Commonwealth of Massachusetts

State Reclamation Board

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

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Newburyport, MA 01950

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Entomologist

Robyn A. Januszewski
Biologist

Commissioners

Peter M. Mirandi, RS, MPH
Chairman

John W. Morris, CHO
Vice Chairman

Vincent J. Russo, MD, MPH

Sharon Cameron, RSMPA

February 20, 2009

John Coulon, Health Agent
Topsfield Health Department
Town Hall 8 West Common Street
Topsfield, MA 01983-1499

Dear John:

Please find enclosed the 2009 Best Management Practice Plan (BMP) for your community. This BMP is designed to incorporate the Districts mosquito control recommendation and the specific needs and concerns of your community, as we understanding them. In particular, I encourage you to take advantage of our inspectional services program and barrier applications for public use areas.

Also find enclosed The Districts 2009 Vector Management Plan (VMP). While BMP's address the needs of individual communities, the VMP is designed to address vector/virus concerns regionally. By subscribing targeted, measured and preemptive responses to specific risk and risk areas, we can use our limited assets more efficiently and effectively to minimize risk and contain or limit risk areas.

As always, I am available to you at your convenience to review and modify your BMP as necessary and mutually agreed.

Best regards,

Walter G. Montgomery
Director

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BOARD OF HEALTH

Commonwealth of Massachusetts

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Best Management Practice Plan

Topsfield

Draft for FY07 Revised: 1/08 1/09

Mosquito Surveillance Summary

Northeast Massachusetts

This year, we have made changes in the presentation of the Mosquito Surveillance Summary. We begin with an overall District summary of mosquitoes and arboviral activities in 2008, followed by a summary pertaining to your municipality. The biology of important species of mosquitoes in your community is now at our website (http://www.northeastmassmosquito.com) under the heading "Mosquito Information". The role of these species as vectors of arboviruses, namely West Nile Virus (WNV) and Eastern Equine Encephalitis Virus (EEEV), is presented there as well. Description of our surveillance program, which was expanded again in 2008, can also be reviewed on our website. During the season, we will again provide you with our "District Bulletins" on unusual mosquito population surges and of arbovirus isolations and alerts; we will send these again, via electronic mail, to all District health agents as well as post these on our website.

After a season-long District-wide drought in 2007, weather patterns were very different in 2008, resulting in often unusual patterns in mosquito distribution and abundance. The year began with average-to-above-average accumulation of precipitation, primarily from snowfall. Then with the arrival of spring came a drought that lasted from April into most of June. While there was plenty of standing water present in early spring, most-to-nearly-all of this water was used by trees for the unfurling and expansion of leaves. This left relatively little standing freshwater to complete mosquito development, thus the emergence of early season mosquitoes, namely the "Spring Brood" mosquitoes, was lower than usual.

Droughts usually result in a higher-than-normal emergence of mosquitoes breeding in high-organic content habitats, such as drying ponds; edges of drying rivers, streams, and brooks; and catch basins. These mosquitoes are also the principal vectors of West Nile Virus in northeastern Massachusetts. However, we did not see an increase but instead a decrease in emergence of such mosquitoes; we feel that our earlier-than-normal larvicidal treatments of urban catch basins may have helped keep these populations down.

Rainfall began to increase in early July and the drought was over after mid July. Rains continued from July to September with much higher-than-normal precipitation. The "explosion" of flood-water mosquitoes, normally members of the "Spring Brood", began in late July and continued with distinct broods of emergences one-to-two weeks after major rain events. Also emerging in huge numbers were mosquitoes breeding in containers as well as in catch basins, which remained filled with water for the rest of the season. Large population emergences continued up to the end of September, with abundant mosquitoes active into early-to-mid October.

In addition, increased rain events lead to unusual flooding of the upper portions of salt marshes, which, in turn lead to emergences of salt marsh mosquitoes in numbers not seen for several years. Furthermore, the rain events often limited our larvicidal applications to the marsh reducing the frequencies treatments were made and in the areas treated. Thus, more mosquito larvae escaped treatments and ultimately more adults emerged.

