MASSACHUSETTS MOSQUITO CONTROL
ANNUAL OPERATIONS REPORT

2011 Year of Report Date of Report: 1/31/2012

Project/District Name: NE MA Mosquito Control and Wetlands Management District

Address: 261 Northern Boulevard

City/Town: Newburyport Zip: 01950

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Report prepared by: ***Jack A. Card, Jr. and William C. Mehaffey, Jr.***

If you have a mission statement, please include it here: The Northeast Massachusetts Mosquito Control and Wetlands Management District represents the mosquito control and wetland management interests of those communities that choose to subscribe to its services. The prime directive of the District is to protect its citizens from mosquito-borne diseases by targeting precise, measured, and preemptive responses to specific risk as prescribed by the District's annually-revised "Vector Management Plan" (VMP). To ensure that our citizens quality of life and regional economy is not severely impacted by abundant pestiferous mosquito outbreaks; strategies targeted to reduce dominant mosquito populations are implemented as prescribed by the District's annually-revised "Best Management Practice" (BMP) plans. BMP's are designed to incorporate the District's environmentally sensitive and cost effective mosquito control strategies with the specific needs and concerns of each member community.

ORGANIZATION SETUP:

Please list your Commissioner's names:

John W. Morris, CHO	Chairman
Vincent J. Russo, MD, MPH	Vice Chairman
Peter M. Mirandi, RS, MPH	
Sharon Cameron, RS, MPA	

Please list the Supt./Director's name: Walter Montgomery
Please list the Supt./Director's contact phone number: (978) 463-6630
Please list your Asst. Supt./Asst. Director's name: Jack A. Card, Jr. (Acting Director)

Do you have a website? Yes

If yes, please list the web address here: http://www.northeastmassmosquito.com

Please list your staffing levels for the year of this report:

Full time: 10
Part time: 1
Seasonal: 4
Other: (please describe)

Please break these down into the following areas:

Administrative staff: 1.5
Field staff: 13

Please check off all that apply, and list employee name(s) next to each category:
☒ Public relations : Walter Montgomery, Esteban Cuebas-Incle, Jack Card and Emily Sullivan (Robyn Januszewski in varying capacities)
☒ Information technology : Jack Card, Emily Sullivan, Robyn Januszewski
☒ Entomologist : Esteban Cuebas-Incle
☒ Wetland Scientist : Emily Sullivan (Wetlands Project Coordinator)
☒ Biologist : Robyn Januszewski
☒ Education : Esteban Cuebas-Incle, Robyn Januszewski
☒ Laboratory : Esteban Cuebas-Incle, Anthony Corricelli
☒ Operations : Walter Montgomery, Jack Card, William Mehaffey, Jr., Esteban Cuebas-Incle, Emily Sullivan, Robyn Januszewski, Anthony Corricelli, Timothy Hay, Dennis Gallant, Ross Mehaffey, Maureen Douglas, Horace Baxter (seasonal), Thaddeus Tatarzzuk (seasonal), William Montgomery (seasonal), Richard Caron (seasonal)
☒ Facilities : Jack Card - (all employees)
☐ Other (please list)

For the year of this report, we maintained:
22 vehicles
14 modified wetland equipment (list type) 4/99 Smally 808-D Excavator/rotary ditcher (out of service); Kassbohrer PB170DR Flail mower/ditcher/grader(out of service); Kassbohrer DR270 Flail mower/grader; Kassbohrer DR270 Flail mower/Rotary ditcher/grader; Kassbohrer PB260 Dump Body/grader; '77 Bombardier Muskeg (out of service); '87 Bombadier Muskeg Backhoe/Dump Body; '99 Link Belt 1600 Excavator; '79 Eager Beaver Heavy Equipment Trailer (out of service); '95 Eager Beaver Heavy Equipment Trailer (rebuilt in 2007); '96 Hudson Spray Trailer; '96 Karavan Boat Trailer; '98 Carmate Utility Trailer; '95 Alumacraft 13' aluminum Boat; '96 Johnson 15 hp outboard motor; Wayne wood chipper; '96 Rokon all-terrain motorcycle; '87 ARGO 6 wheel amphibious ATV; Clark type G fork lift (out of service)
ULV sprayers (list type)

Type	Mod# / Serial #	Purchased	Usage	Status	Vehicle
Electromist	Mod #000442	2003	Adulticiding	Shelf	

Electromist	Mod #000443	2003	Adulticiding	Shelf	
Electromist	Mod #000444	2003	Adulticiding	Shelf	
Electromist	Mod #000445	2003	Spare parts(fire)	Shelf	
Electromist	Mod #000411	NH 2005	Spare parts	Shelf	
Leco	HD Series D 70001047 (Blower Model 26-3210 S/N 6498C85)	NH 6/20/06	Barrier	Active	#18
Leco	S/N # 7200373 ULV 1100 (Blower Model RAI 89D S/N 93534 Roots ID # 865-105-20)	NH 1/22/08	Barrier	Active	#02
LondonAir	XKE London Fog #1783 (Adapco)	2005	Adulticiding	Shelf	
LondonAir	XKE London Fog #1781 (Adapco)	2005	Adulticiding	Shelf	
BecoMist	A0003S / #C55409	2006	Adulticiding	Active	#10
BecoMist	A0003S / #C55411	2006	Adulticiding	Active	#13
BecoMist	A0003S / #C55408	2006	Adulticiding	Active	#01
BecoMist	A0003S / #3601 Replaced (06) with 3535	2006	Adulticiding	Active	#14
BecoMist	A0003S / #C55554	2008	Adulticiding	Active	#06
BecoMist	A0003S / #C55555	2008	Adulticiding	Active	#22
Rears Ag Sprayer	S-95-1044		Veg. Control	Active	Spray Trailer

Larval control equipment (list type)
Birchmeyer and Solo Backpack - Pump Sprayers, Hand Application Devices
Other (please be specific):

Comments: _____

How many cities & towns in your service area? 32
Please list: Amesbury, Andover, Beverly, Boxford, Danvers, Georgetown, Groveland, Hamilton, Haverhill, Ipswich, Lynn, Lynnfield, Manchester-by-the-Sea, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Revere, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, West Newbury, Winthrop

***Please attach a link to a map of your service area if possible. northeastmassmosquito.com (Click on: "About Us" then "Municipalities Served").**

INTEGRATED PEST MANAGEMENT (IPM):

DEFINITION: a comprehensive strategy of pest control whose major objective is to achieve desired levels of pest control in an environmentally responsible manner by combining multiple pest control measures to reduce the need for reliance on chemical pesticides; more specifically, a combination of pest controls which addresses conditions that support pests and may include, but is not limited to, the use of monitoring techniques to determine immediate and ongoing need for pest control, increased sanitation, physical barrier methods, the use of natural pest enemies and a judicious use of lowest risk pesticides when necessary.

Please check off all of the services that you currently provide to your member cities and towns as part of your IPM program; details of these services are in the next sections.

☒ **Larval mosquito control**
☒ **Adult mosquito control**
☒ **Source reduction**
☒ **Ditch maintenance**
☐ **Open Marsh Water Management**
☒ **Adult mosquito surveillance**
☒ **Education, Outreach & Public education**
☒ **Research**
☒ **Other (please list): Inspectional Services, Development Plan Reviews, Invasive Vegetation Control, Wastewater and Water Treatment Facility inspections and treatments, Site Reviews, Greenhead Fly Control, Problem Beaver Managemant and Tire Removal/Recycling**

Comments: INSPECTIONAL SERVICES

INSPECTIONAL SERVICES

The old saying an ounce of prevention is worth a pound of cure rings true for mosquito control. Early intervention, preemptive action and rapid response prevent potential mosquito larval breeding sites from becoming productive sites. 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 though it is not a regulatory agency. The District does not intend to impose its services on any resident or business, but rather to be a resource for information and technology to help property owners prevent and/or reduce mosquitoes to the mutual benefit of the property owner, the community and public health.

The District may act as a technical advisor per request of local Boards of Health to represent the municipalities' public and animal health concerns relative to mosquito larval habitat issues and proposed developments. At the request of a local Board of Health, the District will also review site plans and inspect sites under construction relative to potential and realized mosquito habitat. Upon inspection of a site the District will prepare a written report of recommendations for submission to the Board of Health and the property owner.

The District may routinely inspect areas prone to favor increased potential for Culex species mosquito development. The primary vector species of West Nile Virus, Culex pipiens typically thrives in artificial containers such as catch basins, storm water structures, etc. This species seems to thrive where others fail, due to their ability to survive in highly organic and polluted water. These conditions are often associated with industrial or office parks, commercial or agricultural livestock facilities.

LARVAL MOSQUITO CONTROL:

Do you have a larval mosquito suppression program? Yes

If yes, please describe the purpose of this program: To control mosquito populations pre-emptively, before they become adults.

Please give the time frame for this program: March - October

Describe the areas that this program is used: Fresh water wetlands, Upland, Salt Marsh and Artificial Structures.

Do you use:
☒ **Ground applied (includes hand, portable and/or backpack)**
☒ **Helicopter applications**
☒ **Other (please list): Source Reduction, Tire Removal/Recycling**
Comments: See description below "Source Reduction" for details describing these activities.

What products do you use in – (please use product name and EPA#)

Wetlands: VectoMax WSP #73049-429, Vectobac G #275-50, Vectobac CG #275-70, Altosid Pellets #2724-448-64833, Vectobac 12 AS #73049-38
Catch basins: Vectolex WSP #73049-20, VectoMax WSP #73049-429, VectoMax G #73049-429, Fourstar Briquets (90) #83362-3, Altosid XR Briquets (150) #2724-421, Altosid WSP #2724-448, Altosid Pellets #2724-448-64833

Containers: VectoMax WSP #73049-429, Vectobac G #275-50, Altosid WSP # 2724-448, Vectolex WSP #73049-20, Altosid Pellets #2724-448-64833

Other (please list):

Please list the rates of application for the areas listed above:

Wetlands: Vectobac 12 AS (1qt./acre), VectoMax WSP (1 pkt./basin = 10 gr.), Vectobac G, Vectobac CG, & Altosid Pellets (2.5 - 10 lbs/acre)
Catch basins: Vectolex WSP (1 pkt./basin = 10gr.), Vectomax WSP (1 pkt./ basin = 10 gr.), VectoMax G (10gr./basin), Fourstar Briquets 90 (1 briquet/basin = 15 gr.), Altosid XR Briquets 150 (1 briquet/basin), (Altosid WSP (1 pkt./basin = 7gr.), Altosid Pellets (0.25 oz./basin)
Containers: (application rate / container type & size)
Other: storm water structures - (application rate / type & size)

What is your trigger for larviciding operations? (check all that apply)

☒ Larval dip counts – please list trigger for application: one or more per dip depending on type of mosquito, type of habitat, type of conditions.
☒ Historical records
☒ Best professional judgment

Comments: _____

***Please attach a link to maps of treatment areas if possible.**

ADULT MOSQUITO CONTROL:

Do you have an adult mosquito suppression program? Yes

If yes, please describe the purpose of this program: To control amounts and species for management purposes and resident complaints

Please give the time frame for this program: one half hour after sunset to one half hour before sunrise (as conditions warrant)

Describe the areas that this program is used: Outdoors and only in communities that participate in the NEMMCWMD's program per city/town and resident request. Adult mosquito contorl occurs as outlined in individual municiplaity's Best Managemnt

Practice Plan, BMP and as advised by the NEMMCWMD based on surveillance data and/or MDPH information or other applicable conditions.

Do you use:
☒ **Truck applications**
☐ **Portable applications**
☐ **Aerial applications**
☐ **Other (please list):**
Comments: _____

Please list the names of the products used with EPA #:
1). Anvil 10 + 10 # 1021-1688-8329
2). Suspend SC # 432-763
3).
4).
5).
6).

Please list your application rates for each product:
1). Anvil 10 + 10 - 0.42, 0.62, 0.21 fl oz. / acre ULV variable flow 15 mph 3.8 oz / min
2). Suspend SC - 1 oz./gal. 1 Gal / min (water mix)
3).
4).
5).
6).

Please describe the maximum amounts or frequency used in a particular time frame such as season and areas

Anvil 10 + 10 - 168.12 gal. Active Per Season
Suspend SC - 89.5 oz. Active Per Season

What is your trigger for adulticiding operations? (check all that apply)

☐ Landing rates - please list trigger for application
☒ Light trap data - please list trigger for application - increaseing amount of disease carrying vectors
☒ Complaint calls - please list trigger for application - 2 or more on street or neighborhood.
☒ Arbovirus data
☒ Best professional judgment

Comments: POLICY AND PROCEDURE FOR GROUND ADULTICIDING
Revised 1/98 1/06 3/06 1/07 1/10

General: Adulticiding applications shall be executed in accordance with the Districts Vector Management Plan (VMP) and/or individual municipalities Best Management Practice Plan (BMP) consistent with the provisions of The Generic Environmental Impact Report (GEIR) for mosquito control.

Ultra Low Volume (ULV) Applications: ground ULV applications will done by means of truck mounted ultra low volume (ULV) non thermal aerosol sprayers capable of delivering from 1 to 6 ounces per minute equating to 1 to 6 ounces per acre. ULV will be used for selective, targeted areas and wide area applications.

Selective, Targeted ULV Applications: Shall be done in response to residential request or request from a municipal health department or board in accordance with that municipality's BMP. A minimum of two request from residents in the same vicinity are required to trigger an application of a street, section of a street, neighborhood, block or area or as otherwise requested by the health department or board.

Wide Area ULV Applications: Shall be done in response to surveillance data, multiple residents request, municipal health department or board request in accordance with that municipalities BMP. Or as recommended by the District in response to a specific vector/virus threat in accordance with the Districts VMP.

Time of Application: ULV applications will be conducted during evening hours, after dusk. If circumstances or conditions make an evening application impractical or unsafe then predawn application may be warranted.

Barrier Applications: Barrier applications will be done by means of backpack or truck mounted barrier spray equipment capable of delivering 1 gallon per minute. Barrier applications will be used to achieve control over a longer period of time and thereby reduce the need for repeated ULV applications. Barrier applications will be used on public use areas such as, parks, play grounds, athletic fields and school grounds in response to request from school officials and municipal health departments or boards in accordance with individual municipalities BMP or the Districts VMP.

Time of Application: Barrier spray applications will be conducted after dusk and before dawn.

Post-Application procedure: Technician will complete an Adulticiding Report and a Record of Pesticides Applied. Technicians, on their next return trip to headquarters, will submit reports, down load all GPS and computer data.

Disable ULV sprayer: When not in use all ULV sprayers will be disabled for security reasons.

***Please attach a link to maps of treatment areas if possible.**

SOURCE REDUCTION

Do you perform source reduction methods such as tire/container removal? Yes

If yes, please describe your program:
SOURCE REDUCTION
The District conducts source reduction activities typically by hand and as necessary during inspections, treatments, ditch maintenance, or in conjunction with organized wetlands management projects and clean ups. Emptying, tipping over or removal of containers prone to attract ovipositon by mosquitoes has long been a practice of the District. The District performs activities such as but not limited to: hooking; removal of debris/vegetation that causes obstruction of flow from waterways as well as clearing outfall and inlet grates etc.

TIRE REMOVAL/RECYCLING
Tires have historically been dumped/abandoned in any number of locations including public and private properties in both upland and wetland environments. Once a pile is started it can quickly grow into a substantial public health issue in terms of mosquito proliferation but also as a potential fire hazard or worse; a source of toxic fumes once ignited that can be extremely difficult to extinguish.

Used tires almost always hold water and are a prime location for artificial container breeding mosquito species, most notably Culex pipiens and Aedes japonicus. Culex pipiens is considered a key vector species of West Nile Virus. Aedes japonicus is a relatively new species to the Massachusetts area, since 2000, and was originally thought to have been imported to the United States in tires. Aedes japonicus has tested positively for West Nile virus.

The District has facilitated the removal and proper disposal of used tires from its service area for many years during the course of coordinated clean-ups and petitioned wetland management projects. This practice is considered an important part of the District's source reduction efforts and a strong component to their integrated pest management (IPM) approach. Tire disposal can be costly and increased economic woes may be adding to the problem as more and more people look for ways to cut expenses. For these reasons the District will be offering on a limited basis a tire removal and disposal program for some of its member communities. The District hopes this pilot program will be well received amongst its communities and that it may some day find a valuable place amongst other mosquito control best management practices area wide.

The District may select tire piles from locations in its data base but will primarily accept petitions requesting removal of non-commercial tire piles according to the process outlined in the District's Policy and Procedures for Mechanized Wetland Management (revised January 2011). Small piles (under 250) are considered on an individual basis. As necessary the District will coordinate with appropriate local boards i.e., the

Conservation Commission to address any concerns prior to removal. All tires will be collected and removed to a state approved recycling facility. The District will conduct these projects between November and March or otherwise as time allows.

A maximum number of tires slated for removal / disposal as agreed upon by the District and member municipality may be specified for in the annual Best Management Practices for a member municipality. This number will be reviewed annually. Curbside collection or "drop off days" up to a maximum specified amount may be considered on an individual municipality basis.

What time frame during the year is this method employed? November - March or otherwise as time allows.

Comments: _____

DITCH MAINTENANCE

Do you have a ditch maintenance program? Yes

Please check all that apply:
☒ Inland/freshwater
☒ Salt marsh

If yes, please describe: The District's "Ditch Maintenance Program" has been replaced in kind with the more holistic Wetland Management Program (see details below). Ditch maintenance projects, once common throughout the District's territory, became subject to intense regulatory scrutiny several years back. Changes of the interpretation of the definition for an "existing ditch", inconsistency in regulatory agency review and misinterpretation of the District's legislated authority has been the demise of the ditch maintenance program. Additionally, forced compliance to ambiguous "policies" (despite the District's broad sweeping authority) directly conflict with our agencies ability to offer these services in a cost effective or meaningful program.

Despite regulatory pressures, the District's Wetland Management Program continues to incorporate a range of wetland management activities in accordance with Massachusetts General Laws Chapter 252, in compliance with established federal guidelines and in coordination with local Conservation Commissions and municipal officials. (Whenever possible the District participates in larger scale permitted projects to incorporate mosquito control interests through developed and time tested partnerships). The objectives of the District's Wetlands Management Program are to abate mosquito populations, decrease potential mosquito larval habitat and reduce insecticide applications as part of its integrated pest management, (IPM) strategy. The District offers both mechanized and manual strategies for fresh and salt water habitats whenever possible.

Fresh water activities include small scale ditch maintenance (pre-existing ditches), problem beaver management as well as fresh water restoration which aims to improve flow, reduce flooding and enhance predator access and habitat. The salt water program includes selective salt marsh ditch maintenance (pre-existing ditches) and salt marsh restoration which aims to improve tidal exchange and enhance predator access and refugia. The District is a strong advocate for encouraging partnerships with other local, state and federal agencies that incorporate mosquito control activities while simultaneously improving the ecological integrity of fresh and salt water wetlands.

