

AERIAL MOSQUITO LARVAL CONTROL PROGRAM- SPRING 2022

DAVID MULLINS

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

ABSTRACT

Most mosquito species spend much of their life cycle in the larval stage when they are concentrated and highly susceptible to control efforts. The larvae are confined within water boundaries and relatively immobile with little ability to significantly disperse. Larviciding is a broad term for killing immature mosquitoes by applying agents called larvicides, while taking advantage of their confinement in their larval habitat. Effective larviciding can reduce the number of adult mosquitoes available to disperse, potentially spread disease, create a nuisance, and lay eggs which leads to more mosquitoes. In April 2022, the Central Massachusetts Mosquito Control Project conducted an aerial larvicide in Billerica, Boxborough, and Chelmsford, using *Bacillus thuringiensis israelensis* (Bti), which resulted in 95.69% reduction in mosquito larvae at monitored areas.

OBJECTIVE

The melting of the heavy snows coupled with the early spring rains that were seen in Central Massachusetts have created wetlands and woodland pools with high water levels. These areas of water create ideal habitat for mosquitoes to lay eggs and also supplies the eggs which were laid in previous years the water they need to hatch. In an effort to eliminate some of the mammal-biting adult mosquitoes, the Central Massachusetts Mosquito Control Project performs aerial applications of the larvicide *Bacillus thuringiensis israelensis* in the towns of Billerica, Boxborough and Chelmsford. This year the aerial treatment was conducted on April 20th. The larvicide was applied to 1,798 acres of

wetlands. *Ochlerotatus abserratus*, *Ochlerotatus canadensis* and *Ochlerotatus excrucians* emerge late in the spring and early summer. Additionally, *Ochlerotatus canadensis* has the ability to reproduce multiple times over a season. This particular species has also shown the ability to harbor mosquito-borne diseases such as West Nile virus and Eastern Equine Encephalitis (Andreadis 2005). By reducing the population size of these three mammal-biting mosquitoes, the necessity for adulticide spraying later in the season is lessened to remove the potential disease vectors from our environment.

MATERIALS AND METHODS

As a means to determine if the aerial larvicide program was effective, the

Commonwealth of Massachusetts employs the Generic Environmental Impact Report (GEIR). Recoverable Dip Stations (RDS) are established with one RDS set for every 250 acres to be treated. One untreated RDS is set for each town to be used as a control site. Each RDS has ten flagged dip sites. Each of the dip sites are sampled for larvae, the juvenile form of the mosquito, prior to the treatment. Post-treatment surveys were done to make comparisons. Larval density changes among these observations form the basis for determining the level of control for the aerial larvicide program. Sampled larvae are always returned to ensure that the treatment and control observations are not artificially impacted. CMMCP personnel identified the areas where the aerial drops would have the greatest impact. In addition, per 333CMR 13.04 (7)(a) a legal notification of the aerial larvicide was placed in The Boston Globe on February 11, 2022, and was posted on the CMMCP website (https://www.cmmcp.org/sites/g/files/vyhlf2966f/uploads/2022_aerial_legal_notice.pdf). (Appendix A)

CMMCP uses the organic larvicide AquaBac 200G® (EPA Reg. No. 62637-3). AquaBac 200G®, containing the bacterium *Bacillus thuringiensis israelensis* (Bti). Bti is a biological or a naturally occurring bacterium found in soils. It contains spores that produce toxins that specifically target and only affect the larvae of the mosquito. The

mosquitoes ingest the toxins which breakdown the cells of the digestive system. This leads to the demise of the mosquito. Bti has no toxicity to people, so it can be applied safely to mosquito habitat without a detrimental impact on food crops or water supplies. (<https://www.epa.gov/mosquitocontrol/bti-mosquito-control>). The date of the aerial treatment was April 20th for the member towns of Billerica and Chelmsford, with Warren Farm in Chelmsford, MA. being used as the loading area. Minute Man Airfield in Stow, MA. was used as the staging area for the town of Boxborough. The date were chosen to coincide when the larvae are most vulnerable and thus make the greatest impact on this population of mosquitoes. It is also done now to deliver the biopesticide to the targets before the tree canopy has developed which could impact efficacy. North Fork Helicopter (Cutchogue, New York) was contracted to apply the larvicide to 773.7 acres in Boxborough, 568.3 acres in Billerica and 456.1 acres in Chelmsford for a total of 1798.1 acres. Due to an increase in the operational costs, there was a decrease in the amount of acreage treated in the towns of Chelmsford and Billerica. The rate at which the larvicide was applied was five pounds per acre per label instructions. For this application, organically certified AquaBac G® was used. Following the application of AquaBac 200G®, the CMMCP crews return to the flagged sites after 24 and 48 hours. The density of larvae are recorded

and compared to the pre-treatment collection numbers and used to determine the effectiveness of the aerial larvicide program. During the post-treatment larvicide surveys, the presence or absence of AquaBac G® is noted by the CMMCP field crews.

