



THE COMMONWEALTH OF MASSACHUSETTS
Department of Agricultural Resources
**State Reclamation and
Mosquito Control Board**
251 Causeway Street, Suite 500
Boston, MA 02114-2151
<http://www.mass.gov/agr/mosquito/index.htm>



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Department of Environmental Protection

ROBERT W. GOLLEDGE Jr.
EOEA Secretary

DOUGLAS P. GILLESPIE
MDAR Commissioner

Donna Mitchell
Projects Administrator
Tel: (617) 626-1715
Fax: (617) 626-1850

TO: Commissioner Douglas P. Gillespie (DAR)
Commissioner Stephen Burrington (DCR)
Secretary and Commissioner Robert W. Golledge Jr. (EOEA and DEP)

FROM: State Reclamation and Mosquito Control Board (SRMCB)

DATE: August 18, 2006

RE: EEE AERIAL SPRAY

As outlined in the State Reclamation and Mosquito Control Board (SRMCB) Mosquito-Borne Disease Response Plan, the Board hereby submits a summary report regarding the aerial spray operation that took place on the evening of Tuesday, August 8th, commencing at 7:55 PM and ending on the morning of Wednesday, August 9, 2006 at 1:54 AM. This activity was performed in response to a declaration of Public Health Emergency by the Governor regarding an outbreak of mosquito-borne Eastern Equine Encephalitis virus (EEEv) in the region.

Calibration and characterization of the spray delivery apparatus took place on Monday, August 7th and was completed on the morning of Tuesday August 8th. Calibrations and characterization was conducted by Clarke Mosquito Control and Dynamic Aviation staff and overseen by Fran Krenick, National Technical Service Manager, of Clarke Mosquito Control in the presence of Gary Gonyea (a member of the SRMCB and representing the Massachusetts Department of Environmental Protection (DEP)), John Kenney of MDAR and former Chair of the SRMCB, and personnel from the Plymouth County Mosquito Control Project (PCMCP) and Northeastern Massachusetts Mosquito and Wetlands Management District (NMMWMD). The details and documentation of this procedure will be reported in a final post spray report.

The SRMCB and Department of Agricultural Resources (DAR) supervised the aerial spraying that covered an area approximately 140, 994.3 acres, as calculated by the navigational flight system of the aircraft. The area treated encompassed the municipalities of Middleboro, Lakeville, Carver, Kingston and Plympton, plus parts of the communities of New Bedford, Taunton, Raynham, Freetown, Duxbury, Halifax, Plymouth, Rochester and Acushnet (see map on page 6).

Two (2) -twin turbine Beechcraft King Air, Model A90 aircraft were deployed from Dynamic Aviation Company in Virginia. Based on the area treated and the rate of application 0.62 oz/acre (the maximum allowable amount permitted by the pesticide product label), the aircraft dispensed approximately 683 gallons of Anvil 10 +10 ULV EPA # 1021-1688-8329, (a Clarke Mosquito Control product) at a height of 300 feet above the ground and average airspeed of 172.5 mph and a swath width of the aerosol of 1,000 feet. Additionally, 32 gallons of Anvil 10 +10 ULV was used in the droplet size characterization equipment testing prior to the operation.

Weather conditions during the aerial application appeared optimal for Anvil 10+10 ULV. All weather parameters remained within ranges compatible with the product label. Temperatures ranged from the low 70's at the beginning of the applications down to the low 60's at the end of the application. Wind was calm to light and variable during the application window. Dew points reflected dry conditions. These weather conditions also reflected conditions favorable to mosquito activity during the application window.

