



Vector Control Program Annual Report 2016

SAINT LOUIS COUNTY DEPARTMENT OF PUBLIC HEALTH
6121 NORTH HANLEY ROAD, BERKELEY, MO 63134

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Saint Louis County Department of Public Health

Mission

The Saint Louis County Department of Public Health strives to keep Saint Louis County one of the best places in the region to live, work, or visit. This is accomplished by regularly assessing the health and environment of the county and responding with sound policies that help assure the availability of high quality public health services for everyone.

Vision

The Saint Louis County Department of Public Health's vision is a collaborative public health system entrusted to coordinate and allocate resources for prevention and outreach to promote and create a healthy and safe environment.

Values

The Saint Louis County Department of Public Health is committed to:

- being a public health leader in the community;
- operating in a manner that recognizes the value of all people;
- continuously improving its operations;
- using evidence-based practices;
- attaining the highest level of service through efficiency, consistency, and relationship development;
- promoting innovation to ensure all people in the community are served; and
- operating in a transparent manner and accepting responsibility for outcomes.

Vector Control Program

Mission

The Saint Louis County Department of Public Health Vector Control Program protects the health of Saint Louis County residents and visitors by providing comprehensive vector-borne disease surveillance and implementation of Integrated Pest Management (IPM) strategies and principles in an environmentally friendly approach.

Vector Control Vision

To protect the public health of Saint Louis County residents and visitors by providing a comprehensive vector control program that utilizes all aspects of Integrated Pest Management (IPM) in an ecologically sound manner.

Report Preparation

This report was prepared by the Saint Louis County Department of Public Health, Division of Communicable Disease Control Services.

- Vector Control Program
- Epidemiology Program

For additional information, please contact 314-615-1630 or cdcs.doh@stlouisco.com.

I. Introduction

A. About the Saint Louis County Department of Public Health Vector Control Program

The Saint Louis County Department of Public Health Vector Control Program provides full-scale vector control operations for the majority of the 523 square miles that comprise Saint Louis County. These operations include adult mosquito surveillance, testing of adult mosquitoes for the presence of arboviral disease, larvicidal treatment of mosquito breeding sites, Ultra-Low Volume (ULV) applications for the control of adult mosquitoes, and rodent abatement activities in public areas. The Vector Control Program conducts these operations throughout all of unincorporated Saint Louis County, as well as 71 municipalities within the county who contract with the Vector Control Program to provide vector control services for their residents. All operations are conducted in accordance with Integrated Pest Management (IPM) principles and are overseen by Vector Control Specialists who are licensed and certified by the Missouri Department of Agriculture in Public Health Pest Control. Saint Louis County Department of Public Health Vector Control Specialists must attend recertification training through the Missouri Department of Agriculture to maintain their licenses in Public Health Pest Control.

Vector Control Program Services

- Adult mosquito surveillance to monitor the presence and distribution of disease carrying mosquitoes
- Arboviral disease testing of adult mosquitoes to determine the presence and distribution of arboviral disease in the adult mosquito population
- Larvicidal treatment of mosquito breeding sites to reduce the number of adult mosquitoes
- ULV applications for the control of the adult mosquito population
- Barrier applications for the control of the adult mosquito population
- Rodent surveillance and control in public areas and easements
- Response to service requests and complaints regarding mosquito and rodent activity
- Inspections, technical assistance, and control recommendations to St. Louis County residents, at no cost





B. Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of target organisms through a combination of control techniques that are practical and effective to protect public health, as well as the environment. These techniques include surveillance, prevention, education, source reduction, and chemical control methods. All control methods are surveillance-driven and do not occur until predetermined action thresholds are met. After surveillance results indicate that control methods are warranted, pesticide treatments are made with the goal of removing only the target organism. Pest control products are selected and applied in a manner that reduces pesticide resistance, and minimizes risks to human health, non-target species, beneficial organisms, and the environment.

C. Vector-borne Disease Vectors in Saint Louis County

Although Saint Louis County and the state of Missouri are home to dozens of species of mosquitoes and ticks, most are not relevant vectors for disease in humans. Additionally, while the majority of vector-borne disease in Saint Louis County and statewide is caused by ticks (notable vectors of human tick-borne illness in Missouri include *Amblyomma americanum* (the Lone Star tick), *Dermacentor variabilis* (the American Dog tick), and *Ixodes scapularis* (the Black Legged tick)), surveillance and control of ticks is logistically difficult and underfunded nationwide. Consequently, the majority of Vector Control Program activities involve the surveillance and control of mosquito populations to minimize human illness. Table 1 below presents information on four common genera of disease-causing mosquitoes found in Saint Louis County. See section IIc. of this report for further information on human vector-borne illness.

Table 1: Common mosquito vectors in Saint Louis County

Name	<i>Culex</i>	<i>Aedes</i>	<i>Psorophora</i>	<i>Anopheles</i>
Photograph	 (<i>Cx. quinquefasciatus</i>)	 (<i>Ae. albopictus</i>)	 (<i>Ps. ciliata</i>)	 (<i>An. quadrimaculatus</i>)
St. Louis species	<ul style="list-style-type: none"> • <i>Cx. pipiens</i> • <i>Cx. quinquefasciatus</i> • <i>Cx. erraticus</i> • <i>Cx. restuans</i> 	<ul style="list-style-type: none"> • <i>Ae. albopictus</i> • <i>Ae. vexans</i> 	<ul style="list-style-type: none"> • <i>Ps. ciliata</i> • <i>Ps. ferox</i> 	<ul style="list-style-type: none"> • <i>An. punctipennis</i> • <i>An. quadrimaculatus</i>
Egg laying and habitat	<ul style="list-style-type: none"> • Floating rafts of ~200 eggs • Ditches, standing water, vacant pools, some containers • Prefers polluted waters with high organic content 	<i>Ae. albopictus</i> <ul style="list-style-type: none"> • Small containers such as birdbaths, flower pots, buckets, kiddie pools, clogged gutters, tires <i>Ae. vexans</i> <ul style="list-style-type: none"> • Flood plains 	<ul style="list-style-type: none"> • Temporary rain pools 	<ul style="list-style-type: none"> • Ponds with growing vegetation, canals, irrigation ditches, sluggish streams
Relevant information	Active after dusk and just before dawn	Aggressive biters, especially during the day	Relatively large mosquito, aggressive biters, active during the day	Active during the day or night
Diseases transmitted	West Nile virus, St. Louis encephalitis, and Eastern equine encephalitis	<i>Ae. albopictus</i> <ul style="list-style-type: none"> • Chikungunya, Dengue fever, yellow fever, Zika virus <i>Ae. vexans</i> <ul style="list-style-type: none"> • Canine heartworm, nuisance to humans 	<i>Ps. ferox</i> is capable of transmitting West Nile virus	Malaria, yellow fever, canine heartworm

