City of Corinth
Mosquito and West Nile Virus Control Policy

1.0 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 that there are approximately 82-84 mosquito species in the State of Texas, although only about 12 of these mosquito species have been implicated in the transmission of serious diseases.

Mosquitoes typically need still, 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, drains, gutters, and discarded tires. Not all species feed on humans and other mammals, and many species feed mostly on birds, amphibians, or reptiles. Only a small percentage of the known mosquito species are considered to be diseases vectors.

Although only a small percentage of mosquito species are capable of transmitting diseases, mosquitoes are still considered to be a very important vector for disease transmission. Within the United States, the occurrences of mosquito-borne illnesses have been relatively rare in recent years. However, epidemics of mosquito-borne diseases were once common in the United States. Outbreaks of Yellow Fever have been recorded as far north as Philadelphia during the Colonial Period, and Dengue fever was prevalent along the Gulf Coast until the mid-1940s. At one time, malaria was well established in the continental United States, especially in the south. Other mosquito borne illnesses like LaCrosse, St. Louis, and Eastern Equine Encephalitis are still threats in certain areas of the country. Although many of these historical mosquito-borne diseases have been eliminated or at least controlled, the introduction and subsequent rapid spread of West Nile Virus within the United States is a topic of current concern.

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 larva or adult mosquito populations.

Mosquito control pesticides are applied by various means, depending on the type and size of the area being treated. No matter how pesticides are applied, however, pesticides have the potential to impact non-target species, including humans. Depending on the pesticides used, potential impacts may include acute or chronic toxicity, reproductive and / or developmental effects, and indirect effects through the food chain. The tests required for pesticides registration also may not address

non-target impacts. Information regarding the effects of inert ingredients in pesticide formulations, food chain effects, multi2-generational effects, and the interaction of specific pesticides with other chemicals in the environment may also be lacking. It is therefore important to realize that there are risks associated with the use of pesticides just as there are risks associated with the potential for human or animal infection by a mosquito-borne illness. The purpose of this response plan is to provide a systematic way to consider and balance the risks associated with mosquito control measures.

2.0 OBJECTIVES

The City of Corinth Mosquito Surveillance and Response Plan was developed to meet several objectives. Specifically, the Plan:

- Provides guidelines and information on mosquito populations, prevalence of diseases, and control strategies;
- Provides a systematic approach for using mosquito sampling and human disease data to establish enhanced control measures;
- Establishes actions that will be undertaken for West Nile Virus threat levels;
- Provides municipal staff and elected officials with a decision-support system;
- Outlines the roles and responsibilities of municipal staff and elected officials.

3.0 DISEASE MONITORING

The goal of the mosquito-borne disease surveillance program is to detect mosquito-borne viruses in mosquito populations before sufficient amplification of virus can occur. After virus is detected, management practices can be implemented thereby reducing the number of infected mosquitos and simultaneously reducing the risk of human transmission.

3.1 West Nile Virus Surveillance

Typically, mosquito-borne viruses can first be detected in bird populations, followed by detection in mosquitoes after the virus has had the opportunity to establish itself locally in birds. Of primary concern is the recent introduction of WNV. The principle mosquito species involved in the transmission of WNV are those in the genus *Culex*, especially *Cx. quinquefasciatus* and *Cx. tarsalis.* These mosquitoes are very abundant in the northwestern United States. *Cx. quinquefasciatus* mosquitoes are primarily found in urban areas because the larvae live in water with high organic content, such as sewer drains, catch basins, settling lagoons, and similar areas, while *Cx. Tarsalis* mosquitoes are primarily found in rural areas near irrigated pastures and croplands. Therefore, separating these mosquitoes from others in collections will be important for purposes of surveillance and monitoring.