The results of the operation were remarkable. Mosquito populations in the treated areas were dramatically reduced, and overall risk to the general public was lessened. Bristol and Plymouth County Mosquito Control Projects staff reported large reductions in mosquito abundance in areas that had been so treated. Overall, Bristol and Plymouth Counties reported reductions of 82.8% and 85.5%, respectively, in mosquito abundance. These reductions included mosquitoes of species that are important as maintenance vectors of EEEV amongst birds and those that are aggressive human biters and suspected to be the bridge vectors of EEEV to people. In addition, the staff of the MDPH State Laboratories Institute reported overall reductions of 59.8 % with noted reductions of mosquito species of concern such as *Ae. vexans* and *Cq. perturbans*. The discrepancies and variability of the measured reductions are attributable to differing methods of analysis as well as confounding factors such as weather changes between pre and post collections, terrain, and mosquito species. More details of efficacy results can be found on page 4 and 5.

Fran Krenick (National Technical Service Manager for Clarke Mosquito Control) stated in part "Operationally ... the bridge vector populations have been significantly reduced thereby reducing the potential for human involvement by a much greater margin. Dr. Roger Nasci of Centers for Disease Control and Prevention (CDC) stated that the risk for transmission and amplification has been greatly reduced. Overall, it looks like good reductions in all species."

After evaluation of trap collection data from Bristol and Plymouth County Mosquito Control Projects, and Massachusetts Department of Public Health (DPH) preliminary data on the *Cs. melanura* minimum infection rate (MIR) for the 4 trap sites located within the spray zone, Dr. Roger S. Nasci, Ph.D. Chief, Arboviral Diseases Branch Division of Vector-Borne Infectious Diseases National Center for Zoonotic, Vector-Borne and Enteric Diseases Centers for Disease Control and Prevention stated that the percent reduction of mosquitoes due to the application of Anvil 10+10 ULV in certain parts of Southeast Massachusetts was impressive.

Such an aerial application should result in decreased risk (i.e., the density of infected mosquitoes is reduced) and should impact amplification (i.e., fewer infected adult mosquitoes to infect birds and fewer uninfected adult mosquitoes to acquire virus and become infected/infectious). Since the risk of infection (for a bird, horse, or human) is directly related to the likelihood of being bitten by an infected/infectious mosquito, this equates to a meaningful reduction in the likelihood of that happening. Such reductions in risk seem to have been accomplished in the treated areas.

Significant impacts to the environment have not been observed as a result of the aerial application. Water sampling analysis by the Massachusetts Pesticide Analytical Laboratory (MPAL) indicate there were no detectable residues of d-phenothrin or sumithrin (pyrethroid active ingredient in Anvil 10+10) in surface water and drinking water supplies tested. The levels of the synergist Piperonyl Butoxide (PBO) were very low and were below the expected environmental concentrations (EEC) as estimated by the Environmental Protection Agency (EPA). The EPA has not established a maximum contaminant level or MCL for residues of PBO in drinking water. The levels found do not violate any federal law. Additionally, there have been no reported unintended effects regarding fish, birds, and or bees. However, no quantitative assessment was performed for these non-targets. Verbal reports from the Center for Environmental Health indicate only a few human illness reports (n=8) being investigated as a result of the aerial application. No objective findings have been reported of any alleged adverse effects to the environment to date. The details and documentation of this analysis will be reported in a final post spray report.

Operationally, the only significant problems of the aerial application of August 8th and 9th 2006 related to GIS mapping for areas to be treated and those to be excluded in the operation. The final maps that were sent from DPH to SRMCB/DAR staff, including the buffer zones, were not correct, and hence, the only buffer zone was the 400 ft buffer zone to the fish hatcheries. Finally, SRMCB/DAR did not receive the final maps until late Friday evening, when spraying was scheduled for Monday. One area designated as priority habitat and to be excluded from spraying appears to have been sprayed. A water body of similar size and shape adjoined the no-spray zone. The pilot assumed that there was mapping error. He apparently excluded the water body but sprayed part of the priority habitat.

One other important concern in terms of operational effectiveness is the fact that a number of locations or areas excluded from application overlap with, or were in very close proximity to, "hot spots" where EEEv has been currently and/or historically found. This occurred where Division of Fish and Game had excluded priority habitat areas, even though the Governor has signed a declaration of public health emergency. The SRMCB and DAR being responsible for controlling mosquitoes have significant concerns about the ability to reduce and/or prevent the risk of infection when such areas are excluded.