D. Vector Control Management Areas

The Vector Control Program divides Saint Louis County into five Vector Control Management Areas (VCMAs). As noted in Table 2, each of these areas contains sections of unincorporated Saint Louis County, as well as independent municipalities. The five VCMAs range in size and differ in population density and topography, though all regions are fairly uniform with respect to common mosquito breeding sites. The Saint

Louis County Vector Control Program conducts trapping and adulticiding activities Monday-Friday on a rotating schedule by VCMA.

Table 2: Description of the Saint Louis County Vector Control Management Areas

Region	Size ranking	# trap sites	Jurisdictions	Notable features	Common mosquito breeding sites
North Central	4	40	<ul style="list-style-type: none"> Unincorporated Saint Louis County 28 municipalities 	<ul style="list-style-type: none"> Densely populated 	Standing water, ditches, creeks, retention basins, drainage culverts, storm water sewers, catch basins
North	3	31	<ul style="list-style-type: none"> Unincorporated Saint Louis County 9 municipalities 	<ul style="list-style-type: none"> Populated, with a few rural areas Flood plains, areas not accessible by vehicle 	Standing water, ditches, creeks, swamps, retention basins, drainage culverts, some storm water sewers, some catch basins
South Central	5	35	<ul style="list-style-type: none"> Unincorporated Saint Louis County 15 municipalities 	<ul style="list-style-type: none"> Moderately populated 	Standing water, ditches, creeks, retention basins, drainage culverts, storm water sewers, catch basins
South	2	49	<ul style="list-style-type: none"> Unincorporated Saint Louis County 10 municipalities 	<ul style="list-style-type: none"> Populated, with a few rural areas Meramec River flood plain 	Standing water, ditches, creeks, swamps, retention basins, drainage culverts
West	1	63	<ul style="list-style-type: none"> Unincorporated Saint Louis County 9 municipalities 	<ul style="list-style-type: none"> Contains most diverse mosquito habitats Densely populated and rural areas Missouri and Meramec River flood plains 	Standing water, ditches, creeks, swamps, retention basins, drainage culverts

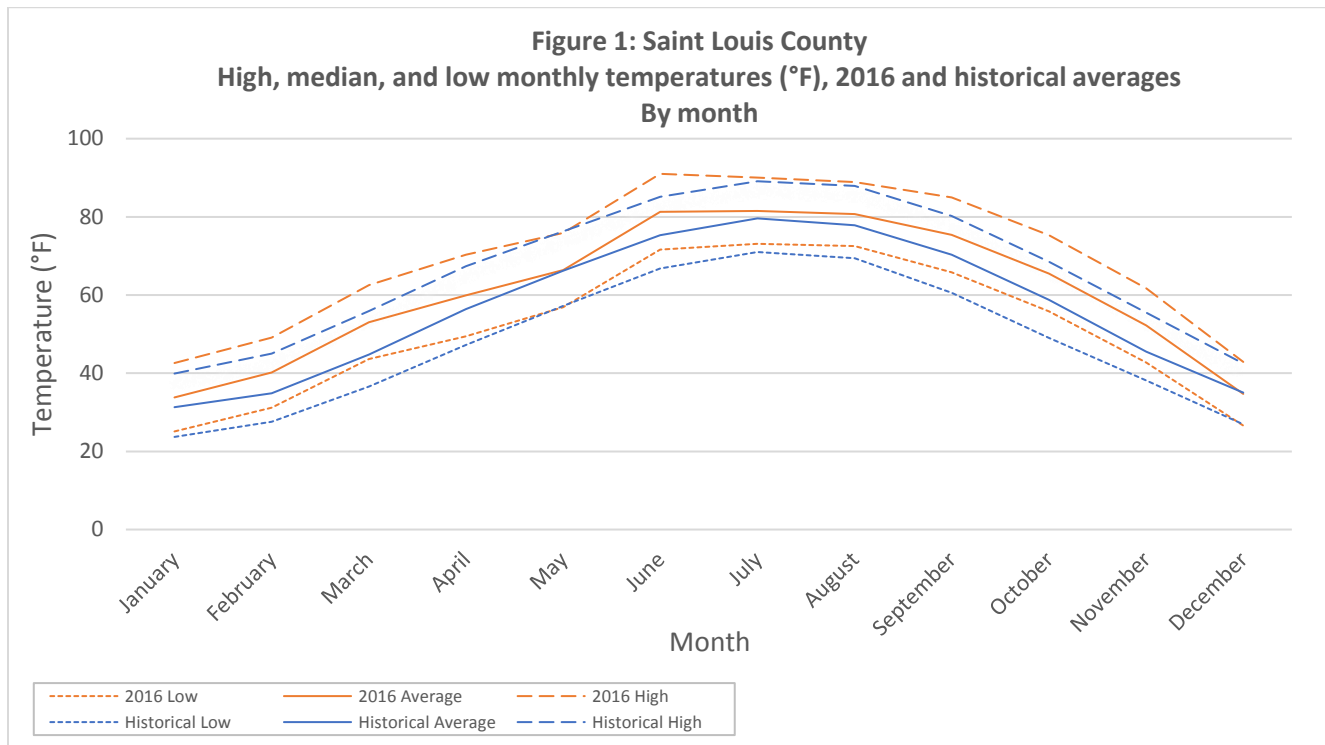
E. 2016 Climate Information

The weather patterns leading into and during the mosquito breeding season can influence mosquito abundance and West Nile virus (WNV) activity. Figures 1 and 2 below present average monthly temperature and precipitation for 2016, compared with historical averages.

