



Town of Flower Mound Environmental Health Services 2018 Mosquito Program Summary

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Introduction

In an attempt to help maintain the quality of life of this family oriented community, Environmental Health Services is charged with the protection of the public health and environment through various programs: food inspections, public pool inspections, on-site sewage facility permitting and inspections, and vector programs (mosquitoes and rodents). In 2012-2013, many municipalities and other agencies in the state increased their mosquito control efforts in response to the high incidence of West Nile virus throughout Texas. In 2015, Flower Mound continued the increased fight against West Nile. The primary concern with mosquitoes is not that they are a nuisance, but the fact that they carry diseases that are transmissible to humans. The process of transmitting disease from vectors to humans is called zoonosis. The primary goal of the Town's mosquito program, as well as most other municipalities and jurisdictions, is to minimize the risk of human exposure to zoonotic diseases. In 2017, Zika became a concern and the mosquito program adapted to address these concerns. In 2018, the concerns about Zika and other Aedes borne viruses were no longer in the news but that doesn't reduce our vigilance.

This document is a comprehensive summary of the 2018 mosquito program.

Included in the summary:

- Purpose
- Description of the Mosquito Program
 - Integrated approach
- Program Components
- New Programs Initiated and Implemented
 - Continued tracking Aedes mosquito species with Denton County
 - New trap sites added to improve town coverage
 - Dunk Giveaway- continued
- West Nile Virus
 - History of West Nile virus
 - Ground spraying
 - Triggers for spraying
 - 2018 Numerical Facts- samples, human cases, financials

- Zika, Chikungunya, and Dengue
- 2019 Goals and Preparations

Purpose

The Town of Flower Mound considers the protection of citizens and the environment a top priority. Flower Mound Environmental Health Services is charged with ensuring that policies and programs are implemented to protect the public from communicable diseases and other environmental concerns. The Town of Flower Mound has developed an Integrated Mosquito Management Program to help minimize the risks of mosquito-borne and zoonotic disease transmission to humans.

Regional mosquito control programs, including the Town and Denton County, are focused on West Nile virus (WNV). West Nile virus is a mosquito-borne viral illness which can range from no or mild, flu-like symptoms to brain damage and death. Zoonotically maintained, infections occur generally between late summer and early fall in temperate regions, and throughout the year in southern climates. Although typical infection of WNV is asymptomatic, the virus can cross into the brain and cause severe illness, paralysis, and even death in both humans and animals. At this time, locally transmitted Zika is not a threat in our region, but we will be working with Denton County health department to monitor this issue.

The purpose of the Town's integrated program is to:

- Protect the public through minimizing human risk of mosquito-borne illness
- Conduct public education and awareness activities through social media, frequently asked questions, website information, press releases, and Flower Mound TV
- Identify key areas of mosquito populations and areas of increased disease incidence
- Identify mosquito populations positive for West Nile virus or other vector-borne diseases

The Town of Flower Mound strives to provide up to date information to the citizens via

all media outlets. This is to inform the public about the risks and provide suggestions that each individual can use to reduce potential exposure to mosquitoes. Environmental Health Services has developed dedicated website information including Mosquito Information, Frequently asked Questions, and News and Information in an effort to provide timely and beneficial information to the public. As pertinent information relating to mosquitoes is received, e.g. lab confirmation of positive West Nile mosquitoes or human infection confirmation, the Town will place the information on the website, as well as all other available social media used by the Town. The Town's response measures are also disseminated to the public through the variety of information outlets. Ensuring Flower Mound remains a safe community is a top priority for the Town, which includes protecting residents from dangerous diseases spread by infected mosquitoes.

The Mosquito Program

The Town takes protecting the health and safety of the residents very seriously. An example of this dedication is the allocation of approximately \$20,000 annually to help combat the spread of zoonotic/mosquito-borne diseases, empowering staff to respond to mosquito related issues, and relying on the expertise and knowledge of the staff who work within this field daily to aid in making the best decisions to protect the Town. The Town follows the integrated mosquito control guidelines established by the Centers for Disease Control (CDC) and U.S. Public Health Service. In both the CDC program guidelines and a prior West Nile virus response guide distributed by the Texas Department of State Health Services, the recommended control measures included integrated methods of surveillance and monitoring, trapping and lab analysis, larviciding, and adulticiding when necessary.