3.2 Trap Sites/ Testing

On a weekly basis, during mosquito season, Corinth utilizes gravid traps to capture mosquitos overnight. Those mosquitos captured are transported to Vector Disease Control in Richardson for species identification and testing for West Nile Virus. Those trap sites are as follows:

- 1. Woods Park
- 2. Meadowview Park
- 3. Community Park Football Fields/ Pond
- 4. Thousand Oaks Pond

4.0 MOSQUITO ABATEMENT AND CONTROL PROGRAM

In December 2015, the City Council approved a mosquito abatement and control program. The program will allow for the following services to be performed in order to combat mosquitos and West Nile Virus:

- Trapping
- Testing
- Weekly Vector Index Report
- Educational information to provide the public
- Larvacide and pupacide applications to control populations
- Adulticiding (if desired) to control the adult mosquito population
- Mapping of City sites and wet areas and monitored control strategies
- Reporting of TPDES to the TCEQ for chemicals used in water for abatement

5.0 THE ROLE OF RESIDENTS

Residents can play an important role in reducing the number of adult mosquitoes by eliminating standing water that may support the development of mosquito larva and pupa. For example, residents can properly dispose of discarded tires, cans, buckets, maintain pools correctly, unclog blocked gutters and drains, dump water from bird baths and pet dishes at least every 2-3 days, ensure that air conditioning condensate is not pooling for several days, control irrigation so that standing water is not produced, irrigate so that runoff is not produced, and perform similar activities around homes and businesses. Water that cannot be eliminated should be treated with a biological mosquito larvicide such as *Bacillus thuringiensis israelensis* (Bti) in accordance with manufacturer's recommendations.

Residents should be aware that *Culex quinquefasciatus*, the target mosquito for control, tends to prefer to lay its eggs in "artificial" sources of water such as those listed above, as opposed to laying eggs in wetland areas, streams, and ponds. Generally, this mosquito cannot fly long distances, so emerging adult mosquitoes often remain near the habitat they lived in as larva and pupa. Adults will rest during the daytime in vegetation, particularly in areas where humidity is high. Irrigated urban and suburban landscapes can offer excellent habitat, especially if there is standing water present. Underground storm drains that receive small amounts of runoff from irrigation are also good habitat for these mosquitoes. As a result, *Culex quinquefasciatus* tends to become more associated with urban and suburban areas during the summer months. Often these same areas will

also have bird baths, bird feeders, trees, and other vegetation that serve to attract birds, especially during the drier times of the year when food and water become scarce. As a result, the opportunities for WNV disease amplification in urban and suburban areas can become more pronounced during summer months. The role of residents and business owners in controlling larval habitat is therefore a crucial component of reducing local WNV risk.

Because of the preferred habitat of the *Culex quinquefasciatus* residents are encouraged to contact Corinth Code Enforcement with information pertaining to vacant or abandoned properties which provide breeding habitat for mosquitos.

6.0 INTEGRATED PEST MANAGEMENT

Integrated pest management dictates that control efforts should be dependent on threshold levels. This means simply that a certain defined risk needs to exist before particular control measures are recommended. Levels of risk are based on knowledge of mosquito biology, the epidemiology of the mosquito-borne diseases, and monitoring efforts for the status assessment of mosquitoes and / or mosquito-borne diseases. Risks levels are then used to design multi-tactic prevention and control program that are comprised of a system of tactics which are compatible with each other and which are proven for their effectiveness. Continual program evaluations and updates ensure that the best methods are being used to meet the prevention and control objectives of the program, and continued public education is used to create awareness, understanding, and support. Frequent mosquito population assessments allow analysts to map potential mosquito breeding grounds and determine overall disease transmission risks. Using this information, more targeted efforts towards habitat disruption, source reduction, larviciding operations, and other control mechanisms are possible.