Compared with historical averages, 2016 had higher average monthly temperatures, as well as higher monthly low and high temperatures. For example, the 2016 average temperature in March 2016 was 53.0°F, compared with a historical average of 44.8°F. Average temperatures in June and October 2016 were 81.3°F and 65.5°F, compared with historical averages of 75.3°F and 58.8°F, respectively. The warmer fall – specifically the later onset of cooler, evening temperatures – could have had the effect of extending the 2016 mosquito season.

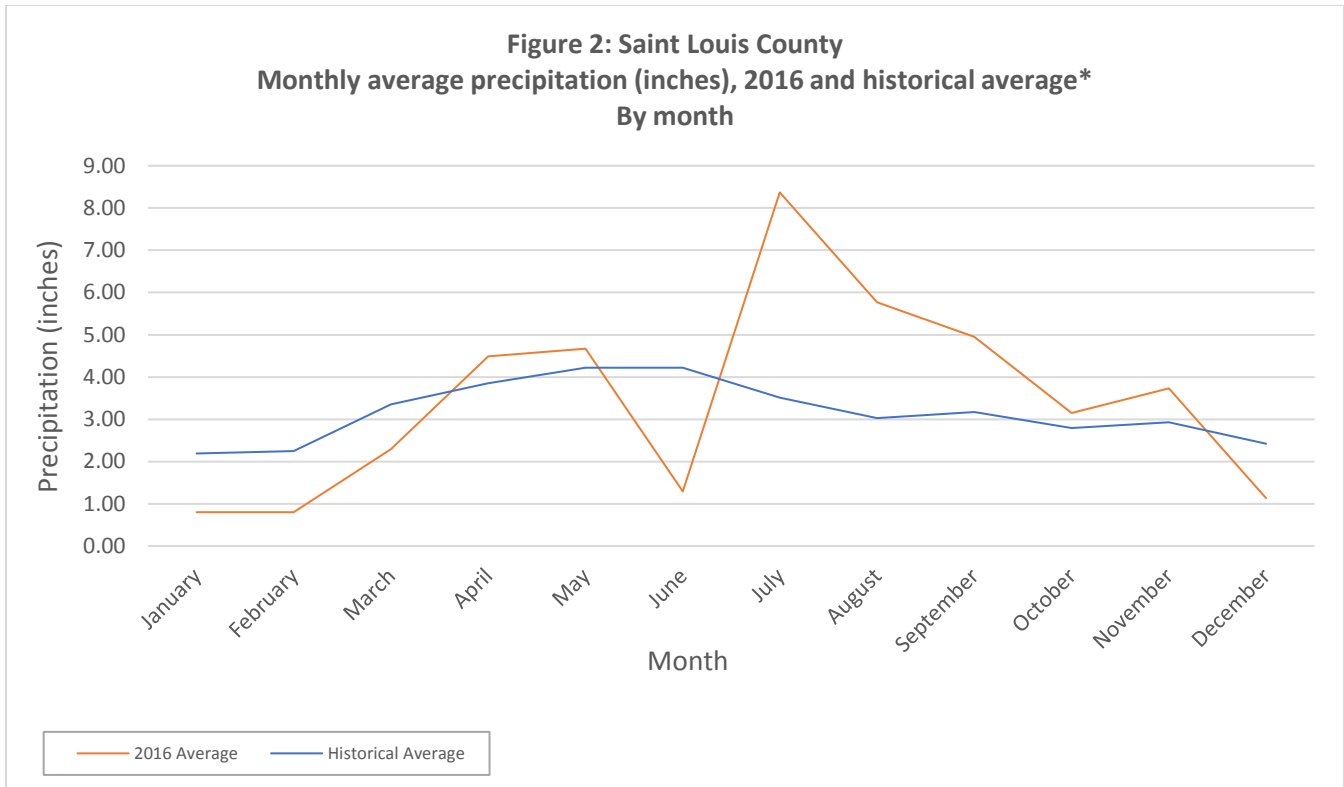
Average monthly precipitation varied widely in 2016, with a notably dry June and wet July-September. The effect of rainfall on mosquito populations varies depending on duration and intensity. While light rain

showers often provide breeding sites, prolonged or especially heavy rainfall could reduce mosquito populations by flushing out breeding sites.



Sources: http://www.weather.gov/media/lx/climate/stl/temp/temp_stl_monthly_seasonal_averages.pdf, <http://www.weather.gov/lx/cliplot>

* Data from 01/1836 – 03/2017



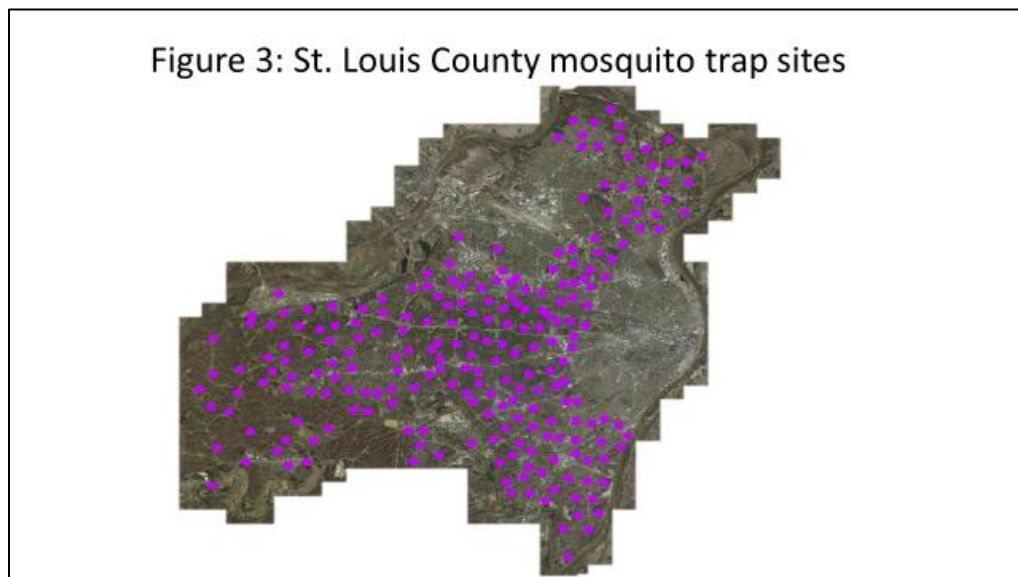
Source: http://www.weather.gov/media/lx/climate/stl/precip/precip_stl_monthly_seasonal.pdf