The Town does not spray for mosquitoes on a routine basis but only does so when absolutely necessary. This is determined by the confirmation of an adult mosquito sample that is lab positive for West Nile virus. Once West Nile virus is detected, it becomes a public health issue and requires action on the part of the Town to help protect our residents. When spraying is required as a disease control effort, it is performed in a very specific, targeted area where a known disease-carrying confirmation was made. Confirmed human cases indicate increased trapping in the immediate area. Spraying for human infection only occurs when a human cluster (multiple unrelated and lab confirmed) of cases is

identified within a one half square mile radius. Ground spraying for adult mosquitoes is conducted by a contracted licensed applicator during the late hours of the night and early morning. The insecticide used in spraying is applied at ultra-low levels, breaks down quickly, and does not leave a toxic residue. The Town's current contractor uses the chemical Aqualuer 20-20; however, if new chemical and/or application methods become available that are effective in killing the target species and have a reduced impact on the environment, the Town will certainly review those options. The Town has found the current process, and agent, to be a safe and effective means in combating dangerous, disease-carrying mosquitoes.

Mosquito spraying is only one component of the Town's integrated approach to mosquito control. Other essential components include surveillance, mosquito breeding ground control through larvicide application and education, mosquito control tips on the Town's website, and addressing standing/stagnant water concerns. Larviciding and addressing mosquito breeding grounds is an effective means to reduce the potential adult mosquito population; however, it does not impact adult mosquitoes already in the air that can potentially bite residents. Public awareness and education balanced with integrated pest control and response, including adulticide application, maintains a well-rounded and thorough program.

Program components

Mosquitoes are established within our community, region, and state. The effective implementation of the integrated program will have an impact on the mosquito population; however, it is important to note that the purpose of a mosquito program is not to combat nuisance mosquito populations, but to protect the citizens from known carriers of disease. The mosquito *Culex quinquefasciatus* is a key vector for West Nile virus. The mosquito program works to battle this mosquito and aid in minimizing the risk of exposure of vector-borne diseases to humans. The decision to adulticide is also not based on mosquito numbers or nuisance conditions. It is important that staff and citizens understand this concept of only applying

adulticides when trigger thresholds are reached. The components of the Flower Mound Mosquito Program are described more below.

1. **Public education and awareness**- Environmental Health Services will respond to citizen complaints and concerns about mosquitoes. Staff will work to educate citizens on source reduction and habitat disruption. Staff will provide information to Homeowner Associations, Neighborhood Associations, etc... through email, phone contact, and in person if so requested. Staff utilizes FMTV, social media, Town website, flyers, utility bill inserts, and press releases to educate the public and emphasize mosquito awareness.
2. **Mosquito Dunk Program**- The Town of Flower Mound continued the annual Mosquito “Dunk” program. Annually, the Town will supply a number of dunks to residents of Flower Mound. Dunks are a source of larvicide that is considered environmentally safe and specific to mosquito larvae. The Town will supply no more than two dunks per year per household. Dunks are available at most home, garden, and hardware stores. This program is designed to be a “starter” program and help to further educate the public.
3. **Surveillance**- Mosquito populations vary in size and thus the risk of diseases spread to humans by mosquitoes depends on the occurrence of disease and the size of the populations. The Town of Flower Mound must be diligent in collecting information on mosquito populations. The information gathered is directly used in preparing control measures and the identification of potential disease occurrences. The Town of Flower Mound utilizes Environmental Health Services to conduct surveillance activities throughout the Town. Historically, beginning on or about June 1, surveillance activities begin. Environmental Health Services collects adult mosquitoes through the use of traps. The trapped “pools” of mosquitoes are shipped to the Texas Department of State Health Services laboratory for analysis or are tested via the RAMP system at the Environmental Services’ office. The RAMP system is an in-house testing system that is

used in testing complaint areas. Results can be obtained on the same day as collection and information is quickly relayed back to the complainant.

In both instances, the information gained will allow for determining mosquito populations and prediction of the incidence of WNV. The information obtained also contributes to public education and information activities. In addition to the use of traps, field staff responds to complaints concerning standing and stagnant water.