Not only did these unusual abundant late-season emergences were by themselves troublesome, but their presence at the time when transmission of WNV and EEEV were at their maximum was cause for great concern. However, fewer WNV isolations from mosquitoes were recorded in 2008 than in 2007 (10 isolations vs. 14) and there were no human infections. As in the recent past, most of the WNV isolations were from mosquitoes in the more congested urbanized municipalities (Winthrop, Revere, Lynn, Saugus, and Danvers) although isolations in Merrimac and North Andover were surprising. Still, when compared to other areas in Massachusetts with similar population/ecological profiles as Essex County, it is reasonable to assume the low numbers of isolations may be in large part due to our District's vector management operations. And although EEEV was isolated again in southeastern New Hampshire, there were no isolations of EEEV anywhere in the District.

Topsfield

With the overwhelming dominance of freshwater habitats, one could almost say that Topsfield is really just one giant swamp. And with that giant swamp comes giant mosquito problems; there is almost astronomical abundance both in species and in numbers! Fortunately for your residents, not all mosquitoes are all equally active and abundant and not all bite humans. Even more fortuitous, while populations increased District-wide, they decreased in Topsfield!

And while freshwater habitats are in great abundance throughout Topsfield, we did not record any major increases in many of the freshwater species, even after heavy rains refilled drying ponds and wetlands. Also, it is possible that 2008 was a "low population cycle year" for species often seen in much greater abundance, such as ***Coquillettidia perturbans, Anopheles punctipennis***, and ***An. quadrimaculatus***.

The spring drought resulted in lower numbers of woodland pool "Spring Brood" mosquitoes especially ***Aë. vexans*** and ***Aë. canadensis***. However, ***Aë. vexans*** will usually make additional "appearances" during the season, emerging ten-to-fourteen days after a major rain event.

Not so this summer, the populations of this species stayed below 2008 levels! Container-breeding ***Aë. japonicus*** and ***Aë. triseriatus*** (in tree-holes, cemetery urns, and discarded tires) were reduced by the spring drought, stayed low after the summer rains.

Also present in Topsfield, but in numbers that were not cause for concern, included ***Cx. salinarius*** and ***Culiseta melanura***. ***Cx. salinarius*** is a species that can breed in the very upper less brackish reaches of the salt marshes. But since ***Cx. salinarius*** can also breed in totally freshwater pools, as well as ditches, it is possible the source of this species is local than from the salt marsh. ***Cs. melanura*** is the principal vector of EEEV in this region. With EEEV being isolated in communities in nearby New Hampshire, we were on alert for identifying and responding to any dramatic increases in this species; all collected specimens were sent to the Massachusetts Department of Public Health (MA DPH) for testing and none were reported infected with EEEV!

Also decreasing were populations of ***Culex pipiens*** and ***Cx. restuans***. These are the principal WNV vectors in the region. Considering how drought conditions favor these species, that populations remained below 2007 levels was a fortuitous surprise; even after the return of rains in July through September, which refilled basins and containers, the populations did not increase. We feel that our larviciding operation, specifically the targeting of catch basins, was one reason for the lack of increase. All specimens collected of both species from all traps were sent to MA DPH and no WNV or EEEV was isolated from these mosquitoes.

Focus: The Districts Vector Management Plan VMP will take precedence over all operations prescribed in this BMP. Regional control efforts will focus primarily on adult mosquito surveillance, virus testing and preemptive virus intervention strategies. Specific to Topsfield, intensive adult mosquito surveillance, wetland and larval surveillance. Larviciding and catch basin applications.

Regional Control Measures

Regional Adult Mosquito Surveillance Program: The importance of surveillance data in reducing the risk of vector borne disease can not be overstated. By focusing on areas of heightened viral activity, preemptive control measures can be timely, efficient and effective. In 2002 we expanded and greatly improved our surveillance program by developing and implemented an automated Carbon Dioxide, CO_2 surveillance system. This system incorporates a CO_2 modified light trap and gravid trap into one automated unit. CO2 traps are used to sample the general adult mosquito population, monitor both short and long term trends. And determine dominant species and population density.

