

**2021**  
**Integrated Mosquito Management**  
**Program**  
**City of Bedford**



Administered by the City of Bedford Public Works Department

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## Assignment of Responsibilities

This plan is effective immediately and supersedes all previous editions. In addition it is understood that your departments have been assigned roles and responsibilities in this plan. You understand these requirements and hereby approve your department's role including but not limited to personnel and resources as both explicitly and implicitly described in this plan.

### Coordinators

Primary Department: Public Works  
Point of Contact: Cheryl Taylor  
Title: Director of Public Works

Primary Department: Public Works  
Point of Contact: Christopher Techau  
Title: Street/Drainage Superintendent

### Support

Supporting Department: City Manager's Office  
Point of Contact: Jimmy Stathatos  
Title: City Manager

Supporting Department: Communications  
Point of Contact: Molly Fox  
Title: Director of Communications

## INTRODUCTION

Mosquitoes are insects that belong to the order Diptera, or True Flies. Female mosquitoes have modified mouthparts that form a long piercing-sucking proboscis, while male mosquitoes have mouthparts that are incapable of piercing skin. There are over 2,500 different species of

mosquitoes that have been identified throughout the world, with approximately 150 species occurring in the United States. The Texas Department of Health estimates there are approximately 82-84 mosquito species in the State of Texas, 45 of which have been found in Tarrant County, although only about 12 of these mosquito species have been implicated in the transmission of serious diseases.

Mosquitoes typically need stagnant water that is isolated from fish or other small predators to complete their metamorphosis from egg to adult. Larval habitats can range from marshes, freshwater wetlands, and tree holes to human-made structures like catchments, gutters, and discarded tires. Not all species of mosquitoes feed on humans and other mammals. Many species feed mostly on birds, amphibians, or reptiles. Only a small percentage of the known mosquito species are considered to carry viruses such as Dengue, Zika, Chikungunya, or the West Nile Virus.

Mosquitoes may be controlled through a variety of different physical, chemical, and biological methods. Physical methods usually involve source reduction, which is simply the physical removal of mosquito breeding habitats. Biological measures mainly center on the use of bacteria that kill mosquito larvae or the use of natural mosquito predators. Chemical treatment typically involves the application of pesticides to attempt to control adult mosquito populations.

Today, communities are developing locally tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. By knowing how many and what kinds of mosquitoes are in the area helps communities respond more effectively when threatened.

## **Explanation of Terms**

### **Acronyms**

- CDC** Centers for Disease Control
- IMMP** Integrated Mosquito Management Program
- WNV** West Nile Virus

**CHIKV** Chikungunya Virus  
**DENV** Dengue Virus  
**ZIKV** Zika Virus

## Definitions

**Adulticide** (spraying or fogging) - product used to kill adult mosquitoes. Adulticides can be applied from hand held sprayers, truck-mounted sprayers, or airplanes. Adulticides, when used can have an immediate impact by reducing the number of adult mosquitoes in an area.

**Aedes** – Genus name for the *Aedes aegypti* (yellow fever) and *Aedes albopictus* (Asian tiger) mosquitoes. These mosquitoes tend to be day-time biters and are sometimes called ankle biters. Resting areas tend to be in tall grasses and shrubs low to the ground. Both species typically remain within a range of 200 meters.

**These two mosquito species are the common transmitter of Dengue, Zika, and Chikungunya virus.**



**Aedes aegypti**



**Aedes albopictus**

**Arbovirus** – Any virus transmitted by arthropods (mosquitoes)

**Bacteria:** - Spinosad is a pesticide made from modified compounds from another soil bacterium, *Sacchrospora spinosa*. These compounds bind to receptors and disrupt the neurotransmitter acetylcholine, acting to paralyze the insect. In this way, it is comparable to organophosphates, but is a very low risk to other wildlife and non-target arthropods.

**Chikungunya** – Chikungunya (pronunciation: \chik-en-goon-ye). The most common symptoms of chikungunya virus infection are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash.