Policy and Procedure for Mechanized Wetland Management
Revised January 7, 2011

Introduction:
Although Mosquito Control Districts are considered state agencies, they are unique in the fact that they are directly accountable to member municipalities. As such, the needs and concerns of participating communities drive operational policy and strategies. For several years now our program has been in transition from what once was considered a primarily nuisance mosquito control program, to a primarily public health based program. Transmission and transplantation of world-wide mosquito-borne viruses to the United States is on the increase. West Nile virus (WNV) is now endemic to northeast Massachusetts. And since 2004, Eastern Equine Encephalitis virus (EEEV) has a presence here as well. In response, the District has enhanced its Adult Mosquito Surveillance Program. Warmer weather trends have also contributed to an increase in significant virus activity beyond the traditional “season”. This results in extending control operations by about two months annually. The extent of the District’s Wetland Management Program capacity has also been restricted by ever tightening regulations for operating in aquatic habitats. This problem is further compounded by an increase in site complexity as aging infrastructure, lack of maintenance and decreased funding for DPWs contribute to long term neglect of drainage statewide. Increased demands on the District’s resources have limited the District’s availability and ability to conduct mechanized and manual wetlands management, i.e. ditch maintenance, as well as the ability of the District to fund these operations through standard member municipality annual assessment. Water management expenses have increased considerably; purchases of specialty equipment and associated maintenance and fuel costs fluctuate dramatically.

Site Specific Appropriation:
In some cases, the District may propose mechanized wetland management projects that necessitate a request for member municipality funding by means of separate and additional appropriation. Though the District understands that this may be a burden to some communities, project solutions will be proposed which consider as many non-funded activities as possible. In order to ensure equal opportunity for each member municipality projects of this type will be considered by the following petition process only.

Petition:
The District operates under the authority of Chapter 252 of the General Laws of the Commonwealth of Massachusetts. To be consistent with the provisions of Chapter 252 and because of reasons described above, wetlands management projects by means of specialized low ground pressure equipment will be considered by site specific petition only. A petition is simply a brief written request from a municipality's Petitioning Body requesting District investigation into a site specific ditch maintenance project or particular location. A municipality may petition for one project at a time and no other petitions will be considered from that municipality until the District deems that project complete.

Petitioning Body:
In an effort to avoid confusion municipalities should consider designating a petitioning body. In the event a municipality wishes to change their designated petitioning body they may do so once annually. Changes should be made at the time of the annual review of each municipality's Best Management Practice Plan (BMP), usually around the end of March or first of April. The District suggests that the local Board of Health, (BOH) is the most appropriate designee. In the event a municipality does not designate a petitioning body, the District will default to the BOH as the petitioning body.

Wetlands Management Proposal:
Once a petition is received by the District a site number will be issued and we will begin an evaluation process. The District will make recommendations to the Petitioning Body regarding wetlands management strategies for the petitioned site. If necessary, the District will develop a site specific proposal outlining the proposed project including but not limited to a site description, site history, scope of services and a "not to exceed" projected cost for implementing said project. The proposal will be submitted to the Petitioning Body for distribution to other appropriate municipal authorities for review, comments and approval indicating the acceptance of the terms and conditions of said project as put forth in the Proposal before implementation of any such project will commence. All wetland management projects will be conducted in accordance with Massachusetts General Law Chapter 252, established federal guidelines and in coordination with local Conservation Commission and municipal officials.

FRESH WATER
The District has evolved its wetland management activities over the years to reflect the most effective and environmentally sensitive best management practices (BMPs). These BMPs are based on the accumulation of years of lessons learned in the field, suggestions provided by regulatory representatives and others in the professional industry, current trends, evolving equipment sophistication, and increased knowledge of environmental response. The District followed recommendations outlined in its own Standards for Ditch Maintenance for years. Since the latest GEIR update it now follows the recommendations outlined in the "Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control" and "Mechanized Wetland Management Activity Post Monitoring Guidelines" as applicable.

Problem Beaver Management
Policy and Procedure for Problem Beaver Management
(Originally an amendment to the District's Policy and Procedures for Mechanized Ditch Maintenance, Revised: 01/07/04, 02/23/05, 11/08/05 and 01-06-2011)

Introduction:
Since the adoption of the anti-trapping ballot referendum in 1996, the beaver population in Massachusetts has nearly tripled. Waterways subject to beaver activity are often altered from free flowing systems to large, slow or no flow systems. As a result, many areas adjacent to wetlands have now become flooded, resulting in the potential of increased breeding habitat for mosquitoes. The District established a pilot program to investigate the relationship between mosquito breeding habitat and beaver habitat; their potential impacts on increased mosquito populations and mosquito borne viruses and their relevance to human populations.

Observations revealed that in many instances beaver active waterways were not of tremendous concern in terms of mosquito development. Water depths typically increase with beaver presence and can promote populations of mosquito predators. In some cases however, local topography supports habitat that is more suitable for mosquito development and likely increases prevalence for flooding of adjacent areas which can be more prone to larval activity. Careful examination of each site is warranted. The District will continue to investigate the correlations between beaver, mosquito and predator.

Petition:
Municipalities may petition the District to investigate locations associated with beaver activity in accordance with the District's Policy and Procedures for Wetlands Management. Upon determination that mosquito breeding or a potential for mosquito breeding exists, the options listed below may be recommended to the Petitioning Body (PB). All wetland management activities conducted on beaver impacted wetlands and waterways will be performed in full cooperation with the Massachusetts Division of Fisheries and Wildlife as well as in partnership with the petitioning municipality.

A. Trapping: Removal of beavers from an area will occur prior to beginning any wetland management activity. Trapping can be done by certified District personnel.

B. Ditch Maintenance: Dams, dikes, blockages, etc. may be cleared from existing ditches to manage the level of water within a wetland or waterway.

C. Water-Flow Devices: In certain circumstances, depending on the site, water-flow devices may be installed to maintain a desired level of water within a wetland or waterway while still allowing beavers to remain in the system.

SALT WATER
In lieu of Coastal Zone Management's decision to issue a negative determination for federal consistency on Open Marsh Water Management, the District's federal permit

renewal application was denied in 2008 and we have begun evaluating sites for selective salt marsh ditch maintenance. Parameters for selecting sites include mosquito prone areas that are difficult to treat by helicopter (see Aerial Salt Marsh Larviciding Program) and/or that are subject to salt marsh haying. Reclamation of ditches in hayed areas promotes drainage and firmer ground conditions, alleviating potentially damaging operation of equipment which lends itself to creation of larval habitat.

Please check off all that apply INLAND DITCH MAINTENANCE:

☒ **Hand tools**
☒ **Mechanized equipment**
☐ **Other (please list):**
Comments: _____

Please check off all that apply SALTMARSH DITCH MAINTENANCE:

☒ **Hand cleaning**
☒ **Mechanized cleaning**
☐ **Other (please list):**

Comments: _____

Please give an estimate of cumulative length of ditches maintained from the list above **INLAND**:

Hand cleaning 2767'
Mechanized cleaning 50'
Other (please list):

Comments: _____

Please give an estimate of cumulative length of ditches maintained from the list above **SALTMARSH**:

Hand cleaning 0

Mechanized cleaning 0

Other (please list):

What time frame during the year is this method employed? year round

Comments: _____

***Please attach a link to maps of ditch maintenance areas if possible.**

MONITORING (Measures of Efficacy)

Please describe monitoring efforts for each of the following:

Aerial Larvicide – wetlands: **Two Biological materials Vectobac 12AS and Vectobac G were used as larvicides on the Salt Marsh. Vectobac 12AS, a liquid BTI was the material used in our Aerial applications with an efficacy rate average of 98.6% using Pre and Post application data from various site locations. Vectobac G, a dry granular form of BTI was used for hand treatments with an efficacy of 100%.**

Larvicide – catch basins: **Efficacy testing was discontinued for 2011 due to the lack of statistically significant breeding in catch basins at the start to middle of the season and personnel were needed for other duties due to the lack of seasonal help and necessary virus intervention practices .**

Larvicide-hand/small area **Data was collected by District technicians prior to treating sites containing mosquito larvae. Data was again collected by the District Biologist within 24 hours of treatment to determine the efficacy of the products used in freshwater. Efficacy for all sites fell between 87% - 100%. Sites with lower efficacy ratings typically held larvae in later growth stages where feeding has diminished or ceased altogether.**

Ground ULV Adulticide: **Efficacy tests for adulticiding products were not conducted in 2011 due to increased virus activity in the District, necessitating extensive intervention efforts without expected personnel support.**

Source Reduction: **as applicable in accordance with the "Mechanized Wetland Management Activity Post Monitoring Guidelines"**

Open Marsh Water Management: **N/A**

Other (please list): **N/A**

Provide or list standard steps, criterion, or protocols regarding the documentation of efficacy, (pre and post data) and resistance testing (if any): **see above**

OPEN MARSH WATER MANAGEMENT

Do you have an OMWM program? No

If yes, please describe:

Please give an estimate of total square feet or acreage:

What time frame during the year is this method employed?

Comments: OMWM Update:
In 2008 the District was denied the renewal of its federal permit to conduct Open Marsh Water Management, (OMWM) for the first time since the programs inception in 1983, marking the end of an era for long term control of salt marsh mosquitoes. Over those 20 + years the District was able to evaluate over 140 sites and complete approximately 70 OMWM sites. At issue were the original Standards for Open Marsh Water Management. The scientific community felt the Standards were insufficiently rigorous despite the fact that there is little evidence that OMWM impacts illustrate cause for concern. The District worked diligently to resolve the issue and helped develop a new Standard. The new Standards call for extensive monitoring which substantially increase the cost of OMWM implementation. The District is considering re-applying for its OMWM permit but any new project will require financial support beyond the scope of the District's current budget.

History:

The following information comes directly from the District's "Fact Sheet 10: Open Marsh Water Management" revised 1-07-2011.

Open Marsh Water Management was originally developed in New Jersey as an environmentally sensitive alternative to grid ditching salt marshes and has also been used in the Mid Atlantic States for many years. A 3 year study of OMWM was initiated in 1982; a collaborative effort with mosquito control, the Town of Rowley Massachusetts, the Manomet Bird Observatory and the Massachusetts Audubon Society. Based upon positive results demonstrated in this study a program was developed incorporating Standards based on the principles established in New Jersey and the Mid Atlantic States but specific to the needs of salt marshes in New England.

The objective of OMWM is to abate mosquito populations and reduce the need for insecticides by enhancing the tidal food web and providing refugia for predatory fish within previously ditched, altered or degraded salt marshes. The OMWM Program is implemented in strict accordance to the Standards for OMWM; a step by step guide defining proper methodology for personnel to follow including data collection, timing, and types of alteration. After a site is monitored the data is analyzed and if necessary a site plan is developed with specific alterations that address mosquito concerns specific to the location. OMWM uses site specific alterations that enhance existing characteristics and/or creates new features such as ponds, pools and pans. These improved habitats not only serve as refugia for mosquito eating fish but also offer water fowl and wading shore bird improved feeding opportunities. Installation of shallow radial ditch connectors to improve predatory fish movement provides direct access to identified mosquito larval habitat on the marsh's surface. Designed alterations are

implemented by customized low ground pressure equipment which is environmentally sensitive and ensures minimal impact to the salt marsh substrate.

***Please attach a link to maps of OMWM areas if possible. N/A**

ADULT MOSQUITO SURVEILLANCE

Do you have an adult mosquito surveillance program? Yes

Please list the number (not location) of MDPH traps in your service area: none

Please check off all the types of surveillance that apply to your program:

☒ Gravid traps	
☒ Resting boxes	
☒ CDC light traps	☐ Canopy
☒ CDC light traps w/CO_2	☒ Canopy
☐ ABC light traps	☐ Canopy
☐ ABC light traps w/CO_2	☐ Canopy
☐ NJ light traps	☐ Canopy
☒ NJ light traps w/CO_2	☐ Canopy

Other (please describe):

Please describe the purpose of this program: To monitor population levels and species / locations for management purposes and public health testing

Do you maintain long-term trap sites in any of your areas? Yes

If yes, please describe how you chose these long-term sites. focal point, location, accesability, type, security, power access
FACT SHEET #5

Adult Mosquito Surveillance

General: There are many different species of mosquitoes. The District has collected 47 different species in our area, of these there are around 12 mosquito species important to human health, nuisance and quality of life. All mosquitoes species have one thing in common, the female must have a blood meal before she can lay eggs. Different mosquitoes have different breeding habitat and host seeking behavior. The key to managing mosquito populations efficiently and effectively is understanding the interaction between mosquitoes and human populations. Adult Mosquito Surveillance is

the means by which we gather this information which is then used in determining operational strategies.

Light Trap: A light trap is a device used to collect adult mosquitoes. It consist of a fan, a light, a Carbon dioxide dispensing device and a collection net. Female mosquitoes looking for a blood meal are attracted to the C02 and are drawn into the net by the fan. The District has one light trap in each member municipality in a fixed location. This fixed location light trap is useful in monitoring long term trends and the effectiveness of control measures as well as short term events which require response. The District also has portable traps which can be deployed at short notice in response to data from fix light trap, complaints or vector surveillance.

Gravid Trap: A gravid trap is a device used to collect a particular species of mosquito. It consist of a pan of highly organic water and a collection chamber which bridges the pan of water. Some mosquito species lay their eggs in artificial container such as catch basins and prefer highly populated or organic water. Female mosquitoes landing on the surface of this water to deposit eggs are drawn into the collection chamber by the Fan. The District has one gravid trap in each member municipality in a fixed location. This fixed location GD is useful in monitoring long term trends, the effectiveness of control measures and vector surveillance. The District also has portable traps which can be deployed at short notice in response to data from fix light trap, complaints or vector surveillance.

Resting Boxes: A resting box is a device designed to collecting blood fed female Culiseta melanura mosquitoes who are the principle vectors of Eastern Equine Encephalitis Virus, EEE. Resting boxes have demonstrated to be an efficient and affective tool. Most of the EEE virus isolations in the District to date were from mosquitoes collected in resting boxes. EEE outbreak cycles in Northeast Mass cannot yet be predicted. Therefore resting boxes will continue to be deployed in areas of concern using historical data as indicators.

Landing rates counts: A landing rate count is exactly what it sounds like. A Field Technician counts the number of mosquitoes which land on an exposed arm for one to five minutes, The mosquitoes can be collected in a device called an aspirator for species identification. this method is often used in response to a specific complaint and is useful in determining the source of the mosquito problem.

Species Identification: Live mosquitoes from fixed location CO2 traps, gravid traps and resting boxes are collected twice weekly from around May 1st. to September 30th.. Mosquitoes are identified and samples sent to the Massachusetts Department of Public Health were they are tested for virus.

VECTOR MANAGEMENT PLAN

2011

Introduction: The U.S. Department of Health and Human Services' Centers for Disease Control and Prevention (CDC) declared that the introduction of West Nile Virus (WNV) to the United States in 1999 raised the issue of how prepared are public health agencies to identify and respond quickly to outbreaks of vector-borne disease. The CDC concluded that "mosquito control is the most effective way to prevent transmission of West Nile" and "the most effective and economical way to control mosquitoes is .... through locally funded abatement programs" (1).

Mosquito control projects and districts in Massachusetts, although considered state agencies, are unique in that they are accountable directly to the subscribing member communities. As such, the needs and concerns of those communities drive operational policy and strategies. That is the operational “mantra” that has presided over the Northeast Massachusetts Mosquito Control District for almost twenty years. As the needs of our member communities have changed and evolved, so have the services we’ve provided. With the invasion and establishments of new arthropod-borne viruses (“arboviruses”) threatening our communities in the past decade, we have transformed our operational strategy from \ primarily nuisance mosquito control to protecting public health. Consider the World Health Organization (WHO) definition of 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 of the imagination to say that astronomical numbers of mosquitoes affecting quality of life is not only a nuisance, but is 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.

The invasion, transmission, and establishment of arboviruses to the United States is on the increase. WNV is now endemic to northeast Massachusetts and since 2004, Eastern Equine Encephalitis Virus (EEEV) has had an almost annual presence here as well; 2009 marked the most EEEV-mosquito isolations ever in Northeast Massachusetts! According to Dr. Jean-Paul Mutebi of the CDC, there are currently three circulating international arboviruses with the greatest potential of establishing themselves in the US, namely those causing Chikungunya, Rift Valley Fever, and Japanese Encephalitis (4). Mosquito species that can easily spread the causative viruses are all found in abundance in the US, most of these species are found in New England as well! Therefore, the purpose of this year’s Vector Management Plan (VMP), updated for 2011, is to present both our current and revised mosquito and arbovirus surveillance strategies, outline our specific responses to these arboviruses, and how we will direct our limited resources effectively and efficiently toward implementing these responses. We begin first with an overview of our surveillance, focusing on both currently and potentially new invading species, then on potential arboviral threats and finally, our plan for response. Our surveillance and responses

specifically to the current circulating arboviruses, WNV and EEEV, are specifically addressed as well.

Regional Adult Mosquito Surveillance: The District will again in 2012 continue its surveillance of mosquito vectors based on protocols established by the CDC and Massachusetts Department of Public Health (DPH). The District's Surveillance Program will again operate and maintain 32 historical trapping stations (HTS) across the region at fixed locations. As done previously, there will be one HTS in each subscribing municipality and each HTS will have two traps. The first is the CO2-baited "New Jersey trap", designed to attract nearly all species of host-seeking female mosquitoes. All mosquitoes collected are identified and tallied. NJ traps are used to sample the general adult mosquito population to determine dominant human-biting and disease-carrying mosquito species. Because the traps are at the same location every year, population trends can be studied and compared between years as well as during a single year. The other trap is the gravid trap designed to attract bloodfed females that lay their eggs in containers of some sort, either natural or artificial. These traps are baited with aged organic material-filled water to attract primarily Culex species mosquitoes that are most responsible for West Nile Virus transmission. Gravid traps have been our most successful tool in identifying WNV-infected mosquitoes. Egg-laying mosquitoes have already fed on blood and thus have a higher probability of being infected with WNV they acquired from biting infected birds. Additional portable gravid traps may be deployed, as necessary, in areas with disturbing Culex 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 September and all specimens of key vector species (principally from Culex and Culiseta species, described below) will be submitted to DPH for virus testing.

In addition for 2012 the District will enhance gravid trap surveillance in communities that have demonstrated a higher risk for WNV. Five additional pre-chosen stations will be established in each of these communities and portable gravid traps will be set there in a random rotation pattern. In the short term, this will provide us with a broader view of Culex mosquito population distributions and densities in these communities; over the long term, better historical data for background on vector populations and viral activity trends will be recorded.

Resting boxes form our third principal surveillance tool and are an effective tool of monitoring mosquitoes for EEEV. The boxes have proven to be invaluable as an early warning system for viral presence in the District. Since 2004 we have set out between 60 and 80 resting boxes in fixed historic locations in communities immediately bordering southeastern New Hampshire; these are our primary EEEV monitoring stations we call our "EEEV Front Line Surveillance". Southeastern NH is a new epicenter for EEEV and from here, the virus migrates south into our District. Culiseta melanura mosquitoes are primarily responsible for the transmission and amplification of EEEV in local bird populations.

These mosquitoes, especially after bloodfeeding, rest in tree holes and cavities during the heat of the midday and resting boxes are designed to simulate this habitat. This arrangement allows for effective and abundant collecting. How the data collected is interpreted for response is discussed in the EEEV section below.

