TrailMark Metropolitan District 2014 Season Mosquito Management Report

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1.0 INTRODUCTION

TrailMark Metropolitan District (TrailMark) contracted OtterTail Environmental, Inc. (OtterTail) to operate a mosquito management program in 2014. TrailMark is a community of approximately 800 homes located just west of the Chatfield Reservoir in Littleton, Colorado (TrailMark, 2011). The goal of TrailMark was to protect local residents from the effects of WNV and to suppress the populations of nuisance mosquitoes. To accomplish this goal, TrailMark wanted to identify possible mosquito habitats on the community's properties and then monitor and treat those sites when mosquito larvae were present.

West Nile is a mosquito-transmitted virus that can cause a wide range of effects, from an asymptomatic infection to a neuroinvasive disease termed West Nile meningitis or encephalitis. West Nile Virus was first detected in the United States during the summer of 1999 in New York City while conducting routine St. Louis Encephalitis (SLE) and Eastern Equine Encephalitis (EEE) surveillance. The virus has since spread across the U.S. and has been confirmed in all continental states. Bird populations act as a reservoir for the virus until a mosquito bites an infected bird. Only then can an infected mosquito pass the virus on to humans, horses, and other animals through their bite. While many people who contract WNV experience mild or no symptoms, the more severe cases of West Nile meningitis or encephalitis can result in severe illness and even death.

There are over 50 mosquito species in Colorado, yet only species from the genus Culex are known to be effective transmitters of WNV. Mosquitoes and other insects that transmit disease are called vectors; mosquitoes that are not known to transmit a disease are often called nuisance mosquitoes. The most abundant mosquito in the region, *Aedes vexans*, is an aggressive nuisance mosquito. The two primary vector mosquitoes that are most likely to spread WNV in Colorado are *Culex tarsalis* and *Culex pipiens*.

Following Integrated Pest Management principles, TrailMark and OtterTail focused on controlling and reducing mosquito populations and thereby protecting public health by decreasing the likelihood of WNV transmission. Through surveillance of potential mosquito breeding sites (larval sites), areas found to be producing mosquito larvae were identified and treated with control materials known as larvicides. Larvicides prevent the mosquitoes from developing into adults, and next to eliminating the source, is the most efficient way to reduce mosquito populations. This report explains the methods used in the mosquito management program and provides a summary of the results for the 2014 season.

2.0 LARVAL MOSQUITO SURVEILLANCE AND CONTROL

LARVAL SURVEILLANCE METHODS

The following is a brief summary of the procedures used by OtterTail during larval surveillance. To inspect a mosquito source, a plastic dipper cup with a 3-foot wooden handle was used to collect water from the site. Each sample (dip) was closely examined for mosquito larvae presence.

Many of the sites had mosquito-sustaining habitat around the perimeter of the site, while the middle remained mosquito free due to water circulation and/or natural predators. At these sites, the dipping effort was completed using a *linear approach* (walking around the perimeter and sampling the margins). Using the *linear approach* sites one acre or less in size were dipped approximately every 10 to 20 feet; sites 1 to 10 acres were dipped approximately every 50 to 100 feet and sites greater than 10 acres were dipped approximately every 200 to 500 feet.

Some sites were small (1 acre or less) and had mosquito habitat throughout the site. At these sites the dipping efforts were completed using *surface area* guidelines where the entire site was methodically sampled. Using *the surface area approach,* sites one acre in size and less were dipped approximately every 10 to 20 square feet. Since each site's characteristics could vary as the season progressed (e.g., become drier, wetter, increased vegetation), there were field adjustments made during the season concerning the appropriate number of dips. For example, at a very small site (less than 1/10 acre), the site might be dipped every square foot to establish an average.

LARVAL SURVEILLANCE SITE SELECTION/CHARACTERIZATION METHODS

OtterTail began to monitor sites within the project area that could support mosquito larvae in May. Mosquito larvae require stagnant water and will thrive in areas where the water is high in nutrients, organic matter, or other organic pollutants. The common habitats found within the project area were cattail marshes, non-flowing drainage ditches, and grassy areas surrounding several ponds that could become suitable larval habitat as their water levels fluctuated throughout the season.

LARVAL CONTROL METHODOLOGY AND APPLICATION METHODS

Larval mosquito control methods employed by OtterTail staff were aimed at reducing the threat of WNV and the annoyance level of mosquitoes to local residents. The threshold for larval control was presence of any mosquito species. The objective of larval mosquito control is to prevent the need for adult mosquito control spraying, which is much less effective and more expensive than larval control.