The above issues are being addressed in order to make the necessary refinements to improve the process and function of any future aerial applications. These refinements include but are not limited to better coordination and communication between all agencies responsible in developing mapping for aerial application such as exclusion areas. The objective being to ensure that the final maps be completed and reviewed by all agencies in a timely fashion before being sent to the aerial applicators. In addition, SRMCB/DAR will brief the pilot(s) prior to take off to further ensure that excluded areas will not be treated. Finally, it is imperative that a balance be struck between minimizing risks to endangered and threatened species of concern in priority habitat and reducing risk of infection to humans of EEEv. To accomplish this goal, it is critical that each of the agencies with interests in mosquito control and priority habitat must communicate effectively and cooperate to devise a balanced approach that protects human health and the environment. A unilateral decision by a single agency with a limited interest fails to protect public interests, especially in light of a declaration of a public health emergency.

Although the aerial application operation during August 8 and 9th of 2006 to fight EEEV is far more advanced technologically than in 1990 (the last time aerial application occurred over Southeast Massachusetts), the operation is still somewhat imprecise due to the scope and complexity of the project, meteorological variables, human pilots, and incredibly small droplet sizes. However, the operation is a standard practice in combating mosquito-borne diseases wherever they occur in the United States, and provides the most meaningful option that ultimately results in positive public health outcomes.

Aerial Intervention August 8-9, 2006 Efficacy Results

**Reported by, Wayne Andrews, Superintendent
Bristol County Mosquito Control Project
Taunton, Massachusetts**

Trapping results for 24-hour post-adulticide:

Outside Spray: Central Taunton, North Taunton, Dighton
Inside Spray: Freetown, New Bedford, East Taunton

Overall: 82.8%

- Cq. perturbans*: 87.1%
- Oc. canadensis* 72.0%
- Cs. melanura* 97.1%
- Ae. vexans* 77.2%

CDC traps with 200cc CO2 per minute. Three traps in each area. The day before and the day after collection were used in the calculations.

Aerial Intervention August 8-9, 2006 Efficacy Results

**Reported by: Ellen Bidlack, Entomologist
Plymouth County Mosquito Control Project**

I am finally satisfied with my calculations for the efficacy of the aerial adulticing. I have used the same method for calculating the efficacy as Wayne Andrews did, so that you can compare results. Below you will find my calculations for those traps where the collection was made 24hrs post treatment. I had 4 traps in each area and I have attached a map so you can see where these traps were located.

Overall: 85.5% control

- Cq. perturbans*: 91.9% control
- Oc. canadensis*: no control
- Cs. melanura*: 79.2% control
- Ae. vexans*: 100% control
- Culex (sp)*: 69.9% control

I am still working on the calculations for 48 and 72 hrs post treatment. These numbers don't look that great at least in part because I had two sites in the treatment where the numbers either stayed the same or increased where as all the controls decreased. On the map I have attached you will see the sites that will be used to calculate the 48 and 72 hr post treatment.

Some other things you should know:

1. I dropped from all calculations the trap sites that are located south of the treatment area. I did this because Fran Krenick recommended it. She said that the wind was blowing out of the north – west and that those sites may have been too close to the treatment area.
2. For the pre-treatment collections all but one collection (Old Center St, Middleboro) was made on the 5-6 Aug 06. Old Center St. had to be run twice and the collection used was made 7-8 Aug 06.

Please forward to anyone I you think I forgot.

Aerial Intervention August 8-9, 2006 Efficacy Results

**Reported by Matthew Osborne
State Laboratories**

Overall: 59.8% control

Cq. perturbans: 35% control

Oc. canadensis: no control

Cs. melanura: 70.1% control

Ae. vexans: 65.2% control

