Allen County Department of Health

2018
Mosquito Surveillance & Control Report

Reported by:

Erika Pitcher, MPH
Director, Community Health & Case Management Services

David Fiess, MPA
Director, Environmental Services

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Executive Summary

The 2018 mosquito season was back to normal compared to the 2017 season. Rainfall was 5.62 inches less than 2017's mosquito season rainfall (*See Table 1 for weather data*). Complaints slightly increased to 261 from the 251 called in by the public in 2017.

Three seasonal mosquito technicians began the larval surveillance and control portion of the mosquito program in early May. By September 28th, 3,122 water site inspections occurred, with 472 larvicide treatments completed. Adult mosquito trapping and testing started in late June. Sixty-four (64) of 222 mosquito samples tested positive for West Nile virus with a positivity rate of twenty-nine percent (29%). Since testing began in 2002, this was the highest positivity rate compared to all of the other years. Environmental surveys around the positive trap locations yielded varying bodies of water breeding the *Culex* group, such as swimming pools, tires, and ditches. These bodies of water were eliminated or treated to prevent the emergence of more possible disease carriers.

There were less than five (5) human cases of West Nile virus in Allen County in 2018 with no fatalities.

Zika virus (Zika) became a national concern in 2016, after it hit the Caribbean and Latin American countries in 2015. Travelers to the region brought the virus back home, causing concern that the virus would be transmitted to others via mosquitoes or sex. Fortunately, the primary mosquito for transmission of Zika (*Aedes aegypti*) is not present in Indiana, but the other type that can transmit it (*Aedes albopictus*) is present in Allen County in minimal numbers. There were no confirmed human cases of Zika in Allen County.

Public education through the media is done every season. Three news releases were sent to the media generating three interviews regarding West Nile virus and mosquito prevention measures. The interest provided opportunities to educate/re-educate the public about mosquito prevention measures.

Introduction

Mosquito Surveillance and Control duties began in the mid-1970s in response to an outbreak of St. Louis Encephalitis in Allen County. These duties, managed by the Vector Control & Healthy Homes Program in the Environmental Services division, are completed by three (3) seasonal employees, five (5) full-time staff, and an administrative assistant to respond to complaints, inspect and treat mosquito breeding sites, and place adult mosquito traps. Mosquito Surveillance and Control runs from May through September.

The goal of the Program is to control the vector mosquito species to prevent the spread of mosquito-borne diseases. The term "vector" means any animal or insect that can transmit a disease to other animals, including humans. *Culex pipiens*, *Culex restuans*, and *Culex salinarius* (*Culex* group) are the species of mosquitoes in Allen County that can carry and transmit diseases such as Eastern Equine Encephalitis, St. Louis Encephalitis and West Nile virus.

These mosquitoes obtain the virus from birds. *Aedes triseriatus*, the tree-hole mosquito, can spread La Crosse Encephalitis, which it can pick up from chipmunks. There are over 30 other types of mosquitoes in Allen County, with most of them being nuisance mosquitoes.

Sanitary code enforcement is conducted by full-time staff. Examples of a need for code enforcement are residents or businesses storing un-rimmed tires and open containers outside and residents not maintaining swimming pools and spas.

As mentioned, adult mosquitoes are captured in gravid traps and tested weekly for mosquito-borne viruses, such as Eastern Equine Encephalitis, St Louis Encephalitis and West Nile virus. If one of these viruses is found in a sample, a 1/2-mile radius area around the positive trap location is surveyed. Employees inspect and treat known breeding sites in the area and search for new ones to check and treat.

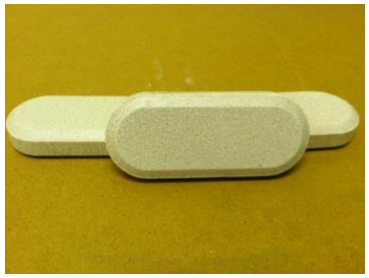
Education is also a component of Mosquito Surveillance and Control. When inspecting a property, employees educate homeowners and tenants about prevention measures, such as flushing out birdbaths once a week and wearing repellants. Whenever staff was interviewed for print, radio or television media, the main points of mosquito prevention were stressed. The Allen County Department of Health's website, www.allencountyhealth.com, was updated with new information about West Nile virus locally and nationally.

The Community Health & Case Management Services division investigates reports of mosquito-borne diseases received from the hospitals and doctors' offices. When a report of a human testing positive for a mosquito-borne disease is received by the division, medical records are reviewed to assist with classifying the case and a questionnaire is completed with the affected individual to determine environmental risk factors, such as living in a wooded area; living around ponds, streams, etc.; and any travel, whether in Indiana or outside of Indiana, that could have increased the risk of infection. The Vector Control & Healthy Homes Program is then notified of these risk factors so that division staff may respond appropriately for each case.

Larval Mosquito Surveillance & Control

During the mosquito season (May – September), the seasonal technicians and full-time staff inspect and treat, if necessary, more than 315 known bodies of water (called permanent sites) that may or may not be breeding mosquitoes. They also locate new sites (*See Figures 1 and 2 for all sites inspected*). The types of bodies of water include ditches, low areas, ponds, swimming pools and tires (*See Figure 3*), hot tubs, containers, bird baths, ornamental ponds, wetlands, woodland pools, and trash cans.

The life cycle of the mosquito begins in the water, with the minimum depth only needing to be a ¼ inch of water. The egg turns into larvae, then into pupae and finally the adult. During the larval stage is when the mosquito is eating organic matter in the water. While in the pupal stage, no feeding is occurring. (*See Table 2 for the type of larvae collected and number of sites where that type was found – the same type may have been found at the same site on different dates.*)



Depending on what stage the mosquito is in determines what larvicide the technician will use. If the mosquito is in the larval stage, then the technician can use Natular G30 (naturally-occurring spinosad – lasts for 30 days) or Natular XRT (naturally-occurring spinosad – lasts for 180 days). The active ingredient in each of these products is ingested by the larvae causing death. CocoBear (90% coconut oil) can be used for the larvae and pupae. The oil disrupts the surface tension of the water, not allowing the larvae or pupae to obtain oxygen at the surface. (*See Figure 4 for locations of treated sites and Table 3 for a zip code breakdown of inspected and treated sites*.)

The following amounts of larvicides were applied in 2018: CocoBear (251 fl. oz.), Natular G30 (246 lbs.), and Natular XRT (66 tablets). (*See Table 4 for comparisons of usage in past seasons*).

Mosquito Surveillance and Control also uses a biological control method. *Gambusia affinis*, also known as "mosquitofish", are a top-feeding guppy that offers excellent control of larvae and pupae in ornamental ponds and backyard garden pools. These fish have upturned mouths and work along the surface, feeding on mosquito larvae and other small invertebrates. They are somewhat tolerant of organic pollution and reproduce rapidly. Since the fish will interfere with the life cycle of other aquatic organisms around them, certain restrictions apply as to where they can be used. In general, they cannot be placed in waterways such as rivers, creeks, ditches, and lakes, where they can interfere with Indiana game fish. The mosquitofish are provided to the public for free. They were placed at fifteen (15) locations during the 2018 mosquito season.

When human cases and virus-positive adult mosquito samples are identified, surveys are conducted in a half-mile radius around the identified locations. Employees attempt to locate bodies of water that could be breeding the *Culex* group. These bodies of water are usually swimming pools, tires, containers, bird baths, ditches and ornamental ponds.

Adult Mosquito Surveillance

Beginning in late June, one of the technicians travels around Allen County setting up adult mosquito traps in each of the townships. The traps are placed either in random locations, by a homeowner's request, or where there might be a cluster of dead birds (locations called in by the public). The traps are set up near bushes or trees where birds may roost at night. The female *Culex* type mosquitoes mate with the males, feed on the birds, and then find stagnant water to lay her eggs. A female needs the protein in blood to form her eggs, so she can become infected from the birds carrying the diseases of concern.

The mosquito trap consists of a tub filled with water (fermented with alfalfa pellets), tube with a fan that sits above the tub, and net that captures the mosquitoes. A 6-volt battery powers the fan. The female *Culex* group mosquitoes lay their eggs on the surface of the water, so as they are sitting on the surface they float under the tube and the fan sucks them up into the net. The technician picks up the traps the following morning. The nets are placed into the freezer to kill the mosquitoes. The mosquitoes are then tested for Eastern Equine Encephalitis, St. Louis Encephalitis and West Nile virus.

Two testing procedures are used to test the female mosquitoes. The program uses the RAMP system, which only tests for West Nile virus. Extra samples of mosquitoes are sent to the Indiana State Department of Health's Microbiology lab to be tested by the PCR method, which can test for up to 6 diseases, including Eastern Equine Encephalitis and St. Louis Encephalitis.

Two hundred and twenty-two (222) adult mosquito traps were set up throughout Allen County from June to September (*Figures 5 and 6; See Figures 7 and 8 for trap locations from 2001 - 2018*). Sixty-four (64) of 222 mosquito samples (some traps captured so many extra mosquitoes that multiple samples per site were tested) tested positive for West Nile virus (*See Figure 9 and Table 5 for a zip code breakdown of where the traps were located and their test results; Figure 10 shows where traps were located in relation to the townships; Figure 11 shows the trap results in relation to the city/town they were located*). The positivity rate for 2018 was twenty-nine percent (29%). Since testing began in 2002, this was the highest positivity rate compared to all of the other years (*See Table 6*). The 222 samples equaled 9,757 female mosquitoes. A sample is fifty (50) mosquitoes or less. In 2017, forty-three (43) of 246 samples tested positive for West Nile virus (*See Figures 12 and 13 for the locations of West Nile virus-positive samples for 2002 – 2018 and Table 6 for a comparison of test results for 2002 - 2018*).