* Data from 01/1870 – 03/2017

II. Arboviral Vector and Disease Surveillance

A. Description of Surveillance Activities, Traps, and Tests

The Saint Louis County Vector Control Program monitors adult disease-carrying mosquito populations and tests adult *Culex spp.* mosquitoes for the presence of vector-borne disease. There are approximately 230+ mosquito trap sites located throughout Saint Louis County (Figure 3). The most common type of mosquito trap used by the Vector Control Program, the gravid trap, is used to collect gravid female *Culex spp.* mosquitoes to test for the presence of WNV. Gravid traps are spaced equally throughout VCMA's based on the flight range of *Culex spp.* mosquitoes (~5 miles). Specific trap locations are selected according to several factors, including ease of access (e.g., parks and easements) and desirability as a mosquito breeding site. Additional traps, including Sentinel 2 traps, Gravid Autocidal traps (GAT), Light traps, and Black Light traps, are placed throughout the county, and designed to attract multiple species of mosquitoes (including *Aedes spp.*) for identification and surveillance. Weather permitting, up to 12 gravid and five Sentinel traps are set five days per week throughout the mosquito season. These traps are set during the afternoon and retrieved the following morning. Additionally, up to five GAT traps are set on Mondays and retrieved on Fridays. Mosquitoes collected from all traps are identified and sorted by sex and species. Female *Culex spp.* mosquitoes are then tested for the presence of WNV in accordance with Rapid Analyte Measurement Platform (RAMP®) test protocols. Surveillance data are used to determine where to concentrate mosquito control efforts and how best to utilize Vector Control Program resources. The Vector Control Program also provides surveillance data to programs within the Saint Louis County Department of Public Health, as well as other local, state, and federal programs.



B. Vector Surveillance Tables

Because surveillance and control of *Culex spp.* mosquitoes capable of transmitting WNV is currently the primary focus of the Vector Control Program’s mosquito activities, gravid traps make up the bulk (88.9%) of traps set. As described above, the geographic distribution of traps throughout Saint Louis County is dictated by population density and the presence of suitable mosquito breeding sites. Although traps are set throughout mosquito season, the majority of traps are set between June and September, largely due to increased *Culex spp.* activity, as well as an increase in staffing and resources of the Vector Control Program during these months. See Tables 3a, 3b, and 3c below for additional information on the type and Vector Control Management Area of traps set each month.

Table 3a: Number of mosquito traps set, by month, Vector Control Management Area, and trap type								
		May	Jun	Jul	Aug	Sep	Oct	Total
North	Black light	0	1	0	0	0	0	1
	GAT	0	0	1	0	0	0	1
Central	Gravid	1	20	44	22	18	11	116
	Sentinel	0	2	3	3	0	0	8
North	Gravid	6	28	30	17	30	10	121
	Light	0	0	1	0	1	0	2
	Sentinel	0	2	6	0	3	3	14
South	Gravid	0	51	26	14	30	0	121
	Sentinel	0	5	2	0	6	0	13
South	Gravid	6	41	20	44	37	5	153
	Light	0	0	0	0	1	0	1
	Sentinel	0	6	5	7	6	0	24
West	GAT	0	0	2	0	0	0	2
	Gravid	6	32	12	53	16	9	128
	Light	0	0	0	0	1	0	1
	Sentinel	0	2	2	5	2	1	12
Total		19	190	154	165	151	39	718

Table 3b: Number of traps set, by trap type		Table 3c: Number of traps set, by Vector Control Management Area	
Black light	1	North Central	126
GAT	3	North	137
Gravid	639	South Central	134
Light	4	South	178
Sentinel	71	West	143
Total	718	Total	718

Almost 2,000 *Culex spp.* mosquito pools (Table 4) and over 85,000 *Culex spp.* mosquitoes (Table 5) were collected during the 2016 mosquito season. Of these, 91.6% of pools and 91.7% of mosquitoes were collected between June-September, corresponding to the increased staffing during this time. Notably, the number of pools and mosquitoes collected during July was lower compared with adjacent months, due to the especially wet weather.

Table 4: Number of mosquito pools collected, by month and Vector Control Management Area (<i>Culex spp.</i>)							
Vector Control Management Area	May	Jun	Jul	Aug	Sept	Oct	2016 Total
North Central	4	57	108	56	51	25	301
North	19	107	92	42	103	24	387
South Central	0	149	70	44	170	0	433
South	28	97	42	127	98	7	399
West	25	79	26	237	44	34	445
Total	76	489	338	506	466	90	1,965

Table 5: Number of mosquitoes collected, by month and Vector Control Management Area (<i>Culex spp.</i>)							
Vector Control Management Area	May	Jun	Jul	Aug	Sept	Oct	2016 Total
North Central	172	2,519	4,761	2,414	2,201	1,014	13,081
North	776	4,694	3,926	1,754	4,526	894	16,570
South Central	0	6,551	2,876	1,895	7,940	0	19,262
South	1,284	3,964	1,715	5,404	4,126	241	16,734
West	1,214	3,204	1,131	10,897	1,869	1,539	19,854
Total	3,446	20,932	14,409	22,364	20,662	3,688	85,501

Two-hundred-sixteen WNV positive pools (11.8% of the total pools tested) were identified during the 2016 mosquito season (Tables 6 and 7). The proportion of WNV positive pools increased dramatically from 1.6% in May and June to 15.9% in July through September, and reached 22.5% in October. WNV first amplifies in birds, peaking in July and August, with mosquito populations soon following.