Gravid traps are designed to collect adult female ***Culex*** species the primary vectors of WNV. One of these dual function units is placed in a fixed location in each member municipality for a total of 32 deployed throughout the District. Mosquitoes are collected and identified from each trap twice a week beginning on or about May 1st. thorough September 30th. and beyond if conditions and circumstance warrant.

The District will operate from 60 to 80 resting boxes. Resting boxes are designed to collecting blood fed female ***Culiseta melanura*** mosquitoes relevant to EEE transmission. The District began deployment of resting boxes in 2006 in response to the emergence of EEE in the Northeast and they have proven to be a valuable tool in early intervention.

Six to eight resting boxes will placed at each fixed location and there will be two fixed locations in communities bordering New Hampshire with the exception of Salisbury which will have just one location. The District will collect and identify samples from each trap twice a week and the specimens will be tested for virus.

Last year the District initiated a pilot program of deploying a new type of trap called the "BG Sentinel trap". While these traps have reportedly been effective in attracting ***Aëdes albopictus***, commonly called the Asian Tiger Mosquito, our experience with these traps was disappointing. ***Aë. albopictus*** has been rapidly spreading throughout the temperate regions of the U.S., including southeastern Massachusetts and in fact has become the dominate mosquito in New Jersey. ***Aë. albopictus*** is the principal vector of a Chikungunya outbreak in countries along the Indian Ocean Basin and Northern Italy. While the continued deployment of these traps regionally is not practical at this it is our intention to develop an early warning surveillance system because of the public health implication posed by ***Aë. albopictus***. In 2009 we plan on deploying one or two of these traps in specific locations to see if we can fine tune these devices to work more efficiently and make comparison with other alternatives we may develop.

Virus Testing: Specimens from our trap collections will be sent to The Massachusetts Department of Public Health, DPH to be tested for the presence of encephalitis viruses.

Control Measures Specific to Topsfield

Surveillance: The Pine Grove Cemetery will serve as the Districts fixed location for a Co2 and gravid trap. Additional traps may be deployed as necessary.

Wetlands Surveillance: Wetlands will be investigated for potential mosquito breeding. A mosquito breeding or larviciding site data base will be developed. Sites will be prioritized by mosquito habitat type, vector virus concerns and proximity to human populations.

Ground Larviciding: Larviciding sites will be treated first in those communities prioritized in the Districts VMP, otherwise larviciding sites from the District's data base and areas requested by the Board of Health will be checked and treated as necessary, in lieu of catch basin treatments, not to exceed one day per week from April 1st to August 31st and beyond if circumstances warrant and conditions allow.

Catch Basins: Catch basins and storm water structures will be checked and treated as necessary not to exceed one day per week (conditions permitting and in lieu of larviciding) from June 1st. to August 31st..

Adulticiding: Selective adulticiding as a vector virus intervention measure only, coordinated through the Board of Health and in accordance with the Districts Vector Management Plan.

Barrier Treatment: The District uses a system called Ultra Low Volume (ULV) for ground adulticiding applications. ULV is designed to dispense very small amounts of pesticides over a large area. While this is a cost effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes present at the time of the application and repeated applications are sometimes necessary to sustain the initial reduction in the mosquito population in some areas.

To reduce the need for repeated applications and provide more sustained relief from mosquitoes in high public use areas, the District may provide barrier treatments to public use areas such as schools (applications to schools must be incompliance with MGL ch85), playgrounds, athletic fields, etc., at the request of boards of health and school departments.

Ditch Maintenance: In the course of larviciding and catch basin treatments, roadside ditches and culverts will be manually cleared of manageable blockages and debris in order to reduce mosquito breeding habitat and or potential habitat.

Wetlands Management: The Town may petition the District to undertake larger scale ditch maintenance projects, wetlands enhancement, mitigation and restoration projects requiring specialized mechanized equipment. Petitioned sites will be evaluated and a site specific proposal will be written for acceptable projects. Wetlands management projects may be beyond the scope of any municipalities assessment and may require separate and additional appropriation. The District may assist in securing funding for such projects.

