

Field Trials of FourStar® Bti CRG for Pre-Hatch Control of Mosquito Larvae in Selected Spring Brood Locations

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ABSTRACT

FourStar® Bti CRG is a highly selective, multi-brood microbial insecticide consisting of *Bacillus thuringiensis israelensis*. According to the manufacturer, these granules are effective against mosquito larvae in a variety of aquatic habitats for up to 40 days or more. Pre-hatch control for mosquito larvae was once used operationally at CMMCP, but ended in the early 1980's with the decision to move away from chemical pesticides to biological pesticides for larval control. We will test this product as a pre-hatch for spring brood mosquito larvae (*Oc. abserratus*, *Oc. excrucians* and possibly *Oc. canadensis*) with the hopes we will once again be able to have the option of pre-hatch control available to us.

INTRODUCTION

From the late 1970's through the early 1980's, pre-hatch control for mosquito larvae was used operationally at the Central Massachusetts Mosquito Control Project (CMMCP). Technicians would apply a pesticide to the snow, ice or bare ground in areas that had previous larval collection data. The pesticide in use at that time was methoxychlor dust, an organochlorine pesticide with a low toxicity and relatively short persistence in biological systems. According to the EXTOXNET (Extension Toxicology Network) website (<http://extoxnet.orst.edu/pips/methoxyc.htm>), "*Methoxychlor is a practically nontoxic compound in EPA toxicity class IV. It is a General Use Pesticide (GUP), and labels for products containing it must bear the Signal Word CAUTION. Methoxychlor is an organochlorine insecticide effective against a wide range of pests encountered in*

agriculture, households, and ornamental plantings. It is registered for use on fruits, vegetables, forage crops, and in forestry. Methoxychlor is also registered for veterinary use to kill parasites on dairy and beef cattle". This profile was last revised in 1996. All use of methoxychlor as a pesticide was suspended in 2000 by the EPA. Once biological pesticides such as *Bacillus thuringiensis israelensis* (Bti) became available to us in the early to mid 1980's, use of this chemical pesticide for larval control ended in our service area. But extended release formulations of Bti available were not suitable for pre-hatch control, so this practice also ended.

In 2013 FourStar Microbial Products made available a slow release formulation of Bti which is marketed as a pre-hatch option for mosquito control districts. Encouraged by this new formulation, we began field trials to determine the efficacy against spring

brood mosquitoes such as *Ochlerotatus abserratus*, *Oc. excrucians* and early instar *Oc. canadensis*.

MATERIALS & METHODS

25 sites were selected; 22 for treatment, and 3 sites as a control. The application rate was 10 lbs. per acre, and sites were monitored twice a week after treatment for 5-6 weeks. Water temperature data was also collected, and any significant weather or other events were noted on the data sheets.

Sites were chosen based on historical larval and treatment data from the CMMCP records, and were selected to be as diverse as possible. We treated sites that were dry, completely frozen over, and had a mix of open water and ice. A few days after treatments we did receive rain and any dry areas that were treated did fill with water and a larval hatch was recorded. Sites were monitored at least twice a week for 5 weeks, or until pupae were observed indicating a failure. Water temperatures were recorded at each site over an average of 3 locations.

Results from these field trials showed zero control in all of the larval habitats. Possible causes could be inadequate product efficacy, low water temperatures, insufficient coverage, etc.

In response to the lack of control shown in the field trials, CMMCP evaluated the FourStar® Bti CRG under laboratory conditions to determine if the lower than anticipated level of control was due to issues with the novel formulation, application technique, or environmental conditions. The FourStar® Bti CRG was examined using

four artificial larval habitats and protocols received from the distributor ADAPCO®. Three of these were treated with an amount of product proportional to the application rate used in the field trials, while the other habitat was not treated and designated as a control. Twenty field collected larvae were introduced into each container along with several gallons of natural substrate. Larval development was noted weekly until all larvae in the cohort were either moribund or emerged as an adult. A second and final cohort was then introduced to all habitats. Once the larvae in the control habitat emerged as adults, the FourStar® Bti CRG was well beyond the 40 days of advertised effectiveness.

CONCLUSION

Results of this assay indicated the FourStar® Bti CRG was effective against local larvae populations under laboratory conditions under the applied field rates used earlier this year. Our conclusion is that since mosquito larvae feed slowly in low water temperatures, the Bti levels are not sufficient to cause significant mortality. This product would seem to be efficacious for pre-hatch control of summer mosquito broods that develop quicker and in warmer water temperatures.

ACKNOWLEDGEMENTS

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FOURSTAR BTI CRG DATA COLLECTION FORM

DISTRICT: 3 NAME: Tim Deschamps

TOWN: Southboro GPS COORDS: 42.271583 -71.53543

SITE LOCATION: Mooney Ln. opposite #1 SITE# SOU216

SITE DESCRIPTION: wetland SITE PHOTO yes

SIZE: 6300 sq. ft. APPLICATION RATE: 10 lbs./acre

DATE OF APPLICATION: 3/28/2014 AMOUNT APPLIED: 1.5 lbs.