(https://www.cdc.gov/westnile/resources/pdfs/13_240124_west_nile_lifecycle_birds_plainlanguage_508.pdf).

The proportion of WNV positive pools was statistically significantly different across Vector Control Management Areas (chi-sq p-value=0.01), with the proportion in the South VMA notably lower than the others. One possible explanation for this difference is that newer construction and better infrastructure in some areas of the South VMA may have provided fewer catch basins available for mosquito breeding habitats.

Table 6: Number of West Nile virus positive pools, by month and Vector Control Management Area							
Vector Control Management Area	May	Jun	Jul	Aug	Sept	Oct	2016 Total
North Central	0	0	13	16	5	6	40
North	1	2	18	10	8	5	44
South Central	0	2	11	5	42	0	60
South	0	4	4	14	3	2	27
West	0	0	1	33	4	7	45
Total	1	8	47	78	62	20	216

Table 7: Percent of West Nile virus positive pools, by month and Vector Control Management Area*							
Vector Control Management Area	May	Jun	Jul	Aug	Sept	Oct	2016 Total
North Central	0	0	12.0	28.6	9.8	25.0	13.3
North	5.3	1.9	19.6	23.8	7.8	20.8	11.4
South Central	0	1.3	15.7	11.4	35.3	0.0	15.7
South	0	4.1	9.5	11.0	3.1	28.6	6.8
West	0	0	3.8	20.8	9.5	20.6	12.3
Total	1.3	1.6	13.9	18.2	15.0	22.5	11.8

* Note: A small number of pools were unable to be tested. This percentages in this table reflect the number of positive pools divided by the total number of pools tested (rather than the total number of pools collected).

Among approximately 55 species of mosquitoes found in Saint Louis County, traps set by the Vector Control Program identified at least 20 species (Table 8). As noted above, the overwhelming majority of mosquitoes trapped and identified were *Culex spp.*, which is expected based on the types of traps set and the primary goal of identifying the presence, proportion, and location of WNV positive mosquitoes.

Table 8: Number of mosquito pools collected, by species and month (all species)								
	Row Labels	May	Jun	Jul	Aug	Sept	Oct	2016 Total
Aedes	<i>Ae. albopictus</i>	4	46	66	88	51	10	265
	<i>Ae. vexans</i>	0	30	19	18	21	6	94
Anopheles	<i>An. punctipennis</i>	0	18	9	10	4	5	46
	<i>An. quadrimaculatus</i>	0	1	1	5	5	2	14
	<i>An. walkeri</i>	0	0	0	0	0	1	1
Culiseta	<i>Cs. inornata</i>	0	0	0	0	0	3	3
Culex	<i>Cx. complex</i>	76	490	346	503	465	88	1,968
	<i>Cx. erraticus</i>	0	1	2	2	5	0	10
Ochlerotatus	<i>Oc. canadensis</i>	0	0	0	2	0	0	2
	<i>Oc. japonicus</i>	4	25	3	22	3	0	57
	<i>Oc. triseriatus</i>	0	46	6	17	5	0	74
	<i>Oc. trivittatus</i>	0	0	0	1	1	0	2
	<i>Oc. trivittatus</i>	0	3	7	4	6	2	22
Orthopodomyia	<i>Or. signifera</i>	4	17	6	11	4	1	43
Psorophora	<i>Ps. ciliata</i>	0	1	2	1	1	0	5
	<i>Ps. columbiae</i>	0	0	4	1	1	0	6
	<i>Ps. cyanescans</i>	0	0	1	0	0	0	1
	<i>Ps. ferox</i>	0	5	3	10	6	4	28
Uranotaenia	<i>Ur. sapphirina</i>	0	1	0	1	0	0	2
	Grand Total	88	685	475	696	578	122	2,643