In 2012, the District will again set up resting boxes in the “Front Line” communities. Eight resting boxes will be placed at each fixed location, with two locations in each of the Front Line communities with the exception of Salisbury, which will have just one location. Resting boxes will again be visited twice weekly from June through the end of September; the contents will be collected, identified, and tallied, and vector species (Cs. melanura and the closely related Cs. morsitans) will be sent to DPH for virus testing. With the 72 boxes set in the “Front Line” sites, together with the supplemental sites described below with at least another 56 boxes, a total of at least 128 boxes will be used. Additional boxes are ready and sites already selected if resting box surveillance is needed to be expanded.

Last year, in response to the increase in EEEV-infected mosquito pools, additional Resting Box sites were established in eleven communities directly south of the “Front Line”, as specified in the 2010 VMP. Collections from these additional sites were made all season long. We have planned for 2012 expanded season-long Resting Box surveillance beyond the “Front Line”. But because of current budgetary constraints, expanded surveillance will proceed only in three areas with (and adjacent to) recent EEEV activity. These areas are Hamilton-Topsfield-Boxford (one site in each), West Peabody-Lynnfield (up to two sites each), and the Byfield-Newbury (at least one site).

In mid September 2009, a horse died of EEEV in West Peabody. Previous, there was no history of EEEV activity in Peabody or in adjacent towns. However, a week after the horse fatality, the East Middlesex Mosquito Control District recovered EEEV from a pool of mosquitoes collected from Reading, which borders Lynnfield and west of Peabody. Therefore, we will conduct season-long resting box surveillance in West Peabody-Lynnfield.

In an attempt to gain an understanding of the “infection status” of other mosquito species in established “EEEV-habitats”, we will again place portable CO2 traps at resting boxes locations where infected Cs. melanura mosquitoes have been collected. These traps will collect other species which upon identification, will be sent to DPH for testing. Whereas Cs. melanura rarely bites humans, they have been biting and infecting local birds which in turn serve as bloodmeal sources for other species which then can bite humans the next time they feed. These additional species with the potential of infecting humans are known as “bridge vectors”.

While infected Cs. melanura specimens have compelled us to take action against them, it may be more prudent to target responses against infected bridge vectors so knowing the “infection status” of bridge vectors in EEEV-known habitats will result in more effective targeted adulticiding responses.

Risk Communications and Public Relations: Access to and effective dissemination of mosquito and arbovirus information is paramount to any mosquito control operation. With the speed which information, as well as rumors and even disinformation, can be conveyed in all public informational media, it is crucial that Boards of Health, as well as subscribing municipality residents, are kept correctly informed. To that end, the District has improved its methods of communication regarding mosquito species, potential arboviral threats, and details of larviciding and adulticiding operations. At the end of every winter, the District sends detailed "Best Management Practice Plans" to each District subscribing municipality which includes summaries of the previous year's mosquito and arbovirus activities, descriptions of current year control operations suggested and agreed-upon, as well as their costs. Every spring, the District conducts an "Arbovirus Surveillance Workshop" (at Endicott Park in Danvers), targeted to health agents and Board members of District subscribing communities. This workshop informs the audience on potential arboviral threats and how the District will plan to combat these threats. The District operates a website (http://www.northeastmassmosquito.com) with all relevant information on mosquitoes, arboviruses, and operations (both larvicidal and adulticidal) however, it is difficult to be updated regularly throughout the summer due to obligations by District personnel to the various control operations. Therefore, a "District Bulletin" is prepared periodically and sent electronically to all subscribing Boards of Health describing current mosquito and arboviral problems, both current and potential, as well as information on current control operations. And finally, our phones line remains open at all times and while we are often unable to respond immediately, being that we are all in the field, we return all our calls.

Emergent Exotic and Recent Immigrant Mosquito Species: Through our Surveillance Program, we will also be vigilant for the appearance of mosquito species new to the region. Within the past ten 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 that could become established in northeast Massachusetts is the "Asian Tiger Mosquito", Aëdes albopictus. It was first found in Houston in 1985 and has spread rapidly throughout the temperate regions of the world (5), including the U.S. up to southeastern New England; it has become the dominate mosquito species in New Jersey. Aë. albopictus is the principal vector of a Chikungunya pandemic in countries along the Indian Ocean basin and an outbreak in Northern Italy in 2007. Although this species has yet been readily 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 targeted surveillance was conducted in 2008 in the attempt to collect additional specimens and possibly locate breeding sites. Towards this endeavor, the District deployed a new type of surveillance trap called the "BG Sentinel trap" (BGS trap).

While these traps have been reported being effective in attracting Aë. albopictus, our experience with them was disappointing. In 2010, we tested the effectiveness of the BGS traps for our general surveillance, both alone and in conjunction with our other traps and baits. Again our experience with these traps was disappointing and we have no plans to use these traps in 2012. Instead, we plan to survey for Aë. albopictus in potential breeding areas, namely those facilities that import and recycle used tires. Gravid traps will be deployed randomly at these facilities and collections will be carefully inspected. Imported used tires were the means by which this species entered the US and facilitated its spread throughout the country. Discarded water-filled tires simulate tree-holes, the natural breeding site for this species, and after eggs are deposited inside the tires, the tires are collected and transported to new locations, they are then again left outside to become filled with water and the eggs subsequently hatch, facilitating the invasion! (5) Therefore, if Aë. albopictus is to become established in the District, it will most likely be that the "beachhead" will be at recycled tire depositories.

Therefore, the possibility of additional mosquito species establishing in our area, some even more effective at transmitting virus and other disease causing agents, cannot be dismissed. Such ignorance of history and arrogance against reality had led to successful invasions and establishment of exotic species. Thus, our Surveillance Program will carefully monitor mosquitoes we collect, not only to measure unusually high populations or unusual distributions, but also to detect any new species.

Virus Testing: Specimens from our trap collections will be sent weekly to Arbovirus Surveillance Laboratories of the Department of Public Health in Jamaica Plain in Boston, to be tested for the presence of encephalitis viruses. The District was charged last year a fee for each mosquito sample submitted ("pool"), $25 per submitted pool with minimum number of ten individuals in each pool (to a maximum of fifty); we are still limited to sending a maximum of sixty pools per week. The total amount spent on testing for 2011 was $16,250. And the species to be submitted for testing was restricted primarily to the principal WNV vectors, Cx. pipiens and Cx. restuans, and the EEEV vectors, Cs. melanura and Cs. morsitans. However, during suspected peak transmission periods, the District has an agreement with DPH to increase the number of pools, as well as the number of species, including bridge vectors, to be tested.

Emergent Virus: West Nile Virus was introduced to New York City in 1999 and within five years it has spread to all fifty US states! 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 Eastern Equine Encephalitis in the Essex County. Every year since 2004, EEEV-infected mosquitoes have been recovered, often in multiple scores, from southeastern New Hampshire and "spilling over" into our District in two of the past five years. World-wide, the threat of mosquito-borne disease is on the rise and the possible introduction into our District of other exotic vector borne disease can no longer be disregarded and deemed as heresy, but must now be seriously considered.

Earlier in this discussion, three exotic arboviral diseases were listed as having the greatest potential of becoming established in the US in the near future: Chikungunya, Rift Valley Fever, and Japanese Encephalitis. The one generating the most concern is Chikungunya (CHIK). While CHIK is rarely fatal, it has the potential to infect large numbers of people very quickly. It is a debilitating illness, causing excessive and prolonged fatigue and extreme pain in joints lasting up to several weeks. (5,6) 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 (7). There is still 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 (8). 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 (9).

Rift Valley fever virus (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 (10). 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 (11).

Japanese encephalitis virus (JEV) is similar to St. Louis Encephalitis virus and whose infection causes signs and symptoms similar to that of West Nile Virus, namely encephalitis to the minority of human cases which can progress to paralysis, seizures, coma, and death. The case fatality rate averages about 30%. It is the leading cause of encephalitis in Asia (Japan west through Korea, eastern China to India and south through Indonesia to New Guinea) averaging between 30,000 to 50,000 cases annually (12). Although its vector is not found in the United States, several domestic species have shown the capacity to transmit this virus (4).

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 when required.

West Nile Virus

Introduction: According to the CDC, since 1999 WNV has infected 29,584 people killing 1,144 as of 8 December 2009 (13). 12,011 have been inflicted with encephalitis and meningitis, 16,795 have suffered with serious and longer than normal fever, and 778 have manifested other clinical disorders. It was previously thought that WNV-associated neurological ailments were short-lived and affected only a small percentage of those infected. However, recent studies suggest that neurological disorders may be more prolonged and serious, affecting more victims than originally thought (14). Another recent study has shown that renal disease can be manifested in patients several years after infection with WNV and thought to have recovered (15). WNV, primarily an avian virus, has been far deadlier for birds with dramatic declines in seven species (16). 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 of the Connecticut Agriculture Experiment Station, concluded that a WNV vector, Culex salinarius feed on mammals 55% of the time. This supports an earlier study by his group that suggested that Cx. salinarius may be the primary vector of WNV in the northeast U.S. (17).

Catch Basin Treatments: While spraying against infected adult mosquitoes is the short-term approach for immediate risk reduction, the preferred long-term and more cost-effective strategy is to eliminate larvae before they become adults. Culex mosquitoes can develop in a variety of freshwater habitats, but the greatest concentration of Culex breeding in the District is in the estimated 80,000 catch basins. While Cx. salinarius can be present in catch basins, this is not its preferred breeding habitat. Instead, the basins are well populated by the two principal urban Culex mosquitoes, Cx. pipiens and Cx. restuans. Cx. pipiens/restuans breed in highly organic or polluted water that collect in artificial containers such as catch basins; they can also breed in storm water structures including detention and retention ponds, as well as discarded tires, gutters, bird baths, etc. With the ability to proliferate in basins to produce massive adult populations, we are confident that these are the principal vectors of WNV in our District, and thus the target of our long-term WNV control strategy.

Treating of catch basins consist of applying either bacteria that are effective towards killing exclusively mosquito larvae or a “growth regulator” that retards or completely ceases their development into adults. Short term 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 conditions do not deter breeding of Cx. pipiens /restuans but instead, may enhance it! In a drought, expansive wetlands dry becoming numerous smaller, shallow pools concentrated with more organic debris, providing Culex with far more breeding habitats. More importantly, catch basins continue to accumulate water during droughts from car washing, lawn watering and concentrated sheet flow from minor rainfall events, etc. Breeding area are therefore always in abundance, even in the driest of circumstances! This is why human WNV-infections are at their highest during a drought. Targeting Culex in basins will eventually reduce adult Culex populations, reduce the transmission of virus from bird-to-bird, reduce the number of infected mosquitoes and ultimately, reduce risk of infection to humans.

Long term surveillance data has shown that the continued annual treatment of basins has gradually and significantly decreased Culex populations throughout the District. The result is fewer WNV positive mosquitoes when compared to areas bordering our district, as seen in Figures 1 and 2. This translates to reduced risk of infection to District residents. 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 reducing virus amplification in birds and reducing risk to humans. This early-season basin-treatment strategy will continue in 2012.

Catch basin treatments in 2012 will be prioritized as follows. As previously stated, WNV is endemic in the Boston metro area and it is clear that the WNV epicenter in our District is the urban coastal communities of Winthrop, Revere, Lynn, Nahant, Saugus, Swampscott, Marblehead, Salem, and to a lesser degree Danvers and Beverly. The basins in these communities will be treated first, starting in May. Another area of concern is the Merrimack River Valley, specifically Andover and North Andover and basins here will be treated early as well. WNV isolations in Andover, North Andover, Haverhill, Merrimac and Methuen in the 2011 season may indicate a potential for renewed WNV activity in the area in 2012.

Waste Water Treatment Facilities Inspection: An additional “preemptive strategy” to reduce WNV risk, the District will request to inspect all wastewater treatment facilities. This way, actual or potential Culex breeding can be reduced or eliminated 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 wastewater 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.

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 there was a 276% increase in the number of human WNV cases in association with a 300% increase in home foreclosures (18). Within most foreclosed

properties in Bakersfield (Kern County, CA) were neglected swimming pools which led to increased breeding and population increases of Cx. pipiens/restuans.

In recent year we have received several requests from Boards of Health to inspect abandoned properties. The district has had a policy of property inspections, albeit a passive approach, at the requests of Boards of Health. Given the current economic climate and likelihood of increasing properties abandonment (with the potential for increased health risk associated with properties abandonment), the District in 2012 will again apply a more aggressive approach to property inspections. In the course of our routine activities in your community, we will be "on the lookout" and report such properties to your Board of Health. We understand that addressing abandoned properties is a matter of time and process. In the long term, we will offer any support that may be appropriate 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 final 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 which dispenses very small amounts of pesticides over a large area. The District may recommend a targeted application within a municipality based on the following criteria: two or more WNV-mosquito isolations in close proximity; one or more human cases of WNV. On occasions, when WNV has yet been recovered but Culex populations are seen increasing at higher-than-usual rates, we have recommended that adulticiding operations be commenced. These operations would only be recommended only during high WNV-transmission periods (late July through September) in communities with historical WNV activity.
Barrier Treatment: While ULV is a cost-effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes active at the time of the application; repeated applications are sometimes necessary to sustain the initial reduction 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". This application would be made to public use areas such as schools (applications to schools must be in compliance with MGL Ch. 85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquitoes for up to two or more weeks. The District strongly recommends member municipalities take advantage of this service when offered.

Eastern Equine Encephalitis Virus

Introduction: From what we have experienced over the past five years, EEEV has become a serious public health threat in our area. It is clear that the current EEEV focus is Southern New Hampshire, in particular area including 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; see Figures 3 through 5. Figure 6 is a summary of the combined isolations in the past six years and it can be clearly seen where the "epicenter" of the EEEV is and how the northern portion of our District is in risk to EEEV.

EEEV was first discovered in horses thus, the basis for the name "Equine Encephalitis". This however is a misnomer as horses are not the source of infection, but unsuspected innocent casualties. When it was later discovered that this same virus caused the same type of encephalitis in humans, the horse discovery superseded and the name "equine" stuck. Humans and horses are not sources of infection and are considered "dead end hosts", meaning that the virus cannot be transmitted from infected horses or humans. Like West Nile Virus, EEEV is an avian virus, transmitted from bird to bird principally by the Cedar Swamp mosquito, Culiseta melanura. While Cs. melanura mosquitoes are primarily responsible the amplification of virus in bird populations, they typically do not bite humans. It is other mosquitoes that feed on both birds and humans, referred to as "bridges vectors", that are responsible for human infections. Nonetheless, it is our judgment that while risks to human from infected Cs. melanura are extremely low, we will continue to take preemptive protective operations when infected Cs. melanura are detected. Lack of early intervention activity can result in accelerated EEEV amplification which later in the season can increase human risk to infection.

In last year's VMP it was stated that "we do not anticipate any EEEV activity in our service area in 2010 but we are prepared for any contingence." This prediction was made in part because in areas where EEEV has historically been a problem, its appearances have followed a cyclical pattern. In southeast Massachusetts, EEEV occurs in outbreaks lasting about three years, followed by almost no activity for 15 to 20 years. With little activity in New Hampshire in 2007 and 2008, we assumed that EEEV was in a "dormant" phase and would stay as such for an extended period. In fact EEEV escalated in 2009, demonstrating that the cyclical model used for southeast MA does not yet apply to New Hampshire and northeast MA. The 2009 outbreak also demonstrated the need for continued vigilance in surveillance and readiness to implement preemptive strategies. Beginning in late August and escalating into September there were numerous EEEV isolations in mosquitoes throughout southern New Hampshire cumulating in a human case. EEEV-infected mosquitoes were found in Massachusetts communities bordering New Hampshire in late August through September and appropriate measures, coordinated with boards of health of these communities, were taken. As describe earlier, a horse died in West Peabody from EEEV and virus was found in mosquitoes in nearby Reading. As there was no previous history of EEEV activity in Peabody and surrounding areas (it was considered to be outside the EEEV risk area), it is more than clear that previously reliable predictive models of EEEV cycles and distribution may no longer apply.

Habitat Surveillance: While predictive models of EEEV cycles and distributions no longer reliable, one consistent observation still valid is that higher populations of Cs. melanura are a good indicator of EEEV activity. Cs. melanura is one of only a few

mosquitoes that survive ("overwinter") in the larval stage. They develop not in open water, but in flooded root meshes, holes and tunnels ("crypts") under tree hummocks in Atlantic white cedar and red maple swamps. These habitats are relatively abundant in northeast MA, although they are remote, isolated and difficult to access. With greater numbers than usual of Cs. melanura adults appearing last September, one result was that they laid more eggs in more habitats; more habitats became available thanks to abundant ground water from last summers rains. Hence, there are currently more larvae developing at this time (winter 2010-2011) which, depending on the severity of the winter, could lead to greater adult populations emerging in the spring. A higher than normal spring adult emergence of Cs. melanura may commence the EEEV transmission cycle earlier than normal and ultimately result in earlier (and more abundant) human infections of EEEV.

Since 2004 when EEEV first became a serious concern in our area, we have been searching for Cs. melanura habitat in the winter to be monitored. Trying to find Cs. melanura larvae breeding in crypts in cedar swamps is very much like trying to find a needle in a hay stack; to date we have been unsuccessful in locating such sites with consistency. In the winter of 2011/2012, we will narrow our focus to areas within a one mile radius of resting box location in communities bordering NH. The objective is to find breeding locations associated with each of our resting boxes location from which we can monitor larval populations through the winter and make better projections of what we may happen and what we can do.

Selective Ground Adulticiding: Because of the elusive nature of Cs. melanura larval breeding habitat in our area, larviciding is not a viable option as a preemptive strategy. Therefore, 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 there are horse and human infections, other mosquito species, the "bridge vectors" are also transmitting the virus and are targeted for adulticiding. But it is late in the season when these intervention efforts are made and their effectiveness in reducing risk are limited at best and often nonexistent. The District will recommend a targeted adulticide application in a subscribing municipality (-ities) based on the following criteria: above average Cs. melanura populations in a year of anticipated EEEV activity; one or more EEEV isolations in Cs. melanura mosquitoes; one or more EEE virus isolations in horses; one or more human EEE cases. As with WNV intervention, the District uses Ultra Low Volume (ULV) for ground adulticiding applications.

Barrier Treatment: While ULV is a cost-effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes active at the time of the application; repeated applications are sometimes necessary to sustain the initial reduction 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". This application would be made to public use areas such as schools (applications to schools must be in compliance with MGL Ch. 85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquitoes for up to

two or more weeks. The District strongly recommends member municipalities take advantage of this service when offered.

Emergency Response Aerial Adulticiding Plan: In the event that the risk level escalates to a point 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 the window of opportunity is short. It is imperative that the complex logistics of executing the application are already in place. There are four components to this plan; 1) Global Positioning Satellite (GPS) mapping; 2) Securing airport facilities and use; 3) Availability of aircraft and pesticides; 4) Last but not least, availability of necessary funds.

1. The District has in place and continually revises a Global Positioning Satellite (GPS) mapping program that designates areas to be excluded from an aerial adulticide operation, such as reservoirs, endangered species areas, etc. The areas to be sprayed would be determined by the current mosquito and risk data and circumstances; the GPS program would be supplemented immediately prior to the operation. This data can be quickly downloaded into an aircraft's navigation system to direct the aircraft and pilot to areas to be sprayed and areas to be avoided.