RESULTS

The average reduction in mosquito larvae amongst the towns of Boxborough, Billerica and Chelmsford

following the 2022 spring larvicide application was 95.69%. Individually, the Billerica RDS exhibited an average reduction of 92.18% while an average reduction of 99.65% in Chelmsford and 95.56% in Boxborough. This is in comparison to the untreated (control) in the three communities which saw only a decrease of 57.47% from the beginning of the program (Table 1; Figures 1-3).

Table 1: Larval Surveillance of Treatment and Control RDS

Treatment Sites	Pre-application	Post-application	Observed Change
BIL (T1)	33	0	-100.00%
BIL (T2)	74	13	-82.43%
BIL (T3)	85	5	-94.12%
BOX (T4)	210	8	-96.19%
BOX (T5)	162	6	-96.30%
BOX (T6)	152	5	-96.71%
BOX (T7)	330	23	-93.03%
CHM (T8)	226	0	-100.00%
CHM (T9)	142	1	-99.30%
Overall:	1414	61	-95.69%
Control Sites	Pre-application	Post-application	Observed Change
BIL (C1)	70	29	-58.57%
BOX (C2)	259	23	-91.12%
CHM (C3)	327	227	-30.58%
Overall:	656	279	-57.47%

Figure 1: Billerica Treatment RDS Pre and Post Application

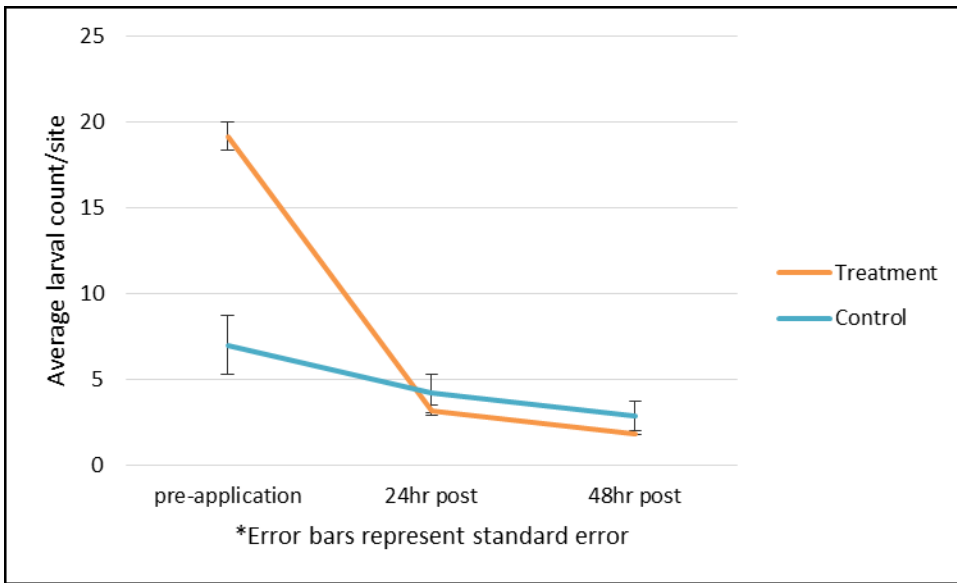


Figure 2: Chelmsford treatment RDS Pre and Post Application

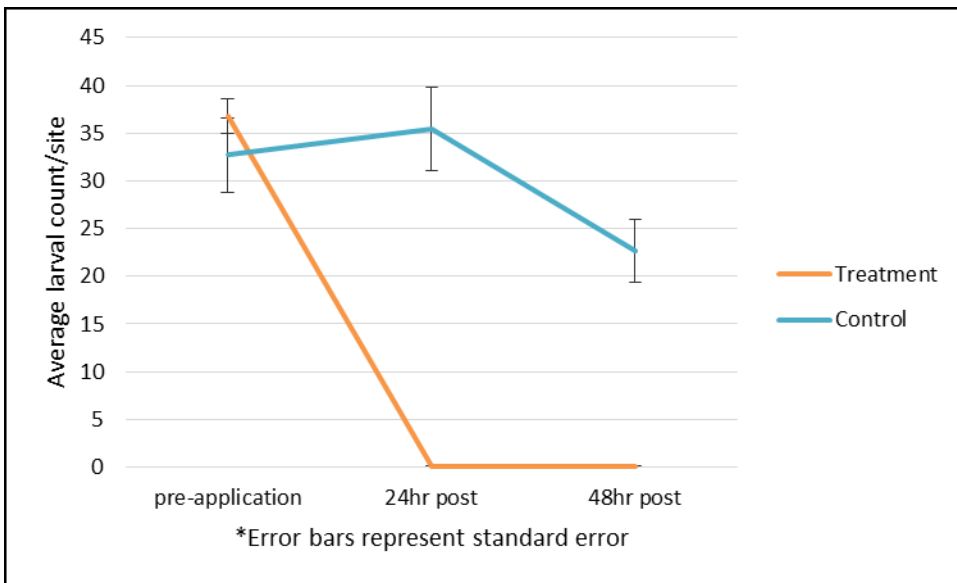
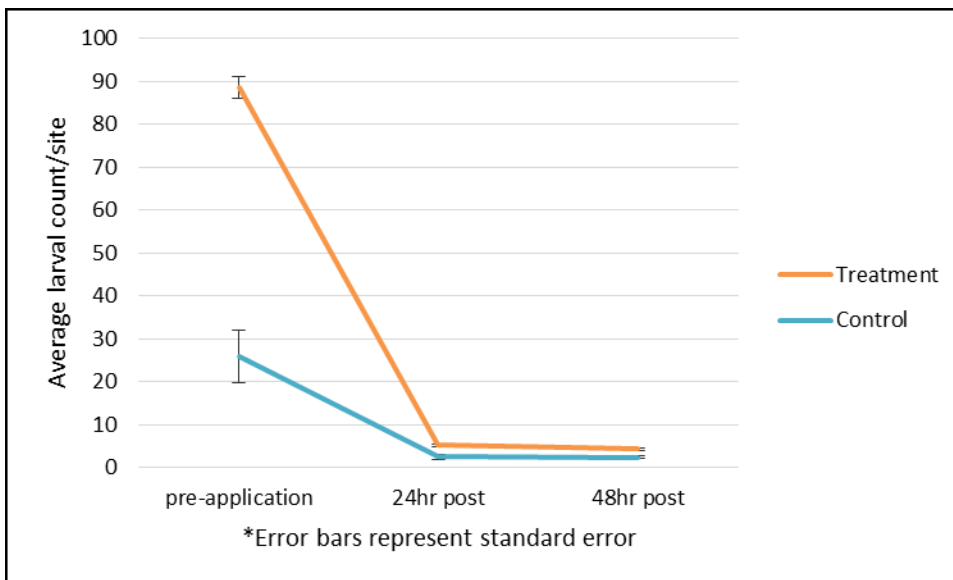


Figure 3: Boxborough Treatment RDS Pre and Post Application



DISCUSSION

Control of mosquito larvae is a key component in the reduction of the adult population. Targeting the developmental stages of the vector by aerial release of AquaBac 200G® allows CMMCP to reach sizeable wetland areas in Boxborough, Billerica and Chelmsford that would otherwise be too large to treat by ground crews. In 2022, the larvicide application took place April 20th. Larval surveys conducted prior to the treatment and twice following the treatment showed an overall average reduction of 95.69%. CMMCP considers this treatment a success. CMMCP typically sees an increase in the amount of larva found on post treatment