The application of *Bacillus thuringiensis israelensis* (*Bti*), *Bacillus sphaericus (Bs),* and BVA-2 mosquito larvicide oil (BVA-2) are OtterTail's primary methods used for larval mosquito control. Control materials were applied within the labeled rates, thereby minimizing any potential adverse impacts to areas being treated. Routine post-treatment checks were conducted to ensure the larval control was effective. If any larvae were found during the post-check, a second application was applied.

In balancing environmental resources, cost effectiveness, and public health needs, *Bti* was selected as the primary treatment product. *Bti* is a naturally occurring protein that is toxic to mosquito larvae upon its ingestion. It provides a residual treatment that lasts for approximately two days. Since new mosquito larvae may hatch after the product dissipates, the sites must be inspected for mosquito larvae every one to two weeks. The presence of mosquito larvae between monitoring periods has the added benefit of allowing these larvae to continue to be part of the aquatic food web, but be eliminated before they can emerge as adults. This helps protect the public from potential WNV transmission while still providing a food source for many aquatic animals.

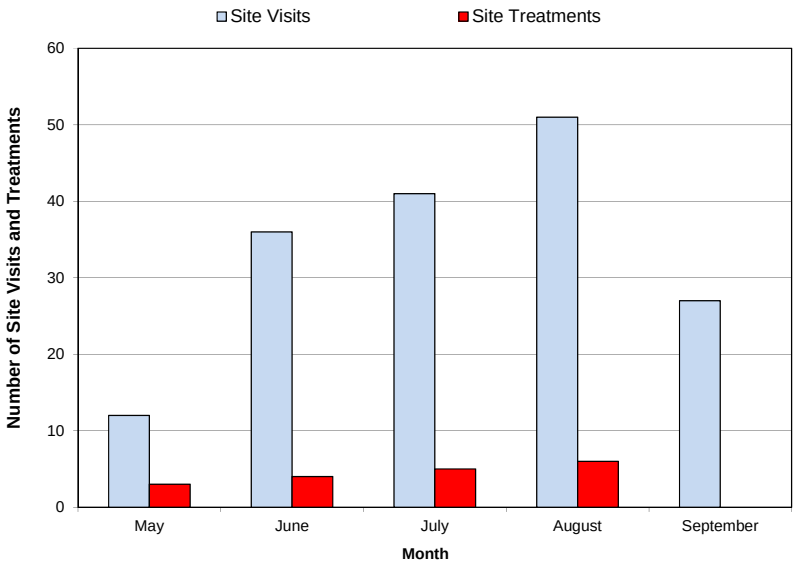
Bacillus sphaericus is a larvicide very similar to *Bti* but has a longer residual time. The protein in *Bs* products is able to provide continuous treatment of mosquito larvae for up to four weeks and was typically used on sites that were found to be continuously producing mosquitoes. Although the longer residual time of this larvicide allows for fewer site checks and cost savings in labor and travel, it is only practical in certain situations because it costs substantially more than *Bti*.

It should be noted that *Bti* was the primary control material used, but this product is not effective if pupae are found at a site. Mosquitoes do not feed during their pupal stage; therefore, the use of *Bti* and *Bs* is ineffective against mosquito pupae since these proteins must be ingested. In these instances of pupae occurrence BVA-2 is used. BVA-2 is a highly refined mineral oil that creates a thin film on the water surface that interrupts the air and water interface during the mosquito's larval and pupal development stages, causing them to drown.

LARVAL SURVEILLANCE AND CONTROL RESULTS

The 2014 larval surveillance season started in May and continued through September. During the season, a total of 167 individual larval site visits were performed on the potential breeding sites within the program area. Approximately 7.4 acres of active breeding habitat was identified and treated during 18 site treatments within the project area in 2014. **Figure 1** shows the number of site visits and treatments performed each month during 2014.

Figure 1 Number of Larval Site Visits and Treatments per Month, 2014



3.0 2014 CONTROL PROGRAM REVIEW AND RECOMMENDATIONS

The 2014 season consisted of identifying and monitoring sites for the presence of mosquitoes, followed by treatments with the appropriate products when mosquito larvae were found. During the season, OtterTail performed 167 site visits and 18 treatments on larval habitat sites within the program area. The thorough larviciding program was a likely reason for keeping the area adult mosquito populations and WNV case counts at low levels.

The mosquito control program for 2015 should continue to concentrate on larval mosquito control and to have any possible adult control based on adult population surveillance, WNV activity levels, and community complaints. Recommendations for 2015 include the following:

- Continued concentration on larval mosquito surveillance and control
- Efforts in public education informing residents on methods of personal protection and property maintenance to help lower the threat of WNV and the annoyance of nuisance mosquitoes

4.0 REFERENCES

TrailMark 2011. [Web page]. Located at http://TrailMark.org. Accessed December 7, 2011