7.0 MOSQUITO CONTROL

The primary objective of mosquito control is to decrease the risk of mosquito-borne human diseases. This objective should be accomplished by:

- Stressing source reduction as a viable means of control, both by residents and on municipal properties, including enforcement actions for stagnant water located on private property;
- Aggressively larviciding where such activities are feasible, practical, and likely to be effective. This includes providing limited supplies of larvicides to citizens for use on private property.
- Promoting the use of personal mosquito protection measures, especially for the elderly and those individuals with compromised immune systems, through public education and outreach.
- Providing public information so that citizens are informed about the current Risk Level, areas of the City where WNV has been located, current municipal control measures, and what can be done by the public to help reduce risks.
- If warranted, implement adult mosquito control measures through targeted ULV pesticide applications (adulticiding).

7.1 Larviciding

The perfect pesticide is one that is easily applied, reasonably inexpensive, not toxic to non-target organisms, and that eliminates the pest quickly before it becomes a threat. Although no single pesticide can combine all of these factors, certain types of *Bacillus* bacteria have been developed into pesticides that are very close to the perfect pesticide model. *Bacillus thuringiensis israelensis* (Bti), for example, is a naturally occurring soil bacterium that produces a poison capable of killing mosquito larvae. Bti is considered ideal for mosquito management because of its specificity for mosquito larvae and because of the minimal to no toxicity to non-target organisms. These bacteria form reproductive cells, called endospores, which enable them to survive in adverse conditions. The endospores of Bti also contain crystals of an insecticidal protein toxin called delta endotoxin. Once ingested by a mosquito, the alkaline conditions of the stomach dissolve the crystal and release the delta-endotoxin. The toxin has an affinity for the stomach wall lining causing the cells to first swell then rupture. When enough stomach cells burst, the mosquito larvae is unable to effectively digest food. Once affected, larvae stop eating and rapidly die. Currently, Bti is commercially available in powder, liquid, granular, capsule, and "briquette" formulations.

Application of larvacides shall commence at testing sites and surrounding water bodies when the factors leading to West Nile Virus transmission become present. Those indicators are:

- Peak mosquito season (July- September)
- Increased number of the Culex species identified in traps

7.2 Adulticiding

Adulticiding (atmospheric spraying with the a synthetic pyrethroid as the active ingredient) will be considered a supplemental control measure. Adulticiding shall be considered only when there is evidence of WNV activity at a level suggesting a high probability of human infection. In general, finding an isolated WNV-positive mosquito pool does not by itself constitute evidence of an imminent threat to human health and does not warrant adulticiding.

The City Manager is authorized to approve adulticiding in the City of Corinth under the following condition without City Council Action:

- Vector Index reaches 4.5 or higher

A vector index is a measure of infectivity that takes into account the following information:

- Vector species composition- Key species carrying West Nile Virus in our region.
- Vector species population density- Vector abundance relative to trapping effort.
- Vector species infection rate- Proportion of vectors infected with West Nile Virus.

7.3 Adulticiding Application Area

In cases where adulticiding has been deemed necessary, the following criteria will be met for the application of the pesticide.

- Application site will be within .5 (1/2) mile radius of the site selected for application.

- In cases where Corinth city limits are within that .5 mile radius caution will be used to ensure we do not spray outside of our city limits.

7.4 Public Notice of Adulticiding

When triggering mechanisms are met for spraying, the public shall be notified through the following methods but not limited to:

- Electronic message boards near major intersections around the trapping site
- Corinth website
- Corinth Facebook page
- Corinth Twitter account
- "Notify Me" alert.

A minimum of two days advanced notice of intent to spray shall be given in order to allow residents time to make arrangements they feel necessary. Some residents may wish to cover their gardens, or bring pets indoors. A map of the spraying area, and the material Safety Data Sheet (MSDS) for the chemical used will be provided on the City's website for citizen review.

8.0 SUMMARY

Utilizing surveillance methods, public education, trapping and testing, larvacide, and adulticiding (if necessary) are all necessary steps in combating mosquito population growth and the transmission of the West Nile Virus. Public information will be provided through various media outlets to our citizens so they may help combat habitat issues on private property.