Besides conducting general adult mosquito surveillance with the traps, attention is also paid to the areas where humans positive with a mosquito-borne disease live. When notified of these locations, a trap is placed nearby to identify if any of the mosquitoes flying in the area are infected. There were less than five (5) human cases of West Nile virus in 2018.

Human Surveillance

West Nile Virus

Human cases are identified through laboratory testing and clinical presentation at physician's offices and hospitals. Most people that are infected with West Nile virus have no symptoms, but many will have West Nile fever, which included fever, headache, fatigue, and occasionally swollen lymph nodes, skin rash and eye pain. Less frequently, clinical symptoms can progress and cause neuroinvasive disease, which is characterized by altered mental status which can progress to lethargy, confusion, and even coma; limb paralysis;

tremors; and movement disorders. There is no specific treatment for West Nile virus besides supportive treatment, which includes intravenous fluids, assistance with breathing, and supportive nursing care.

In regards to West Nile in humans in Allen County, there were less than five (5) cases in 2018.

Zika Virus

Human cases of Zika virus are identified through laboratory testing at either private, or public health laboratories. Zika virus typically presents with clinical symptoms of fever, rash, joint pain and conjunctivitis. There is no treatment for Zika virus, it most often just has to run its course over the span of a few weeks. In rare instances, it can lead to Guillan-Barre syndrome and birth defects. Due to the high volume of cases and low volume of laboratories with testing capabilities initially, the Indiana State Department of Health established testing authorization guidelines for screening patients. These guidelines allowed testing for the following populations: Travelers (to areas with known transmission) with any of the FRAC (fever, rash, arthralgia, conjunctivitis) symptoms, pregnant women who have traveled to an area with Zika (regardless of symptoms), and pregnant women who have had unprotected sex with a man who has traveled to an area with Zika and is symptomatic. During the summer of 2016, several private laboratories developed the capability to conduct Zika testing for all populations, regardless of risk or exposure. This testing has led to several challenges, including: unnecessary testing, inappropriate testing (serology vs PCR), misinterpretation of results, and incorrect education of patients who test positive for Zika virus. As of October 10, 2017, Allen County had no confirmed cases of Zika virus. (*See Table 7 for a comparison of Allen County, Indiana and national human data for arboviral diseases for 1999 – 2018 comparisons*).

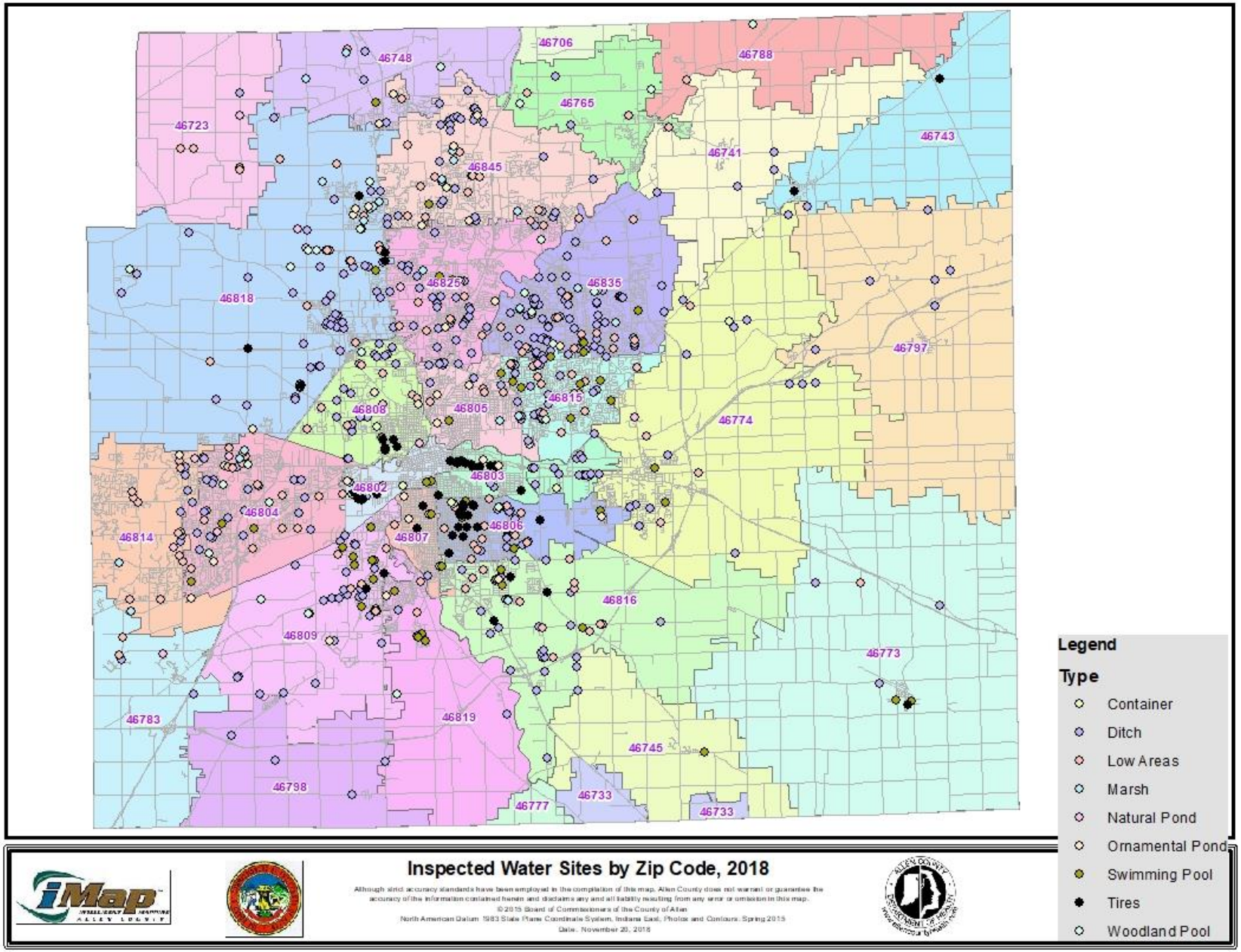
Predictions for 2019

According to Lyle Peterson, MD, MPH, director of the Division of Vector-Borne Infectious Diseases at the U.S. Centers for Disease Control and Prevention, it is difficult to predict a West Nile virus season because "a variety of environmental factors, temperature, rainfall, and early onsets of spring or late onsets of spring or late onsets of fall, et cetera, can affect all of these parameters that affect transmission of West Nile virus in nature" (CDC telebriefing, September 6, 2012). The environmental factors consist of the population of vector mosquitoes (increased number allows for a greater chance of those mosquitoes becoming infected), population of birds (more birds are carrying the virus, but not dying), infectiousness of the mosquitoes (higher temperatures can make mosquitoes more infectious, allowing for easy transmission to other animals), and man-made breeding sites (the more tires, containers, and clogged gutters there are in a community, the more vector mosquitoes will be produced).

The Vector Control & Healthy Homes Program and Community Health & Case Management Services division's plans for 2019 will be similar to the 2018 plan. Breeding sites will be checked and treated, if necessary. The public will be educated about prevention and control measures. Human cases will be investigated. Traps will be set to monitor virus activity in the community. Mosquitoes will be tested for West Nile virus locally with the RAMP system, while samples will be sent to the Indiana State Department of Health to test

for Eastern Equine Encephalitis and St. Louis Encephalitis. Surveillance for *Aedes albopictus*, "Asian Tiger Mosquito", will continue with the utilization of BG Sentinel 2 traps that are specific to capturing this type of mosquito. *Ae. albopictus* can transmit dengue, chikungunya, and Zika viruses from person-to-person.