Inspectional Services: While the District is authorized under the provisions of chapter 252: section 4 of the General Laws of the Commonwealth to enter upon lands for the purpose of inspection, it is not a regulatory agency. Nor is it our intention to impose on any resident or business, but rather to be a resource for information and technology to help property owners prevent or abate mosquitoes to the mutual benefit of the property owner and the community. The District will act as a technical advisor as requested by the Board of Health and represent the municipality's public health and human annoyance concerns relative to mosquito breeding, potential larval habitat and proposed development.

The District, at the request of the Board of Health will also review site plans and inspect sites were storm water structures are planned or in the process of being constructed. Upon inspection of a site the District will make written recommendations, submit these recommendations to the Board of Health and cc the land owner.

Property Inspection: Socioeconomics often plays an important role in mosquito control and associated public health risk. This is evident by a study conducted in 2007 entitled "Delinquent Mortgages, Neglected Swimming Pools, and West Nile Virus, California" which demonstrates a 276% increase in the number of human WNV cases in the summer of 2007 associated with a 300% increase in foreclosures which led to a large number of neglected swimming pools in Bakersfield, Kern County. Last year we received several request from Boards of Health to inspect abandoned properties.

While the district has a long standing policy of property inspections at the request of Boards of health, in the past we have taken a passive approach to property inspection. Given the current economic climate and likelihood of increasing property abandonment and the potential for increased health risk associated with property abandonment the district in 2009 will take a more aggressive approach to property inspections. In the course of our routine activities in your community we will be on the lookout for such properties and report such properties to Boards of Health. We understand that addressing concerns related to such properties is a matter of time and process. In the Long term we will offer any support that may be appropriated to resolve mosquito problems related to such properties and in the short term with the Boards of Health's support we will implement the necessary control measures to mitigate the immediate mosquito problem associated with such properties.

Research and Development: Investigate new methods, procedures and technologies in mosquito control and wetlands management and evaluate there implications for use in Topsfield.

Education and Out Reach: Present education displays and programs on mosquito control and related wetlands management programs at the request of health officials, schools or civic organizations.

FY09 percentage of assessment allocated to specific measures as prescribed by individual municipalities Best Management Practice.

While the Districts budget has increased in recent year as a result of municipalities joining, the District has not requested a budget increase since 2004. Over the past two fiscal years the assessments for each municipality has remained the same. Over the past three years the assessment for 17 of our 32 member municipalities has actually gone down. In consideration of the continued fiscal constraints facing the municipalities we serve the District will level fund again for FY10

Assessment: As estimated by the Massachusetts Department of Revenue, Division of Local Services for, in accordance with Chapter 516 of the General Laws of the Commonwealth. The assessment formula is based on a regional concept, which considers square miles and evaluation. The District offers this breakdown as a general guide to how these funds are allocated specific to your community.

FY09 Estimated Assessment for the Town of Topsfield		$ 37,874.00

District Breakdown of Administrative and General Operational Cost

State Reclamation and Mosquito Control Board	1.4%	$ 530.24
Administration and Facilities Cost Share	22.4%	$ 8,483.78
Balance of assessment allocated to Operational Cost	76.2%	$ 28,859.98

District Breakdown in Approximate Percentages
Specific Control Measures as Prescribed by BMP

General Operational Cost Share	25.8%
Regional Adult Mosquito Surveillance Program	9.4%
Regional Vector/Virus Intervention	19.8%
Wetlands Surveillance	0%
Catch Basins/Larviciding/ Manual Ditch Maintenance	40%
Inspectional Services	
Adulticiding	
Research and Development	
Education	5%

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VECTOR MANAGEMENT PLAN

2009

Introduction: According to the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention (CDC), the introduction of West Nile Virus (WNV) in 1999 to the northeast United States raised the issue of preparedness of public health agencies to handle outbreaks of vector borne disease. CDC stated that "mosquito control is the most effective way to prevent transmission of WN" and "the most effective and economical way to control mosquitoes is by larval source reduction through locally funded abatement programs" (1).

