

CMMCP AERIAL MOSQUITO LARVAL CONTROL PROGRAM



SPRING 2015

FRANK H. CORNINE III, TODD B. DUVAL & TIMOTHY D. DESCHAMPS

Central Mass. Mosquito Control Project
111 Otis Street Northborough, MA 01532
(508) 393-3055 • www.cmmcp.org



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ABSTRACT

The Central Massachusetts Mosquito Control Project conducted a targeted aerial application of *Bacillus thuringiensis israelensis* to select wetlands in the towns of Billerica, Boxborough, and Chelmsford. This spring aerial application occurred on April 22nd and 23rd 2015, and was utilized to reduce the volume of several early summer mosquito species that emerge in significant numbers. Approximately two thousand acres were treated between the three participating communities. Larval surveillance in these large wetlands following the treatment indicated an overall reduction of 92.62% in these mammal-biting mosquito species from observed pre-treatment levels.

OBJECTIVE

Early season mosquito species such as *Ochlerotatus abserratus* and *Ochlerotatus excrucians* develop in temporary pools created by melted snow that floods dormant eggs from the previous season. These univoltine species are some of the first to emerge as adults and cause significant issue to nearby residents due to their pestiferous nature. Because they are univoltine, the eggs that are laid by these adult mosquitoes will lay dormant until snow melt pools are created the following year. Another species, *Ochlerotatus canadensis*, will also develop in this habitat but may produce more than one generation over the course of a season (multivoltine). More importantly *Oc. canadensis* has the potential to transmit West Nile virus and Eastern Equine Encephalitis (Andreadis 2005). Controlling these early season mosquito species while they are still in the larval stage is much more advantageous than waiting for them to emerge as adults. As larvae they are relatively contained within their woodland pools, but once able to fly may disperse over a much

wider area. At that point control methods would likely require applications of ultra-low volume adulticides. Through this aerial larvicide CMMCP is able to reduce the abundant pestiferous species *Oc. abserratus*, *Oc. excrucians*, and *Oc. canadensis*, which in turn decreases service requests. In the specific case of *Oc. canadensis*, a vector of West Nile virus and Eastern Equine Encephalitis is reduced as well.

METHODS AND MATERIALS

VectoBac G® (EPA Reg. No. 73049-10) was the *Bacillus thuringiensis israelensis* (Btl) product chosen for this aerial larvicide application. This formulation is also used in the CMMCP ground larvicide program with great success (CMMCP 2015). This bacterial strain creates a very target-specific compound that, when ingested by the mosquito larvae, causes larval death within 24-48 hours (Extension Toxicology Network 1996; National Pesticide Information Center 2015). VectoBac G® was used at a rate of 5lbs/acre, which is well within the

suggested rate of 2.5-10lbs/acre per the product label.

The application was enabled by helicopter services provided by North Fork Helicopter (Cutchogue, New York). On April 22nd the Billerica and Chelmsford portions of the application took place, using the Warren Farm in Chelmsford as the helicopter loading zone area. The anticipated acreage treated for Billerica and Chelmsford was approximately 600 and 520 acres respectively. The following day, April 23rd, the Boxborough application targets were treated through the aerial larvicide program, with Minute Man Airfield (Stow, MA) used as the loading zone. The anticipated acreage treated for Boxborough was approximately 880 acres. Sites treated through this application were chosen with the following considerations: past mosquito larvae activity, vicinity to residential properties, current mosquito larvae levels, and relative inability to be treated through the ground larvicide program. Targets are typically designated as either shrub swamp, shallow marsh or wooded swamp (deciduous, conifer, or mixed) (MassGIS 2015). As per 333CMR 13.04 (7) a legal notification of the aerial larvicide was placed in The Boston Globe on February 4th, 2015, and also posted on the CMMCP website (<http://www.cmmcp.org>) (Appendix A). The procedures for larval surveillance used by CMMCP originate from the Generic Environmental Impact Report (GEIR) (Massachusetts Department of Agricultural Resources 1998). The GEIR calls for the establishment of recoverable dip stations (RDS), more specifically one RDS for every 250

acres treated, per town, plus one located in an untreated section of wetlands. At each RDS, both treated and untreated, ten larvae sampling points are flagged and monitored for larvae density before and after the aerial application. With this surveillance the level of control achieved through the aerial larvicide program can be determined. The number of mosquito larvae observed and their instar stage are noted at these flagged positions, with presence of Bti product also determined following the application. Larvae that are sampled at these specific points are placed back into the wetlands right away as to not skew the post-application results. Within the target wetlands, at locations other than the flagged positions, larvae are collected to be identified by species. By knowing the species of larvae involved in the aerial larvicide program, CMMCP can gauge the relative impact of the application on *Oc. abserratus*, *Oc. excrucians*, and *Oc. canadensis* individually.