Figure 1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Natural Pond
Ornamental Pond
Swimming Pool
Tires
Woodland Pool
Inspected Water Sites by Zip Code, 2018
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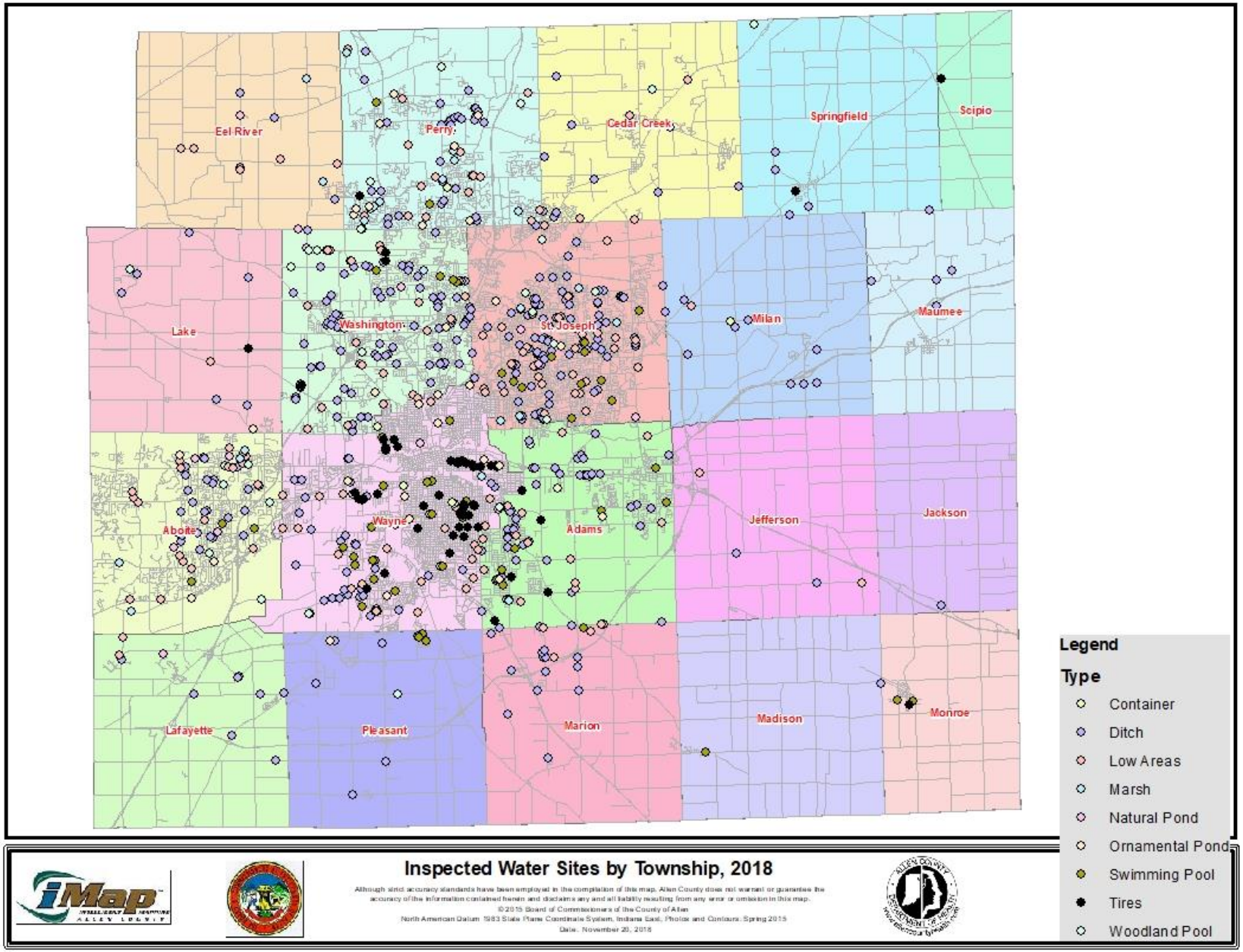
Figure 2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Natural Pond
Ornamental Pond
Swimming Pool
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Woodland Pool
Inspected Water Sites by Township, 2018
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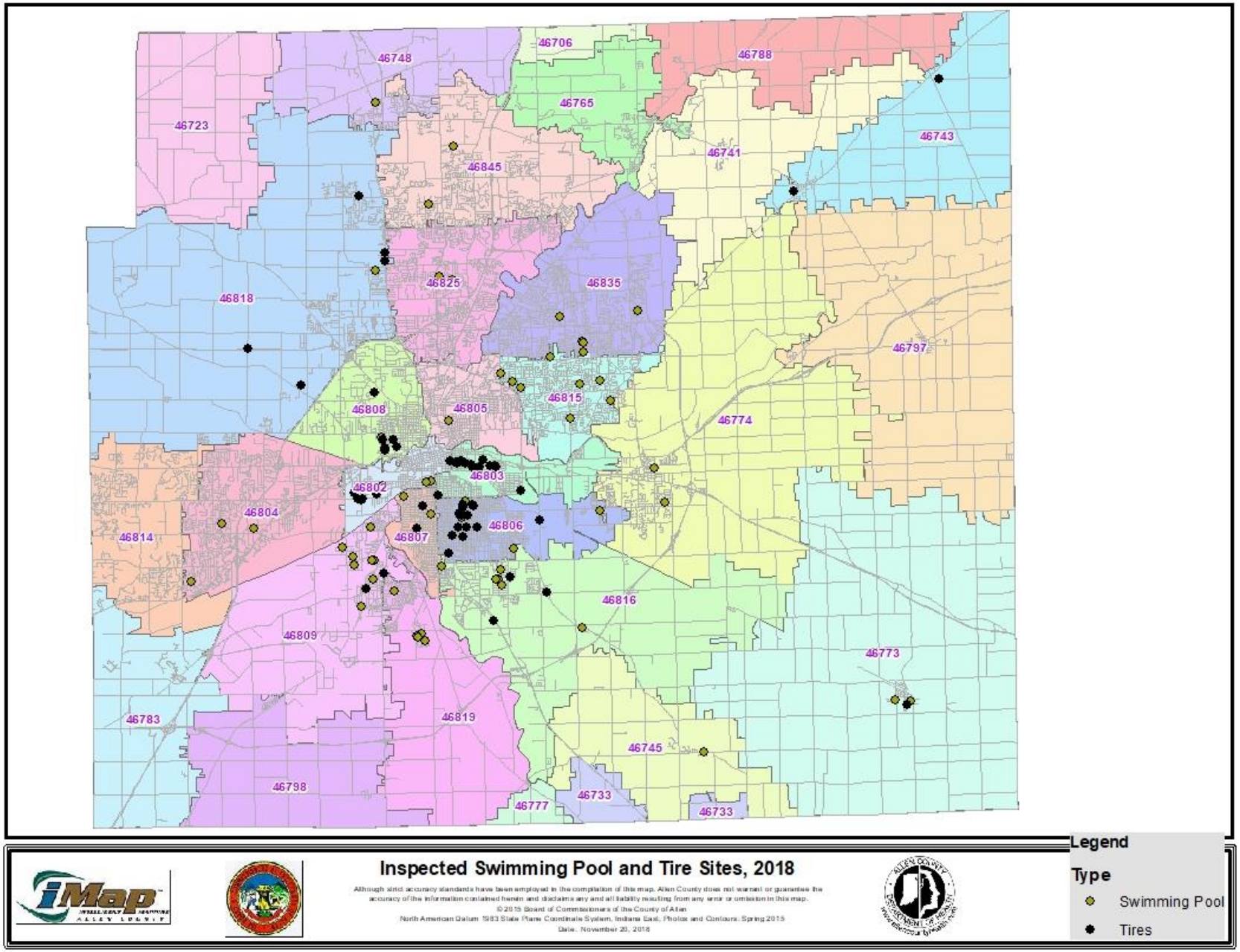
Figure 3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Inspected Swimming Pool and Tire Sites, 2018
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North American Datum 1983 State Plane Coordinate System, Indiana East, Photos and Contours: Spring 2015
Date: November 20, 2018
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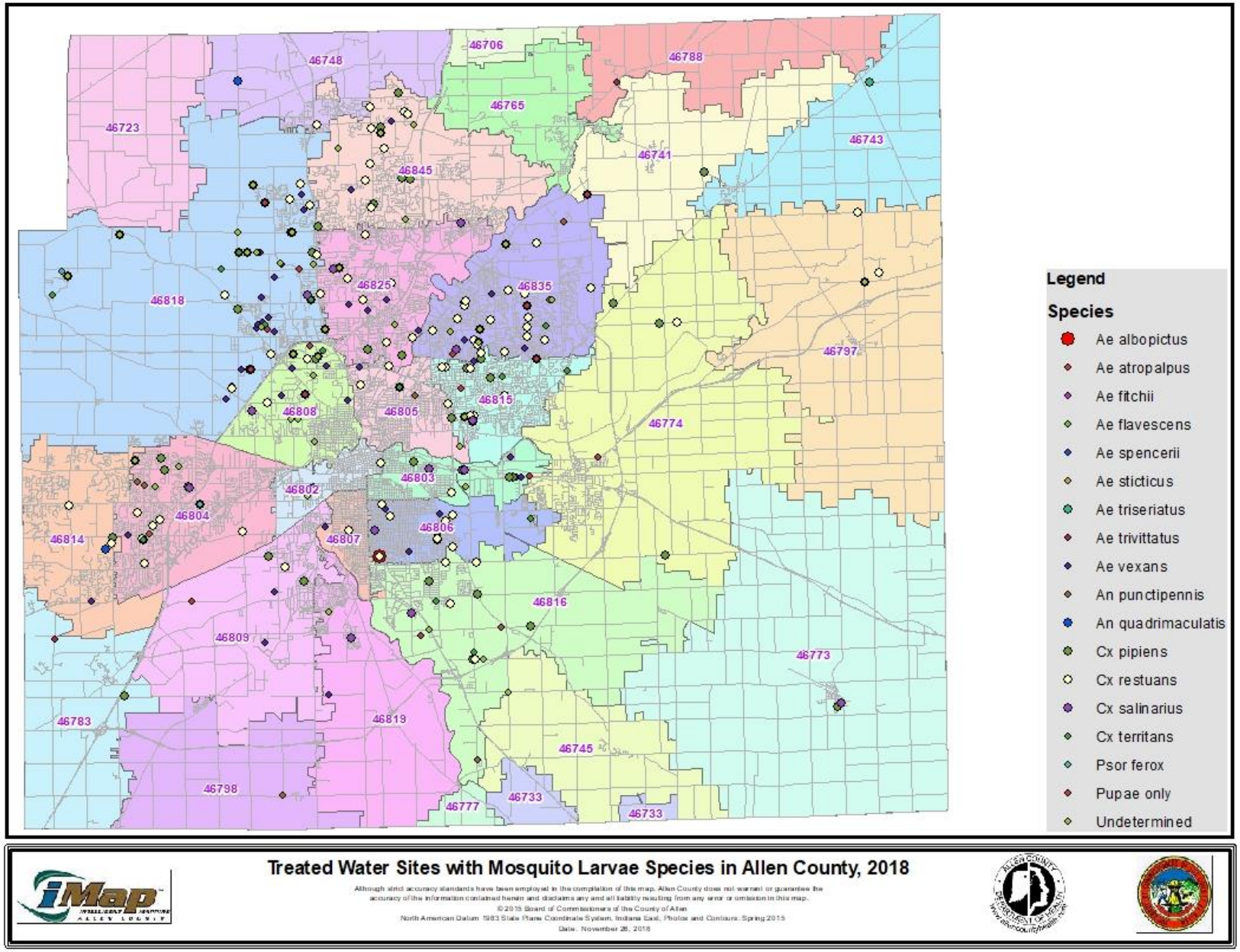
Tires