Mosquito control districts or programs although considered state agencies, are unique as we are directly accountable to our member communities. As such, the needs and concerns of those communities drive operational policy and strategies. For several years, our program has been transformed from primarily nuisance mosquito control to primarily a public health-based program. While the line between what might be considered nuisance control as opposed to public health mosquito control has always been at best obscure, now it is nonexistent. Consider the World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (2). It is not a stretch to say that shear numbers of mosquitoes that affect quality of life is not just a nuisance but in fact a health issue. The Federal Insecticide, Fungicide and Rodenticide Act defines "vector" as "any organism capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including mosquitoes..." (3). This make clear that by definition, all mosquitoes are potential vectors and all mosquito control activities are in the interest of public health.

Transmission and transplantation of world-wide mosquito-borne viruses to the United States is on the increase. WNV is now endemic to northeast Massachusetts and since 2004, Eastern Equine Encephalitis Virus (EEEV) has a presence here as well. The purpose of this VMP is to outline our specific responses to these arboviruses and how we will direct our limited resources effectively and efficiently toward implementing these responses.

Regional Adult Mosquito Surveillance: The District will continue its surveillance of mosquito vectors based on protocols established by the Massachusetts Department of Public Health (DPH). The District's Surveillance Program will operate and maintain 32 historical trapping stations across the region at fixed locations. Each subscribing municipality will have situated one trap station

Each station will have two traps. One is the CO_2-baited "New Jersey trap", designed to attract host-seeking female mosquitoes. NJ traps are used to sample the general adult mosquito population to determine dominant human-biting and disease-carrying mosquito species; population densities and because they are at the same location every year; this way, population trends can be studied during the year and compared between years. The other trap employed is the gravid trap designed to attract bloodfed egg-laying females. These traps are baited with aged organic material-filled water to attract ***Culex*** species mosquitoes and other container breeding species relevant to WNV transmission. Additional portable traps may be used as necessary, in areas with disturbing population trends and in response to virus activity. The District will collect and identify samples from each trap twice a week from early May through the end of October.

In 2009, we will operate between 60 and 80 resting boxes in communities immediately bordering southeastern New Hampshire. This area of New Hampshire is considered to be the epicenter of EEEV that is transmitted to our District. The primary EEEV vector species are attracted to these boxes. Six to eight resting boxes will be placed at each fixed location and there will be two locations in each of the municipality bordering NH with the exception of Salisbury, which will have just one location. The District will collect and identify samples from the resting boxes twice a week from June through the end of October. We will continue the resting box surveillance for the foreseeable future in order to monitor any establishment of EEEV cycles in our service area, as well as to serve as an early warning system. It is important to note that we can rapidly deploy additional resting boxes to additional communities if necessary.

Last year the District initiated a pilot program to attempt to collect the Asian Tiger Mosquito, ***Aëdes albopictus***, using a new type of trap "BG Sentinel trap". These traps have shown to be more effective in attracting these mosquitoes. ***Aë. albopictus*** is a principal vector of the virus causing "Chikungunya" (CHIK). This is a disease that is manifested by severe headache, chills, nausea, vomiting, and extremely persistent and painful arthritic joints persisting for weeks to months.

Fortunately we did not collect any ***Aë. albopictus*** from these traps. Our experience with these traps however, was disappointing as they did not fuction to our standards. For this reason continued regional deployment of these traps in 2009 would not be practical. Having said that, the potential public health implication posed by ***Aë. albopictus*** is of such important it is still our intention to develop an early warning surveillance system. Therefore, in 2009 we plan testing one or two of these traps in specific locations to see if we can "fine tune" these devices to work more efficiently, as well as constructing other alternative devises.

Emergent Exotic and Recent Immigrant Mosquito Species: Also through our Surveillance Program, we will be on guard for the appearance of new mosquito species. Within the past five years, we have seen the appearance and rapid spread of an exotic species, ***Aëdes japonicus***, the "Japanese Rock Pool Mosquito", throughout our District. While this species is a competent disease vector in other areas, there is little to suggest it is currently a disease vector in the Northeast.

Another competent disease vector is ***Aëdes albopictus***, first found in Houston in 1985, and has spread rapidly throughout the temperate regions of the world (4), including the U.S. (up to southeastern Massachusetts). Although this species has yet to be collected in our district, the possibility of its arrival is very real and its potential as a disease causing agent should not be underestimated. In 2007 District personnel collected specimens believed to be ***Aë. albopictus*** and as previously addressed in the surveillance section of this VMP a pilot program to confirm the presence and distribution of ***Aë. albopictus*** began last summer and will continue.

