,437	1		1	
Dallam	6,703	2		1	
Dallas	2,368,139	16	0.7	11	0.5
Deaf Smith	19,372	5	25.8	3	
Denton	662,614	9	1.4	4	
Donley	3,677	1		0	
Ector	137,130	1		1	
El Paso	800,647	16	2.0	15	1.9
Floyd	6,446	2		1	
Foard	1,336	1		1	
Fort Bend	585,375	1		1	
Gaines	17,526	3		1	
Glasscock	1,226	2		2	
Guadalupe	131,533	1		1	
Hale	36,273	4		1	
Hansford	5,613	1		1	
Harris	4,092,459	9	0.2	6	0.1
Hemphill	3,807	1		0	
Hidalgo	774,769	1		1	
Hockley	22,935	3		2	
Howard	35,012	5	14.3	3	
Hudspeth	3,476	1		1	
Hunt	86,129	1		0	
Hutchinson	22,150	1		1	
Jackson	14,075	1		1	
Jefferson	252,273	1		0	
Johnson	150,934	2		1	
Jones	20,202	1		0	
Kaufman	103,350	2		0	

County	Population*	Total Cases		Neuroinvasive	
		Case Count	Incidence Rate (per 100,000)*	Case Count	Incidence Rate (per 100,000)*
Lamb	13,977	1		0	
Lavaca	19,263	1		0	
Lubbock	278,831	11	3.9	4	
Midland	136,872	5	3.7	4	
Mitchell	9,403	1		1	
Montgomery	455,746	3		3	
Moore	21,904	1		1	
Nueces	340,223	2		1	
Oldham	2,052	1		0	
Parmer	10,269	1		0	
Potter	121,073	4		3	
Randall	120,725	8	6.6	6	5.0
Runnels	10,501	1		1	
Starr	60,968	1		1	
Stephens	9,630	1		1	
Stonewall	1,490	1		0	
Swisher	7,854	2		0	
Tarrant	1,809,034	8	0.4	5	0.3
Taylor	131,506	1		1	
Titus	32,334	2		2	
Tom Green	110,224	1		1	
Walker	67,861	1		1	
Webb	250,304	1		1	
Wharton	41,280	1		1	
Wichita	131,500	2		2	
Yoakum	7,879	1		0	
Texas	**25,145,561**	**183**	**0.7**	**113**	**0.4**

Population estimate based on 2010 Census

*Calculation of rates is not recommended when there are fewer than five events in the numerator because the calculated rate can be unstable and exhibit wide confidence intervals.

The DSHS Health Service Regions (HSRs) disproportionally affected by WNV disease were in the Texas Panhandle (Table 5). HSR 1 reported 7.1 cases per 100,000 population and HSR 9/10 reported 2.6 cases per 100,000 population.

Table 5. Reported Human WNV Disease Cases and Incidence Rates in Texas by DSHS Health Service Region (HSR), 2013

HSR	Case Count	Incidence Rate (per 100,000)*
1	60	7.1
2/3	58	0.8
4/5N	4	
6/5S	16	0.2
7	0	0.0
8	3	
9/10	36	2.6
11	6	0.3
TOTAL	**183**	**0.7**

Population estimate based on 2010 Census

*Calculation of rates is not recommended when there are fewer than five events in the numerator because the calculated rate can be unstable and exhibit wide confidence intervals.

Acknowledgements and data sources:

Local and regional health departments, DSHS laboratory, mosquito control agencies, medical providers, veterinarians and the Texas Veterinary Medical Diagnostic Laboratory.