Figure 4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Species
Ae albopictus
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Ae spencerii
Ae sticticus
Ae triseriatus
Ae trivittatus
Ae vexans
An punctipennis
An quadrimaculatis
Cx pipiens
Cx restuans
Cx salinarius
Cx territans
Psor ferox
Pupae only
Undetermined
Treated Water Sites with Mosquito Larvae Species in Allen County, 2018
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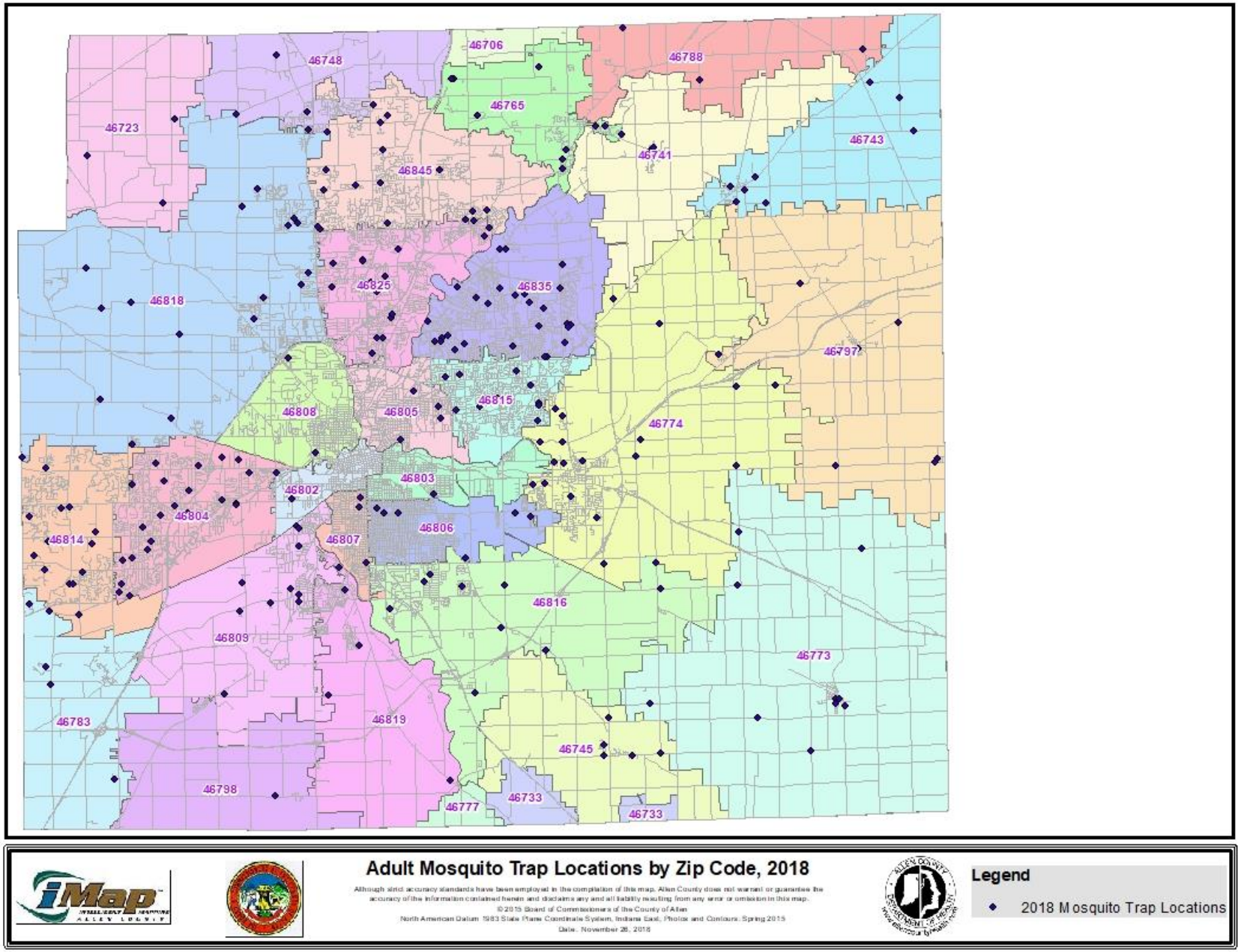
Figure 5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Adult Mosquito Trap Locations by Zip Code, 2018
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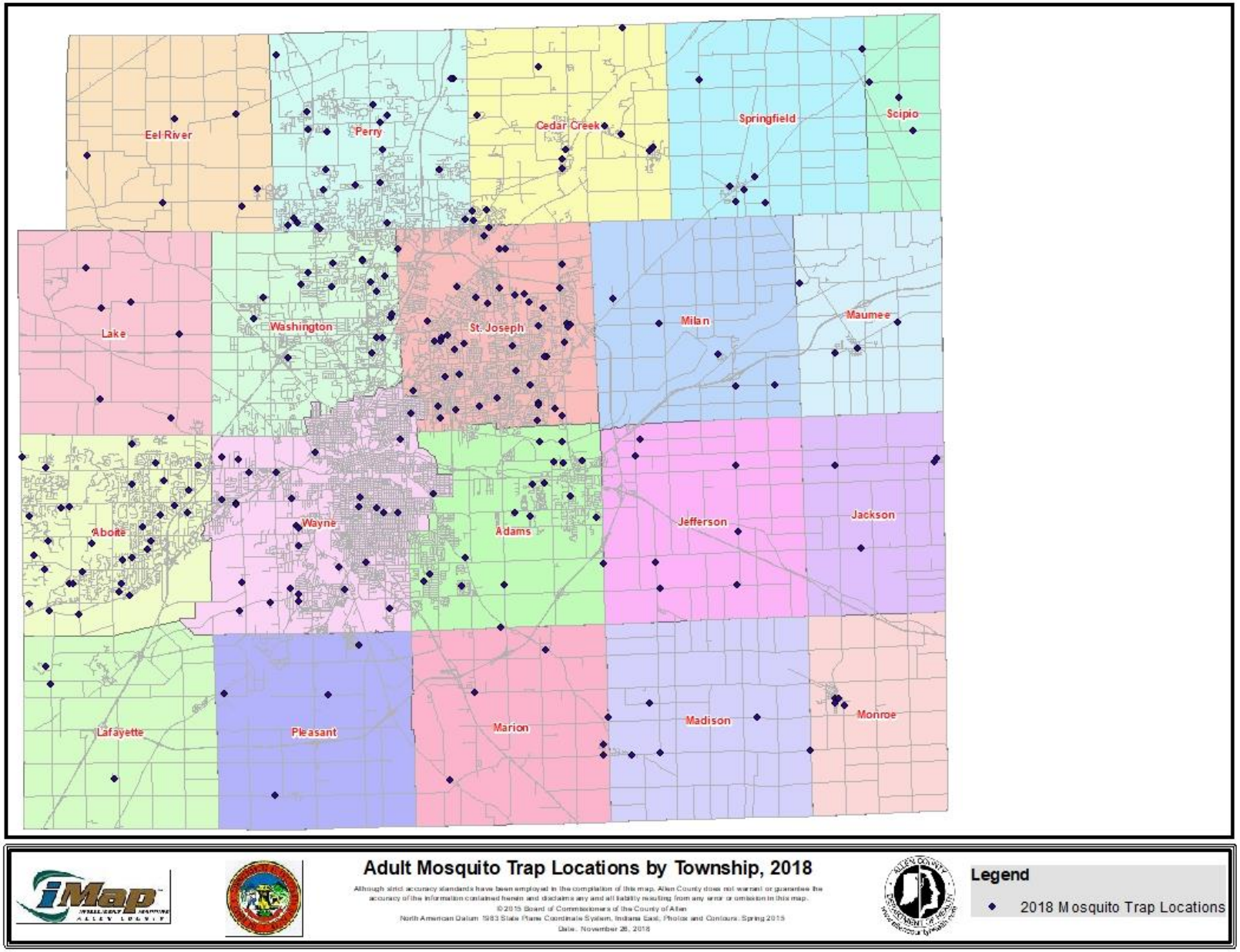
2018 Mosquito Trap Locations

Figure 6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Adult Mosquito Trap Locations by Township, 2018
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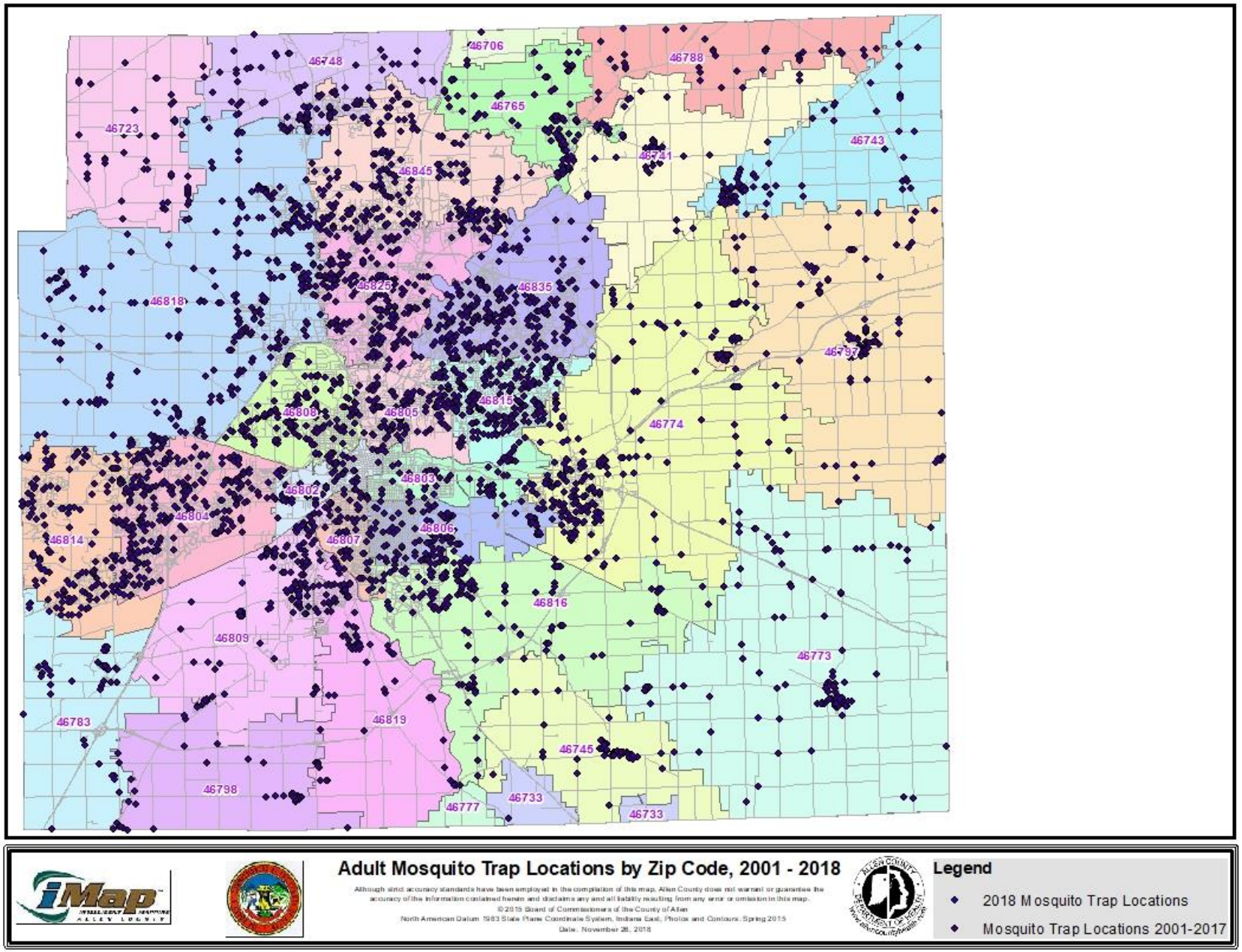
2018 Mosquito Trap Locations