Therefore, the possibility of additional mosquito species establishing in our area, some even more effective at transmitting virus and other disease causing agents can not be dismissed. Thus, our Surveillance Program will aggressively monitor mosquitoes we collect, not only to measure unusually high populations, but also to detect any new species.

Virus Testing: Specimens from our trap collections will be sent weekly to Department of Public Health (DPH) to be tested for the presence of encephalitis viruses. The District has a cooperative agreement with DPH to increase the number of pools tested.

Emergent Virus: Since its introduction in New York City in 1999, WNV has spread throughout the country. It was first isolated in Massachusetts in 2000 and is now endemic in Northeast MA, specifically the Boston metro area. Prior to 2004 there were no serious concerns about EEEV in the Essex County. This has changed with multiple EEEV isolations in mosquitoes in recent years. World-wide, the threat of mosquito-borne disease is on the rise and the possible introduction of other exotic vector borne disease must be seriously considered. Through our affiliations and associations with the scientific and mosquito control communities world-wide, we will monitor these potential threats on behalf of our member municipalities.

The next mosquito-borne virus of concern may be Chikungunya (CHIK). While CHIK is rarely fatal, it has the potential to infect large numbers of people very quickly. In 2005 and 2006 it sickened almost one third of the 800,000 inhabitants of the French island of La Reunion, off the east African coast (5). There is currently a CHIK pandemic in countries along the Indian Ocean basin (and with nearly 2 million people infected). A CHIK epidemic broke out in northern Italy in September of 2007 (with over 200 cases); the Italian epidemic is the first known outbreak of this virus outside the tropics. According to Dr. Randy Gaugler, director of the Center for Vector Biology at Rutgers University, it is likely we will have outbreaks of CHIK in the U.S. within the next five years.

Another virus of concern is Rift Valley fever (RVF). RVF is a fast-developing ("acute") fever causing mosquito-borne viral disease that affects livestock animals and humans. Whereas many infected persons do not exhibit symptoms, others develop fever, generalized weakness, back pain, dizziness and extreme weight loss at the onset of illness. Some suffer a mild illness with liver abnormalities while a small percentage may suffer hemorrhagic fever. Approximately 1% to 10% of affected patients may have some permanent vision loss. Approximately 1% of humans that become infected with RVF die of the disease. There is no established treatment for infected patients and there is neither a cure nor a vaccine currently available.

RVF was first identified in 1931 and has historically been confined primarily in eastern and southern Africa. However, in 2000, there was an outbreak of RVF in the Arabian peninsula and since then, there has been concerns of RVF spreading into North America.

The virus is transmitted primarily via floodwater mosquitoes (***Aëdes*** species). While no mosquitoes in RVF endemic regions are found in the US, several common species have been infected experimentally and at least one species found in Massachusetts has demonstrated the ability to infect laboratory animals (6).

As already stated, through our affiliations and associations with the scientific and mosquito control communities, we will monitor these potential threats. Necessary and appropriate vector/virus intervention measures will continue to be developed and implemented.

West Nile Virus

Introduction: According to the CDC, since 1999 WNV has infected 28,921 people killing 1,114 as of 16 December 2008 (7). 11,676 have been inflicted with encephalitis and meningitis, 16,493 have suffered with serious and longer than normal fever, and 752 have manifested other clinical disorders. It was previously thought that neurological disorders associated with WNV were short-lived and only affected a small percentage of those infected. However, recent studies suggest that neurological disorders may be more prolonged and serious, and affect more victims then original thought (8). WNV, primarily an avian virus, has been far deadlier for birds with dramatic declines in seven species (9). WNV has had a devastating ecological impact in North America and avian populations have yet to recover.

Culex species are primarily responsible for the amplification of virus in birds and are vectors to humans in endemic areas. Dr. Ted Andreadis concluded that a WNV vector, ***Culex salinarius*** feed on mammals 55% of the time. This supports an earlier study by Dr. Andreadis that suggest that ***Cx. salinarius*** may be the primary vector of WNV in the northeast U.S. (10).