Flower Mound Environmental Health Services uses the information gained to develop a better understanding of transmission cycles, increase the efforts in larvicide applications, source reduction, as well as other control measures. Dependent on surveillance results, Environmental Health Services and Town management may determine that the trapping times be amended either shorter or longer. The use of traps can be a source of determination of the effectiveness of the mosquito control measures in place.

Surveillance programs should target specific goals. The Town of Flower Mound goals for the mosquito surveillance program are as follows: assessing risk posed to the public health by spread of zoonotic disease, determining the need for staff impact efforts, locate habitats of larvae, locate areas considered high risk, and determine program effectiveness. Environmental Health Services utilizes variable surveillance sites throughout the Town. The use of moveable traps allows Town staff to sample mosquito populations from different areas and obtain a representative sample of the Town as a whole. The Town began the use of sentinel sites in 2013 when it created 8 sites. This was expanded to 12 sites in 2014 and 17 sites in 2016. We also added 11 trap sites to monitor for the mosquito that could potentially carry Zika. The sites are trapped on a rotating, weekly basis.

Flower Mound mosquito surveillance takes into consideration many factors including varied trapping methods, varying habitats, proximity of human populations and interaction, complaint response, and confirmed human

case of vector-borne (specifically mosquito-borne) disease.

Surveillance measures aide in the detection of early viral activity in a specific area or region or if it is widespread. Through laboratory analysis of the mosquito pools, the Town can obtain many key pieces of information. Even though surveillance is only a part of the integrated pest management program, it is a key component. When conducting surveillance and trapping, collection of adult mosquitoes is utilized to determine the species in a particular area, their prevalence, and disease causing possibility. The information gathered about the mosquito population in the area can then be used to determine other control measures contained within the integrated pest management program.

The Town utilizes gravid traps to capture Culex species, and BG Sentinel II traps to capture Aedes species. The adult mosquitoes are gathered from the traps and sent to the Texas Department of State Health Services Lab in Austin where the Culex are tested for West Nile and St. Louis Encephalitis and the Aedes are tested for Zika and Dengue. All mosquitos tested in-house are only examined for West Nile using RAMP testing. The information gained within the surveillance module of the integrated pest management system is used to develop management and control strategies. These strategies vary all across the state and country.

The Town of Flower Mound maintains two constant strategies for mosquito control and integrates other measures when necessary. Surveillance is the primary strategy. A secondary strategy is the application of larvicide. There are a number of larvicidal agents on the market, but the Town utilizes two agents at this time, *Bacillus thurengiensis israelensis (Bti)* and Altosid XR. Bti is a bacterium that occurs naturally in the soil. Bti produces a toxin that is specific for mosquito larvae. The use of Bti is considered to be environmentally safe and is ideal due to the fact that non-target organisms are not affected. Altosid XR is an insect growth regulating product that has an extended use which can last up to 150 days. While there are numerous

other methods and strategies that may be utilized, the Town currently uses surveillance and larviciding techniques as indicators for increased control activities and as additional components of the integrated pest management program.

When determining mosquito control strategies, it is important to note that utilization of chemical control is a last resort strategy. Currently, it is not one of the long-term management and control methods for the Town. Integrated pest management includes many combined strategies to reduce the risk to public health. As a part of the program, adulticide programs are included, but the over-use of chemical control agents can lead to an adaptive change in mosquitoes. The Town's program recognizes that repetitive application of the adulticides can lead to resistance development by the target insect.

As stated earlier, the integrated pest management program utilizes several strategies to aid in the control of mosquitoes. Within the program, there are trigger points for additional methods to be used. Each year, staff must monitor trap counts and surveillance information to determine activity in specific areas. The continued evaluation of the information allows staff the ability to determine if trigger thresholds have been reached. If trigger points have been reached, then additional methods and strategies are put in motion.

Flower Mound Environmental Health Services staff set a minimum of 4 to 8 traps per week. In high complaint and increased infection rate years, the number of traps and the number of days trapped per week may be increased as management deems necessary. Surveillance is the key method within the Town's Integrated Mosquito Management Program. Included in the surveillance component of the program is the use of Geographic

Information Systems to assist with managing the data and maps associated with extensive trapping and other surveillance activities.