Figure 7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Adult Mosquito Trap Locations by Zip Code, 2001 - 2018
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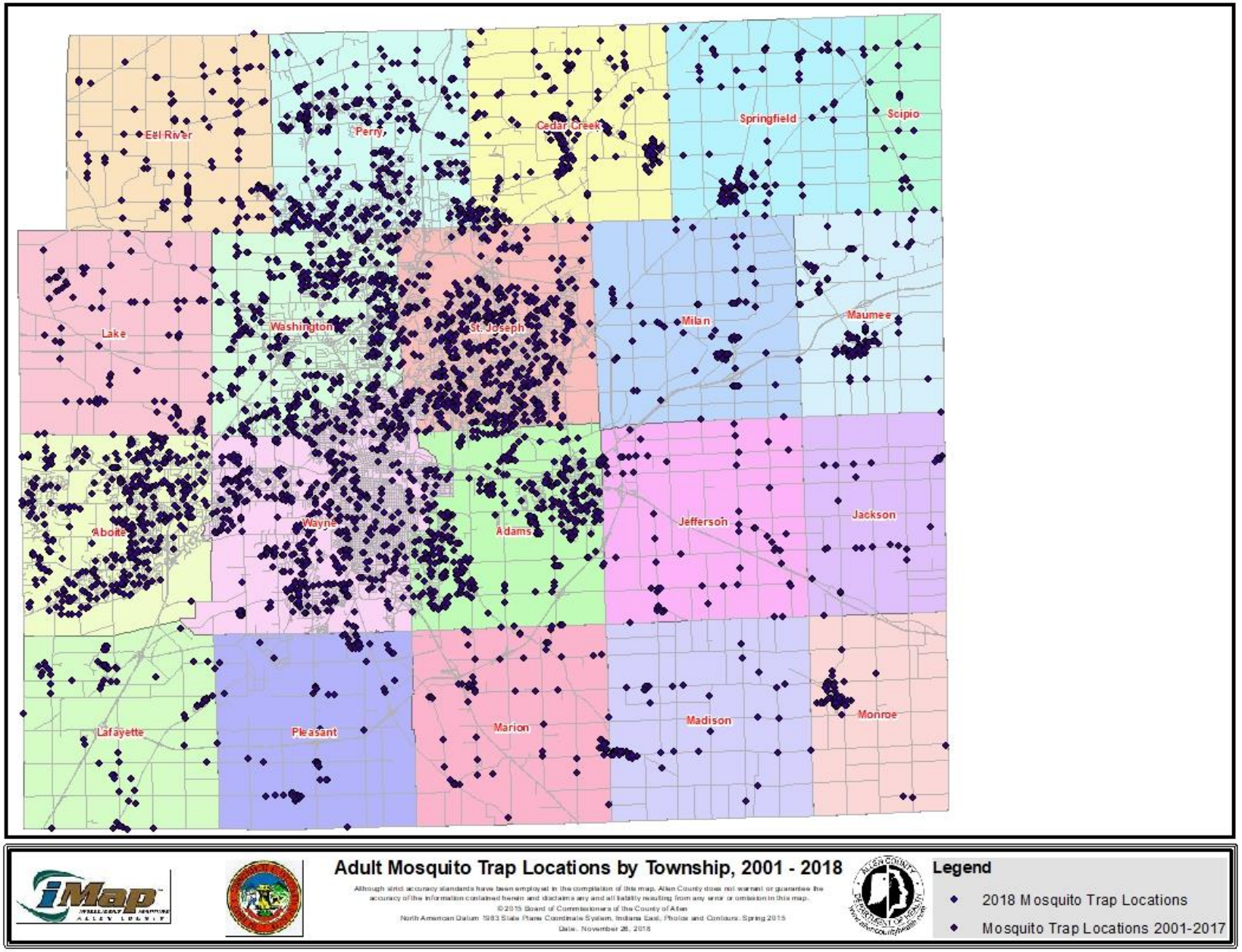
2018 Mosquito Trap Locations
Mosquito Trap Locations 2001-2017

Figure 8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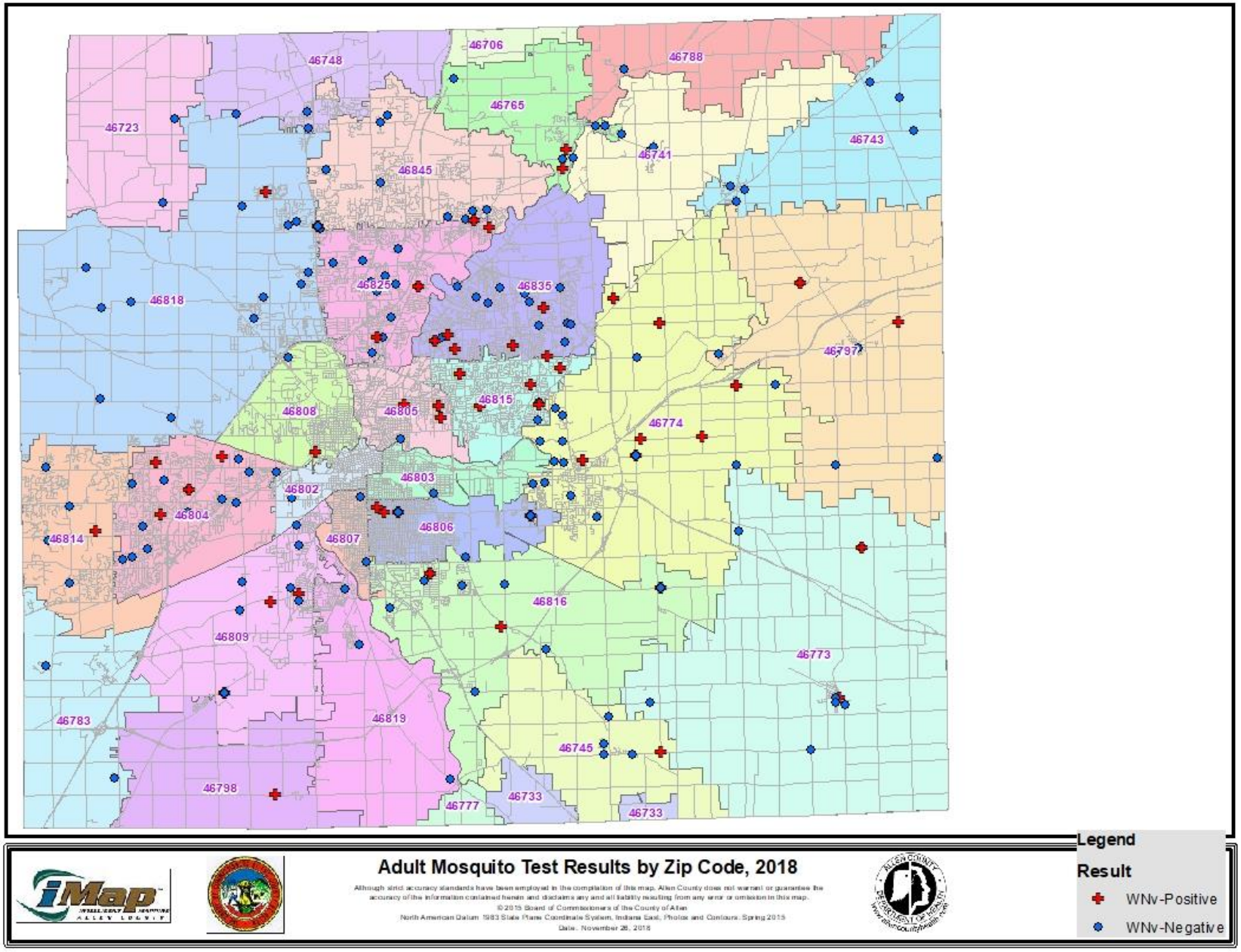
2018 Mosquito Trap Locations
Mosquito Trap Locations 2001-2017