2. The District has in place and annually revises a "Memorandum of Understanding" (MOU) with the Lawrence and Beverly Airports. In the event an aerial adulticiding application is necessary, Lawrence airport would be closest to the likely target area. In the event Lawrence airport is unavailable or the target area has broadened, then Beverly Airport would be used.

3. Through the state's procurement program, contracts are in place for the acquirement of aircraft and pesticides. If events warrant, the District will communicate with aircraft and pesticide contractors to inform them that an aerial adulticiding application may be necessary and equipment and materials are to be made available for our use.

4. The District has resources in its stabilization fund to conduct an aerial adulticiding application in the communities bordering the New Hampshire most likely to be treated to contain EEEV spread. In the event further applications are needed, additional funding would be necessary.

References Cited

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(13) Totals for all manifestations of WNV infections since 1999 can be obtained at “Statistics, Surveillance & Control” page of the CDC website: www.cdc.gov/ncidod/dvbid/westnile/surv&control.htm
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(17) Goudarz Molaei et al. 2007. Host feeding patterns of Culex mosquitoes and West Nile Virus transmission, Northeastern United States. Emerging Infectious Diseases. 12: 468- 474.
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Please check off the species of concern in your service area:

☐ *Ae. albopictus*
☐ *Ae. cinereus*
☒ *Ae. vexans*
☒ *An. punctipennis*
☒ *An. quadrimaculatus*
☒ *Cq. perturbans*
☒ *Cx. pipiens*
☒ *Cx. restuans*
☒ *Cx. salinarius*
☒ *Cs. melanura*
☒ *Cs. morsitans*
☐ *Oc. abserratus*
☒ *Oc. canadensis*
☒ *Oc. cantator*
☐ *Oc. excrucians*
☐ *Oc. fitchii*
☒ *Oc. j. japonicus*
☐ *Oc. punctor*
☒ *Oc. sollicitans*
☐ *Oc. stimulans*
☐ *Oc. taeniorhynchus*
☒ *Oc. triseriatus*
☐ *Oc. trivittatus*
☐ *Ps. ferox*
☐ *Ur. sapphirina*

☐ Other (please list):

Do you participate in the MDPH Arboviral Surveillance program? Yes

How many pools do you submit weekly on average? 60

Please check off the arboviruses found in your area in the past 5 years:

☒ West Nile Virus
☒ Eastern Equine Encephalitis
☐ Other Please list:

Did the above listed diseases cause human or horse illnesses? Yes

Please explain: EEE - Horse in West Peabody, and Alpaca in Byfield in 2009
WN - Human case in Revere in 2010, Human case in Peabody in 2011

At what arbovirus risk level did the year begin in your area? (If more than one please list)

WNV: - LOW Risk: All District towns (32)

EEE: - REMOTE: Ipswich; Manchester; Wenham; Marblehead; Swampscott
(Non-District towns also REMOTE Risk: Essex, Gloucester, Rockport)
- LOW: All remaining District-subscribing municipalities
- MODERATE: Methuen; Haverhill; Merrimac; Amesbury; West Newbury; Newbury; Peabody;

At what arbovirus risk level did the year end in your area? (If more than one please list)

WNV: - REMOTE: All remaining District-subscribing municipalities
- MODERATE: Methuen, Saugus
- HIGH:

EEE: - REMOTE: All District-subscribing municipalities
(Non-District towns also REMOTE Risk: Essex, Gloucester, Rockport)
- LOW:
- MODERATE:

What time frame during the year is this method employed? May - October

Comments: _____

***Please attach a link to maps of surveillance areas if possible.**

EDUCATION, OUTREACH & PUBLIC RELATIONS

Do you have an education/public outreach program program? Yes

If yes, please describe: POLICY AND PROCEDURE FOR EDUCATIONAL OUTREACH

General: The District will provide educational outreach on mosquito control and related environmental science to schools, civic organization and public officials upon request.

Website: The District will maintain a Website www.northeastmassmosquito.com which will provide general information about operational strategies and procedures.

Other Media: the District has various DVD's available which will be provided to schools and civic groups, etc. at their request.

Outreach Programs: During the off season the District's Entomologist and /or Biologist will present educational programs tailored to the specific needs of schools, civic organization and public officials. See list of events below.

Please check off all that apply:

☐ School based program
☒ Website
☒ PR brochures/handouts
☒ Community events
☐ Science fairs
☒ Meeting presentations
☒ Other (please describe): As requested by school / town / associations / agencies / board of health etc.

Please give an estimate of attendance/participants in this program: 5 to 500

Please list some events you participated in for the year of this report:
Greenhead trap assistance (Maine), Plastic Barrel offering to cities/towns
BOH Arbovirus annual presentation
North Andover Board of Health Public Meeting
North Andover Senior Citizen Center Meeting
Tick Presentation at Georgetown Garden Club
Tick Presentation at Groveland Garden Club
Tick Presentation at Manchester-by-the-Sea Board of Health
Tick Presentation at West Newbury Garden Club
Tick Presentation at West Newbury Board of Health
Mosquito/Arbovirus Workshop at Endicott Park in Danvers
Mosquito/Arbovirus Workshop at Anna Jacques Hospital in Newburyport
Paper presentation MCD Wetland Mgmt. + Restoration Specialists

What time frame during the year is this method employed? Year Round

Have you performed any research projects, efficacy, bottle assays, etc.? Yes

If yes, please elaborate on your research projects: Middleton Tire Pile

Are you involved in any collaboration with academia, industry, environmental groups, etc.? Yes

If yes, please elaborate on your collaborations this past year: study the changes in Greenhead Trap Assistance (Maine), Plastic Barrel offering to cities and towns.

Please provide a list of technical reports, white/grey papers, publication in journal or trade magazines, etc. Papers at the NMCA Conference, Association of MA Wetland Scientists, AMWS Newsletter

Does your staff participate in educational opportunities? Yes

If yes, please list the training and education your staff received this year: NMCA Annual Conference, Clarke Mosquito: Community Mosquito Control Update Workshop, NMCA Field Day, AMCA Annual Conference, Florida Mosquito Control Annual Meeting, Association of MA Wetlands Scientists (AMWS): Riverbank Stabilization Techniques, Ferns Identification Workshop, Winter Botany, USFWS: Early Detection Workshop, UMASS Extension: Invasive Insect Pests, Invasive Plant Pests, Dig Safe: Managing Underground Safety Training, EJ Prescott, Inc: Know H2OW To – Harnessing the Power of Water: Winter Botany: AMWS

Please list the certifications and degrees held by your staff: Doctorate, Bachelor, Associate Degrees

Comments: _____

BIOLOGICAL CONTROL EFFORTS

Do you have a biological control program? Yes

If yes, please describe: Wetlands Management Program

Is this program the introduction of mosquito predators or the enhancement of habitat for native predators? Enhancement of habitat/refugia for native predators

Please check off all that apply:

☒ Predatory fish
☒ Predatory invertebrates
☐ Other (please describe):

What time frame during the year is this method employed? year round

Comments: Improvement of predatory fish habitat (feeding and refugia) are a main focus of efforts within the District's Wetland Management Program. Unfortunately, the MFWS has strict regulations regarding intorduction of fish in local mosquito larval development habitat prohibiting the use of this method of biological control.

INFORMATION TECHNOLOGY

Does your program use (check all that applies):

☒ Computers
☒ GIS mapping
☒ GPS equipment
☒ Computer databases
☒ Aerial Photography

☐ Other (please describe):

Please describe your capabilities in these areas: Though District staff is still training our capabilities continue to grow fairly consistently. GIS is used for mapping projects particularly in the District's Wetland Management Program. Available MA GIS layers such as sensitive areas, wetlands, topography etc. are overlaid on project locations and examined to reveal data which can then be used to help define the project. Data are also collected in the field and eventually will be mapped to illustrate recoverable dip stations, recoverable photo stations, project bounds, etc.

Please describe your current GIS abilities: Intermediate

Give details if possible on your GIS abilities: The District has ArcMap 9.3. We can prepare professional looking maps, add layers for analysis of data, calculate acreage and determine linear footage. The district is also working on becoming more proficient with digitizing, creating/using attribute tables and adding shapefiles. In addition, we have been working on developing a functional geodatabase that might eventually incoprorate all aspects of the District's mosquito control operations.

Please describe any changes/enhancements in this area from the previous year: The District has added laptops to spray trucks to aid in a more effective and accurate adulticiding effort, i.e., spray exemptions are continually updated and these are delineated on the mapping program. We are also developing data collection in other aspects of mosquito control. The District recently acquired a Trimble unit which should make data communication with other ESRI mapping products much simpler and more effective.

Comments: _____

REVENUES & EXPENDITURES

Please give a concise statement of revenues & expenditures for the prior fiscal year ending June 30.

Proposed Budget $1,518,953.00

Account 2520/1500 Line Item Budget Spending Plan
Encumbances
AA - Full Time Payroll 43.4% $660,000.00

BB - Travel 0.65% $10,000.00

CC-Com/Contract Employes 4.8% $73,632.00 Cont Emp$70,632.00 Com Meetings $3,000.00

DD-Retire/Ins/Fringe 19.4% $294,538.45

Retirement 15.5% $102,311.94
Group Ins 25.89% of FT payroll $170,874.00
Terminal Leave 1.18% $7,788.00
Un Employment Ins. 0.37% $2,627.68
Un Health Ins. 0.07% $497.13
Medicare tax 1.47% $10,439.70

Office/Administration 1.4% $21,920.00

Network consulting/maint GU Network + 50% $3,000.00
Computers/accessories Dell $3000.00
Office Supplies NE Office Supply $3000.00
Office Supplies Office Max $2,000.00

Printing G&G Printing $1,000.00
Postage U.S. Post Office $400.00
Out of Pocket Expenses Employee Reim $5,000.00
Legal Notice Community News $1,000.00
Pre registration/dues NMCA Associations $3,520.00

Litigation

Facility Operation/Utilities 1.1% $17,130.00

Electric service National Grid $6,000.00
Propane gas heat Osterman Gas $2,000.00
Heat Oil
Dumpsters Allied Waste $1,500.00
Water Bill Town of Andover $100.00
Long dsitance phone AT&T $200.00
Internet service Comcast $830.00
Cell and direct connect service Nextel $5,000.00
Office Phones Verizon $1,500.00

Facilitiy Maintenance 0.5% $7,500.00

Maint tools/supplies Home Depot $5,000.00
Heating/cooling maintenance Johnson Controls $2,500.00
Ops Fleet Maint/Repair 4.2% $64,500.00

Vehicle Maintenance/repair Fleet Response $20,000.00
Welding Gunderson Welding $5,000.00
Wetlands Equip maint/repair Kassbohrer $20,000.00
Hydraulic hoses & connections Tech Hydraulics $2,000.00
Heavy Truck Maint./ repair Minuteman $2,500.00

Equipment transport/ towing Chadwick BaRoss $2,500.00
Vehicle maint/repair MHQ $1,000.00
Excavator/maint/repair Chadwick Ba Ross $3,000.00
Misc equip/parts/supplies Granger $3,000.00
Auto Glass J.N. Phillps $500.00
Misc equip/parts/supplies Napa Auto $3,000.00
Tires Goodyear $2,000.00

Operations Fleet Fuel 2.6% $40,000.00

Fleet Fuel gas/diesel Wright Express $40,000.00

Ops Support/Contractors 9% $137,000.00

Helicopter Contract JBI Helicopter $75,000.00
GIS Mapping True North Mapping $30,000.00
Co2 surveillance Airgas $4,000.00
Virus Testing DPH $15,000.00
Airport user Fee Plum Island Airport
Field equipment & Supplies Forestry Suppliers $3,000.00
Surveillance/Lab supplies Fisher Scientific $1,000.00
Surveillance/Lab supplies Bio Quip $3,000.00
Surveillance/Lab supplies BioSensory $1,000.00
Erosion Control materials E.J. Prescott $1,000.00
Northeast Nursery $1,000.00
Work gear / uniforms Armark $3,000.00

Ops Pest/Spray equip/parts 9.9% $150,000.00

Pesticicdes / Sprayer parts Clarke $125,000.00
Pesticicdes / Sprayer parts Adapco $25,000.00

Lease/Purchase

Capital Equipment 2.7% $38,442.55

Total Spending $1,518,953.00

Budget Alotment $1,518,953.00

FY11 Stabilization Fund $57,413.93

Total Budget $1,576,366.93

List each **member municipality along with the corresponding (cherry sheet) funding assessment** dollar amount for the prior fiscal year.

Comments:

Amesbury	**$39,883**
Andover	**$107,180**
Beverly	**$65,298**
Boxford	**$68,632**
Danvers	**$51,191**
Georgetown	**$38,137**
Groveland	**$26,444**
Hamilton	**$43,293**
Haverhill	**$109,364**
Ipswich	**$93,891**
Lynn	**$54,884**
Lynnfield	**$35,505**
Manchester	**$32,189**
Marblehead	**$32,915**
Merrimac	**$24,818**
Methuen	**$77,405**
Middleton	**$42,603**
Nahant	**$6,407**
North Andover	**$85,862**
Newbury	**$67,680**
Newburyport	**$35,235**
Peabody	**$70,270**
Revere	**$35,013**
Rowley	**$51,812**
Salem	**$39,193**
Salisbury	**$45,642**
Saugus	**$44,185**
Swampscott	**$17,681**
Topsfield	**$37,572**
Wenham	**$23,035**
West Newbury	**$37,870**
Winthrop	**$12,933**

PESTICIDE USAGE

Please total your pesticide usage with information from your Mass. Pesticide Use Report, WNV Larvicide Use records and contracted pesticide applications. Applications methods include; hand/backpack, aerial, ULV, mistblower, other (please explain)

Product Name: Altosid Pellets
EPA Reg. #: 2724-448-64833
Application method: hand
Targeted life stage: Larvae
Total amount of concentrate applied: 76.6 lbs.
Comments: _____

Product Name: Vectolex WSP
EPA Reg. #: 73049-20
Application method: hand
Targeted life stage: Larvae
Total amount of concentrate applied: 56.3 lbs
Comments: _____

Product Name: VectoMax G
EPA Reg. #: 73049-429
Application method: hand
Targeted life stage: Larvae
Total amount of concentrate applied: 12.3 lbs.
Comments: _____

Product Name: Vectobac G
EPA Reg. #: 73049-10
Application method: hand & aerial
Targeted life stage: Larvae
Total amount of concentrate applied: 1,986.8 lbs.
Comments: 1,226.8 lbs. by hand & 760 lbs. by aerial

Product Name: Altosid WSP
EPA Reg. #: 2724-448
Application method: hand
Targeted life stage: Larvae
Total amount of concentrate applied: 322.6 lbs.
Comments: _____

Product Name: VectoMax WSP
EPA Reg. #: 73049-429
Application method: hand
Targeted life stage: Larvae
Total amount of concentrate applied: 8.2 lbs.
Comments: _____

Product Name: Altosid XR Briquets
EPA Reg. #: 2724-421
Application method: hand
Targeted life stage: Larvae

Total amount of concentrate applied: 18,093 briquets
Comments: _____

Product Name: Vectobac 12 AS
EPA Reg. #: 73049-38
Application method: Aerial
Targeted life stage: Larvae
Total amount of concentrate applied: 2,220 Gallons
Comments: _____

Product Name: Anvil 10 + 10
EPA Reg. #: 1021-1688-8329
Application method: ULV
Targeted life stage: Adult
Total amount of concentrate applied: 168.12 Gallons
Comments: _____

Product Name: Suspend SC
EPA Reg. #: 432-763
Application method: ULV Barrier (retro fit)
Targeted life stage: Adult
Total amount of concentrate applied: 89.5 ozs.
Comments: _____

Product Name: Four Star Briquets
EPA Reg. #: 83362-3
Application method: Hand
Targeted life stage: Larvae
Total amount of concentrate applied: 305 Briquets
Comments: _____

Product Name: Escort
EPA Reg. #: 352-439
Application method: Hand
Targeted life stage: Pre-flowering Plant
Total amount of concentrate applied: 4.62 ozs.
Comments: _____

Product Name:
EPA Reg. #:
Application method:
Targeted life stage:
Total amount of concentrate applied:
Comments: _____

LARGE AREA EXCLUSIONS

Do you have large areas of pesticide exclusion, such as estimated or priority habitats? No

If yes, please explain, and attach maps or a web link if possible.

SPECIAL PROJECTS

Do you perform any inspectional services such as inspections at sewage treatment facilities or review sub division plans? Yes

If yes, please elaborate INSPECTIONAL SERVICES

The old saying "an ounce of prevention is worth a pound of cure" is very true in mosquito control. Early intervention or preemptive action to prevent potential mosquito breeding sites from becoming actual breeding sites is as much a control strategy as an application or treatment is. 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 cause an imposition to any citizen or business, but rather to be a resource for information and technology to help property owners prevent and/or reduce mosquitoes to the mutual benefit of the property owner, the community and mosquito control.

The District acts as a technical advisor at the request of local Boards of Health and represents the municipalities' public and animal health concerns relative to mosquito breeding issues and proposed developments. The District, at the request of a local Board of Health, will also review site plans and inspect sites under construction relative to mosquito breeding issues. Upon inspection of a site the District will make written recommendations and submit these recommendations to the Board of Health and the land owner.

The primary vector species of West Nile Virus, Culex pipiens, typically breeds in artificial containers such as catch basins, storm water structures, etc. This species seems to thrive where others fail, due to their ability to survive in highly organic and polluted water These conditions are often associated with industrial or office parks, commercial or agricultural livestock facilities. The District will routinely inspect these areas due to the increased potential for Culex species mosquito breeding in and around these areas.

The District also inspects Waste Water Treatment Plants, compost facilities, recycling centers, and junkyards. The District may also inspect private farms at the request of the local Board of Health, farmowner, or in the event of increased mosquito and/or virus activity in the area.

Do you work with DPW departments or other local or state officials to address stormwater systems, clogged culverts or other areas that you have identified as man-made mosquito problem areas? Yes

If yes, please elaborate: The District works very closely with local Boards of Health, Conservation Commissions, Planning Boards and DPWs in this function. Complaints are received and issued to District technicians. Inspections are completed and appropriate actions taken to alleviate conditions warranting treatment. District technicians frequently clear culverts and blocked grates to improve flow and limit flooding. Some cases warrant larval treatment. In some cases, Inspectional Service Reports are written to outline recommendations for municipality action such as cleaning of catch basin systems, etc. Occasionally larger areas require more significant effort and recommendations to the appropriate official for petitioning of a wetland management project may be made. See District's Policy and Procedure for Mechanized Wetland Management.

Have you worked with these departments on long term solutions? Yes

If yes, please elaborate: The District has been and will continue to be a strong advocate in favor of maintenance to these systems. The District voices its concern to numerous agencies including MA Highway, MA DEP, local DPWs, planning boards and Conservation Commissions. We offer all of our communities an Inspectional Service including review and recommendations for new development plans.

Did you conduct or participate in any cooperative research or restoration projects?

If yes, please elaborate: Beaver impacted waterway - stream restoration, invasive species management - mapping and control , salt marsh clean-ups.

Did you participate on any **State/Regional/National workgroups or panels or attend any meeting pertaining to the above**?