4. **Larvicide**- Town staff also applies larvicide. Environmental Health Services and Code Enforcement field personnel will respond to citizen concerns about standing water, stagnant pools, etc. Town staff cannot apply restricted use pesticides on private property. Also, staff will not apply larvicide to flowing creeks and streams, and larvicide application is not recommended in healthy aquatic environments that contain natural predators. Additionally, EHS works closely with the Stormwater Manager and other departments in the application of larvicides to storm water inlets and other mosquito breeding areas. The stormwater treatment program has been enhanced so all storm water inlets surrounding schools, daycares, hospitals, and nursing facilities are treated routinely beginning in April. Other storm drain inlets are treated as trap activity and positive results are received.
5. **Adulticide**- Though spraying is a last resort strategy in controlling mosquitoes; it is a component of integrated pest management. Chemical control agents are used only to supplement the other measures within the program. Spraying adulticide to control mosquitoes is based on data exceeding trigger points. The Town does not conduct routine spraying activities for nuisance mosquitoes. The following items are factors considered in the Town's ground spraying policy:
 - A. **Positive mosquito sample**- Adulticide application activities occur when the Town receives confirmation from the Texas Department of State Health Services that a pool of sampled mosquitoes tested positive for West Nile virus or a sample of mosquitoes tested positive utilizing the RAMP system.
 - B. **Human West Nile infection**- Adulticide application activities occur when there is laboratory confirmation of a cluster of human cases of West Nile virus or West Nile Fever. A cluster is defined by the Town as multiple, unrelated, lab-confirmed human cases within a one-half square mile radius.

C. **Human Zika infection-** We will be working closely with Denton County Health department to determine when a human Zika infection poses a risk to Flower Mound residents. Every effort will be made to protect the privacy of the infected individual while also providing an appropriate response to the risk.

For West Nile, adulticide applications are performed between the hours of 10:00 pm and 6:00 am in an approximate one half square mile radius of the specified block of the sampled mosquito pool or human cluster. CDC recommends that adulticide activities be conducted for three consecutive nights. The Town has adopted these recommendations. There are many factors that can impact the effectiveness of adulticide applications, such as housing density, terrain, vegetation, and other physical barriers. It is important to note the type of area/terrain when conducting surveillance and other activities. Physical obstructions can render pesticides and applications ineffective.

Another factor to consider when conducting adulticide application activities is the local ideology about spraying. Every community has particular ideas about spraying. Adulticide operations fuel debates frequently and while there are strong opinions on either side of the issue, the Town does include spraying as a part of the mosquito control program and integrated management strategy. The Town does take into consideration the citizens, animals, non-target organisms, and the environment when developing a spraying policy. Thus, spraying in Flower Mound will only occur when triggered by data exceeding a threshold limit.

Spraying activities are done by driving residential streets only by a licensed third party contractor. No alleys are driven unless a specific need arises. The insecticide used in spraying is applied at ultra-low levels, breaks down quickly, and does not leave a toxic residue. Residents are notified of spraying activities by neighborhood signs, social media, FMTV, press release, Town web site, and EHS web page. Notification will occur within 24-48 hours of application.

The Town has found this process and agent to be a safe and effective integrated strategy in combating dangerous, disease-carrying mosquitoes when triggered.

In 2018, the Town continued its trail spraying program utilizing a fogger mounted on an ATV.

West Nile Virus

West Nile virus (WNV) is a mosquito-borne viral illness that can infect with varying seriousness, ranging from no symptoms or mild flu-like symptoms, to brain damage and death. West Nile virus is a mosquito-borne flavivirus belonging to the Japanese Encephalitis serocomplex, which includes St. Louis encephalitis, Murray Valley encephalitis, and Kunjin virus. Zoonotically maintained, infections occur generally between late summer and early fall in temperate regions, and throughout the year in southern climates. Although typical infection of WNV is asymptomatic, the virus can cross into the brain and cause severe illness paralysis, and even death in both humans and animals.

WNV was originally isolated in a woman in the West Nile District of Uganda in 1937. In the summer of 1999, the first North American cases of WNV occurred in the New York City area. It is still unknown how WNV reached the continental United States, but it is suspected that the transport of infected birds or the international travel of infected humans may have been to blame. After its arrival in the New York area, the virus spread rapidly across the United States, northward into Canada, and southward into Mexico. As of January 2018, the CDC recorded avian or animal WNV infections in every state. Experts believe that WNV is now firmly established in the Western Hemisphere, and particularly the United States.