Figure 9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Adult Mosquito Test Results by Zip Code, 2018
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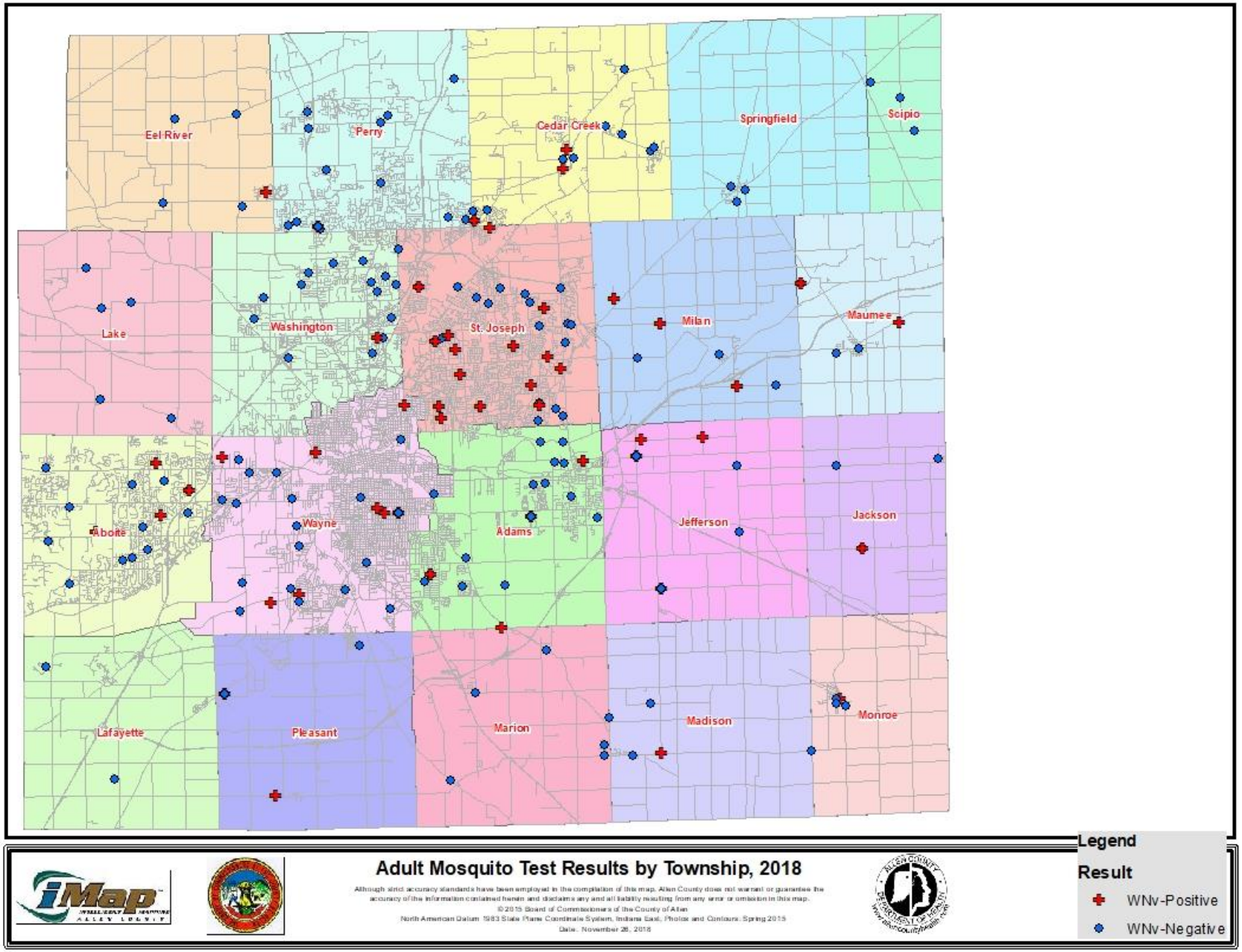
Result
WNv-Positive
WNv-Negative

Figure 10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Adult Mosquito Test Results by Township, 2018
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Result
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WNv-Negative

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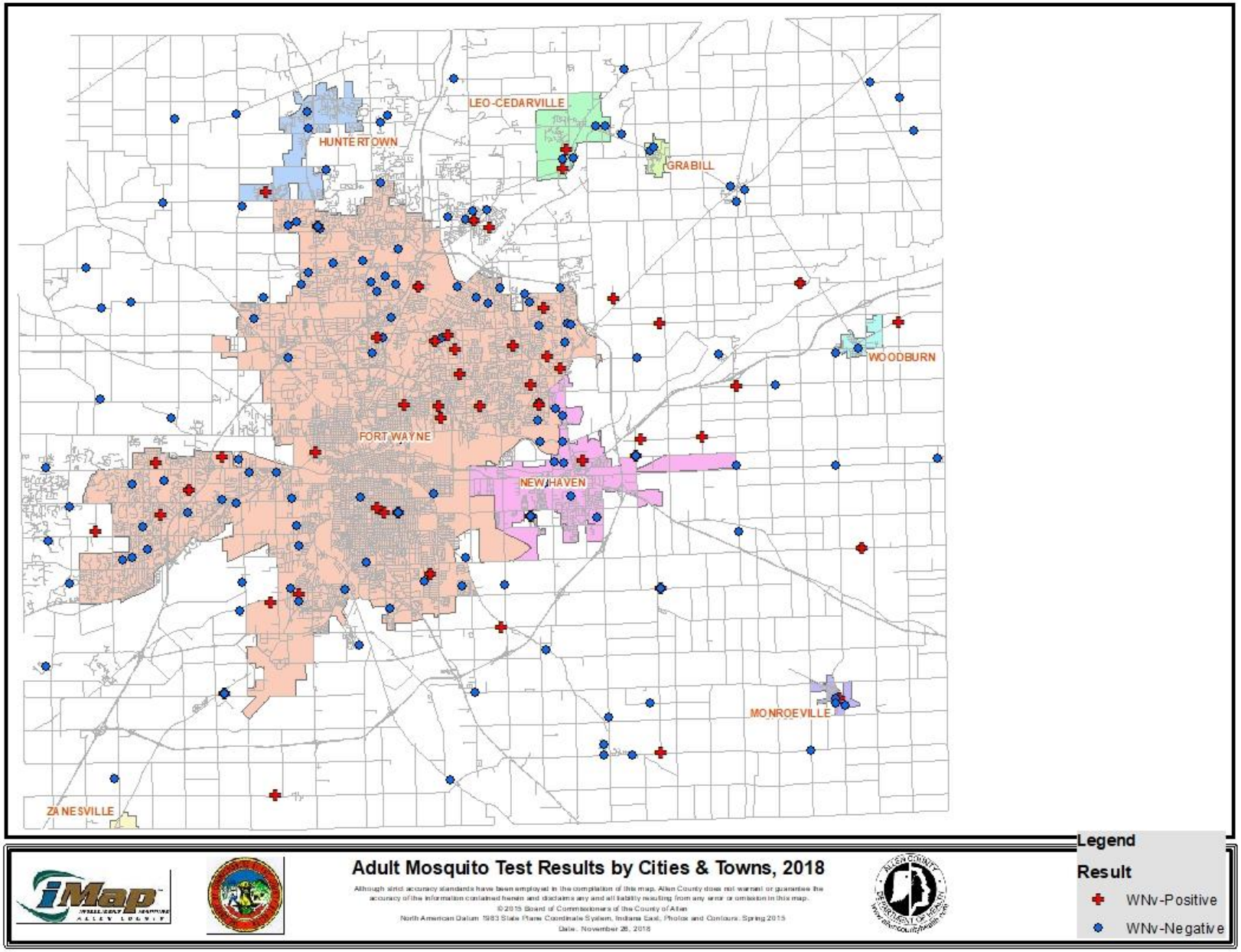
LEO-CEDARVILLE
HUNTERTOWN
GRABILL
WOODBURN
FORT WAYNE
NEW HAVEN
MONROEVILLE
ZANESVILLE
Adult Mosquito Test Results by Cities & Towns, 2018
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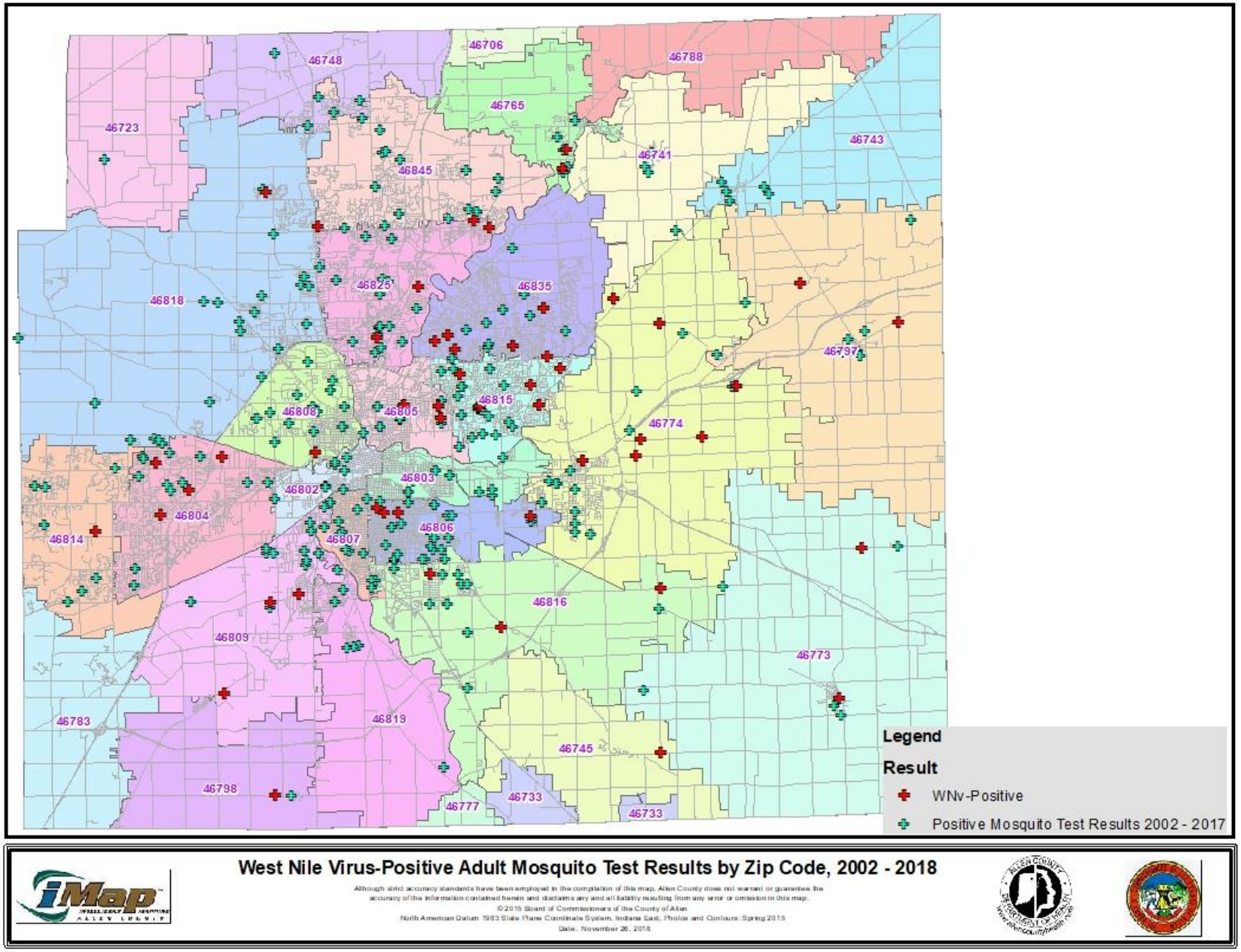
Result
WNv-Positive
WNv-Negative