If yes, please elaborate: yes,

Merrimac River Watershed Council: MAPP Program - Water Quality Monitoring Team
Great Marsh Revitalization Task Force, GMRTF
GMRTF - Research Subcommittee
MA-NH-ME Invasives Workgroup
Northeastern Mosquito Control Association: Board

CHILDREN AND FAMILIES PROTECTION ACT

Is your program impacted by the Children and Families Protection Act? Yes

If yes, please explain: Not able to address mosquito control in a timely fashion due to protocols and compliance.

If you have data on compliance with this Act and your program, please list here: The District sends an annual notice, including the recommended amendment for mosquito control, to all schools and day care facilities in our jurisdiction asking that they update their IPM plans to include mosquito control.

If you had difficulties with implementation of your program due to this law, please elaborate here: Due to increased health risks associated with vector mosquitoes, requests for spraying on school properties have increased putting greater demand on Mosquito Control personnel to respond quickly. Complying with specified law requirements in a timely fashion for applications on school property is a constant challenge.

Comments:

GENERAL COMMENTS

Please list any comments not covered in this report: _____

Commonwealth of Massachusetts
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT
261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Phone: (978) 463-6630 / Fax: (978) 463-6631
www.northeastmassmosquito.com

National Pollutant Discharge Elimination System
Pesticide Discharge Management Plan
Final Draft: July 2011
Revised: 01/2012

- Committed to a partnership of the principles of mosquito control and wetland management -

National Pollutant Discharge Elimination System
Pesticide Discharge Management Plan
Final Draft: July 2011- Revised: 01/2012

Introduction

In accordance with the 2011 National Pollutant Discharge Elimination System (NPDES), Pesticide General Permit (PGP) for Discharges of Pesticides, the Northeast Massachusetts Mosquito Control and Wetlands Management District has developed its Pesticide Discharge Management Plan (PDMP) from existing documents housed within the District's Operations Manual. All PDMP required information and explanations pertaining to PDMP compliance are incorporated within the Operations Manual itself. The District updates much of this information annually or on an as needed basis in accordance with State and Federal guidelines and in the best interest of the District, its employees and the communities for which we serve. The District's Operations Manual is required to be within each vehicle in the District's fleet. District personnel conduct themselves in strict accordance with the documents within. Information pertaining to applicable Federal and State regulation/guidance, pesticide labels, Material Safety Data Sheets, and all District policies/procedures can be found in the Operations Manual as well as on the Distrcit's web site: http://northeastmassmosquito.com/ .

TABLE OF CONTENTS

Mission Statement

Pest Management Area Map

Target Mosquito Species

PDMP Team Contact Information

Municipal Emergency Numbers

Policy, Procedure and Facts Sheets

- General Operations
- IPM Control Strategies
- Adult Mosquito Surveillance
- Inspectional Services
- All Pesticide Applications
- Vehicular Accident – Pesticide Spill
- Larval Control
  - General Ground
  - Catch Basin
  - Storm Water Control Structure
- Aerial Larval Control
  - Fresh Water
  - Salt Water
- Adult Control
  - Ground Ultra Low Volume (ULV)
  - Ground Barrier
- Invasive Species Control
  - General Ground
- Efficacy and Resistance Evaluation
- Research and Development

APPENDICES

Appendix 1: Example Best Management Practice Plan

Appendix 2: District Vector Management Plan - 2011

Appendix 3: Vehicle and Sprayer Inventory Information

Appendix 4: Example Pesticide Record Reports and Records

Adverse Incident Report

Larval Control Records

- Service Request Record
- Property Inspection Record
- Larval Site Data Base Record
- Pesticide Applied Record – Vectobac G
- General Ground/Catch Basin Record
- Pesticide Applied Record – VectoLex WSP
- Aerial Larviciding Pre-Treatment Record
- Aerial Larviciding Post-Treatment Record
- Aerial Larviciding Efficacy Record
- Pesticide Applied Record – Aerial Larviciding

Adult Control Records

- Pesticide Applied Record – Anvil 10 + 10
- Adulticiding Record – Street Sheet
- Ground ULV Mosquito Adulticiding Report and Data Master Map
- Pesticide Applied Record – Suspend SC

Invasive Species Control

- Pesticide Applied Record – Accord Concentrate
- Example Herbicide Application Map

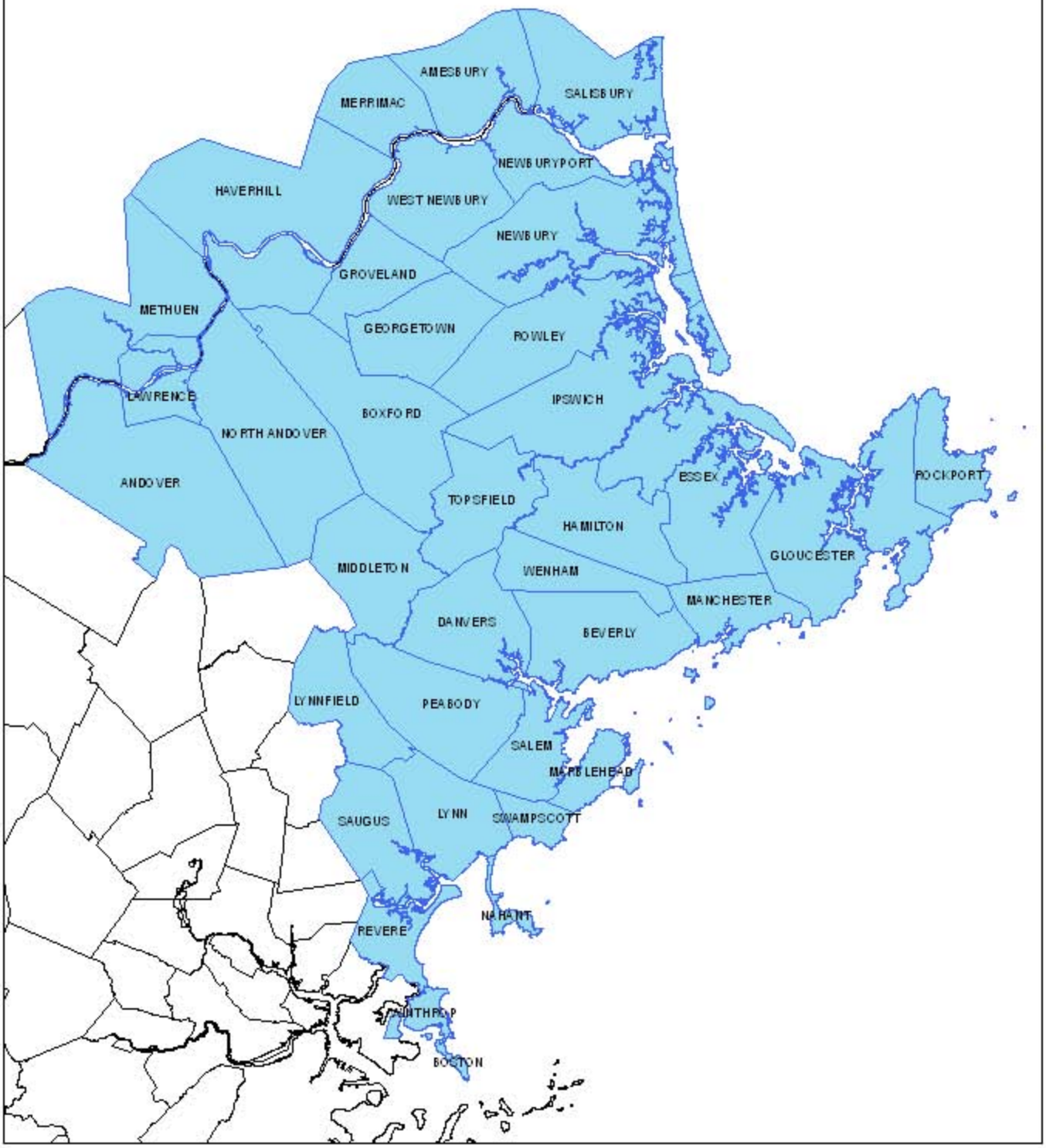
Commonwealth of Massachusetts
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT
261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Phone: (978) 463-6630 / Fax: (978) 463-6631
www.northeastmassmosquito.com

Mission Statement

The Northeast Massachusetts Mosquito Control and Wetlands Management District represents the mosquito control and wetland management interests of those communities that choose to subscribe to its services. The prime directive of the District is to protect its citizens from mosquito-borne diseases by targeting precise, measured, and preemptive responses to specific risk as prescribed by the District's annually-revised "Vector Management Plan" (VMP). To ensure that our citizens quality of life and regional economy is not severely impacted by abundant pestiferous mosquito outbreaks; strategies targeted to reduce dominant mosquito populations are implemented as prescribed by the District's annually-revised "Best Management Practice" (BMP) plans. BMP's are designed to incorporate the District's environmentally sensitive and cost effective mosquito control strategies with the specific needs and concerns of each member community.

NE MA Mosquito Control and Wetland Mangement District
Pest Management Area - NPDES



0 3 6 12 Miles

TARGET MOSQUITO SPECIES IN NORTHEAST MASSACHUSETTS

The following mosquito species are targeted pests of concern due to their potential or demonstrated ability to transmit viruses and/or have demonstrated annoyance potential.

Scientific Name[1]	Common Name	Larval Habitat[2]	Virus[3]
Aedes abserratus		Permanent	Other
Aedes atropalpus		Natural/artificial containers	WNV
Aedes aurifer		Woodland pools	Other
Aedes canadensis	"woodland pool mosquito"	Temporary woodland pools	EEE/WNV
Aedes cantator	"brown salt marsh mosquito"	Temporary brackish/fresh pools	EEE/WNV
Aedes cinereus		Temporary/semi-permanent woodland pools	EEE/WNV
Aedes communis		Temporary snowmelt pools – coniferous	Other
Aedes excrucians		Permanent/semi-permanent woodland pools	Other
Aedes intrudens		Temporary and semi-permanent woodland pools	None
Aedes japonicus	"Japanese rock pool mosquito"	Natural/artificial containers	WNV
Aedes provocans		Temporary snowmelt pools and roadside ditches	Other
Aedes sollicitans	"golden salt marsh mosquito"	Temporary saline pools –coastal marsh	EEE/WNV
Aedes stimulans		Permanent/semi-permanent woodland pools - shaded	Other
Aedes taeniorhynchus	"Southern salt marsh mosquito"	Temporary saline pools –coastal marsh	EEE/WNV
Aedes triseriatus	"eastern tree-hole mosquito"	Tree holes and artificial containers	EEE/WNV
Aedes trivittatus		Temporary woodland pools and reflood	EEE/WNV
Aedes vexans	"re-flood mosquito"	Re-flood/temporary open pools	EEE/WNV
Anopheles barberi		Tree holes and artificial containers	None
Anopheles crucians		Permanent	None
Anopheles punctipennis	"mottle-winged mosquito"	Semi-permanent/permanent	EEE/WNV
Anopheles quadrimaculatus	"malaria-carrying mosquito"	permanent	EEE/WNV
Anopheles walkeri		permanent	EEE/WNV
Coquillettidia perturbans	"cattail marsh mosquito"	permanent	EEE/WNV
Culex pipiens	"northern house mosquito"	Artificial containers and temporary pools	EEE/WNV
Culex restuans	"white-dotted mosquito"	Natural/artificial containers and temporary pools	EEE/WNV
Culex salinarius	"un-banded salt marsh mosquito"	Brackish-fresh wetlands/ containers	EEE/WNV
Culiseta melanura	"cedar swamp mosquito"	Crypt/cavities	EEE/WNV
Culiseta morsitans		Permanent/semi-permanent and cavities	EEE
Psorophora ferox		Temporary woodland pools and shaded floodplains	EEE/WNV

[1] Nomenclature Note: the use of *Aedes* has been restored in place of *Ochlerotatus* due to nation-wide confusion amongst mosquito control abatement professionals, taxonomists and as deemed appropriate by the editors of the Journal of American Mosquito Control Association and the Walter Reed Biosystematic Unit.
[2] Andreadis, T.G. Thomas, M.C. and Shepard, J. J. 2005. Identification Guide to the Mosquitoes of Connecticut. The Connecticut Agricultural Experiment Station. pp 173.
[3] Turell, M. J., Dohm, D.J., Sardelis, M.R. , O'Guinn, M.L., Andreadis, T.G., and Blow, J.A. 2005. An Update on the Potential of North American Mosquitoes (Diptera: Culicidae) to Transmit West Nile Virus. Journal of Medical Entomology 42 (1): 57-62.

PDMP Team Emergency Contact Information

Employee Name	ID #	License #	Home # - H Cell # - C		Direct Connect (180*17847*)	PDMP Team Code*
Jack A. Card Jr.	04	02971	H	(978) 463-0887	2	a,b,c
			C	(508) 726-0185		
William Montgomery	06	03312	H	(978) 546-3204	9	a,c
			C	(978) 375-7502		
Timothy Hay	08	02655	H	(978) 465-2145	10	a,c
			C	(978) 815-8110		
Emily Sullivan	13	18521	H	(978) 465-0482	6	a,b,c
			C	(508) 726-0186		
Robyn Januszewski	20	25996	H	(978)360-0811	12	a,c School Contact
			C	(508) 726-1007		
William Mehaffey, Jr	21	26947	H	(978) 948-7084	7	a,b,c
			C	(508) 726-0190		
Esteban Cuebas-Incle	23		H	(978) 465-3016	17	a,b,c
			C	(978) 479-5530		
Anthony Corricelli	28	33577	H	(978) 768-3536	4	a,c
			C	(978) 375-7205		
Dennis Gallant	29	32976	H	(978) 356-0030	14	a,c
			C	(978) 375-9443		
Maureen Douglas	30		H	(603) 434-6420	3	
			C	(508) 726-2961		
Hawk Baxter	31	35891	H	(978) 417-6503	1	a,c
			C	(508) 726-2860		
Ted Tartarzzuk	32	37732	H	(978) 373-0989	8	a,c
			C	(508) 726-4329		
Richard Caron	34		H	(978) 518-2593	13	
			C	(978) 360-7088		
Ross Mehaffey	25	31945	H	(978) 948-7084	15	a,c
			C	(978) 360-7112		
JBI, Helicopters 720 Clough Mill Road Pembroke, NH 03275 Owner: Ray Newcomb	Private Contractor: Aerial Larviciding Applications		Services: Applicator, Spray Equipment, Mapping and Records		NEMMC Assistance: Set-up, ground work, loading and in flight application spotting	

In Case of Pesticide Related Emergency call:
MA Pesticide Bureau at (617) 727-7712

National Response Center: (800) 424-8802
George Papadopoulos: EPA (617) 918-1579

Parker River Wildlife Refuge: (978) 465-5753
MA FWS: (617) 626-1500

NHESP: (508) 389-6300
NMFS: (978) 281-9300

*** a** = Person(s) responsible for managing pests in relation to the pest management area
b = Person(s) responsible for developing and revising the PDMP
c = Person(s) responsible for developing, revising and implementing corrective actions and other effluent limitation requirements

MUNICIPAL AND OTHER EMERGENCY NUMBERS

Poison Control: (800) 682-9211

MA State Police

Danvers: (978) 538-6161 Newbury: (978) 462-7478 Revere: (781)284-0038

Town/City	Police	Fire
Amesbury	978-388-1217	978-388-1333
Andover	978-475-0411	978-475-1281
Beverly	978-922-1212	978-922-2424
Boxford	978-887-8135	978-887-8137
Danvers	978-774-1213	978-774-2425
Essex	978-768-6200	978-768-6363
Georgetown	978-352-5700	978-352-5757
Gloucester	978-283-1212	978-281-9760
Groveland	978-521-1212	978-374-1923
Hamilton	978-468-1212	978-468-5558
Ipswich	978-356-4343	978-356-4321
Lynn	781-595-2000	781-593-1234
Lynnfield	781-334-3132	781-334-5152
Manchester	978-526-1212	978-526-4040
Marblehead	781-631-1212	781-631-0142
Middleton	978-774-4424	978-774-2466
Merrimac	978-346-8321	978-346-8111
Methuen	978-794-3245	978-794-3252
Nahant	781-581-1212	781-581-1234
Newbury	978-462-4440	978-462-2282
Newburyport	978-462-4411	978-465-4427
North Andover	978-683-3168	978-688-9590
Peabody	978-531-1226	978-531-3444
Revere	781-284-1212	781-286-8366
Rowley	978-948-7644	978-948-3812
Salem	978-744-0171	978-744-1235
Salisbury	978-465-3121	978-465-3631
Saugus	781-233-1740	781-233-4155
Swampscott	781-595-1111	781-595-4050
Topsfield	978-887-6533	978-887-5148
Wenham	978-468-4000	978-468-5508
Winthrop	781-846-1212	781-846-3474
West Newbury	978-363-1213	978-363-1111

POLICY, PROCEDURE AND FACTS: GENERAL OPERATIONS
Original: 01/00 - Revised: 04/11

Best Management Practice Plan: A regional or area wide approach is perhaps the most effective way to reduce mosquito populations however it may not necessarily address particular needs and concerns of individual municipalities. In 1992 the Districted adopted a policy of developing Best Management Practice Plans (BMPs) for each of its member municipalities. BMPs are designed to provide the greatest measure of relief and/or reduction in disease risk levels by focusing on dominant mosquito problems and preemptive vector/virus intervention. Details within a BMP are based upon IPM operational strategies which have been developed from historic surveillance data and practical knowledge of mosquito populations, habitat type and their proximity to human populations. BMP options may include but are not necessarily limited to larviciding, adulticiding, wetland management activities, inspectional services, outreach and education, and research and development.

Individual BMPs either have already been or will be (in the case of newly joined municipalities) developed for all District member municipalities. BMPs are designed to be cost effective and environmentally sound but are essentially based on a municipality's assessment and the specific needs and concerns as voiced by the municipality. BMPs provide a breakdown of the District budget for each municipality including administrative, general operation cost share and percentage of assessment designated to specific control measure within the municipality.

The District annually makes recommendations for revisions which reflect current trends in relation to public health and human annoyance factors. All BMPs are reviewed annually at the discretion of each member municipality by one or more of the following municipal boards or public official: Board of Selectmen, City Council, Board of Health, Health Agent/Director, and / or Public Works Director.

Operational Standards: All District operations are governed by written policies and procedures which comprise the District's Operations Manual. Technicians are required to complete daily reports of operational activities which are available to municipal officials upon request. The District also publishes an Annual Report of regional activities on its website. See http://northeastmassmosquito.com/ for details.

District Personnel: All Field Technicians are state certified and must regularly attend training sessions to maintain their certification. Technicians implement control measures in accordance with the written policies, procedures and performance standards as outlined in the District's Operations Manual.

POLICY, PROCEDURE AND FACTS: IPM CONTROL STRATEGIES
Original: 01/00 - Merged: 04/11

Best Management Practice Plan: A Best Management Practice Plan (BMP) will be developed for all Northeast Massachusetts Mosquito Control and Wetlands Management District member municipalities. BMPs are based on a municipality's assessment and the specific needs and concerns of the community. BMPs are designed to be cost effective and environmentally sound. BMPs are based upon IPM operational strategies which have been developed from historic data and practical knowledge of mosquito populations, habitat and their proximity to human populations. All BMPs are revised and reviewed annually by municipal boards of health. Revisions reflect current trends in relation to public health and human annoyance factors.