**Culex** – Genus name of a general group of mosquitoes which are nighttime-active, opportunistic blood feeders and a primary vector for the WNV. Temperature-dependence drives prevalence of species. In warm temperatures *Culex quinquefasciatus* (southern house) mosquito, becomes prevalent, although *Culex restuans* is an important vector species in the early spring and late fall. These species tend to rest high in trees during the day and come down at night to feed. The feeding range can be up to 1 mile. *Culex quinquefasciatus* is a medium-sized brown mosquito that exists throughout the tropics and the lower latitudes of temperate regions.



***Culex quinquefasciatus***



***Culex restuans***

**Dengue** – Dengue (pronounced den' gee) is a disease caused by any one of four closely related dengue viruses (DENV 1, DENV 2, DENV 3, or DENV 4). The principal symptoms of dengue fever are high fever, severe headache, severe pain behind the eyes, joint pain, muscle and bone pain, rash, and mild bleeding (e.g., nose or gums bleed, easy bruising). Dengue Hemorrhagic Fever (DHF) is a more severe form of dengue infection. With good medical management, mortality due to DHF can be less than 1%.

**Fish** - *Gambusia affinis*, also known as the mosquito fish, are native to many Texas streams and rivers. Their diet consists mainly of mosquito larvae. This makes them great to use for mosquito control purposes because they are natural and sustainable.

**Integrated Pest Management (IPM)** – a science-based, commonsense approach for managing populations of disease vectors and public health pests. IPM uses a variety of pest management techniques that focus on pest prevention, pest reduction, and the elimination of conditions that lead to pest infestations. IPM simply means (1) don't attract pests, (2) keep them out, and (3) get rid of them, if you are sure you have them, with the safest, most effective methods.

**Larvicide** – products used to kill immature mosquitoes before they become adults. Larvicides can be either biological (such as toxin from specific bacteria that is lethal to mosquito larvae, but not to other organisms) or chemical products, such as insect growth regulators, surface films, or organophosphates. Larvicides are applied directly to water sources that hold mosquito eggs, larvae, or pupae. Larvicides can help to reduce the overall mosquito burden by limiting the number of new mosquitoes produced.

**Oils:** - Oils can be dispersed over the surface of the water to prevent mosquito larvae and pupae from breathing. Mosquito larvae and pupae do not have gills, but must access air through a breathing apparatus. Since oils do not need to be ingested, this is a good choice to kill later instar larvae and pupae that do not ingest food.

**Vector** – the primary agent that transmits a disease. For the purpose of this plan, mosquitoes are the common vector.

**West Nile Virus (WNV)** – most people infected with WNV will have no symptoms. About 1 in 5 people who are infected will develop a fever with other symptoms. Less than 1% of infected people develop a serious, sometimes fatal, neurologic illness. There are no medications to treat or vaccines to prevent WNV infection. Risk of being infected is reduced by using insect repellent and wearing protective clothing to prevent mosquito bites.

**Zika** – a disease caused by the Zika virus. Common symptoms are fever, rash, joint pain, and conjunctivitis (red eyes). The illness is usually mild with symptoms lasting for several days to a week.

## **Situations and Assumptions**

### **Situations**

- West Nile has been present in the DFW region since 2003. The City of Bedford has experienced both positive mosquito samples and positive human cases of the West Nile Virus in recent years
- Imported Chikungunya cases have been reported in Texas and the un-exposed American population is at risk if the disease becomes autochthonous
- The Zika Virus became an emerging concern in 2016
- These viruses are now part of our environment and should be anticipated as a continuous concern to the City each year
- Adulticide is the most extreme method for addressing the mosquito population, and can be used to help reduce the adult mosquito population however only effective when physically contacting mosquitoes that are actively flying
- There are multiple arboviruses and the different species of mosquitoes (vector) that spread them vary in behavior and ecology
- The City's response, as a vector control agency, will vary vastly depending on the vectors importance in the spread of each disease.

### **Assumptions**

- Personal protective measures are an effective method for preventing the spread of arboviruses
- The City monitors for the presence of WNV in mosquito pools year-round

- Chikungunya and Zika have yet to show a pattern to establish assumptions, but this plan will be scalable to address any and all arboviral needs.

