

# Emergence of Eastern Equine Encephalitis Virus in Northeastern Massachusetts: Strategies Developed to Contain its Spread.

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## Introduction

The Northeast Massachusetts Mosquito Control and Wetlands Management District is the state governmental agency responsible for monitoring mosquitoes, and the pathogens they transmit, in Essex County. With the emergence of Eastern Equine Encephalitis virus (EEEV) in northeast MA and southeast New Hampshire (primarily Rockingham County) in 2004, the District has actively increased mosquito surveillance and has developed response strategies to contain spread of EEEV and protect human population from infection. See preceding poster (Cuebas-Incle, *et al.* 2006) for explanations on how vector surveillance was enhanced. An aerial application for the municipalities bordering NH was under consideration, but ultimately not recommended in September 2005, due to prevailing cooler temperatures and declining mosquito populations. However, had an aerial spray been mandated, there would have been unavoidable bureaucratic, fiscal, and operational delays in its execution, possibly increasing the risk of infection to the public. More effective planning was needed to insure that aerial adulticiding could be implemented quickly if necessary in 2006.

The District's 2006 Vector Management Plan (VMP) included both increased surveillance along the border with New Hampshire and the development of a comprehensive "Emergency Response Aerial Adulticiding Plan" (ERAAP). This poster presents how plans for the aerial adulticiding spray were developed.

## "Pre-emptive Control" of Potential Mosquito Vectors

It was decided that adulticiding was the principal method to control *Culiseta melanura*. Due to the lack of accessible *Cx. melanura* larval habitats, pre-season larviciding was not seen as an effective pre-season control strategy. Furthermore, several of the communities targeted for EEEV attention did not formally enter the District until the late spring 2006, hampering attempts to locate and treat *Cx. melanura* larval habitats. Finally, most of the accessible larval habitats were found to be lacking water in the early Spring, due to winter-long drought. Therefore, only limited larviciding operations were attempted and "Teknar G" (*Bit*) granules were applied by hand.

The 2006 VMP called for targeted ground-based adulticiding in response to unexpected population increases in potential vector species to disrupt possible EEEV transmission. "Pre-emptive adulticiding strikes" against increasing enzootic vectors (*Cx. melanura* and *Cx. moritans*) and selected bridge species (e.g., *Aedes vexans*, *Coupletella perturbans*, *Culex pipiens*) were recommended to towns with previous EEEV isolations. When population increases were observed, relevant municipal Boards of Health were contacted with recommendations to adulticide; all the towns complied. Also, when EEEV mosquito isolations were reported, adulticiding was recommended, either limiting the operation to neighborhoods where the isolations were obtained or to the entire municipality; the towns all wholeheartedly approved! When adjacent New Hampshire municipalities had isolations, we received approval for adulticiding in District towns nearest the affected NH towns. Being that we were in constant communication with the mosquito control agency in southeast NH, "Dragon Mosquito Control", adulticiding was conducted on the New Hampshire side at approximately the same times as our operations. Adulticiding was done with Sumithrin, marketed as "ANVIL 10-10" via truck-mounted ULV-sprayers. Although the coverage of the adulticide was limited, the expectation was to reduce potential vector populations to reduce transmission of EEEV.

For adulticiding in school properties and athletic fields, "barrier spraying" was recommended. Due to the provisions of the Massachusetts "Children's and Families' Protection Act of 2000" (Massachusetts Dept. Agricultural Resources, 2006), which created a cumbersome process for adulticide applications to be done on school properties, barrier spraying was deemed to be cost-effective. According to the Act, 72-hour written notification had to be sent to parents of each student of schools to be sprayed; written notices were required to be clearly posted around school properties prior to any application. Therefore, application of an adulticide with residual activity for up to fifteen days would require only one set of legal notices be distributed, rather than several sets that may need to be prepared and released every time a ULV adulticide was applied. Truck-based barrier adulticide applied was a 10% dilution of Permethrin ("FLIT 10 EC"; Meheffey & Gallant, 2006); see Figure 1.

## Response and Control of EEEV-infected Mosquitoes

If, on the other hand, numerous and area-wide isolations were obtained in both enzootic and bridge vectors, according to our VMP, regional aerial adulticiding was the next step. The ERAAP (Emergency Response Aerial Adulticiding Plan) developed in the winter of 2005-2006 insured that all logistical and operational components necessary to conduct an aerial adulticiding application were in place well in advance of any potential need for such an application. No other Mosquito Control Project or District in Massachusetts designed such a plan to the extent developed by our District.

The key component of the ERAAP is a navigational mapping database. This database identifies all the sensitive areas to be excluded from an aerial application: "sensitive areas" included all schools, bodies of water, "endangered species" protected habitats, and organic farms. The database could then be easily downloaded to an aircraft's navigational spray system. The District contracted "True North Mapping" (of Plymouth MA) to collect and incorporate these "data layers" from the numerous state and federal agencies and interest groups to develop a final spray map (see Figure 1). Memorandums of understanding were developed and signed with regional airports (Beverly & Lawrence) to availability of all facilities should they be needed at short notice. Contracts with private aviation companies were initiated and reviewed to insure quick response when needed. Arrangements were made with pesticide suppliers for rapid availability and delivery of sufficient materials.

\$92,000 was allocated from the District's budget towards implementing the ERAAP for a minimum aerial application of two to four towns. With the ERAAP in place, all that were required for its activation was approval by the relevant municipal Boards of Health and final authorization from the State's departments of Public Health and Agricultural Resources (specifically, the State Board of Reclamation & Mosquito Control).

Meanwhile, in southeast MA, based on early and abundant EEEV isolations in both the enzootic and bridge vectors, and after extensive debates and deliberations, two regional-wide aerial applications in southeast MA were authorized. The aerial application occurred from 8 to 9 August and 21 to 24 August 2006; the former application treated 159,000 acres while the latter had treated 350,000 acres. These were the first two aerial adulticiding applications in Massachusetts since 1990. The results for Essex County (eleven EEEV isolations in mosquitoes, no horse, exotic bird or human infections) did not warrant a similar response. **But the District was ready!**

## References:

Cuebas-Incle, Esteban; Montgomery, Walter; and Card, Jack. 2006. Emergence of Eastern Equine Encephalitis Virus in Northeastern Massachusetts: Improving surveillance of infected mosquitoes. Poster (NMCA-2006 & AMCA-2007).

Massachusetts Department of Agricultural Resources. 2006. Children's and Families' Protection Act of 2000 (Chapter 85 of the Acts of 2000). <http://massrec.org/ipm/schools-daycare/child-protection-act-2000/full-text.html>

Meheffey, William & Gallant, Dennis. 2006. Converting a ULV-Leeco to a Barrier Sprayer. Poster presented at the 2006 Northeastern Mosquito Control Association Meetings.

Figure 1. Application of Barrier Spray.



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Figure 1. "Emergency Response Aerial Adulticiding Plan" database map, prepared with all major sensitive areas indicated that would be excluded from an aerial application, to be downloaded into spray aircraft's navigational system in the event such an application was to be made in 2006.