Adult Mosquito Surveillance: The District has collected as many as 47 different species of mosquito from its territory. Approximately 12 of these species are significant in terms of public health, human nuisance and quality of life. Different mosquito species have different larval development habitat preferences and host seeking behaviors. All mosquito species have one thing in common; the female must have a blood meal before she can lay eggs. The key to managing mosquito populations efficiently and effectively is often based on understanding the interaction between mosquito and host. Adult Mosquito Surveillance provides data relative to mosquito species, numbers, and potential for disease prevalence and is used for determining operational strategies.

Inspectional Services: 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. The District carries no regulatory authority nor is it our intention to impose upon any citizen or business but to rather be a source of information to help people prevent or abate mosquitoes to the mutual benefit of the community. The District may act as technical advisor as requested by local boards of health to represent the municipalities' public and animal health as well as human annoyance concerns relative to factors effecting mosquito populations (potential and realized). The District may also review proposed new development site plans upon request and /or inspect sites where storm water control structures are located or are in the process of being constructed. Upon inspection of a site the District makes written recommendations and submits them to the Board of Health, cc-ing the land owner. The District will routinely inspect areas around industrial facilities, office parks, and agricultural based operations because of the potential for Culex species proliferation and its correlation to West Nile Virus.

Larvicide Application: Larviciding is the application of an insecticide to various fresh or salt water habitats. Larviciding controls aquatic stages of the mosquito and prevent emergence of adult mosquitoes. These targeted preemptive control measures are the most cost effective, efficient and environmentally friendly way to reduce mosquito populations. The District maintains an historic data base of known larval development sites which are checked and treated by means of hand, power equipment or by aerial application. The District mainly uses Bacillus products for larviciding. Bacillus is a

naturally occurring bacterium that has been formulated into a larvicide very specific to mosquitoes.

Ground Larviciding - Catch Basin: The District applies an insecticide to catch basins and other storm water control structures to control aquatic stages of the mosquito and prevent emergence of adult mosquitoes. The District uses Methoprene and Bacillus products.

Ground Larviciding - Storm Water Control Structure: The District applies a larvicide to storm water control structures to control aquatic stages of the mosquito and prevent emergence of adult mosquitoes. The District uses Methoprene and Bacillus products.

Aerial Larviciding – Fresh Water: The District conducts site specific application of an insecticide to fresh water wetlands to control mosquitoes in their immature aquatic stages and before they emerge as adult mosquitoes. Larviciding applications typically are conducted in the spring months (March – May). The application targets early season nuisance species such as *Aedes canadensis* a very pestiferous species to humans.

Aerial Larviciding – Salt Water: The District conducts site specific applications of an insecticide to salt water wetlands to control mosquitoes in their immature aquatic stages and before they emerge as adult mosquitoes. Salt marsh mosquitoes such as *Aedes sollicitans* are known for their aggressive day-time biting behavior and thrive all season long producing multiple broods

Adulticide Application: Adulticiding is a term used to describe the application of an insecticide for the purpose of controlling adult/ flying mosquitoes. There are three methods of delivering the insecticide. Aerial adulticide applications typically use a fixed wing aircraft or helicopter. Aerial adulticide applications are only conducted in the event of a public health emergency. (See the District's 2011 Vector Management Plan for more details).

Ground adulticiding applications typically use a small pick-up truck equipped with a spraying apparatus. Ground applications can further be distinguished in 2 categories: Ultra Low Volume (ULV) or Barrier treatments. Adulticiding can be targeted or wide area application in response to surveillance data, board of health request, complaints or as a disease intervention measure.

Ultra Low Volume Applications: ULV applications are used for "road side spraying" operations. The District dispenses a relatively minimal amount of insecticide by using a truck mounted ultra low volume non-thermal aerosol sprayer.

Barrier Applications: Barrier applications are used on public use areas such as, parks, play grounds, athletic fields and school grounds. Pesticides used in barrier applications have a longer residual effect and thereby reduce the need for repeated ULV applications

Wetland Management Activities: The District conducts wetland management activities in both fresh and salt water habitats. The Wetland Management Program offers a variety of techniques to improve flow and reduce stagnant water which are favored for mosquito larval development. These practices provide predator access to mosquito larvae and may also potentially enhance mosquito predator habitat. Manual work may be performed during the mosquito season in the course of larviciding and/or catch basin treatments. Field Technicians remove sedimentation, vegetation and/or debris which obstruct flow in waterways. Mechanized projects may be performed utilizing the District's specialized low ground pressure equipment.

Herbicide Application:
The District performs ground herbiciding applications to invasive plant species which if left untreated would obstruct, prohibit, or potentially expand into or otherwise negatively impact water flow and mosquito predator survival/access to potential or known mosquito larval development habitat. The District works alongside multiple project partners (private, state and federal) to identify, evaluate monitor sites, arranging for treatment as feasible. Invasive plant species management has become an important part of the District's efforts to promote biological integrity and species diversity; both key issues for sustaining healthy wetland communities which provide essential elements for the survival of mosquito predator species.

Education and Outreach: The District is available to present educational and informative talks and/or displays relative to mosquito control at participating member municipality schools, civic organizations and public forums. The District is active in several groups regionally promoting the concept of IPM and the significance of public health as it relates to mosquitoes.

Research and Development: The District will research new technologies, methods and procedures to evaluate their implication for use in member municipalities.

POLICY, PROCEDURE AND FACTS: ADULT MOSQUITO SURVEILLANCE
Original: 01/00 - Merged: 04/11

General: The District has collected as many as 47 different species of mosquito from its territory. Approximately 12 of these species are significant in terms of public health, human nuisance and quality of life. Different mosquito species have different larval development habitat preferences and host seeking behaviors. All mosquito species have one thing in common; the female must have a blood meal before she can lay eggs. The key to managing mosquito populations efficiently and effectively is often based on understanding the interaction between mosquito and host. Adult Mosquito Surveillance provides data relative to mosquito species, numbers, and potential for disease prevalence and is used for determining operational strategies.

Light Trap: A light trap is a device used to collect adult mosquitoes. It consists of a fan, a light, a Carbon dioxide dispensing device and a collection net. Female mosquitoes looking for a blood meal are attracted to the C02 and are drawn into the net by the fan. The District maintains one light trap in each member municipality in a fixed location. This fixed location makes it useful to monitor long term trends, short term events which require response and the effectiveness of control measures. The District also operates portable traps which can be deployed at short notice in response to data from fixed light traps, complaints or vector surveillance information.

Gravid Trap: A gravid trap is a device used to collect container breeding vector mosquito species. The trap consists of a pan of highly organic water spanned by a collection chamber with fan. Female mosquitoes land on the surface of the water to deposit eggs and are drawn into the collection chamber by the fan. The District has one gravid trap in each member municipality in a fixed location. This fixed location makes it useful to monitor long term trends, short term events which require response and the effectiveness of control measures. The District also operates portable traps which can be deployed at short notice in response to data from fixed light traps, complaints or vector surveillance information.

Resting Box Trap: A resting box trap is a device designed to collect blood fed female *Culiseta melanura* mosquitoes, the principle vectors of Eastern Equine Encephalitis Virus, EEE. Resting box traps have demonstrated to be an efficient and affective tool in collecting this species. Most of the District's EEE virus isolations to date have come from mosquitoes collected in resting boxes. Resting box traps are deployed in municipalities which exhibit strong prevalence for disease incidence or anticipated EEE activity.

Landing Rates Count: A landing rate count, (LRC) quantifies the number of mosquitoes to land on an individual within a specified amount of time. Mosquitoes can be collected in a device called an aspirator for species identification. This method has been used in response to complaints and can be helpful in determining the source of the mosquito problem. With increased disease prevalence throughout District territory the District is less inclined to perform this methodology.

Species Identification: Live mosquitoes from LRC, fixed location light, gravid and resting box traps are collected twice weekly from around May 1st to September 30th. Mosquitoes are identified and samples sent to Massachusetts Department of Public Health for virus testing.

POLICY, PROCEDURE AND FACTS: INSPECTIONAL SERVICES
Original: 02/09 - Merged: 04/11

General: Existing and potential mosquito development habitats can often be readily corrected without treatment of an insecticide if early intervention actions are conducted. 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. The District carries no regulatory authority nor is it our intention to impose upon any citizen or business but to rather be a source of information to help people prevent or abate mosquitoes to the mutual benefit of the community. The District may act as technical advisor as requested by local boards of health to represent the municipalities' public and animal health as well as human annoyance concerns relative to factors effecting mosquito populations (potential and realized).

The primary vector species of West Nile Virus, *Culex pipiens* usually breeds in artificial containers, catch basins, storm water control structures, and other highly organic and polluted water. Therefore the District will routinely inspect areas in and around industrial facilities, office parks, and agricultural based operations because of the potential for Culex species proliferation and its correlation to West Nile Virus by request of the Board of Health. The District may review proposed new development site plans upon request and /or inspect sites where storm water control structures are located or are in the process of being constructed. Upon inspection of a site the District makes written recommendations and submits them to the Board of Health, cc-ing the land owner.

The District has recently found that in many cases, routine maintenance practices on private properties have been abandoned in lieu of recent economic decline. Neglect often leads to increased potential for mosquito larval development habitat i.e., discarded items in and around yards like trash, tarps, debris, abandoned swimming pools etc. The District works with local boards of health to assist in abating mosquito issues related to abandoned/neglected properties.

POLICY, PROCEDURE AND FACTS: ALL PESTICIDE APPLICATIONS
Original: 2/94 - Revised: 01/98, 01/07 – Merged: 04/11

General: All District pesticide applications shall be executed in accordance with all applicable federal and state regulation and guidance, as detailed in label directions and at label specified application rates, see below. All pesticides will be applied in strict compliance with the District's Vector Management Plan (VMP) and/or individual municipalities' Best Management Practice Plan (BMP). Hard copies of all the regulation, guidance and plans are available at District headquarters. Links to the following regulations: the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), National Pollutant Discharge Elimination System (NPDES) Draft Final Pesticide General Permit, the Code of Massachusetts Regulation (CMR) 333: Pesticide Board, MA General Laws Chapter 132b: MA Pesticide Control Act, Chapter 85 of the Acts of 2000: MA Children's Protection Act, MA Endangered Species Act (MESA), the MA Generic Environmental Impact Report (GEIR) and updates, the District's VMP and individual municipality BMPs can be found by accessing the District's website: http://northeastmassmosquito.com/ .

For any given application the District's pesticide of choice may be determined by factors such as but not limited to; life stage, Best Management Practice Plans per individual municipality, habitat characteristics, extent of population, current/predicted weather conditions, site conditions, and water quality etc. Often these factors are evaluated in the field using best professional judgment. Applicators then apply the minimum amount (and in concurrence with label specifications) to successfully treat the target. The District will not exceed label recommendations for frequency of application for any of its products, typically falling well below legal limits for re-application of pesticide products applied.

Pesticide Exempt Properties: The District will honor all individual and municipal requests for exempting properties from pesticide application. The District updates its "No Spray" list daily or as needed for inclusion in all District vehicle Operations Manuals.

Identification: District uniformed Field Technicians will display or have on their person a current MA pesticide license and District issued identification card during all pesticide applications.

Personal Protective Equipment: All District personnel will wear the appropriate personal protective clothing and equipment (PPE) as required by pesticide label specifications when mixing, handling or applying any pesticide. District vehicles are equipped with a standard spill kit, first aid kit, all current Material Safety Data Sheets (MSDS) and Operations Manual containing all policy and procedure for pesticide applications. Hard copies of the Operations Manual and MSDS for currently used products are available at District headquarters. Links are also provided on the District's web site: http://northeastmassmosquito.com/

Equipment Maintenance and Inspection: District Field Technicians maintain the equipment as recommended by the manufacturer as needed and once annually the equipment is thoroughly broken down, cleaned and securely stored for the off-season. Pre-application inspections are

conducted on all equipment used in the pesticide application to ensure safe, efficient and proper operation.

Record Keeping: Field Technicians will keep true and accurate records of each insecticide application in strict accordance with all applicable federal and state regulations and guidance. Field Technicians are required to complete a Record of Pesticide Applied Report which is accompanied by one or more of the following as appropriate: Adulticiding, Larviciding or Catch Basin Report. Field technicians may be asked to depict location of treatments on a map to further identify the application. In the event of a spill, complaint or confrontation, emergency or accident associated with the application of pesticides the Field Technician completes an Adverse Incident Report. For more details see the Districts' Policy and Procedure for Pesticide Spill.

Securing Equipment and Pesticides: District personnel will ensure that; all pesticides are properly marked with an approved pesticide label, all pesticides are secured in a proper fashion to prevent spillage while in transport, all pesticides being stored temporarily (overnight) will be locked inside the vehicle, all pesticides will be returned to the appropriate storage facility when not in use, and all used pesticide containers will be disposed of in accordance with label directions in a timely fashion.

conducted on all equipment used in the pesticide application to ensure safe, efficient and proper operation.

Record Keeping: Field Technicians will keep true and accurate records of each insecticide application in strict accordance with all applicable federal and state regulations and guidance. Field Technicians are required to complete a Record of Pesticide Applied Report which is accompanied by one or more of the following as appropriate: Adulticiding, Larviciding or Catch Basin Report. Field technicians may be asked to depict location of treatments on a map to further identify the application. In the event of a spill, complaint or confrontation, emergency or accident associated with the application of pesticides the Field Technician completes an Adverse Incident Report. For more details see the Districts' Policy and Procedure for Pesticide Spill.

Securing Equipment and Pesticides: District personnel will ensure that; all pesticides are properly marked with an approved pesticide label, all pesticides are secured in a proper fashion to prevent spillage while in transport, all pesticides being stored temporarily (overnight) will be locked inside the vehicle, all pesticides will be returned to the appropriate storage facility when not in use, and all used pesticide containers will be disposed of in accordance with label directions in a timely fashion.

POLICY, PROCEDURE AND FACTS: VEHICULAR ACCIDENT - PESTICIDE SPILL
Original: 4/11

General: In the event of a vehicular accident or pesticide spill emergency District personnel are trained to first ensure the immediate health of any exposed individuals which may require contacting emergency personnel (i.e., 911). Once it is established there is no immediate threat to a person(s) District personnel will verify the security of all pesticides on board.

Vehicular Accident Only: District personnel exchange registration papers, license and contact information. Pictures should be taken to document the scene, vehicles and visual damages. District personnel notify the Director or Operations Manager and are responsible for filing all necessary paper work in a timely manner: police report (1 copy delivered to Police Department), 1 copy to District Headquarters along with a complete Adverse Incident Report and developed pictures. District personnel assist the Director or Operations Manager in any manner that is required regarding the insurance (and/or adjustor), the Commonwealth of MA, and the auto repair shop. If District personnel are contacted by anyone other than AG office they will refuse to answer and notify the Director/ Operations Manager.

Pesticide Spill: District personnel are instructed to prohibit further spillage, contain existing spillage and minimize contamination of the environment. Once all reasonable efforts to contain the spill are taken District personnel contact headquarters, request assistance if necessary and relay details specific to the incident such as: the nature of the emergency, any injury noted, personnel involved, time, location, product spilled, volume and/or duration of event. District personnel will work together to determine whether and which other stakeholders may need to be notified. The MA Pesticide Bureau and the EPA are notified (phone call) of all spills within 24 hours at the numbers listed in the Adverse Incident Report. The MA Pesticide Bureau and the EPA are provided written notice within 30 days.

Emergency Contact Information: All District vehicles are equipped with an Operations Manual which maintains a complete listing of emergency numbers specific to District member municipalities, agencies and local stakeholders.

Emergency Spill Kit: All District vehicles used for transportation and/or application of pesticides are equipped with a first aid kit, an emergency spill kit and an Operations Manual. A spill kit minimally consists of PDMP Team and Emergency Contact #s, a pair of disposable coveralls, a pair of safety glasses, a pair of rubber gloves, two pounds of speedy dry, absorbent pads, a dust pan and brush, two contractor trash bags, label marker (i.e., sharpie) and a container with a secure cover.

Spill Cleanup Procedure: In the event of a small pesticide spill, technicians will put on disposable coveralls, safety glasses and gloves. The spill is covered with speedy dry and/or absorbent pads. Once absorbed pads and/or speedy dry is placed in the plastic bag and secured in the container. Coveralls are removed and placed in the container which is secured with a cover and labeled. The container is brought to headquarters for proper disposal. If a spill threatens to contaminate wetland District personnel may dig earthen dikes or block culvert inlets to contain or prevent further contamination down gradient.

Record Keeping: District personnel are required to document any spill, complaint/ confrontation, emergency or accident associated with the application of pesticides. The Field Technician(s) is responsible for completing an Adverse Incident Report as specified and in accordance with regulations.

POLICY, PROCEDURE AND FACTS: LARVICIDING – GENERAL GROUND
Original: 2/94 - Revised: 1/98, 1/07 - Merged: 04/11

General: Ground larviciding is a site specific application of an insecticide to potential and/or realized mosquito larval habitat (i.e., wetland) to control mosquitoes in their aquatic stages before they emerge as adult mosquitoes. The Operations Manager assigns Field Technicians to specific areas within District territory. Field Technicians inspect and treat known larval development sites from the District's data base within their assigned area.

Historic Mosquito Larval Development Sites: The District has an extensive data base defining potential and/or realized mosquito larval habitat throughout the service area. Sites from the data base are inspected and treated in accordance with BMPs for each member municipality. The District continues to document breeding history for each of these sites ie, dip data to establish a breeding history, prioritize sites and provide justification for wetlands management site selection. If larval development site changes have occurred Field Technicians note all discrepancies and submit it with their Larviciding Report.

Site Inspection: Field Technicians sample for immature aquatic mosquito stages by taking 10 dips of water with a standard white 250 – 300 ml dipper. Field Technicians are trained to identify and select the most suitable mosquito habitat for each dip location. All immature mosquito stages are counted for each dip and recorded on a Larviciding Report (including location). A maximum of thirty (30) larvae/pupae per dip are counted. Ultimately Field Technician uses their best professional judgment to determine whether or not a site will be treated but many factors are considered including; # of mosquitoes, stage of mosquito, amount of water, water temperature, time of season, possibility of site to dry back prior to emergence and anticipated weather conditions at the site.

Application: When Field Technicians determine that an application is necessary a pesticide (typically Bti, *Bacillus Thuringiensis var. israelensis*) is applied to the site by means of hand or power equipment. Bti is a naturally occurring bacterium which is non-toxic to people, birds, fish and bees. Bti is non-toxic to most insect species except mosquito larva and a few other closely related aquatic insects in the fly family.

> Freshwater: Ground larviciding efforts will be restricted to small areas that can be treated in a reasonable period of time. Ground larviciding efforts preferably occur in close proximity to residential or public use areas.
>
> Salt Marsh: As practical and following aerial salt marsh larviciding applications Field Technicians may conduct spot treatment of certain areas i.e., where poor or no control was noted, difficult to treat areas (adjacent to sensitive areas). This effort is conducted at the Field Technicians discretion or as directed by the Operations Manager.