## **Objectives**

The City of Bedford's Integrated Mosquito Management Plan was developed to meet several objectives, including but not limited to:

- Provide public education and personal responsibility through the distribution of guidelines and information on mosquito populations, prevalence of diseases, with respect to three distinct arboviruses; West Nile Virus, Chikungunya, and Zika
- Provide a systematic approach of surveillance and monitoring utilizing mosquito sampling and human disease data to establish risk levels
- Establish mosquito control methods through consultation with subject matter experts
- Establish three risk levels and response actions that will be undertaken for each risk level
- Establish the escalation and de-escalation between risk levels
- Use Social Media, Website, and other available channels to notify the public.

## **Public Education**

### **General Information**

The prevention of any mosquito-borne disease is most efficiently accomplished by ensuring prompt and accurate information reaches the public in a timely manner, and that personal protective measures are implemented without panic and confusion. The typical risk begins as mosquitoes emerge in the spring months, therefore, the City will renew a public education campaign, and will provide continuous information on the City's website, social media, publications, signs concerning arbovirus/disease frequently asked questions (FAQs), disease symptoms, personal preventative measures, and points of contact for additional information.

### **Personal Protection and Responsibility**

Because the CDC and other health-related entities have found the most effective control of arboviral disease is personal protection, all citizens must be active in personal protection and do their part to aid in the abatement process to protect themselves, their family, homes, and community.

Avoiding bites by using personal protection is a very effective way to avoid acquiring disease. In addition, since much of the land within Bedford is private property, it is imperative residents are aware mosquito breeding sites are developed due to the creation of artificial breeding sites around their homes, thus homeowners must take personal action to prevent breeding mosquitoes.



### **The key components of personal responsibility include:**

- DEET: Use repellants containing DEET as the active ingredient for treating exposed skin areas
- Dress: Keep skin covered as much as possible by wearing loose, long sleeved shirts and long pants. Light-colored clothing can be more effective as it allows you to see mosquitoes more effectively
- Drain: Drain any standing water on your property. This includes water from flower pots, bird baths, rain gutters, rain barrels, and pet dishes.
- Dusk & Dawn: The best way to avoid West Nile virus is to prevent mosquito bites. Stay indoors if possible, during peak mosquito biting hours (generally from dusk to early dawn; sunset to 1.5 hours after sunset appear to be the most active "feeding time" for the species that carry West Nile virus).

### **Reduce exposure to adult mosquito populations through the following actions:**

- Mow tall grass and reduce the amount of brush and other foliage on the property, both provide a resting site for adult mosquitoes
- Use screening in homes and pet kennels. Keep doors and window screens in good repair, and be sure they are properly sealed around the frames
- Protect pets with drugs that eliminate heartworm.

### **Mosquito Surveillance and Monitoring**

The City's surveillance and monitoring program is conducted in partnership with Tarrant County Health Department. The timing of the surveillance program is April through November, but may be adjusted as recommended by Tarrant County Health Department. The City can consider Texas Department of State Health Services or utilize private laboratory services, if necessary, for similar services.

Information obtained from these surveillance efforts will be used to map mosquito populations, provide public information, and determine the occurrence of any mosquito-borne disease. All surveillance data is published on Tarrant County's website.

The City will use mosquito surveillance and monitoring to determine what control measures are to be used, and evaluate the potential for any arboviral disease outbreak within the community. The objective of the surveillance and monitoring program is to:

- Identify areas conducive to being at risk for increased adult mosquito populations
- Identify larval habitats in need of targeted control

- Monitor the effectiveness of control measures;
- Determine what level of control methods need to be implemented.

Trapping for pools of mosquitoes in a location can provide a scientific basis for taking action and preventing the risk of disease in humans. The purpose of using traps is to determine the relative human health threat by detecting the presence of arboviral agents in female mosquitoes. The City utilizes two distinct traps based upon the species targeted. The information obtained from these surveillance efforts will determine the need for various control measures and their effectiveness and to assess the extent of the problem. Every effort is made to consistently collect a sample of mosquitoes weekly through the trapping season, as defined by Tarrant County (typically, the first week of April through November).