LARVAL ID: _____

COLLECTION DATA

LARVAL SAMPLE

DATE: 28-Mar DATA: 0 (ice) N WATER TEMP: 33.1

DATE: 1-Apr DATA: 2/dip 1st N WATER TEMP: 42.1

DATE: 4-Apr DATA: <1/dip 1st N WATER TEMP: 37.4

DATE: 9-Apr DATA: 5/dip 1st N WATER TEMP: 48.7

DATE: 16-Apr DATA: 4/dip 2nd 3rd N WATER TEMP: 48.5

DATE: 24-Apr DATA: 5/dip 3rd N WATER TEMP: 52.5

DATE: 5-May DATA: 2/dip 2nd 3rd N WATER TEMP: 53.7

DATE: _____ DATA: _____ Y N WATER TEMP: _____

DATE: _____ DATA: _____ Y N WATER TEMP: _____

DATE: _____ DATA: _____ Y N WATER TEMP: _____

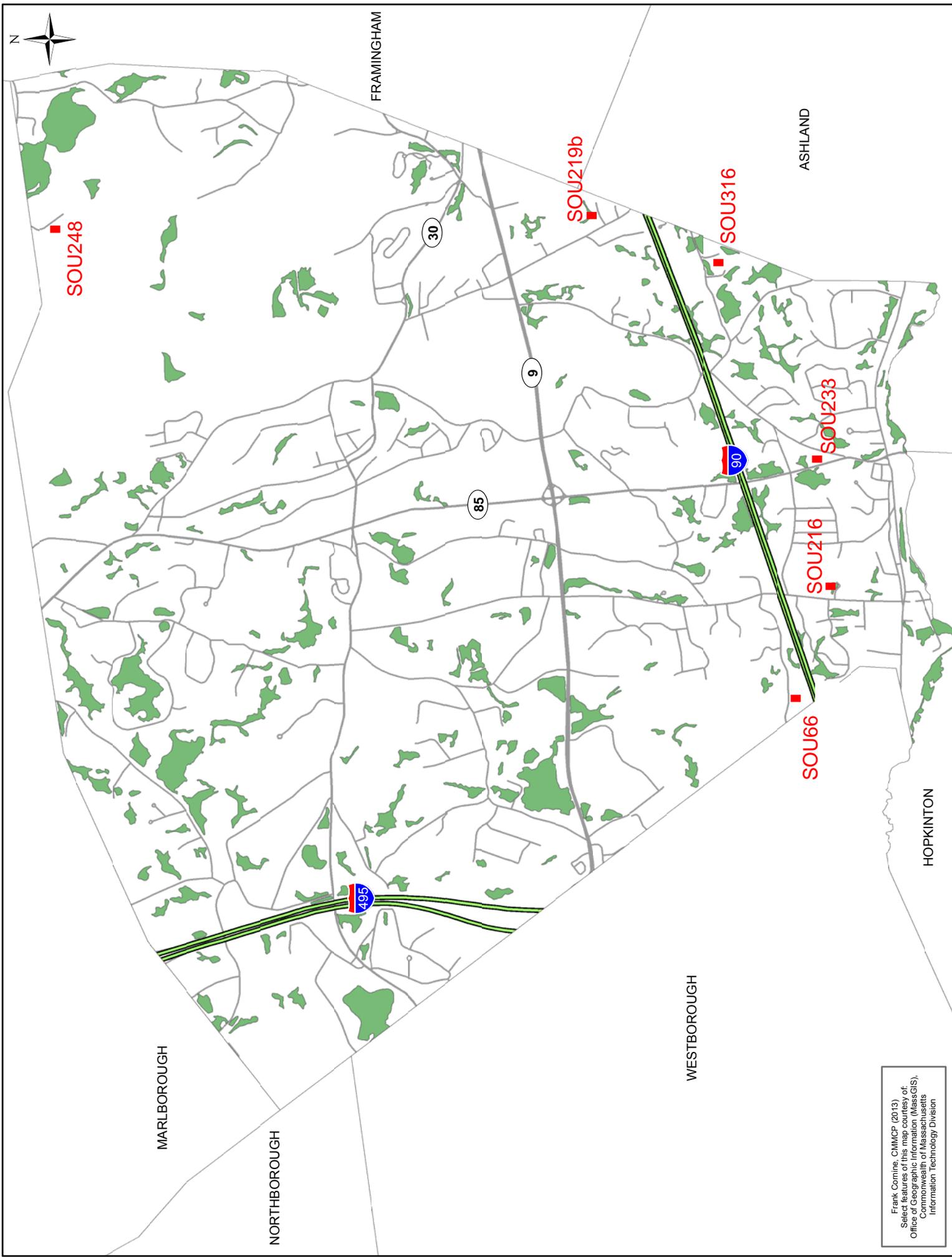
DATE: _____ DATA: _____ Y N WATER TEMP: _____

DATE: _____ DATA: _____ Y N WATER TEMP: _____

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DATE: _____ DATA: _____ Y N WATER TEMP: _____

Collection data is average # of larvae over 5 dips at 4 stations, with instar. Larvae are returned after dip



Frank Corrine, CMMCP (2013)
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