Figure 12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Legend
Result
WNv-Positive
Positive Mosquito Test Results 2002 - 2017
West Nile Virus-Positive Adult Mosquito Test Results by Zip Code, 2002 - 2018
Although strict accuracy standards have been employed in the compilation of this map, Allen County does not warrant or guarantee the accuracy of the information contained herein and disclaims any and all liability resulting from any error or omission in this map.
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North American Datum 1983 State Plane Coordinate System, Indiana East, Photos and Contours: Spring 2015
Date: November 26, 2018

Figure 13

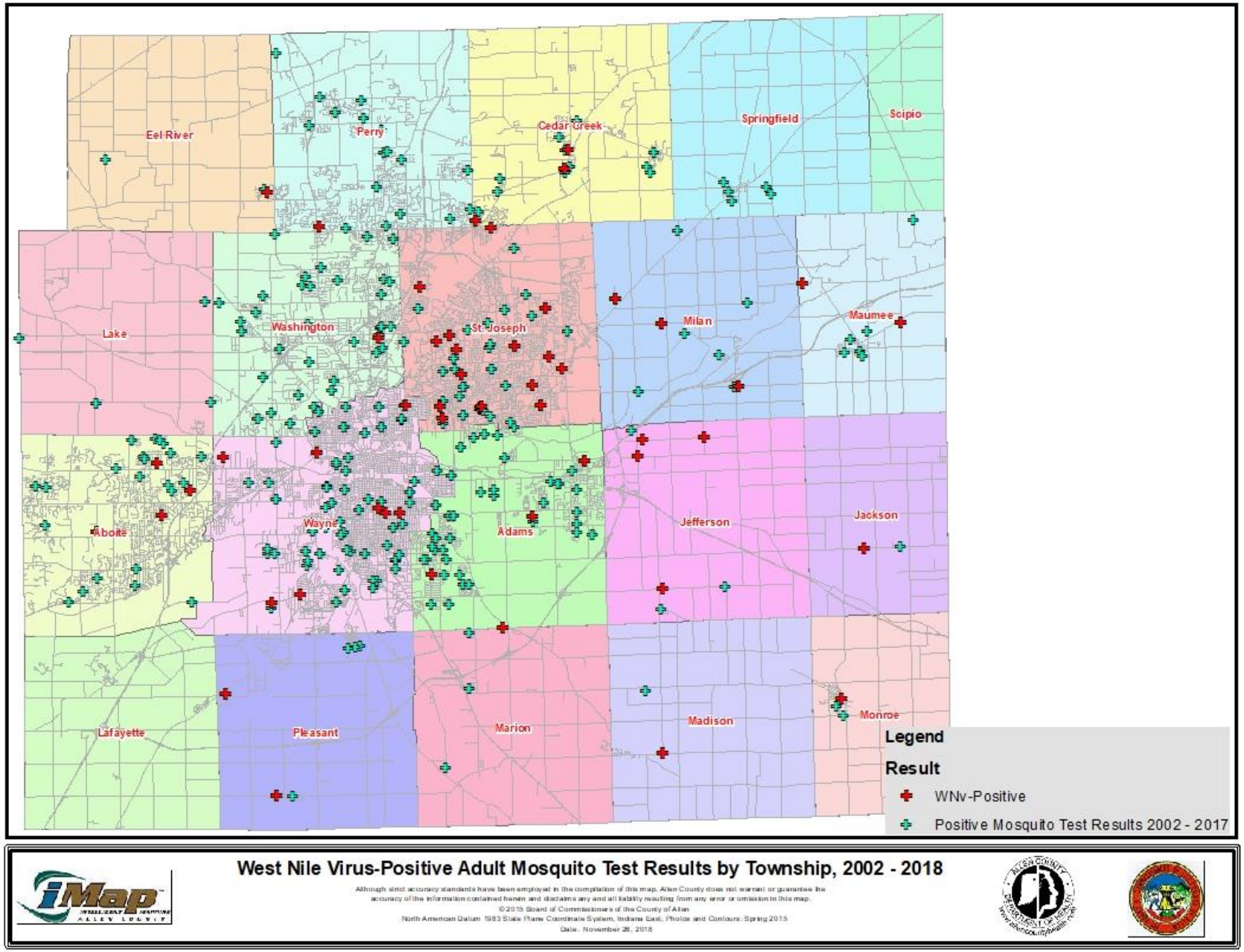
Eel River
Perry
Cedar Creek
Springfield
Scipio
Lake
Washington
St. Joseph
Milan
Maumee
Wayne
Adams
Jefferson
Jackson
Aboite
Lafayette
Pleasant
Marion
Madison
Monroe
Legend
Result
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Table 1 – Temperature Change/Rainfall for Allen County*

Month	2018 Average Temperature Difference Compared to Normal	2018 Average Rainfall Difference Compared to Normal	2018 Amount (Inches)	2017 Amount (Inches)	2016 Amount (Inches)	2015 Amount (Inches)
April	-5.9° F	-1.27	2.25	3.95	3.05	3.28
May	+7.8° F	-0.96	3.31	9.22	4.13	5.01
June	+3.1° F	+1.86	6.02	7.31	5.44	11.98
July	+0.5° F	-1.19	3.05	4.36	1.12	5.97
August	+2.5° F	+4.13	7.77	3.16	3.06	3.57
September	+4.6° F	-1.15	1.65	1.67	5.44	3.03
TOTALS	**+12.6° F**	**+1.42**	**24.05**	**29.67**	**22.24**	**32.84**

*Per Nicholas Ferreri, WANE-TV meteorologist, via email on 10/9/2018

Table 2 – Mosquito Larvae Collection

Mosquito Type	Number of Sites Found	Vector, Nuisance, Larvae-Eater or Frog-Biter		Mosquito Type	Number of Sites Found	Vector, Nuisance, Larvae-Eater or Frog-Biter
Aedes albopictus[1]	1	Vector		*Anopheles punctipennis*	19	Nuisance
Aedes atropalpus	2	Nuisance		*Anopheles quadrimaculatus*[4]	4	Vector
Aedes fitchii	2	Nuisance		*Culex pipiens*[5]	77	Vector
Aedes flavescens	10	Nuisance		*Culex restuans*[6]	114	Vector
Aedes spencerii	4	Nuisance		*Culex salinarius*[7]	17	Vector
Aedes sticticus	1	Nuisance		*Culex territans*	18	Frog-Biter
Aedes triseriatus[2]	3	Vector		*Psorophora ferox*	2	Nuisance
Aedes trivittatus	3	Nuisance		Pupae Only	16	
Aedes vexans[3]	136	Nuisance/Vector		Undetermined[8]	43	
Total	**162**			**Total**	**310**	

Grand Total – 472 sites where larvae were found.

Notes:
1 – *Aedes albopictus* is a vector for Chikungunya virus, Dengue virus, Zika virus, and, possibly, West Nile virus.
2 – *Aedes triseriatus* is a vector for LaCrosse Encephalitis.
3 – *Aedes vexans* is a nuisance for humans, but can transmit heartworms to dogs and cats.
4 – *Anopheles quadrimaculatus* is a vector for malaria.
5 – *Culex pipiens* is vector for West Nile virus and St. Louis Encephalitis.
6 – *Culex restuans* is a vector for West Nile virus and St. Louis Encephalitis. It mainly transmits the viruses from bird to bird.
7 – *Culex salinarius* is a vector for West Nile virus and St. Louis Encephalitis.
8 – Larvae go through 4 instar stages before becoming pupae. Stages 3 and 4 are the best periods of time to conduct identification.