POLICY, PROCEDURE AND FACTS: LARVICIDING - CATCH BASIN
Original: 1/03 - Revised: 1/07 – Merged: 04/11

General: A catch basin treatment involves the application of an insecticide to a catch basin or storm drain structure to control immature aquatic stages of mosquitoes before they emerge as adult mosquitoes. The District ramped up its catch basin treatment program in response to the introduction of West Nile Virus to the Unites States in 1999.

Culex mosquitoes are primarily responsible for the amplification of the West Nile Virus (WNV) cycle in birds. Culex mosquitoes are the primary vectors of this virus to humans. *Culex pipiens* prefer highly organic or polluted water that collects in artificial containers such as catch basins, storm water structures (detention and retention ponds), tires, gutters, bird baths etc. The preemptive strategy of treating catch basins in District municipalities has been effective at reducing the population of this and other species. Surveillance data shows an 80% reduction in Culex species in communities where basins are treated as compared to communities with untreated basins.

Catch basin applications are prioritized in communities with a higher risk of WNV prevalence in accordance with the District's annually revised Vector Management Plan (VMP) and or as specified in individual Best Management Practice Plans (BMPs). Because so many catch basins are treated on an annual basis in high risk areas the District is concerned with the potential for mosquitoes developing resistance to the products we use. Therefore the District may apply three different active ingredient products; bacillus, temephos and methoprene based in rotation.

Inspection: Field Technicians inspect each basin for condition; presence of water, flowing water, ability to hold water, and ability to dry back before treatment. Field Technicians use their best professional judgment when determining whether to treat a basin or not.

Catch Basin Treatment Table – Material, Rates and Total Finish Spray Applied

Pesticide	**Formulation**	**Application Rate / Basin**	**Total Finish Spray / 100 Basins**
Abate	Briquette	1 Briquette	100 Basins x 1 brq. = 100 briquettes
Altosid	Pellets	7 grams **or** 0.25 ounces **or** 2/3 of a tablespoon	100 Basins x 0.25 oz = 25 ounces
Altosid	WSP	1 packet	100 Basins x 1 pkt. = 100 packets
Altosid	XR	1 Briquette	100 Basins x 1 brq. = 100 briquettes
4-Star	Briquette	1 Briquette	100 Basins x 1 brq. = 100 briquettes
Vectolex	WDG	2 ounces	100 Basins x 2 oz = 200 ounces
Vectolex	WSP	1 packet	100 Basins x 1 pkt. = 100 packets.
Vectomax	WSP	1 packet	100 Basins x 1 pkt. = 100 packets

POLICY, PROCEDURE AND FACTS: LARVICIDING - STORM WATER CONTROL STRUCTURE

Original: 1/03 - Revised: 1/07 - Merged: 04/11

General: Current Strom Water Policy adopted by the MA Department of Environmental Protection (DEP) in November 1996, calls for installation of storm water control structures, wetland replication areas, and retention / detention ponds in association with new development impact. Dependent on design, artificially created habitats can hold water long after natural areas have dried back. The structures can become blocked with silt, road sand, and natural debris. They are favored places for dumping i.e., yard waste, Christmas trees, building debris, etc Poor maintenance practices promote conditions which favor mosquito development (highly organic) and poor water quality that is not conducive to mosquito predator survival. These structures can be prime habitat for vector species mosquitoes and are frequently situated in close proximity to human populations. Both *Culex pipiens*, the primary vector for West Nile Virus, and the recently discovered exotic species, *Aedes japonicus* not only thrive but prefer artificial, highly polluted and organic habitats.

Inspection: In the course of routine larviciding and catch basin treatment, storm water control structures will be inspected for aquatic life stages of mosquito and treated to prevent emergence of adult/flying mosquitoes. Field Technicians conduct dip samples to determine need for treatment of storm water control structures.

Historic Data Base Development: Increased numbers of SWCS may potentially expand the presence of West Nile Virus. Therefore the District is developing a data base, in order to prioritize sites in respect to known mosquito presence and habitat potential and develop appropriate control strategies and protocol. If the SWCS is not currently indicated on the data base the Field Technician notes the location and a brief description. These records are submitted to the Operations Manager for entry into the data base and further evaluation.

POLICY, PROCEDURE AND FACTS: LARVICIDING – AERIAL FRESH WATER
Original: Unknown - Merged: 04/11

General: Aerial fresh water larviciding is a site specific application of an insecticide to fresh water wetlands to control mosquitoes in their immature aquatic stages and before they emerge as adult mosquitoes. Aerial fresh water larviciding is typically conducted in the spring months (March – May). The application targets early season nuisance species such as *Aedes canadensis.*

Notification: The Director will publish an annual legal notice in February in accordance with 333 CMR 13.05. The legal notice provides general information about aerial fresh water larviciding applications, a contact person and telephone number. Specific dates and times of applications are determined by field surveillance data. Municipal Boards of Health and the MA Pesticide Bureau are notified by phone/fax prior to each application.

Pre-treatment Surveillance: The Operations Manager will assign Field Technicians to designated areas. Field Technicians observe fresh water wetland conditions relating to flooding scope and rainfall events. Field Technicians survey potential larval development habitat dipping randomly as needed to determine location, developmental stage and extent of the mosquito brood. Field Technicians establish 10 fully recoverable dip stations (RDS) for their designated area. Prior to application each RDS is sampled. Larval stage and number are recorded on the Aerial Larviciding Survey – Pre Treatment form.

Timing and Notice: The Operations Manager will determine the optimum time of the application based on pretreatment surveillance data, rain events, weather conditions, availability of aircraft and input from Field Technicians. The Operations Manager notifies and coordinates with airport personnel, property owners, local authorities, stakeholders and persons in charge of designated landing zones (LZ) as previously arranged. The Director notifies municipal health departments within the application area. Ideally, aerial applications are scheduled immediately upon finding uniformed distribution of early larval stages as applications are most effective at that time and the window of opportunity is short.

Application: When pre-treatment surveillance indicates an application is necessary, granular Bti is applied by helicopter. The District's material of choice is Bti (*Bacillus Thuringiensis var. israelensis*). Bti is a naturally occurring bacterium which is non-toxic to people, birds, fish and bees. Bti is non-toxic to most insect species except mosquito larva and a few other closely related aquatic insects in the fly family.

Landing Zone Operations: The Operations Manager will coordinate all LZ support operations such as water supply, pesticide supply, mixing, and formulation of finished spray and application rate, as well as record keeping. All data relative to the application is recorded in the Aerial Larviciding Report. Field Technicians are responsible for proper rinsing and disposal of pesticide containers.

Post-treatment Surveillance: Mosquito larval sites targeted during the application will be surveyed 24 hours after the application. Numerous random dip samples are taken as is necessary to determine the overall efficacy of the application. Previously sampled fully recoverable dip stations are revisited and count numbers recorded for comparison with pre-treatment survey.

POLICY, PROCEDURE AND FACTS: LARVICIDING - AERIAL SALT WATER
Original: 01/98 - Revised: 1/10 - Merged: 04/11

General: There are approximately 23,000 acres of salt marsh on the North Shore of Massachusetts stretching from Boston north to the New Hampshire border. Two species of salt marsh mosquitoes lay there eggs in moist muddy areas like salt pannes, depressions and overgrown ditches along the upper edges of the salt marsh. Flooding of the marsh, the result of monthly high run tides, storms or rain events, triggers the hatching of dormant mosquito eggs into mosquito larvae. The larvae then progress through a series of instars, pupating and then eventually emerging as adult mosquitoes. Under optimal conditions the whole process from egg to adult can occur in as little as four days. Salt marsh mosquitoes are known for their aggressive biting behavior even in the heat of daylight hours. If not controlled salt marsh mosquitoes can be present in large numbers from April through to September.

Pre Season Notification: The Director will publish an annual legal notice in February in accordance with 333 CMR 13.05. The legal notice provides general information about aerial salt marsh larviciding applications, a contact person and telephone number. Specific dates and times of applications are determined by field surveillance data. Municipal Boards of Health and the MA Pesticide Bureau are notified by phone/fax prior to each application.

Pre Treatment Surveillance: The Operations Manager will assign Field Technicians to designated areas. Field Technicians observe salt marsh conditions relating to tidal flooding and rainfall events. Field Technicians survey potential larval development habitat dipping randomly as needed to determine location, developmental stage and extent of the mosquito brood. Field Technicians establish 10 fully recoverable dip stations (RDS) for their designated area. Prior to application each RDS is sampled. Larval stage and number are recorded on the Aerial Larviciding Survey – Pre Treatment form.

Timing and Notice: The Operations Manager will determine the optimum time of each application based on pretreatment surveillance data, tides, weather conditions, availability of aircraft and input from Field Technicians. The Operations Manager notifies and coordinates with airport personnel, property owners, local authorities, stakeholders and persons in charge of designated landing zones (LZ) as previously arranged. The Director notifies municipal health departments within the application area.

Application: The District prefers to use a helicopter equipped with an 80 gallon spray tank and 250-300 micron rain drop style nozzles that mount on a spray boom which is capable of delivering an 80 foot swath for the application. District personnel assigned to conduct pre-surveillance of designated areas accompany the pilot during the application to assist in spotting targets and hazards in flight. The District's material of choice is a liquid formulation of Bti (*Bacillus Thuringiensis var. israelensis*). Bti is a naturally occurring bacterium which is non-toxic to people, birds, fish and bees. Bti is non-toxic to most insect species except mosquito larva and a few other closely related aquatic insects in the fly family.

Landing Zone Operations: The Operations Manager will coordinate all LZ support operations such as water supply, pesticide supply, mixing, and formulation of finished spray and application rate, as well as record keeping. All data relative to the application is recorded in the Aerial Larviciding Report. Field Technicians are responsible for proper rinsing and disposal of pesticide containers.

Post Treatment Surveillance: Field Technicians will survey sprayed sites after 24 hours post application. Field Technicians randomly dip as needed to determine the overall efficacy of the application. The 10 pre-selected RDS are sampled. Larval stages and number of dead/live/moribund are recorded on the Aerial Larviciding Survey – Post Treatment form for efficacy comparisons.

POLICY, PROCEDURE AND FACTS: ADULTICIDING – GROUND ULV
Original: 1/98 - Revised: 1/06, 3/06, 1/07, 1/10 - Merged: 04/11

General: Ultra Low Volume Applications (ULV) applications are done in response to surveillance data, multiple resident requests, municipal Health Department or other approved board request in accordance with the individual municipality BMP. The District uses truck mounted ultra low volume (ULV) non-thermal aerosol sprayers for selective, targeted and wide area applications. These high tech sprayers atomize the product resulting in droplets in the range of 8 to 15 microns. A small pickup trucks drive along the road travelling between 5 and 20 miles per hour. A computerized variable flow system automatically calibrates the correct amount of material applied and dispenses a mist like swath. Depending on wind direction the swath of tiny droplets can drift off the road up to 300 feet and impinge upon the flying mosquitoes and vegetation that they rest on. All ULV machines are independently calibrated and certified for accuracy on an annual basis.

Selective and Targeted ULV Applications: The District expects a minimum of two residential requests from the same vicinity before ground adulticiding. ULV application targets are determined by location and number of complaints and may include a street, section of a street, neighborhood, block or specified area as requested by the Health Department.

Wide Area ULV Applications: The District may make recommendations for a wide area ULV application in response to surveillance data and specific vector/virus threats in accordance with the District's VMP.

Insecticide: Currently the District uses the insecticide Anvil 10 + 10 for all ULV applications. The active ingredient in Anvil 10 + 10 is Sumithrin which has very low mammalian toxicity. This product is registered for use by the US EPA and the Massachusetts Pesticide Bureau. A label and Materials Safety Data Sheet are available upon request. All District-used product labels and MSDS can be viewed at http://northeastmassmosquito.com/ .

Timing of Application: ULV applications will be conducted during evening hours, after dusk, before dawn and as weather conditions permit. If any circumstances prevent safe or effective evening application then predawn application may be considered.

Post Application Security: Field Technicians cover the ULV sprayer when not in use.

POLICY, PROCEDURE AND FACTS: ADULTICIDING - GROUND BARRIER
Original: 1/10 Merged: 04/11

General: Pesticides used in barrier applications have a longer residual effect and thereby reduce the need for repeated ULV applications. Barrier applications are used on public use areas such as, parks, play grounds, athletic fields and school grounds in response to requests from school officials and municipal health departments or other approved board in accordance with individual municipality BMP or the District's VMP. Since barrier applications may be performed within areas that children frequent, all applications are conducted in strict accordance with the MA Children's Protection Act. The District only uses EPA registered pesticides approved by the MA Pesticide Bureau and in compliance with federal and state regulations.

Application: Barrier applications will be done by means of backpack or truck mounted barrier spray equipment. Truck mounted sprayers will be capable of delivering 1 gallon of mixed product per minute.

> Applications on School Property: Prior to the application the applicator will make sure that no student/child is present or that any student/child remains minimally at least 150 feet away form the treatment area. At the time of the application the applicator will post approved signs at conspicuous points of access to the treated areas.

Timing of Application: Barrier applications will be conducted during evening hours, after dusk, before dawn and as weather conditions permit. If any circumstances prevent safe or effective evening application then predawn application may be considered.

Insecticide: Currently the District is investigating potential products for use in this application.

Post Application Security: Field Technicians will disable the barrier sprayer when not in use.

POLICY, PROCEDURE AND FACTS: HERBICIDING – GROUND
Original: 01/12

General: The District performs ground herbiciding applications to invasive plant species which if left untreated would obstruct, prohibit, or potentially expand into or otherwise negatively impact water flow and mosquito predator survival/access to potential or known mosquito larval development habitat. The District works alongside multiple project partners (private, state and federal) to identify, evaluate monitor sites, arranging for treatment as feasible. Invasive plant species management has become an important part of the District's efforts to promote biological integrity and species diversity; both key issues for sustaining healthy wetland communities which provide essential elements for the survival of mosquito predator species.

Site Identification: Projects may be petitioned for in accordance with the District's Policy for Petitioning a Wetlands Management Project. Projects may also be identified in the course of day to day activities of District personnel. Currently the Wetlands projects Coordinator participates on the MA-NH-ME Invasives Group and is a member of the Great Marsh Task Force and its Research Subcommittee.

Species of Concern: At present, *Phragmites australis* (Phragmites) and more recently *Lepidium latifolium* (perennial pepperweed) are the primary focus of invasive plant management for the District. There are other invasive species of concern that may eventually or site specifically warrant consideration for inclusion in the District's program and these are typically found in and around the wetland habitat usually but not always in areas of previous disturbance.

Herbicide Products: The District has or anticipates using any of the following materials: Accord Concentrate: EPA Reg.# 62719-324, Escort XP: EPA Reg.# 352-439, Rodeo: EPA Reg.# 524-343, and Habitat: EPA Reg.# 241-426. All products are EPA registered, approved for use by the MA Pesticide Board. All products are labeled for use in aquatic environments with the exception of Escort which is only applied above mean high water and never directly applied to: water or areas where surface water is present. All products are applied; at label-recommended rates and concentrations, sprayed directly onto the invasive plant species using best management practices, with considerations such as but not limited to wind, relative humidity, predicted precipitation and tidal influence. To minimize any potential drift applicators do not apply in strong winds nor at flood tides to prevent direct water contact.

At present, the District applies products containing "glyphosate" for the control of Phragmites and "metsulfuron methyl" based products for controlling pepperweed. The District is currently evaluating evidence which demonstrates more efficacious control of Phragmites by mixing "imazypyr" in with the "glyphosate" solution for possible use in the program. The science and technology behind controlling invasives and the possibility for identification of new species is ever expanding the District may edit/adapt its herbicide use and control methods as appropriate.

Application Methods: Herbicides are ground applied by several methods: back pack sprayer, hand pump/canister or high volume spray equipment (mounted in the back of specialized low ground pressure equipment). The District determines the optimal method for application by evaluating many factors including but not limited to site characteristics, presence of sensitive species, proximity to non-targets, weather, etc.

POLICY, PROCEDURE AND FACTS: EFFICACY AND RESISTANCE EVALUATION
Original: 11/07 – Revised: 12/08 - Merged: 04/11

General: The effectiveness of the products used by the District to manage mosquito populations can never be assumed. Therefore, the District Biologist will use widely accepted industry practice to evaluate for proper operational application procedures and mosquito resistance to insecticides in larval, adult and catch basin treatment.

Aerial Larviciding: Efficacy is evaluated in accordance with the District's Policy and Procedures for Aerial Fresh Water and Salt Marsh Larviciding. Efficacy of each application is measured. Pre and post-treatment dip samples are taken by Field Technicians from ten pre-chosen and fully recoverable dip stations in each municipality.

Ground Larviciding: The District Biologist will annually evaluate the efficacy of each product used for larviciding. The Biologist coordinates with the Operations Manager and/or Field Technicians to locate sites previously larvicided then randomly selects a representative sample of sites treated. Dip samples are collected no sooner then twenty four hours post application. The Biologist compares pre-application dip sample numbers recorded by the applicator with the post-application dip sample numbers.

Catch Basin Treatments: The District Biologist will annually evaluate the efficacy of the product currently being used for treating catch basins. The Biologist coordinates with the Operations Manager and/or Field Technicians to locate catch basin treatment areas randomly selecting a representative sample of those sites treated. Dip samples are collected no sooner then twenty four hours post application. When Altosid is used, dip samples from treated basins are reared to see if they expire prior to adult emergence.

Adulticiding: The District Biologist will annually set up field trial(s) using caged mosquitoes. Predetermined numbers of mosquitoes are placed in cages at 50 foot intervals for 300 feet in both open and vegetated areas. Spray vehicles make one pass upwind of caged mosquitoes. Live/dead caged mosquitoes are counted post-treatment to determine efficacy.

Resistance: The District Biologist will annually evaluate potential mosquito resistance to current District applied larviciding products, catch basin treatment products and adulticiding products by observing for emergence in the field and laboratory settings.

Efficacy and Resistance Evaluation Report: The District Biologist will annually summarize efficacy and resistance findings in a written report which is included in the District's Annual Report

POLICY, PROCEDURE AND FACTS: RESEARCH AND DEVELOPMENT
Original: Unknown – Merged: 04/11

General: The District's Research and Development Program has grown out of direct need for new and improved but practical operational applications for controlling mosquitoes. Mosquito control has operated on the same basic principles for decades with little or no change. Over the course of roughly twenty five years the District challenged even the most basic principles of mosquito control (i.e., draining stagnant water) by incorporating the practice of Open Marsh Water Management, OMWM into its control toolbox. Though originally it was felt that grid ditching was the best practice for eliminating mosquito habitat, the District efforts soon proved differently. OMWM principles rely on increasing water depths and preventing drainage by accentuating marsh features like ponds and pannes. These natural features serve as reservoirs for mosquito eating fish and provide access for fish to mosquito breeding areas through radial connectors. OMWM has enhanced or created habitat for water fowl and wading shore birds while simultaneously controlling upwards of 90% of the resident mosquito population.