RESULTS

An overall reduction of 92.62% in mosquito larvae was observed at the RDS following the 2015 spring aerial larvicide of Billerica, Boxborough, and Chelmsford from the pre-application levels. More specifically, the towns of Billerica, Boxborough, and Chelmsford experienced larvae decreases of 87.76%, 100.0%, and 92.45% respectively at their RDS post-application. An overall decrease of 19.93% was also observed at the three untreated (control) RDS from pre-application levels (Table 1; Figures 1-4).

Table 1: Larval Surveillance of Treatment and Control RDS

Treatment Sites	Pre-application	Post-application	Observed Change
BIL116	94	30	-68.08%
BIL112	124	9	-92.74%
BIL408	125	3	-97.06%
BOX128	51	0	-100.00%
BOX118	58	0	-100.00%
BOX92	58	0	-100.00%
BOX121	64	0	-100.00%
CHM81	53	0	-100.00%
CHM279	61	2	-96.72%
CHM236	98	14	-85.71%
Overall:	786	58	92.62%
Control Sites	Pre-application	Post-application	Observed Change
BIL227	105	78	-25.71%
ACT37	75	76	1.33%
CHM146	121	87	-28.10%
Overall:	301	241	-19.93%

Figure 1: Billerica Treatment RDS Results Pre- and Post Application

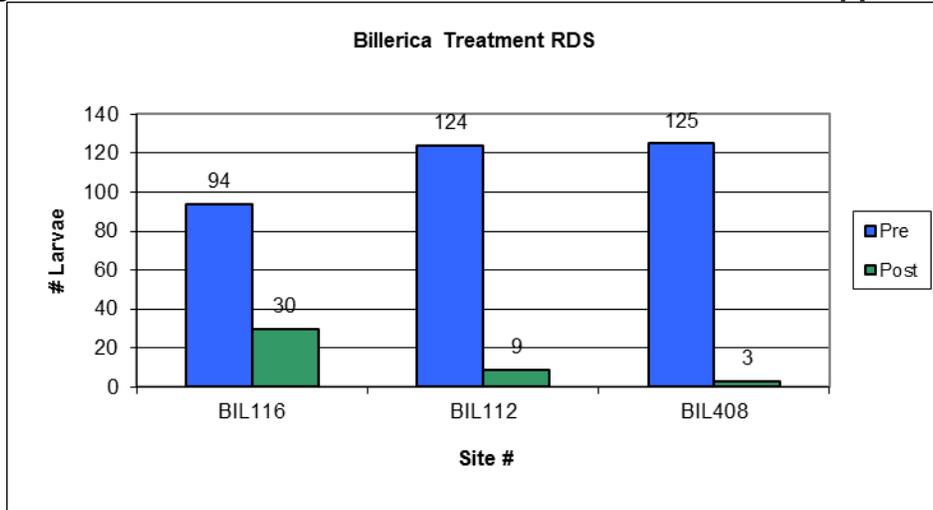


Figure 2: Boxborough Treatment RDS Results Pre- and Post Application

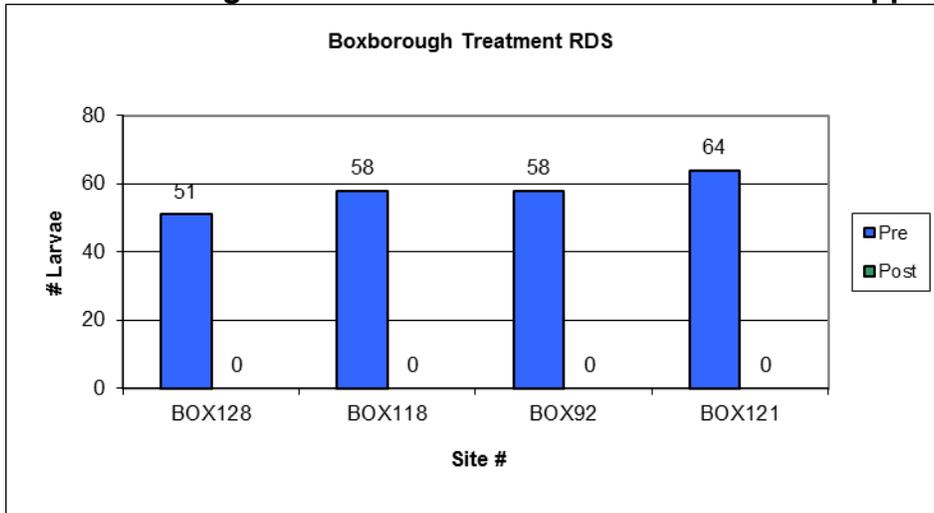


Figure 3: Chelmsford Treatment RDS Results Pre- and Post Application

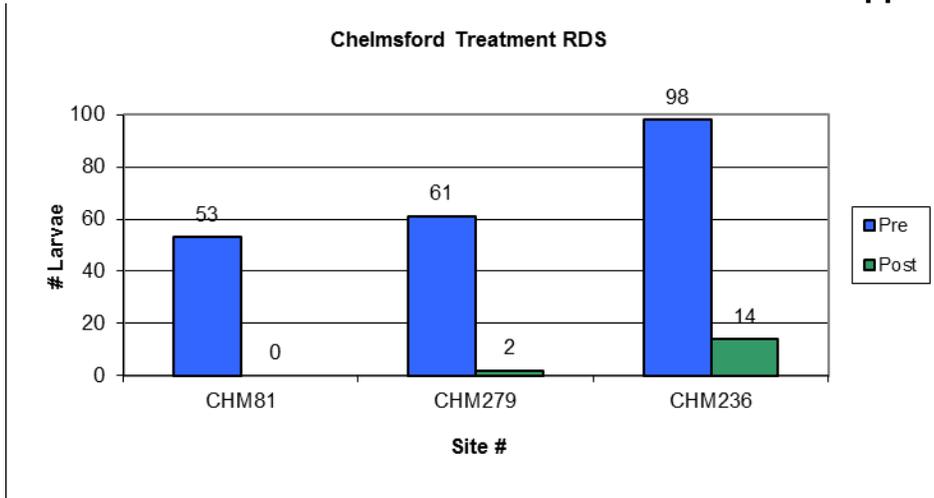
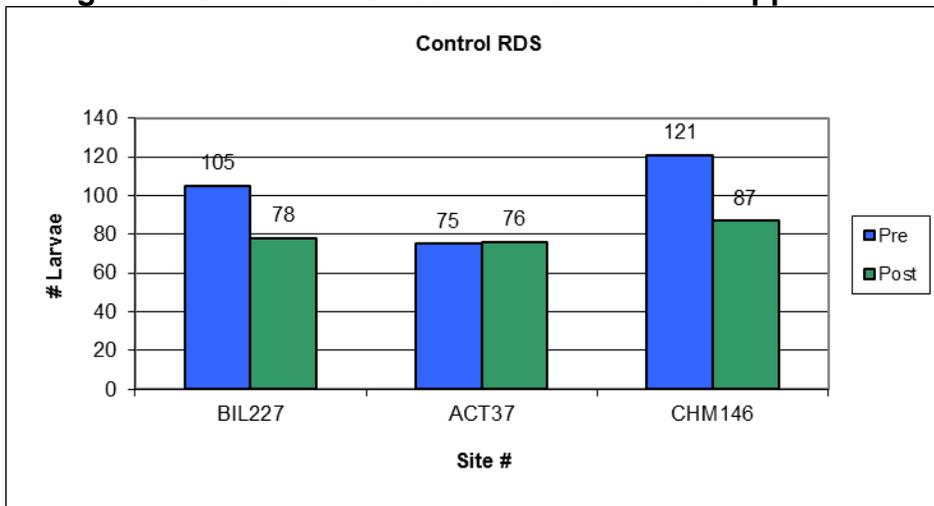


Figure 4: Control RDS Results Pre- and Post Application



DISCUSSION

Once the snow pack melts and temporary woodland pools begin to appear, the CMMCP field technicians begin to monitor for the presence of newly hatched mosquito larvae. This season, surveillance in early April indicated that the level of mosquito larvae and the stage of development would warrant an aerial larvicide application later that month. The application for Billerica and Chelmsford was projected for April 22nd, with Boxborough on April 23rd. Following the aerial larvicide treatments, CMMCP personnel observed an overall decrease in mosquito larvae of 92.62%. The untreated control sites in each of the towns experienced an overall reduction of 19.93%, which was relatively similar to the 2014 aerial application. All of the RDS had complete Bti product coverage at the surveillance flags expect for one. Despite this single varied location, the level of control was still strong within that wetland target.

The 2015 spring aerial larvicide is considered a success for the towns of Billerica, Boxborough and Chelmsford with approximately 92.62% control achieved. The reduction in *Oc. abserratus*, *Oc. excrucians* and *Oc. canadensis* will provide relief for the residents of these municipalities and decrease the need for ULV adulticiding of these species. There is the potential for additional towns in the CMMCP service area to participate in this aerial larvicide program. This possibility will be explored for the 2016 spring aerial larvicide.

ACKNOWLEDGEMENTS

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