While ***Cx. salinarius*** can be present in catch basins, this is not its preferred breeding habitat. With the overwhelming abundance of catch basins in our District, and with this habitat so well exploited by the two principal urban ***Culex*** mosquitoes, ***Cx. pipiens*** and ***Cx. restuans***, we are confident that these are the principal vectors of WNV in our District. ***Cx. pipiens/restuans*** breed in highly organic or polluted water that collect in artificial containers such as catch basins and storm water structures including detention and retention ponds, as well as discarded tires, gutters, bird baths, etc. It is for this reason our early-season intervention strategy of treating catch basin has been successful in reducing ***Cx. pipiens/restuans*** populations, and therefore reduce virus amplification in birds and reduce risk to human infections. This early-season strategy will continue in 2009.

Our surveillance data shows an 80% reduction in ***Culex*** species in communities where basins are treated as compared to communities with untreated basins. In a study conducted in Portsmouth NH in 2007 by Municipal Pest Management Services Inc., there was demonstrated a 75% reduction in mosquitoes breeding in treated catch basins compared to untreated basin and that 92% of the species breeding in the basins are ***Cx. pipiens/restuans***; only 5% of mosquitoes tallied in this study were ***Cx. salinarius***

Contrary to what one would think, drought does not deter breeding of ***Cx. pipiens/restuans*** but instead may enhance it! Wetlands areas dry back and pools become more concentrated with organic debris, providing ***Culex*** with additional breeding habitat. Also during droughts, catch basins continue to accumulate water from car washing, lawn watering and concentrated sheet

flow from minor rainfall events, etc. Targeting ***Culex*** in basins will reduce adult ***Culex*** populations, hence bird-to-bird virus transmission and therefore, reduce risk to humans.

Waste Water Treatment Facilities Inspection: As a preemptive strategy the District will request to inspect all wastewater treatment facilities in an effort to reduce or eliminate ***Culex*** breeding or potential breeding in these facilities. While the District is authorized under the provisions of Chapter 252 Section 4 of the General Laws of The Commonwealth to enter upon lands for the purpose of inspections, we are not a regulatory agency. It is not our intention to cause any imposition to the management of waste water facilities. Rather, we wish to be a resource of information and technology to assist wastewater facility managers to prevent and/or abate mosquito breeding to the mutual benefit of the facility, the community and mosquito control.

Catch basin treatment in 2009 will be prioritized as follows. As previously stated WNV is now endemic in the Boston metro area and it has become clear that the epicenter in our District is the urban coastal communities of Winthrop, Revere, Lynn, Nahant, Saugus, Swampscott, Marblehead and Salem. Second in order of priority will be Beverly and Danvers.

Property Inspection: Socioeconomics often plays an important role in mosquito control and associated public health risk. This is evident by a study conducted in California in 2007 in which it was demonstrated a 276% increase in the number of human WNV cases was associated with a 300% increase in foreclosures (11). Within foreclosed properties were a large number of neglected swimming pools in Bakersfield, Kern County which led to increased breeding and populations of ***Cx. pipiens/restuans***. Last year we received several request from Boards of Health to inspect abandoned properties.

While the district has a long standing policy of property inspections at the request of Boards of Health, in the past we have taken a passive approach to property inspection. Given the current economic climate and likelihood of increasing property abandonment (and the potential for increased health risk associated with property abandonment) the District in 2009 will take a more aggressive approach to property inspections. In the course of our routine activities in your community, we will be on the lookout for such properties and report such properties to Boards of Health. We understand that addressing concerns related to such properties is a matter of time and process.

In the long term we will offer any support that may be appropriated to resolve mosquito problems related to such properties. In the short term with the support of the Board of Health, we will implement the necessary control measures to mitigate the immediate mosquito problem associated with such properties.