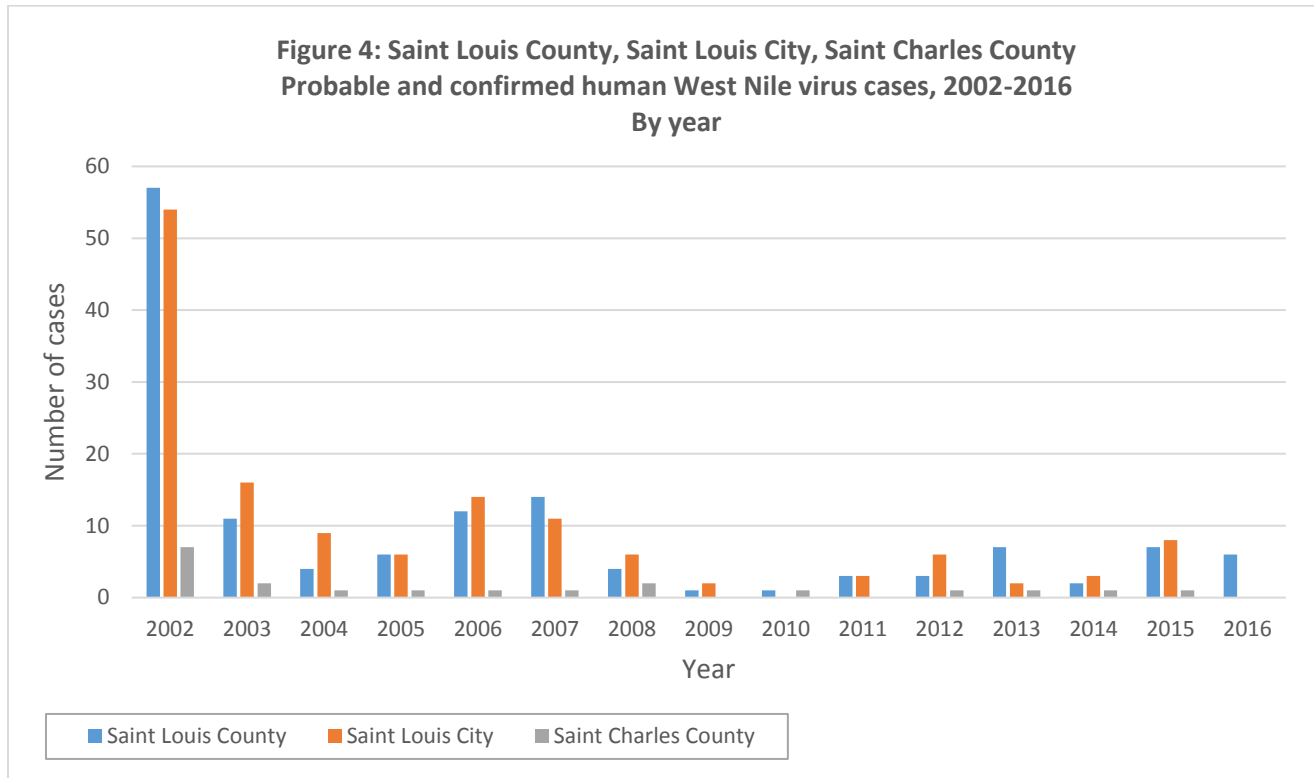
C. Human Vector-borne Disease

Vector-borne illness, including arboviral diseases as well as those caused by bacteria/rickettsia, protozoa, and helminths, are responsible for causing a substantial burden of human morbidity and mortality throughout the world. Clinically, these illnesses vary in presentation and severity, ranging from asymptomatic infections and mild febrile illness to hemorrhagic and neuroinvasive disease. With a few notable exceptions (e.g., yellow fever, Japanese encephalitis), vaccinations are unavailable to prevent vector-borne infections. Changes in climate, land use, human travel, and commercial trade have dramatically increased the global

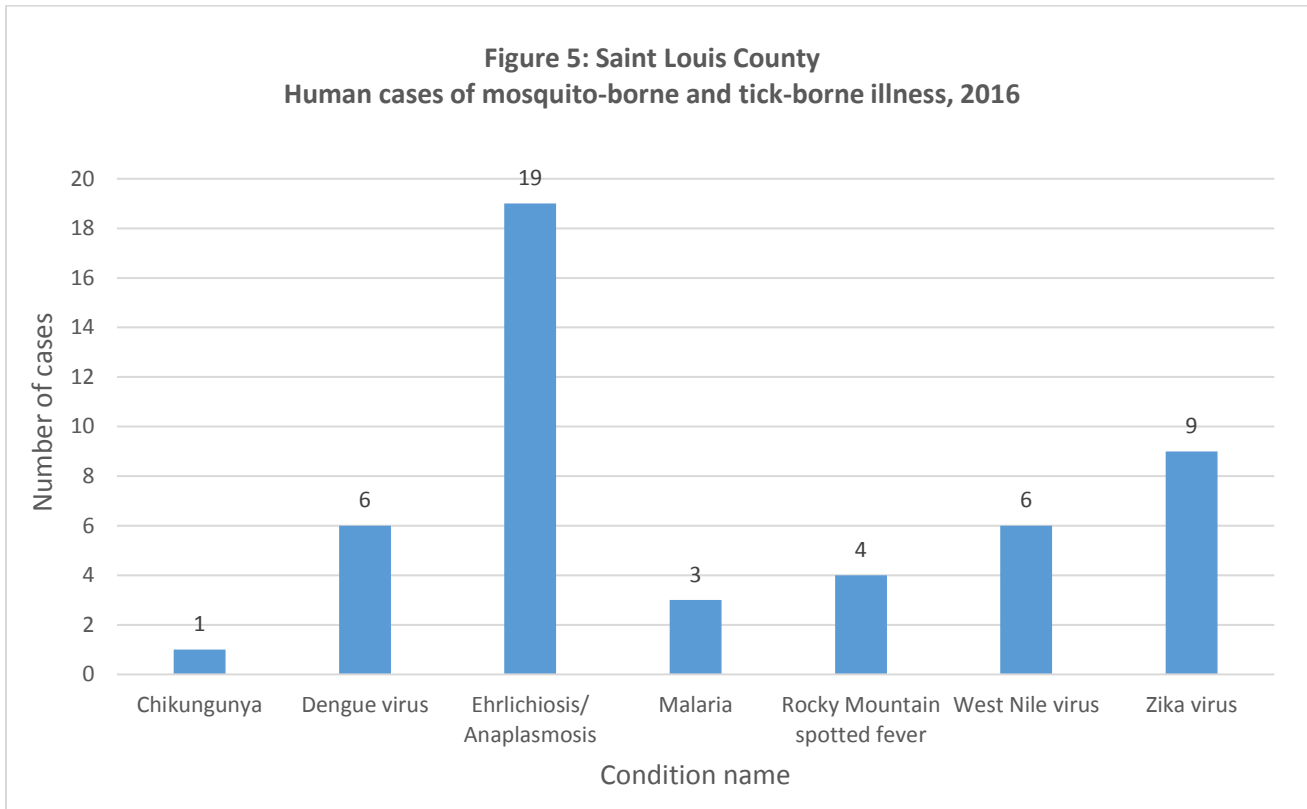
distribution of vector-borne diseases and introduced a myriad of new conditions previously unseen in Missouri and other non-tropical areas of the Western Hemisphere.

In Missouri, depending on how certain conditions are classified, at least 20 vector-borne diseases are considered reportable to the state of Missouri and notifiable nationally. See Appendix A for a list of these conditions, along with the case definitions used by the Council of State and Territorial Epidemiologists and the Missouri Department of Health and Senior Services to identify confirmed, probable, and suspected cases of each disease. In addition to the morbidity and mortality due to naturally occurring vector-borne diseases, several conditions (plague, Q fever, and tularemia) are considered to be potential bioterrorism agents. Because of this, any cases of these illnesses are of particular interest to public health investigators. When cases of any reportable vector-borne illness are received by the Saint Louis County Department of Public Health, investigators work with the Vector Control Program to ensure that proper control measures are implemented to prevent/minimize the further spread of disease.