### **Trapping for Culex Species**

The City will utilize five (5) gravid traps to collect for Culex species, an important vector of WNV. Four (4) of these traps will be kept in static locations across the City, and one trap will be moved to different locations in the City, depending on surveillance results or supporting evidence of a localized problem. Exact locations of the traps will not be disclosed to the public in order to maintain the integrity of the program.

### **Trapping for Aedes Species**

Aedes poses a threat to spreading Dengue, CHIKV, and Zika. The City has two (2) BG Sentinel traps, which are the industry standard for collecting Aedes species and are placed at two static sites weekly.

Trapping for this species can provide information on the timing of presence and population distribution.

Understanding the population dynamics is the lead indicator of disease threat. Currently, Tarrant County does not test for the presence of disease.



In the event of a human case of one of the diseases currently monitored; WNV, Dengue, CHIKV, and Zika, Tarrant County will notify the City. This information is considered confidential to the patient and will not be published or shared. For some diseases, monitoring for human cases is indicative of the risk for local acquisition of disease for the community.

## **Mosquito Control Methods**

### **Source Reduction**

The elimination or modification of mosquito breeding sites is critical, and typically, the most effective and economical solution for long-term mosquito control.

The normal habitat for mosquito larvae is produced by summer rain pools and stagnate water from over watering of landscapes. Small pools of water are created by irrigation or heavy rains during the summer produce most of our nuisance species of mosquitoes. A summer rainfall of less than an inch can produce breeding grounds for mosquitoes. Almost anything, whether natural or artificial, that will hold water for about a week or more, may breed mosquitoes. Mosquitoes have adapted to a wide variety of larval habitats, and it is important to check for larvae in any pools of standing water.

However, it may be noted one of the most frequent bodies of water reported to the City are creeks, especially neighborhood creeks. Where mosquito fish and other natural predators (e.g. frogs and benthic insects) exist, these bodies of water rarely support a mosquito population. Introduce or re-introduce populations of predators, especially mosquito fish, where possible.

Source reduction practices are a key component for mosquito control which focuses on eliminating breeding sites for larvae by encouraging the following:

- Inspect property on a regular basis, especially after each rain event, for potential breeding sites
- Drain and treat areas where shallow stagnant water can accumulate
- Where appropriate, keep grass cut low to reduce mosquito resting places
- Reduce all standing water around the property that may provide breeding sites by emptying items such as dog bowls, birdbaths, wading pools, and flower containers
- Inspect irrigation systems for leaks or breaks and adjust to prevent excessive-watering of lawns and plant beds
- Clean gutters often to remove debris which traps water
- Use mosquito fish in decorative ponds and fountains
- Fill holes or depressions in trees with sand or mortar, or drain them after each rain by drilling holes into the tree
- Treat culverts, catch basins, fountains, manhole covers, storm water inlets, and other standing water areas with larvicides or other vector control measures
- Utilize larvicidal dunks where water cannot be drained or otherwise treated
- Provide education outreach to address misinformation about mosquito breeding areas
- When requested, or if a need exists, perform a field assessment of property, assisting residents in identifying potential breeding areas
- Provide solutions to property owner(s) when breeding sources are found
- Report unmaintained swimming pools located in homes for rent or abandoned.

## Larval Mosquito Control

Larviciding is utilized when source water cannot be eliminated. There are several larval control methods available and the City will consider effectiveness, ecological impact, and economics when choosing which larval control to apply.

### These include:

- Industry standard mosquito larvicides with reduced environmental impacts
- Oils
- Mosquito fish.

The City will focus on applying larvicide in its natural creek channels with the exception if they are concrete. When inspections determine the source water that cannot be eliminated lies on private property the City encourages the property owner to eliminate the source. In conjunction with section §341.019 of the Health and Safety Code, the City will apply larvicide when either the property owner is not available, non-cooperative, and/or the City believes the source water is creating a health risk.

