

# A Comparison of Mosquito Species in Developed and Undeveloped parts of the College Station/Bryan Area in the Brazos County, Texas

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**Abstract:** Mosquitoes are the deadliest vectors of human diseases, but are often unable to fly far distances from their place of emergence. Developed areas may have different species than nearby undeveloped areas due to this attribute of weak flying. This experiment involved setting out water sources at two nearby sites at each of three locations. These sites were then sampled for larvae that were identified. We identified *Culex restuans* (Theobald) (Diptera: Culicidae) at every single site (besides Location 3 Site 1 where our bucket was stolen). We also identified *Toxorhynchites rutilus* (Coquillett) (Diptera: Culicidae) at Location 1 Site 2. There was not enough information to determine a pattern with our data. It is suggested that more data be collected during years with more standard weather.

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The family Culicidae is responsible for the largest number of cases for vectored diseases and death from vectored diseases every year. Many different species of mosquitoes reside in Brazos County including vectors of Dengue fever and West Nile virus. The biology of mosquitoes have adapted to host and environments to have variable feeding times as well as using temporary and permanent sources of water for breeding. Container breeders represent a new challenge for epidemiology. In states such as Florida, unconventional items including unused Jacuzzis and stacks of used tires have provided breeding grounds for species such as *Aedes aegypti* (L.) (Diptera: Culicidae), which is linked to the recent outbreak of Dengue fever in Key West (Blake 2010). While mosquitoes are excellent vectors,

they can be poor flyers. *Anopheles quadrimaculatus* (Say) (Diptera: Culicidae) can only fly a few hundred meters away from its breeding location (Service 1997). The edge between urban civilization and rural areas provided an interesting area for mosquito study. Some mosquitoes in forested areas have primary hosts other than humans or are too far away from nearby suburban areas to fly and find human hosts. This may cause a gradient in different Culicidae species between undeveloped areas nearby to suburbs and housing. A species survey may lead to a better understanding of vectors in Bryan/College Station area and help with control methods.

## Materials and Methods

Three different locations were selected from the Bryan/College Station, Texas area. These areas were selected based on under-developed or uninhabited space with nearby residential suburbs or housing. At each location two sites were chosen: one near residential areas and one in the uninhabited areas.

Location 1 (Site 1) bordered along a subdivision for a residential neighborhood and a trail (Fig. 1). Location 1 (Site 2) was about 20 feet off a trail near a small creek with high amount of debris (Fig. 2). Location 2 (Site 1) was next to a tree located near a medium-sized pond (Fig. 3). Location 2 (Site 2) was placed on a ditch that went through an isolated area near an emergency training school (Fig. 4). Location 3 (Site 1) was placed near a ditch next to a Target commercial supermarket (Fig. 6). There is no picture of Location 3 Site 1 because our bucket was stolen. Location 3 (Site 2) was placed along a creek that fed into a large pond that was a part of a park (Fig. 5).



Figure 1. Location 1 (Site 1): Lat: 30°33'23.50"N; Long: 96°13'47.98"W Lick Creek Park.



Figure 2. Location 1 (Site 2): Lat: 30°33'23.63"N; Long: 96°13'35.10"W Lick Creek Park.



Figure 3. Location 2 (Site 1): Lat: 30°34'13.21"N; Long: 96°20'59.34"W Easter Wood Airport.



Figure 4. Location 2 (Site 2): Lat: 30°35'4.82"N; Long: 96°21'23.03"W Easter Wood Airport.



Figure 5. Location 3 (Site 2): Lat: 30°40'1.32"N; Long: 96°19'6.72"W Brazos Wildlife Center.



Figure 6. Map of each location site where collections were taken.

For each site we placed a five-gallon bucket (Encore, Sandusky, OH) with approximately three gallons of tap water and approximately 55 grams leaf litter obtained from beneath a live oak tree. These were placed on 16-III-2014. Collection of larvae was done on 31-III-2014 and again on IV-14-2014 to allow for mosquitoes to propagate. Two methods were used for larval collection: live and in alcohol. The alcohol specimens were simply collected with a scoop (Adcraft, Hicksville, NY) and put into vials (Bioquip, Rancho Dominguez, CA) containing 70 percent ethyl alcohol. The live specimens were put into breeding container constructed out of plastic cups (Dixie, Atlanta, GA). These were then allowed to sit for several weeks to allow for pupation and emergence of adults.

After obtaining our specimens, compound microscopes (Model OM159, Omano, Roanoke, VA), petri dishes (Bioquip, Rancho Dominguez, CA), forceps (Bioquip, Rancho Dominguez, CA), and a larval key (Littig 1994) were used to identify them down to species.

## Results

On our trip to collect specimens, we discovered that bucket from our Location 3 Site 1 was stolen. Larvae collection was only completed for the other five sites. Out of these sites *Culex restuans* (Theobald) was identified from the alcohol specimens in all locations. The larvae collected live to rear never passed the pupal stage. The specimens still in the larva stage once the identification process started were taken out and killed. They were then identified with the rest of the alcohol specimens. Location 1 Site 1, Location 2 Site 1, Location 2 Site 2, and Location 3 Site 2 all yielded more *Culex restuans*. A single *Toxorhynchites rutilus* (Coquillett) larva was located in Location 1 Site 2. It should be noted that while we collected several larvae, this was the only remaining larvae in the rearing apparatus at the time of identification.

## Discussion

The first surprising result we had with this project was the lack of species diversity in our samples as well as the lack of adults reared in our rearing containers. However, this is easily explained by the unusual weather experienced in the Bryan/College Station area this spring. There has been an unseasonably cold start to spring with three cold fronts in March alone [1]. Mosquitoes such as *Culex restuans* are highly dependent on temperature (Wang *et al.* 2011).

*Culex restuans* typical habitat is comprised of stagnant water and artificial containers that can range from clear to highly polluted. The larvae is

usually present throughout early spring to late fall, and are very common in central/eastern United States. It is also considered a bird feeder that primarily vectors Eastern Equine Encephalitis, with not many current efforts made for control (Wang *et al.* 2011). *Toxorhynchites rutilus* larvae can be located in flooded tree holes and man-made containers. They are carnivorous on macroinvertebrates and are also cannibalistic. They are not known to vector any disease (Murrell and Juliano 2013).

Our results showed no difference between species in the urban areas versus the undeveloped areas with the exception of our single *Toxorhynchites rutilus* larva. The fact that we got almost exclusively *Culex restuans* just emphasizes how variable they are as a species. The ability to lay eggs in temporary water as a container breeder and tolerate water pollution allows this species to spread successfully. Other factors such as the weather and timing of our experiment may have affected other species common in the Bryan/College Station area.

In conclusion, our results did not show any difference of significance between species of Culicidae that may be potential vectors. However, because this was done in less than optimum conditions, further research would be required during years of more average weather to truly determine if flight distance has an effect on species distribution in developed and undeveloped areas.

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