Human WNV disease was first reported in Saint Louis County (and in the state of Missouri) in 2002, and has been a nationally notifiable disease since 2005. From a peak of 57 reported cases in 2002, Saint Louis County has had a median of 6 cases of human WNV disease (both neuroinvasive and non-neuroinvasive) between 2002-2016. (Figure 4). Neighboring Saint Louis City and Saint Charles County reported a median of 6 cases (range 0-54) and 1 case (range 0-7), respectively, during that same time period. The total number of cases in Missouri from 2002-2016 was 571. The proportion of Missouri cases occurring in Saint Louis County between 2002-2016 ranged from 11.1% (in 2004) to 60.0% (in 2016). It is likely that many factors, including population susceptibility, national focus, and access to healthcare and laboratory services contributed to the variations in the geographic and temporal distribution of human WNV cases.



In 2016, 48 cases of human vector-borne illness were reported to the Saint Louis County Department of Public Health (Figure 5). Of these, 47.9% were mosquito-borne and 52.1% were tick-borne. Aside from 6 cases of WNV, all other cases of mosquito-borne illness were travel-acquired. Tick-borne illnesses, including ehrlichiosis/anaplasmosis, the most commonly reported vector-borne illness in Saint Louis County, were likely locally-acquired.



III. Mosquito Control Activities

A. Larviciding Activities

The Saint Louis County Vector Control Program monitors roughly 6000+ known mosquito breeding sites throughout unincorporated Saint Louis County and contracting municipalities. The types of sites monitored include ditches, ponds, lakes, creeks, canals, swamps, marshes, sewers, storm water retention basins, and any other areas where standing water is present and the potential exists for mosquito breeding to occur. Sites are regularly monitored by Vector Control Specialists and Vector Control Assistants for the presence of mosquito breeding activity throughout the mosquito season. Sites in which mosquito breeding is identified or where conditions show a high potential for mosquito breeding are treated with an appropriate EPA-registered mosquito control product. All mosquito control products are applied in accordance with the product label. Whenever possible, the Vector Control Program uses biologically- and environmentally-friendly mosquito control products and application methods that minimize potential impacts on beneficial organisms and the environment.

In 2016, larviciding occurred from March – November, with Vector Control Assistants spending a total of 2180.9 hours on larviciding activities (Table 9). At least 300 hours of larviciding occurred in each month between June and October, with 31.7% of these in unincorporated Saint Louis County and 68.3% of these in municipalities. Each larviciding route was treated four times. Additionally, almost 20,000 larvicide sites were inspected and over 50,000 larviciding applications were administered. As noted above, because of the later onset of cooler nighttime temperatures, larviciding activities continued into November 2016, which was slightly later than in previous seasons.

Table 9: Mosquito control – larviciding, by month and jurisdiction

	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	2016 Total
Larviciding Hours	14.2	219.0	200.7	305.3	374.9	355.5	313.5	377.6	20.2	2,180.9
Municipal	0.0	126.6	125.7	231.7	261.3	208.4	249.9	274.1	12.4	1,490.1
Unincorporated	14.2	92.4	75.0	73.6	113.6	147.1	63.6	103.5	7.8	690.8
Larvicide Sites										
Inspected	113	837	1,877	3,585	3,290	3,536	2,842	3,549	171	19,800
Larvicide Applications	237	6,578	5,296	3,443	7,508	9,810	9,382	7,622	543	50,419

B. Adulthood Activities

To control the adult mosquito population, the Saint Louis County Vector Control Program conducts nighttime Ultra-Low Volume (ULV) mosquito adulticide applications using truck-mounted ULV machines throughout unincorporated Saint Louis County and contracting municipalities. During the mosquito season, ULV applications are conducted five nights per week, as weather conditions allow. When conducting ULV operations, control efforts are focused on areas where arboviral disease has been identified in the mosquito population, followed by areas where surveillance has indicated the presence of higher numbers of mosquitoes with the potential to transmit disease. In addition, the Vector Control Program administers barrier applications in areas such as parks and ballfields for both routine and special event control of adult mosquito populations.

In 2016, the Vector Control Program devoted 642 total hours to adulticiding, with 45.2% of these in unincorporated Saint Louis County, and 54.8% in various municipalities (Table 10). In addition, 15 hours were spent administering barrier applications; most of these were by request. The amount of time necessary for control activities for adult mosquito populations dropped sharply in October, with the onset of cooler nighttime temperatures. Because mosquito activity was still observed, however, the Vector Control Program shifted its focus and resources to larviciding.

Table 10: Mosquito control – adulticiding, by month and jurisdiction

	May	June	July	August	September	October	2016 Total
Adulticiding Hours	18.0	113.0	181.0	191.0	133.0	6.0	642.0
Municipal	11.0	70.0	105.0	102.0	63.0	1.0	352.0
Unincorporated	7.0	43.0	76.0	89.0	70.0	5.0	290.0
Barrier applications Hours	1.0	4.0	6.0	2.0	2.0	0.0	15.0

IV. Rodent Control Activities

The Vector Control Program works to control rodents which are capable of spreading disease to humans within Saint Louis County. The Saint Louis County Vector Control Program’s Rodent Control Program is a complaint-driven program that provides for the control of rodent pests on public property within the boundaries of Saint Louis County. The Vector Control Program investigates citizen complaints on public and private property as a reactive approach to rodent control. County residents notify the Vector Control Program when rat activity is observed, initiating an investigation by a Vector Control Specialist in the area of the complaint. Based upon the specialist’s findings during the complaint investigation, proper control methods are utilized using IPM, or if on private property, professional recommendations for proper treatment methods are given to the property owner. The Vector Control Program also conducts proactive rodent control measures. These measures include the retreatment of areas where activity has been previously identified, assessing neighborhoods for evidence of rodent activity, and surveying/treating areas with historically high rodent populations.