## Adult Mosquito Control

Adulticiding is the application of pesticides to kill adult mosquitoes. It will be an optional procedure utilized at the medium and high risk level. The City will use the following threshold when applying adulticide:

- When a mosquito pool has tested positive for an arbovirus two (2) times during the season
- When the City has been notified by Tarrant County of a confirmed human case.
- When the City has been notified by Tarrant County of a significant increase in the population of Aedes mosquitoes that warrants further action
- Upon the recommendation by Tarrant County for any public health reason
- Or, when the City's leadership believes the threat level has increased to necessitate a response, for example: the presence of an increased population in a location at or before a large public event
- The City will use the following guidelines when applying adulticide:
- Spraying shall be conducted during hours as appropriate for the vector
- Notification to stakeholders (businesses, residents, regional partners) in the areas being sprayed must occur 24 hours prior to any application
- The areas where spraying takes places CAN be treated up to 3 times on 3 consecutive days
- When variables prohibit on a specific day the spray schedule will not be altered
- The City will seek permission from the property owner prior to applying adulticide on private property in the case of Zika or Chikungunya cases
- Spraying activity will be conducted as recommended by Tarrant County or the C

## Risk Levels and Response

The City of Bedford will operate the Integrated Mosquito Management Program under three different risk levels. The risk levels and the actions taken by the City are described below.



### LOW RISK LEVEL

Probability of human outbreak is low, subnormal to normal mosquito activity is observed, and no evidence of WNV in the immediate area.

**Public Education** – The City of Bedford will conduct abatement mosquito operations by providing continuous information on the City’s website, social media, providing printed materials (brochures, flyers about mosquito habitat reduction), disease symptoms, personal prevention measures, and points of contact for additional information.

- provide property inspections by request to help identify mosquito breeding habitats on individual properties, and publicize information about avoiding mosquito bites and encourage larviciding by residents using *Bacillus Thuringiensis Israelensis* (BTI) and other low toxicity products. The Tarrant County Public Health Department (TCPH) website is a good source of educational materials and contains frequently asked questions – <http://www.tarrantcounty.com/ehealth/cwp/view>

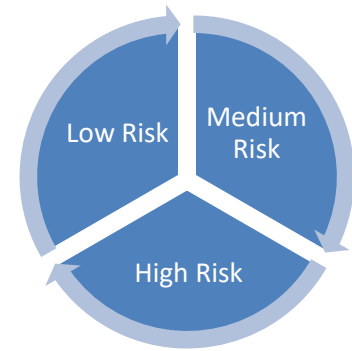
**Larvicide** – The City of Bedford will larvicide within public right-of-way areas and City-owned properties containing stagnant water with mosquito larvae, using low toxicity materials such as Vectolex FG granules along with Natular T30, XRT tablets, granules and Cocobear larvicide oil. These products could change due to availability and product tolerance. This operation will be done during mosquito season (as directed by Tarrant County Public Health).

**Surveillance** – The City of Bedford will set up five traps (For WNV Mosquitoes) each week, four in static locations and one roving trap alternating throughout the City and two (2) BG Sentinel (For Zika virus Mosquitoes) weather permitting. The City then submits the weekly samples to Tarrant County Public Health Department for testing. The City will also work with Tarrant County Public Health Department to participate in the winter month sampling program.

**Preparedness** – The City of Bedford will utilize the Tarrant County Interlocal Agreement to provide abatement actions should the need ever arises.

## MEDIUM RISK LEVEL

A virus has been detected in trapped mosquitoes, probability of human outbreak is increasing, and normal to above normal mosquito activity is observed. All activities at the Low Risk Level will continue and the following additional actions will take place at this level.