WNV is maintained in a natural host-vector-host cycle, where the primary vector is the mosquito. The cycle begins with a reservoir host, which is most commonly of avian origin. When a mosquito feeds on the infected bird, the virus is passed to the insect along with the blood meal. The virus then multiplies rapidly within the mosquito's body and salivary glands over the next few days. When the insect feeds on another animal or human, the virus can be transmitted through the bite and cause serious illness.

Most mosquitoes can become infected with WNV. However, female *Culex pipiens* mosquitos are of particular concern, as they live in suburban and urban areas, can survive through the winter, prefer to feed on birds, and frequently bite humans. *Culex pipiens*, also known as the house mosquito, is also the most common vector for WNV transmission. *Culex restuans*, *Culex quinquefasciatus*, *Aedes albopictus*, and *Aedes vexans* are also common carriers of the WNV.

Common food sources for mosquitoes include birds which represent the primary WNV reservoir species. American crows, in particular, are extremely susceptible to WNV and have become the virus' primary host population. The virus has been identified in more than 250 bird species in the United States, including blue jays, ravens, magpies, sparrows, and starlings. Many in the scientific community believe that the rapid spread of WNV in North America may be due in part to the migratory nature of birds. Infected birds carry the virus with them as they travel in summer and winter, thus acting as reservoirs in their new nesting sites.

Most vertebrates, such as alligators, bats, chipmunks, skunks, squirrels, and rabbits, can also be infected with WNV. Horses, in particular, are commonly infected with WNV. Like humans, the majority of horses suffer either no or mild symptoms, but severe illness and death can and does occur. There are relatively few cases of dogs and cats becoming infected with WNV.

There is no evidence of WNV transmission from person-to-person through touch, kissing, or other contact. There is evidence of WNV trans-placental (mother-to-child)

transmission, as well as viral transmission through breastfeeding. Pregnant mothers should be aware of the presence of WNV in their area and take appropriate precautions. People who are immunocompromised (from disease or chemotherapy) and people aged 50 and older represent the highest risk group for serious WNV infection.

The incubation period for WNV after infection typical ranges between 3 to 14 days. Eighty percent of infected persons will exhibit no clinically apparent symptoms whatsoever. Roughly 20% of infected persons will exhibit a series of mild flu-like symptoms, also known as West Nile Fever. These mild symptoms can persist for 3 to 6 days, possibly weeks, and include: eye pain, fever, headache, enlarged lymph nodes, malaise, myalgia, nausea, rash, and vomiting.

In approximately 1 in 150 cases, WNV can cross the blood-brain barrier and develop into a severe neuro-invasive disease. Immunocompromised and elderly (>50 years of age) patients are at an increased risk for developing more severe syndromes. Symptoms indicating the possible presence of severe West Nile-related syndromes include: severe headache, high fever, acute muscle weakness, neck stiffness, convulsions and tremors, disorientation, paralysis, and coma.

Typically, severe WNV syndromes manifest as one of three illnesses: West Nile encephalitis; West Nile meningitis; or West Nile meningoencephalitis. These three illnesses can cause severe brain damage and even death. Severe WNV disease carries a mortality rate ranging between 3% and 15%. The majority of these deaths are as a result of complications attributable to West Nile meningoencephalitis. Additionally, severe WNV disease can cause acute vision loss due to inflammatory disorders of the eye. Less frequently, the patient can exhibit acute flaccid paralysis, similar to poliomyelitis or Guillain-Barre syndrome, caused by inflammation of the spinal cord and/or damage to the peripheral nerves. In some severe cases, this acute flaccid paralysis can disrupt muscles that control breathing and result in respiratory failure.

A proper diagnosis of WNV infection depends heavily upon clinical presentation, laboratory testing, and patient history. Patients with a known susceptibility to WNV (the elderly and immunocompromised) that exhibit symptoms during the late spring to early fall, or at any time in warmer climates, should be tested for WNV and other arboviral infections. Health providers should remain constantly aware of the local presence of WNV activity, such as reports of recent animal and/or human cases. Similarities of symptomology between and serological cross-reactivity of WNV and other flaviviruses, may lead to confusion and an incorrect diagnosis. Health providers must use thorough laboratory testing to differentiate WNV antibodies from those of other arboviruses.