Table 3 – Zip Code Breakdown for Water Site Inspections

Zip Code	City/Town	# of water site inspections	# of bodies of water breeding that were treated	# of tire sites inspections	# of swimming pool inspections
All	All	3,122	472	158	121
46706	Auburn	0	0	0	0
46723	Churubusco	8	0	0	0
46725	Columbia City	0	0	0	0
46741	Grabill	10	3	0	0
46743	Harlan	9	1	2	0
46745	Hoagland	13	1	0	1
46748	Huntertown	37	3	0	6
46765	Leo	14	0	0	0
46773	Monroeville	27	3	7	3
46774	New Haven	84	6	0	3
46783	Roanoke	12	2	0	0
46788	Spencerville	4	1	0	0
46797	Woodburn	30	5	0	0
46798	Yoder	11	1	0	0
46802	Fort Wayne	39	5	29	5
46803	Fort Wayne	151	18	30	0
46804	Fort Wayne	193	35	0	6
46805	Fort Wayne	113	17	0	2
46806	Fort Wayne	163	31	22	9
46807	Fort Wayne	30	3	8	3
46808	Fort Wayne	192	33	14	1
46809	Fort Wayne	144	7	9	17
46814	Fort Wayne	95	7	0	0
46815	Fort Wayne	185	25	0	11
46816	Fort Wayne	204	25	10	15
46818	Fort Wayne	426	106	20	1
46819	Fort Wayne	38	3	0	18
46825	Fort Wayne	251	32	7	5
46835	Fort Wayne	414	61	0	10
46845	Fort Wayne	225	38	0	5

Table 4 – Larvicide Application Comparison, 2014-2018

Larvicide Used:	2018	2017	2016	2015	2014
Agnique MMF (fl oz)	0	0	0	278	128
Altosid, 30-day (# briquettes)	0	0	0	11	6
CocoBear Oil (fl oz)	251	837	128	749	0
Natular G30 (lbs)	246	168	104	488	187
Natular XRT, 180-day (# tablets)	66	103	53	151	226

Table 5 – Zip Code Breakdown of Trap Locations

Zip Code	City	# of Traps placed	# of Positive Samples WNv	# of Samples Tested	% Positive
All	All	255	64	222	28.8
46706	Auburn	0	0	0	0.0
46723	Churubusco	3	0	2	0.0
46725	Columbia City	0	0	0	0.0
46741	Grabill	2	0	3	0.0
46743	Harlan	9	1	7	14.3
46745	Hoagland	5	1	5	20.0
46748	Huntertown	4	0	2	0.0
46765	Leo	10	2	9	22.2
46773	Monroeville	7	2	8	25.0
46774	New Haven	23	11	28	39.3
46783	Roanoke	4	0	2	0.0
46788	Spencerville	5	0	1	0.0
46797	Woodburn	9	2	8	25.0
46798	Yoder	1	1	1	100.0
46799	Zanesville	0	0	0	0.0
46802	Fort Wayne	2	0	3	0.0
46803	Fort Wayne	1	0	1	0.0
46804	Fort Wayne	24	4	16	25.0
46805	Fort Wayne	6	5	7	71.4
46806	Fort Wayne	5	3	7	42.9
46807	Fort Wayne	3	0	4	0.0
46808	Fort Wayne	2	1	2	50.0
46809	Fort Wayne	10	3	10	30.0
46814	Fort Wayne	12	1	5	20.0
46815	Fort Wayne	12	8	8	100.0
46816	Fort Wayne	10	3	11	27.3
46818	Fort Wayne	20	1	13	7.7
46819	Fort Wayne	5	0	3	0.0
46825	Fort Wayne	18	3	16	18.8
46835	Fort Wayne	28	9	26	34.6
46845	Fort Wayne	17	2	12	16.7

Table 6 – Comparison of Mosquito Test Results, 2002 - 2018

	Number of Positive Mosquito Samples	Number Samples Tested	% Positive
2018	64	222	29.0
2017	43	248	17.3
2016	7	141	5.0
2015	17	268	10.1
2014	8	259	3.0
2013	48	325	14.8
2012	37	242	15.3
2011	43	475	9.0
2010	51	301	16.9
2009	18	583	3.1
2008	19	467	4.0
2007	1	342	0.2
2006	16	119	13.4
2005	1	132	0.8
2004	3	223	1.3
2003	5	274	1.8
2002	27	146	18.5
Total	**400**	**4,409**	**9.0**

Table 7 – Comparison of Human Case Numbers, 2002 – 2018

	West Nile Virus**,<			St Louis Encephalitis**			La Crosse Encephalitis**			Eastern Equine Encephalitis**			Imported Dengue**			Locally-Acquired Dengue**		
Year	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^
2018	<5 (0)	19 (3)	1611 (68)	0	0	2	0	0	42	0	0	5	0	1	n/a	0	0	0
2017	<5 (<5)	17 (3)	2097 (146)	0	0	n/a	0	1	63	0	0	n/a	0	2	n/a	0	0	n/a
2016	<5 (0)	18 (2)	2149 (106)	0	0	9	0	0	31	0	0	5	0	9	731	0	0	46
2015	<5 (<5)	18 (3)	2175 (146)	0	0	19	0	0	51	0	0	5	0	0	459	0	0	37
2014	0 (0)	9 (0)	2205 (97)	0	0	9	0	0	76	0	0	8	0	4	376	0	0	6
2013	<5 (0)	20 (1)	2469 (119)	0	0	1	0	1	77	0	0	7	0	6	772	0	0	49
2012	12 (<5)	75 (7)	5674 (286)	0	0	3	0	3	71	0	0	15	0	9	544	0	0	2
2011	<5 (0)	9 (1)	712 (43)	0	0	6	0	2	116	0	0	3	0	2	243	0	0	7
2010	<5 (0)	13 (1)	1021 (57)	0	0	10	0	0	67	0	0	10	<5	14	642	0	0	58
2009	0 (0)	3 (1)	720 (32)	0	1	12	0	1	44	0	0	4	n/a	n/a	n/a	0	0	n/a
2008	0 (0)	3 (0)	1356 (44)	0	0	13	0	0	49	0	0	4	n/a	n/a	n/a	0	0	n/a
2007	<5 (0)	24 (1)	3630 (124)	0	0	9	0	0	53	0	0	4	n/a	n/a	n/a	0	0	n/a
2006	10 (<5)	80 (5)	4269 (177)	0	0	10	<5	3	67	0	0	8	n/a	n/a	n/a	0	0	n/a
2005	<5 (0)	23 (1)	3000 (119)	0	0	11	0	1	82	0	0	21	n/a	n/a	n/a	0	0	n/a
2004	<5 (0)	13 (1)	2539 (100)	0	0	15	<5	2	117	0	0	7	n/a	n/a	n/a	0	0	n/a
2003	7 (<5)	47 (4)	9862 (264)	0	1	49	n/a	3	n/a	0	0	15	n/a	n/a	n/a	0	0	n/a
2002	69 (<5)	293 (11)	4156 (284)	0	0	28	n/a	4	n/a	0	0	3	n/a	n/a	n/a	0	0	n/a
2001	0 (0)	0 (0)	66 (10)	n/a	0	40	n/a	5	n/a	0	0	4	n/a	n/a	n/a	0	0	n/a
2000	0 (0)	0 (0)	21 (2)	n/a	0	3	n/a	2	n/a	0	0	2	n/a	n/a	n/a	0	0	n/a
1999	0 (0)	0 (0)	62 (7)	n/a	0	1	n/a	0	n/a	0	0	2	n/a	n/a	n/a	0	0	n/a

*** - Data from CDC/US Geological Survey**
1 - As of 10/5/18, ISDH
**** - As of 10/2/18, CDC**
< - West Nile virus cases w/ deaths in parenthesis
^ - Excludes Puerto Rico/US Virgin Islands

	Imported Chikungunya**			Locally-Acquired Chikungunya**			Imported Zika Virus**			Locally-Acquired Zika Virus**			Imported Malaria**			Locally-Acquired Malaria**		
Year	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^	Allen County	Indiana[1]	United States^
2018	0	0	55	0	0	0	0	0	46	0	0	0	0	12	n/a	0	0	0
2017	0	0	28	0	0	0	0	3	424	0	0	4	0	14	n/a	0	0	0
2016	0	2	174	0	0	0	5	52	4780	0	0	220	<5	n/a	n/a	0	0	n/a
2015	0	7	625	0	0	0	0	7	0	0	0	0	<5	9	n/a	0	0	n/a
2014	<5	23	2010	0	0	11	0	0	0	0	0	0	0	21	1724	0	0	n/a
2013	0	0	0	0	0	0	0	0	0	0	0	0	5	23	1727	0	0	n/a
2012	0	0	0	0	0	0	0	0	0	0	0	0	5	25	1687	0	0	n/a
2011	0	0	0	0	0	0	0	0	0	0	0	0	<5	15	1925	0	0	n/a
2010	0	0	0	0	0	0	0	0	0	0	0	0	<5	8	1691	0	0	n/a
2009	0	0	0	0	0	0	0	0	0	0	0	0	<5	25	1484	0	0	n/a
2008	0	0	0	0	0	0	0	0	0	0	0	0	<5	0	1298	0	0	n/a
2007	0	0	0	0	0	0	0	0	0	0	0	0	<5	0	1505	0	0	n/a
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1564	0	0	n/a
2005	0	0	0	0	0	0	0	0	0	0	0	0	<5	6	1528	0	0	n/a
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1324	0	0	n/a
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1278	0	0	7
2002	0	0	0	0	0	0	0	0	0	0	0	0	<5	9	1337	0	0	n/a
2001	0	0	0	0	0	0	0	0	0	0	0	0	<5	14	1383	0	0	n/a
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1402	0	0	n/a
1999	0	0	0	0	0	0	0	0	0	0	0	0	<5	19	1540	0	0	n/a

*** - Data from CDC/US Geological Survey**
1 - As of 10/5/18, ISDH
**** - As of 10/2/18, CDC**
< - West Nile virus cases w/ deaths in parenthesis
^ - Excludes Puerto Rico/US Virgin Islands