- **Notification** – Citizens and property owners will be immediately notified of the detection of virus in trapped mosquitoes by the Bedford Alert notification system within at least a ¼ mile radius of the positive site, information will be posted on the City’s website and sent out through social media.
- **Monitoring** – Public Works staff will prepare and distribute a weekly status report of mosquito activity and program functions to the City Manager’s Office.
- **Site-specific investigation** - The City will conduct an area inspection within a ¼-mile radius of the mosquito-sampling site that tested positive in order to identify locations in need of mosquito source or habitat reduction. The survey will include all areas that are visible from public property and will not involve City staff entering private property. If obvious sources of mosquito breeding environments are found, code enforcement officials will notify property owners of the situation and direct that action be taken to eliminate the source(s) within ten (10) days. If, after the ten-day period, the breeding sources have not been remediated, a citation may be issued. Obvious sources of mosquito breeding environments include, but are not limited to tires, open containers, and overhead roof drains plugged with leaves, etc.;
- **Test site mitigation** – Immediately upon receiving notification of a positive sample, the test site location will be treated using low toxicity materials such as Vectolex FG granule, Natular T30, and a Larvicide Oil COCOBEAR. Larvicide options may change due to availability or product tolerance.
- **Targeted Application of Adulticides** – In a situation where a single test site has had three positive samples in a row, targeted application of adulticides by barrier treatment will be required. This will take place in the creek channels and City parks twice a month at the positive location and enhance mosquito inspection within a half mile. Once the test site tests negative for two straight weeks, barrier treatments and or ULV fogging applications will cease. The first application will occur in response to the second consecutive sample that test positive at the same location.

## HIGH RISK LEVEL

Confirmed human case has occurred within the jurisdiction. Multiple static trap sites have tested positive for a mosquito born virus or four (4) mosquito samples at one location have tested positive for four consecutive weeks, and the detection of increased or continued viral mosquito activity is observed. All activities at the Medium Risk Level will continue, and the following additional actions may take place at this level.



- **Notification** – Citizens will be immediately notified of the positive trap site by Bedford Alert within a ¼ mile radius and information on the infected area will be posted on the City’s website and sent out through social media so that citizens can take extra precautions to avoid being bitten.
- **Site-specific investigation** - The City will conduct an area inspection within a ¼-mile radius of the mosquito-sampling site that tested positive in order to identify locations in need of mosquito source or habitat reduction. The survey will include all areas that are visible from public property and will not involve City staff entering private property. If obvious sources of mosquito breeding environments are found, code enforcement officials will notify property owners of the situation and direct that action is taken to eliminate the source(s) within ten (10) days. If, after the ten-day period, the breeding sources have not been remediated, a citation may be issued. Obvious sources of mosquito breeding environments include, but are not limited to tires, open containers, and overhead roof drains plugged with leaves, etc.;

**Adulticiding** – The City may initiate adulticide application based on the following:

- With the recommendation of the City Manager, Mayor and the City Council, authorizes to initiate a larger application of adulticide utilizing truck mounted fogging equipment to apply within public right-of-way.
- Consistent with the adulticing policy identified at the medium risk level.
- In response to a confirmed human case.
- Operations will take place in City parks, City creek banks.
- In order to be effective, adulticiding will be combined with larviciding and public notification.
- In conjunction with Tarrant County Public Health in response to an identified concern related to public health.

## **Elevated Risk Information**

If a sample mosquito pool tests positive for arbovirus/diseases, information will be posted on the City's website describing a general location of cross streets of the sampling event, the date, and any other pertinent information.

Information dissemination methods may include the following:

- Utilization of the City's website to post mosquito abatement activities, maps, personal protection best practices, and mosquito control website links.
- Utilization of Bedford Alert to the community alerting of any potential virus threat and adulticide control applications.
- Pamphlets, brochures, and /or door hangers distributed within the community.
- Presentations to community groups and target populations concerning mosquito breeding reduction and related activities.
- Social media releases describing arboviral response activities.



## Contact Information

**City of Bedford Streets/Drainage Superintendent 817-952-2250**

**City of Bedford Public Works Main Office 817-952-2200**

**Tarrant County Public Health Department 817-884-1111**

The Tarrant County Public Health Department (TCPH) website is a good source of educational materials and contains frequently asked questions.

<http://access.tarrantcounty.com/en/public-health/disease-control---prevention/west-nile-virus/about-west-nile-virus.html>

The Tarrant County Public Health Department (TCPH) Vector Surveillance Interactive Mapping Tool

<https://gisit.tarrantcounty.com/VSCoop/>

Center for Disease Control West Nile site

<http://www.cdc.gov/westnile/>

Center for Disease Control Zika site

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