In 2016, 573 total rodent inspections were conducted, with 53.2% of these occurring in unincorporated Saint Louis County, and 46.8% in various municipalities (Table 11). Additionally, 346 rodenticide applications were administered (56.9% in unincorporated Saint Louis County and 43.1% in municipalities), and the Vector Control Program responded to 261 rodent service requests (52.9% in unincorporated Saint Louis County and 47.1% in municipalities). Rodent abatement activities occurred in all 12 months of 2016.

Table 11: Rodent abatement activities, by month and jurisdiction

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2016 Total
Rodent Inspections	23	30	43	51	60	74	75	76	40	40	36	25	573
Municipal	13	12	18	21	25	34	37	41	20	22	15	10	268
Unincorporated	10	18	25	30	35	40	38	35	20	18	21	15	305
Rodenticide Applications	18	24	17	26	27	48	50	40	33	27	23	13	346
Municipal	8	11	6	8	10	22	23	18	15	15	8	5	149
Unincorporated	10	13	11	18	17	26	27	22	18	12	15	8	197
Rodent Service Requests	10	15	20	23	34	40	32	30	21	19	10	7	261
Municipal	7	8	11	9	17	15	16	17	9	10	1	3	123
Unincorporated	3	7	9	14	17	25	16	13	12	9	9	4	138

V. Summary of Service Requests

In addition to their routine mosquito surveillance and control activities, the Vector Control Program responds to service calls year-round. When requests are received, each request is assessed and the Vector Control Program responds appropriately. In 2016, they received 925 service requests for the inspection and control of adult mosquito populations, mosquito breeding sites, stinging insect populations, rodent populations, rodent habitats and numerous other vector-related concerns (Table 12). Of these 925 requests, 46.2% were for adulticiding services, 11.0% were for control of mosquito breeding sites, 28.2% were for rodent control, and 14.6% were for other services.

Table 12: Summary of service requests, by month and jurisdiction													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2016 Total
Adulticide Service Requests	0	0	2	14	26	93	55	129	95	13	0	0	427
Municipal	0	0	1	7	17	41	25	46	30	6	0	0	173
Unincorporated	0	0	1	7	9	52	30	83	65	7	0	0	254
Mosquito Breeding Service Requests	0	1	4	15	19	17	11	20	7	8	0	0	102
Municipal	0	1	3	10	6	8	8	10	3	4	0	0	53
Unincorporated	0	0	1	5	13	9	3	10	4	4	0	0	49
Stinging Insect Service Request	0	0	0	2	3	2	10	11	3	2	0	0	33
Municipal	0	0	0	2	2	2	6	5	2	0	0	0	19
Unincorporated	0	0	0	0	1	0	4	6	1	2	0	0	14
Rodent Service Requests	10	15	20	23	34	40	32	30	21	19	10	7	261
Municipal	7	8	11	9	17	15	16	17	9	10	1	3	123
Unincorporated	3	7	9	14	17	25	16	13	12	9	9	4	138
Misc. Service Requests	0	1	3	11	15	15	14	20	12	6	2	3	102
Total Service Requests	10	17	29	65	97	167	122	210	138	48	12	10	925

VI. Appendix A: Vector-borne Diseases and Conditions Reportable in Missouri in 2016

Appendix A: Vector-borne diseases and conditions reportable in Missouri in 2016	
Condition	Link to case definition
Anaplasmosis/Ehrlichiosis	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Ehrlichiosis.pdf
Arboviral Diseases, neuroinvasive and non-neuroinvasive <ul style="list-style-type: none"> • California serogroup viruses, including La Crosse virus • Chikungunya virus • Eastern equine encephalitis • Powassan virus • St. Louis encephalitis virus • Venezuelan equine encephalitis virus • West Nile virus • Western equine encephalitis virus 	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Arbovirus.pdf
Babesiosis	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Babesiosis.pdf
Dengue	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Dengue.pdf
Lyme-like disease	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Lyme.pdf
Malaria	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Malaria.pdf
Plague	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Plague.pdf
Q Fever	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/QFever.pdf
Rocky Mountain spotted fever	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/RMSF.pdf
Tularemia	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/Tularemia.pdf
Yellow fever	http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/pdf/YellowFever.pdf
Zika	https://www.cste2.org/docs/Zika_Virus_Disease_and_Congenital_Zika_Virus_Infection_Interim.pdf

VII. Appendix B: Abatement Products

Appendix B: Products used by the Saint Louis County Vector Control Program			
Product	Active Ingredient	EPA Registration No.	Application
AquaDUET	Prallethrin Sumithrin Piperonyl Butoxide	1021-2562-8329	Adulticide
Aqua-Reslin	Permethrin Piperonyl Butoxide	432-796	Adulticide
Summit BTI	B.t.i.	6218-47	Larvicide
VectoLex WSP	Bacillus sphaericus	73049-20	Larvicide
VectoMax WSP	Bacillus sphaericus B.t.i.	73049-429	Larvicide
Fourstar Briquets (45)	Bacillus sphaericus B.t.i.	83362-3	Larvicide
Fourstar Briquets (180)	Bacillus sphaericus B.t.i.	83362-3	Larvicide
Fourstar MGB	Bacillus sphaericus B.t.i.	85685-3	Larvicide
Altosid Pellets	Methoprene	2724-448	Larvicide
Altosid Briquets	Methoprene	2724-375	Larvicide
AquaBAC xt	B.t.i.	62637-1	Larvicide
CocoBear	Mineral Oil	8329-93	Larvicide/Pupicide
Mavrik	Tau-fluvalinate	2724-478	Perimeter Control
Final	Brodifacoum	12455-89	Rodenticide
Terad 3	Chlolecalciferol	12455-106	Rodenticide
Maki	Bromadiolone	7173-187	Rodenticide
Fastrac	Bromethalin	12455-97	Rodenticide