rechecks. There was a significant rain event the day before the application which we feel may have allowed larvae to be more dispersed and thus lowered concentrations on recheck.

The removal of the early brood *Ochlerotatus excrucians*, *Ochlerotatus abserratus* and *Ochlerotatus canadensis* mosquitoes from the environment, the residents of Billerica, Boxborough and Chelmsford will find less of these biting pests. Because of this success the need for adulticide spraying should be reduced early in the season. CMMCP will incorporate this year's experience into future aerial programs. This includes the potential expansion of the program into additional CMMCP member communities.

ACKNOWLEDGMENTS

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The Boston Globe

Classified Legal Notice Proof

Central Mass Mosquito Control
111 OTIS ST
NORTHBOROUGH, MA 01532

Thank you for placing your Legal Notice in The Boston Globe.

**Legal Notice -
Aerial Application to
Control Mosquito Larvae**

Per 333CMR 13.04(7)(a), the Central Mass. Mosquito Control Project (CMMCP), North Fork Helicopters and/or other contractors will be conducting aerial applications to control mosquito larvae over selected wetlands in Worcester and Middlesex counties. The applications will be conducted during the daylight hours from March 1 to October 31, 2022 as conditions warrant. The trade name(s) of the product(s) to be used are Aquabac 200G EPA Reg. #62637-3; Vectobac G EPA Reg. #73049-10; FourStar Bti CRG, EPA Reg. #85685-4; Natular G EPA Reg. #8329-80; Natular G30 EPA Reg. #8329-83. For additional information please contact Tim Deschamps at (508) 393-3055.