Selective Ground Adulticiding: As a preemptive measure the District may recommend selective and targeted adulticiding applications to reduce ***Culex*** populations when WNV isolations in mosquitoes are discovered. The District uses a system called Ultra Low Volume (ULV) for ground adulticiding applications. ULV is designed to dispense very small amounts of pesticides over a large area. The District may recommend a target application based on the following criteria: two or more WNV isolations in mosquitoes in close proximity; one or more human cases of WNV.

Barrier Treatment: While ULV is a cost effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes present at the time of the application and repeated applications are sometimes necessary to sustain the initial reduction in the mosquito population in some areas. To reduce the need for repeated applications and provide more sustained relief from mosquitoes in high public use areas, the District may recommend barrier spray treatment. This application would be made to public use areas such as schools (applications to schools must be incompliance with MGL ch85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquitoes for two or more weeks. The District strongly recommends member municipalities take advantage of this service.

Eastern Equine Encephalitis Virus

Introduction: From what we have learned over the past four years it is apparent that recent EEEV isolations in our District originate from the Southern New Hampshire area, in particular the towns of Exeter, Kingston and Newton. There has been EEEV activity in these towns from the beginning of the current cycle in 2004 to the present. It appears that EEEV "migrates" south from this focus area to Northeast Massachusetts.

In 2008, there were EEEV isolations in New Hampshire mosquitoes; there were human EEE cases in NH in 2007. However, there was no EEEV activity in our service area, although we did recommend and conduct adulticiding application in Amesbury, Merrimac and Haverhill as preemptive measures. These operations were undertaken in response to "spikes" in mosquito vector populations. We do not anticipate any EEEV activity in our service area in 2009 but are prepared for any contingence.

Habitat Surveillance: Through the winter months the District will continue to locate, identify and enter into our database the potential ***Culiseta melanura*** habitat in communities bordering New Hampshire. ***Cs. melanura*** is the principal EEEV vector. The communities to be surveyed Amesbury, Merrimac Methuen and Haverhill. We will also survey the communities of Boxford and Hamilton.

Selective Ground Adulticiding: As a preemptive measure the District may recommend selective and targeted adulticiding applications to reduce ***Cs. melanura*** populations in an effort to break the bird-to-bird transmission phase of the virus cycle. Often by the time EEE appears in horses and humans, other mosquito species, the so called "bridge vectors" are transmitting the virus and are targeted for adulticiding. But it is late in the season when these intervention efforts are made and they are limited at best and often nonexistent. The District will recommend a targeted adulticide application based on the following criteria: above average ***Cs. melanura*** populations in a year of anticipated EEE activity; one or more EEE virus isolations in mosquitoes; one or more EEE virus isolations in horses; one or more human EEE cases. The District uses a system called Ultra Low Volume (ULV) for ground adulticiding applications. ULV is designed to dispense very small amounts of pesticides over a large area.

Barrier Treatment: While ULV is a cost effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes present at the time of the application and repeated applications are sometimes necessary to sustain the initial reduction in the mosquito population in some areas. To reduce the need for repeated applications and provide more sustained relief from mosquitoes in high public use areas, the District may recommend a barrier spray treatment

to public use areas such as schools (applications to schools must be incompliance with MGL ch85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquitoes for two or more weeks. The District strongly recommends member municipalities take advantage of this service.

Emergency Response Aerial Adulticiding Plan (ERAAP): In the event that the risk level escalates to a point that it is deemed that ground adulticiding is insufficient to reduce that risk an emergency aerial adulticiding application may be warranted. To be implemented, it would require a consensus of the District, the State Reclamation and Mosquito Control Board (SRB), the Massachusetts Department of Health, an independent advisory board and a declaration of a Public Health Emergency from the Governor.

Typically, once the decision is made, the need for action is immediate and window of opportunity is short. It is imperative that the complex logistics of executing the application are in place, hence the ERAAP. ERAAP consist of continually revised Global Positioning Satellite GPS mapping program, which can be downloaded into aircraft navigation systems to direct aircraft as to where to spray. "Memorandums of Understandings" with designated airports have been formalized to insure that operational staging areas and ground support facilities are available and ready. Contracts with aerial applicators and insecticide suppliers are in place for rapid delivery and deployment. With all these factors already addressed and accounted, aerial applications can commence very soon after the Public Health Emergency is declared.

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