Zika, Chikungunya, and Dengue

These three viruses have a number of things common; they are all related to each other, they are all spread by a different mosquito than West Nile, they have all been in the news lately. Zika has been in the news the most, in part, because it is new, but also because it has the potential to cause birth defects. All of the cases of Dengue and Chikungunya, in Texas, have been associated with people traveling to other countries where the virus is endemic.

Some very important facts to understand about all three viruses:

They are most commonly spread by *Aedes* mosquitos. The best carrier is *Aedes aegypti*. This is not a common mosquito in Texas. Our most common is *Aedes albopictus*. These mosquitos are voracious, day biting mosquitos. Currently, there is no laboratory test for mosquitos to test for any of these viruses. Environmental Health Services will be trapping specifically for these mosquitos this year. These monitoring traps help assess the population densities of *Aedes* mosquitos. Like West Nile, most people exposed to these viruses do not ever show symptoms.

Following the 4 “D”’s is still the best way to prevent becoming ill. This is especially true when traveling in countries where these viruses are more common. DEET can be difficult to obtain in other countries, so packing your own bug spray in your checked luggage may be a good idea.

2018 Facts and Figures Summary

The facts and figures below represent the 2018 mosquito season:

Category	2018
Complaint traps	21
Proactive Traps	187
Total traps	208
2018 traps	172
WNV positive samples	2
Percent WNV samples	1%
WNV- human	1
West Nile virus- neuroinvasive	0
West Nile virus- neuroinvasive %	0
West Nile fever	1
West Nile fever %	100%
Deaths	0
Dunks given away	58

Budget Item	2018 Expenditures
Shipping & postage	\$1309.62
Spraying	\$2659.36
Chemicals/Larvicides	\$2097.93
Printing & supplies	\$0
Equipment	\$0
Total	\$6066.91

2018 West Nile Positive Mosquito Pools and Human Cases

Date Reported	Type of Case	Lab Confirmation	Location	Spray Date
10/1/2018	Mosquito	Positive Pool	3000 Block of Woodpark	10/3/2018-10/5/2018
10/5/2018	Mosquito	Positive Pool	700 Block of Fallbrook	10/10/2018-10/12/2018
11/6/2018	Human	Positive Human	The Villages of Northshore	N/A

It seems every year is different from the last in multiple ways.

2018 was a unique mosquito season in several ways:

- We had the latest positive mosquito trap that we have ever recorded.
- We had the latest first positive mosquito trap that we have ever recorded.
- We set more traps than we have ever set.

We can always hope for continued mild seasons, but we strive to be prepared for the worst.

2019 Goals and Preparations

Environmental Health Services has continued to monitor the information concerning mosquitoes and West Nile virus. Below are the goals that EHS has for the 2019 mosquito season. Knowing that every year will typically not see an outbreak as extensive as in 2012, it is necessary to prepare as though the succeeding year will be as extensive or worse. Thus, the goals for 2019 will encompass preparations for an active mosquito control season.

1. **Continue mosquito surveillance and trapping activities based on weather patterns.** When the over-night low temperatures are consistently over 50°F mosquitos begin to become active. At 70°F mosquitos begin biting and laying eggs. EHS will begin monitoring when temperatures are regularly over 50°F
2. **Continue the Dunk Give-away program.** Program to commence on May 1,

2018, unless mosquito activity necessitates an earlier start.

3. **Use ATV mounted sprayer to enhance ground spray activities.** EHS maintains personnel with a Texas Department of Agriculture Governmental Pesticide Applicator License. This portion of the vector program will allow spray activities to occur in areas of parklands, greenbelts, and trails, which are normally unable to be reached by typical truck-mounted spraying.
4. **Continue development of a Zika response plan.** We have a ZIKA response plan in place now. However, we are continuing to evaluate the plan, work with Denton County and follow the best practices in the field to respond appropriately and effectively to any threat.
5. **Continue to update and enhance the mosquito webpage within the TOFM website.**

As with any program, the flexibility and fluidity of the goals as activity increases or decreases and as outside forces arise, the mosquito program must be able to adapt and adjust to meet the desired goals. As the 2018 mosquito season has closed, preparations for the 2019 season are fast underway and though no one knows what the season will bring, EHS is prepared to work with the above listed goals to better protect the citizens of the Town.