Previous efforts spent on Research and Development in the profession revealed truly remarkable pesticide products like *Bacillus thuringiensis israelensis* (Bti). Bti is a naturally occurring bacterium which is non-toxic to people, birds, fish and bees. Bti is non-toxic to most insect species except mosquito larva and a few other closely related aquatic insects in the fly family. Extensive research and development went into evolving the old “mist blower” spray apparatus into the new ultra low volume non-thermal aerosol foggers of today. Mist blowers dispensed gallons of insecticide over small scale areas and short distances. ULV spray technology operates on the principle of "atomizing" insecticides into extremely tiny molecular droplets (8 to 15 micron average). This is not only a more economical treatment but also more effective as well as environmentally preferable using less active material (0.1-7 ounces per acre).

With the introduction of foreign mosquito species and increased public health concerns regarding potential introduction of new disease, the profession of mosquito control has changed more over the last decade then it has since its inception. Research and development is often a seamless part of our operational program and is conducted in partnership with the academic and research communities. Our objective is to continually explore new opportunities, apply theories and expand operational strategies with cost-effectiveness, efficiency, and environmental sensitivity.

Some of the current research being conducted by District staff: Beaver Impacts, Greenhead Trap Design, Wetland Management Techniques and a Pilot Tire Recycling Program.

Appendix 1: Example Best Management Practice Plan

Commonwealth of Massachusetts
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT
261 Northern Boulevard, Plum Island
Newburyport, MA 01950
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Best Management Practice Plan

Peabody

Revised: 1/99 1/00 1/01 1/02 2/03 3/04 11/04 1/06 1/07 1/08 1/09 1/10 1/11

Mosquito/Arbovirus Surveillance Summary

Introduction

Although forty-nine species of mosquitoes reside in Massachusetts, only about a dozen are of concern to the public. The concern is not primarily of their biting activity, which can be of great nuisance by itself. However, it's the ability of mosquitoes to transmit microorganisms that cause painful, debilitating, and fatal diseases to our residents that is paramount. Furthermore, it is often not realized that mosquitoes can also cause economic losses to a community by driving away tourists and debilitating livestock. Therefore, it is important that a community keeps track of local mosquito activity and abundance to help protect the health of its residents and indirectly, to help maintain its economy. Vigilance on mosquito activity and abundance is the core of the mission of the Northeast Massachusetts Mosquito Control and Wetlands Management District. We possess the expertise and means which to keep tract of mosquito populations, the protocols and connections to state agencies to test for viruses mosquitoes may carry, and the experience and equipment to manage populations in both the short- and long-term. Our District's mosquito control operations have evolved from being fully "nuisance control" to more-and-more "vector management". With "vector management", our surveillance and control strategies are designed to identify, monitor, and control vectors of the principal arthropod-born viruses (or "arboviruses") of northeast Massachusetts, these being West Nile and Eastern Equine Encephalitis viruses.

The **Best Management Plan** presented here will present summaries for 2010 of mosquito and arbovirus activity in the District overall, then focus on such activities and our responses in your community. This will then be followed by preliminary plans (and costs) for surveillance and control, as to be agreed upon with your Board of Health in your municipality for 2011.

Northeast Massachusetts

Our mosquito surveillance program runs for approximately five months with at least one trapping station (each with two different kinds of traps) in each of the District's thirty-two subscribing municipalities. This arrangement allows for the capture of nearly all the mosquito species found in the District during most of the time people are engaged in extensive outdoor activities, from the middle of the spring until the beginning of the fall. This arrangement allows facilitates the detection of the two principal viruses ("arboviruses" in that these are

"**ar**thropod-**bo**rne **viruses**") transmitted in northeast Massachusetts, namely Eastern Equine Encephalitis virus ("EEEV") and west Nile Encephalitis virus (WNV").

The 2010 mosquito/arbovirus surveillance program began on May 10th and ended on September 29th. There were two collections per week in each of the thirty-two District cities and towns. Our EEEV-***Culiseta*** surveillance program began on June 14th and also ended on September 29th; ***Culiseta*** is the general name of mosquitoes that principally transmit EEEV to and from local birds. There were two collections per week at the nine ***Culiseta*** trapping sites along the border with New Hampshire; furthermore, additional traps were set in communities away from the NH border in response to 2009 EEEV-infected mosquito pools and animals. When necessary, additional traps were set to increase surveillance of mosquitoes transmitting WNV. These traps were set in communities with the following characteristics: exhibited recent histories of WNV activity, experienced unusual WNV-carrier ("vectors") population increases, and in periods when virus transmissions were suspected to be higher than usual.

All mosquitoes trapped were immediately identified, tallied, and recorded into our database. Just over 41,000 mosquitoes were collected total from all District towns in all three types of surveillance traps with the same numbers of traps and stations; over 78,000, nearly twice as many mosquitoes, were collected from the approximately the same number of traps in 2009. In fact, fewer mosquitoes were collected overall this year than in the previous five years. The reasons for this reduction are explained below. However, as will be explained as well, within the overall numbers this year, we experienced near-record highs of species that are excellent vectors of WNV; the result was that the District recorded more WNV-infected mosquito pools than ever, since the appearance of WNV in the District in 2000.

Specimens from the four species that best transmit EEEV and WNV were separated, packaged, cataloged, and shipped to the MA Department of Public Health's Arbovirus Surveillance Lab (DPH/ASL). These specimens (grouped into units called "pools") were tested for presence of these viruses. Specimens were sent on every Thursday beginning on July 1st, received the following day at the Lab where they were processed and tested. The "virus status" for each pool could be determined as early as the end of Friday (i.e., the day the pools were received); hence the reason why some Boards of Health were informed of virus collections, in their towns, in some late Friday afternoons. This year, there were **no** positive EEEV-infected pools in the District, however **twenty-one** WNV-infected pools were recovered (in North Andover, Methuen, Saugus, Lynn, Revere, and Winthrop). There was one human WNV case in Revere, a person aged over 65 who suffered from meningoencephalitis and who has reportedly recovered from the most obvious symptoms. (It should be noted that the status of recovery of arbovirus-infected patients is never reported; i.e., how well has infected patients recovered from their ailments is never discussed!) The Revere case was the first documented human case of WNV-associated disease in the District since 2002.

The District was initially charged a fee of $25 for each mosquito pool submitted for testing. However by mid-summer, there was a dramatic increase in infected pools state-wide and DPH/ASL received emergency funding to cover the costs of testing. Therefore, we were not charged for subsequent testing. With this "windfall", we not only increased the numbers of pools for testing of suspected vector species, but also send more specimens considered "bridge vectors" to be tested as well. Therefore, we sent 713 pools, as compared only 567 pools sent

last year (when Mosquito Control Projects, "MCP's", were charged for the first time for all pools submitted). 773 pools were submitted in 2008 and 849 pools in 2007 when MCP's were not charged.

As you all know, 2010 was a **most** unusual year, even more so than 2009 and 2008. The previous two years had the spring starting relatively dry with some communities experiencing droughts by June, and then came heavy rains in early and mid-summers. 2010, on the other hand started with a very wet early spring, with record rainfalls statewide in the end of March, and then drought conditions for the rest of the spring and into summer. The drought in the summer also coincided with a much warmer and more humid-than-normal conditions.

The results of this unusual weather year were some unusual records for the District: the earliest salt marsh larvicidal air spray (April 7th on a day that reached 90° F.!); the most larvicidal salt marsh-air sprays in many years (five air spray operations); the earliest adulticidal truck-spray (Lynnfield on May 7th); the lowest numbers of mosquitoes collected overall since 2003; most WNV-mosquito pools were collected in the District (twenty-one); most towns with at least one WNV-mosquito pool (six; tied with 2006); most WNV-mosquito pools from one town (North Andover with twelve pools); most weeks with WNV-mosquito pools collected from the same town (nine); most different locations in the same town where WNV-mosquito were collected (four); and the earliest recovered WNV-mosquito pool (collected on June 28th and 30th; announced on July 2nd).

From mid-April through mid-June, there is the annual emergence of mosquitoes (i.e., "Spring Brood") that develop in the waters resulting from the winter ice and snow. Over one-third of all District species develop at this time, and most of them only at this time of the year (most being species that have only one generation a year). As you can imagine, with all the water released from the winter's accumulations, these emergences can be most profound, dramatic, and most noticeable! However, with the 2010 spring drought, we had overall **much** lower-than-normal emergence of adult "Spring Brood" mosquitoes. There were "pockets" in the District where local hydrology allowed for abundant standing water to be present throughout the spring resulting in greater-than-usual populations of these mosquitoes, such as in Lynnfield. Some species can appear later in the year if abundant rainfall has accumulated for extended periods of time. Only after two episodes of heavy rains (late August and early September 2010) was sufficient water deposited in some floodplains and related habitats to allow for the development and emergence of adult floodwater mosquitoes. The emergence patterns were more like "sparks" that were maintained for only a few days and not sustained since the sources were not replenished with continuous rain. These mosquitoes include ***Aëdes cinereus***, ***Aë. canadensis***, and most famously, ***Aë. vexans***.

Although a notorious human biter, ***Aë. vexans*** is not a major player in arbovirus transmission unless it is abundant at the time of high arboviral "presence". This period occurs from late July through August when the greatest proportion of birds is infected with arboviruses. ***Aë. vexans*** not only bites humans, but can bite infected birds and "incubate" the viruses well enough to pass them onto humans at their next feeding. Therefore, when high populations of ***Aë. vexans*** are present, the probability of more infected blood-seeking mosquitoes increases thus, the risk to human infection by one of these infected mosquitoes also increases. This was the scenario that occurred in 2009 in New Hampshire and indeed, one of the EEEV-infected

mosquito pools collected in Merrimac in late August was ***Aë. vexans***. However, in 2010, no members of this species was found infected with EEEV and when the "sparks" of emergence appeared, these occurred primarily after the theoretical peak period of EEEV transmission.

Other mosquito species had their populations greatly affected by the unusual weather this year. Whereas salt marsh mosquito emergences & overall populations are governed by the tides, as well as by our aerial salt marsh larviciding program, the timing of rainfall will exert an influence. When heavy rains fell between "Spring tides" in late August and early September, more than usual emergences of both ***Aëdes sollicitans and Aë. cantator*** were recorded. This was especially true in the uppermost reaches of the marsh (areas normally more difficult to treat). There were greater-than-normal salt marsh mosquito emergences recorded in Ipswich in late July through early August because breeding areas here were not treated earlier in the month due to equipment malfunction.

Although far from being a salt marsh mosquito, one species collected in high abundance at one of our salt marsh traps was ***Aë. vexans***, the principal floodwater mosquito. This species was collected after the heavy rains of late August and early September. The source of this species may have been some distance away (this species can fly as much as 20 miles) but, more likely, came from nearby flooded freshwater sources. What this observation shows that even when salt marsh mosquito populations are controlled, fresh-water species breeding at/near salt marshes can still terrorize local residents!

Apparently, the lack of rainfall influenced greatly the abundance of the "Cattail Swamp/ Salt and Pepper mosquito", ***Coquillettidia perturbans***, with less than half collected compared to the year before. This is another once-a-year species and the bulk of its adult emergence usually occurs from mid-June through mid-July, "peaking" in early July, well before arboviruses have maximized their appearance (i.e., circulating in the bird-mosquito cycle). ***Cq. perturbans*** can bite infected birds as well as mammals and are considered a most "dangerous" bridge vector. However, a pattern has been seen developing in recent years in that enough adults continue emerging into late August; this pattern was seen again in 2010. Therefore, although in much lower numbers by mid-August, this species is present in enough numbers to pose a public health threat in mid-to-late summer if there is higher than usual circulation of endemic arboviruses. As in recent years, we did not send adults of this species for arboviral testing unless they were aged; none of the pools we sent were infected with EEEV. Increasing numbers of pools of this species from southeastern MA were infected, earlier in the season than usual, with EEEV, which caused state officials to declare a public health emergency and authorize an adulticidal air-spray in early August (discussed further below).

The extended drought also had a profound impact on tree-hole breeding mosquitoes, reducing their overall numbers by almost half. These species not only breed in tree holes, but also take advantage of water-filled artificial containers, which thanks to the drought, were not in any abundance. In particular, the "Japanese Rock pool mosquito" ***Aë. japonicus***, which is a notorious mammalian and human biting mosquito took a "big hit" in 2010. This species also can function as a "bridge vector" of locally transmitting arboviruses, thus pools were sent from areas with suspected high levels of arbovirus transmission in September. Fortunately, none were found infected.

With those species that transmit the endemic arboviruses, let us begin with EEEV. With the greater-than-normal populations of the principal vector, the Cedar Swamp mosquito (***Cs. melanura***) reproducing at the end of the 2009 season, it was expected that there would be greater numbers of overwintering larvae (this species survives the winter as larvae inside crypts in hummocks in hardwood swamps). There was the lack of a hard freezing winter in 2009-2010. These last two factors, together with the early spring heavy rains flooding their breeding sites, we expected greater spring adult emergence of ***Cs. melanura*** and for a while, this phenomenon was being observed. We observed earlier than usual emergences and in more areas than previously reported. Then the drought came "hard and fast" and this species declined hard in numbers for the rest of the season; in comparison to collections from Resting Box sites in 2009, there was over 650% decrease in overall ***Cs. melanura*** numbers collected in 2010; this pattern of low ***Cs. melanura*** collections was also repeated in our New Jersey traps. The low populations of ***Cs. melanura*** is the reason we believe why there was no EEEV detected in the District in 2010.

New Hampshire was also in a drought April until September and their ***Cs. melanura*** populations also took a "heavy hit" in 2010. No infected EEEV-infected pools were recovered and there was only one mammalian EEEV-infection, a horse in Freedom NH. Southeast Massachusetts was a different story however. The drought there was limited and with heavy rains returning in June, the numbers of infected mosquito pools by mid-July had increased alarmingly; 22 of the 65 infected EEEV pools were from bridge vectors (***Cq. perturbans*** and ***Aë. canadensis***). The rate of increase and the timing of the infections triggered an adulticidal air spray that was conducted in most of Plymouth and parts of Bristol counties on 6 & 7 August (285,000 acres sprayed). Statewide, there were four EEEV animal infections and one human case, but as discussed earlier, there were no mosquito, animal, or human infections with EEEV in 2010. If there is a pattern emerging with regards to EEEV appearance in northeast Massachusetts, it is that if it is a dry season, vector numbers will be very low, and EEEV collections will be minimal-to-none.

On the other hand, if it is a dry year, then WNV vector numbers will be high and WNV collections will increase. Whereas the heavy rains during the last two summers lead to much smaller-than-usual populations of these urban container-breeding ***Culex*** mosquitoes (***Cx. pipiens*** & ***Cx. restuan*s*)***, the much less rainfall this spring and summer (with the increased heat) led to near-high records for collections of the aforementioned ***Culex*** species. With their population increases, also increased were numbers of WNV-infected mosquito pools, as well as the risk to human infections with WNV. This basically what had happened in North Andover this year and to a lesser extent to Winthrop and Saugus, towns with multiple WNV-mosquito pools. The notion that these ***Culex*** species do well during drought conditions always seems counter-intuitive to normal mosquito ecology so their breeding habits must be always be further discussed.

These ***Culex*** mosquitoes "breed" in organically-polluted waters in pools that appear in greater and greater frequency during a drought, especially along the edges of drying swamps, ponds and lakes, as well as along drying rivers, streams, and brooks. The numbers of aquatic predators decline and the numbers of these ***Culex*** mosquitoes continue to increase (and at a faster rate due to the warmer temperatures of the pools as they dry). And since basically all of northeast Massachusetts is one giant freshwater swamp, drought conditions with excessive heat will create ideal conditions for great proliferation of these ***Culex*** species. Also, during

droughts, people tend to water their lawns more frequently (as well as wash their cars- who knows why?) and the excess water runs off into catch basins keeping them filled and thus creating more habitat for ***Culex*** breeding".

Most of the historically high-WNV risk communities had their catch basins treated by mid-summer, with some of them treated again in mid-to-late summer in response to WNV-mosquito collections. However in severe drought years, such as in 2010, treating basins may not enough to curb ***Culex*** population growths because there are so many more and varied habitats for their larvae to develop and adults to emerge. Also, collections from the Rumney Salt Marsh were made in early September (to determine extent of salt marsh mosquito populations) and to our surprise, the majority of mosquitoes collected were ***Culex pipiens***; these were also sent for testing and were also positive for WNV!

If there was a silver lining in the drought, it was that by the end of August, the drought became so severe that even the aforementioned ***Culex*** species were, for the most part, experiencing population declines! The exception was in North Andover. Statewide, the numbers of WNV-mosquito pools increased "astronomically" in 2010, with 121 positive mosquito pools (only 26 positive WNV pools were collected in 2009). The reason for the dramatic increase statewide (especially in the Boston-metro area) is the same as for our District, the increase in ***Cx. pipiens/restuans*** populations brought on by the season-long drought. There were seven WNV-human cases in Massachusetts (including one case in Revere), with one mortality, and just one WNV-human fatality in New Hampshire.

Peabody

Although mosquito populations decreased district-wide, they increased dramatically in Peabody. Closer examination of surveillance data showed that the bulk of the increase came not from the urban container-breeding mosquitoes ***Culex pipiens*** or ***Cx. restuans***, which were expected to increase, but from the cattail swamp mosquito ***Coquillettidia perturbans***. This species is probably the most abundant freshwater species (and human biter) in northeast Massachusetts and its annual populations do not strictly follow rainfall accumulation patterns. Populations may instead follow inherent parameters specific to the species and/or may be sensitive to local habitat changes/disruptions. Not all District communities where ***Cq. perturbans*** historically dominate did their populations increase in 2010 and last year may have been an "upswing" year in its cycle, at least in Peabody. An additional, albeit smaller, source of increase was that of the principal floodwater mosquito ***Aëdes vexans***. There was a surge in population in the late summer into fall, which developed from breeding in woodland depressions, along pond shores, and roadside ditches resulting from occasional late summer rains. While most Peabody residents noticed the decline of mosquitoes, residents living near certain wetlands and forests were still subjected to "attacks" by abundant mosquitoes, even during periods of extreme drought, because local hydrology would still favor mosquito breeding and development.

The aforementioned ***Cx. pipiens*** and ***Cx. restuans***, which normally increase their populations significant during a drought, as discussed in the previous section, remained basically unchanged from their 2009 levels, which were small to begin with. We attribute our larvicidal catch basin program with helping to keep low the populations of these species. These are the principal WNV vectors in the region. Since virus transmission was kept low, the risk of infection to the residents was kept low as well. Nonetheless, we also set temporary traps on several occasions in

Sarah O'Connor Park to keep track of these mosquitoes and we found their numbers depressed here as well. All ***Cx. pipiens*** and ***Cx. restuans*** collected this year were sent to the DPH/ASL and no WNV or EEEV were recovered from these mosquitoes. However, as presented in the previous section, WNV-infected mosquito pools were collected in municipalities near Peabody with the same urban ecology as Peabody (with a human case in Revere).

WNV is endemic in Peabody and throughout the metro Boston area. This means that the virus is always present in Peabody; only the degree of how much is being transmitted is what varies. Therefore, it is crucial that mosquito vector populations are kept as low as possible to reduce the risk of spread to residents. Recall that there is no cure nor will there be any developed in the near future. Moreover, while the fatality rate is relatively low, infected survivors will never fully recover and will be debilitated and requiring considerable medical attention for the remainder of their lives!

The horse death in West Peabody from Eastern Equine Encephalitis in 2009 caused considerable apprehension to both the District and the Board of Health. As we proposed in the 2010 BMP, additional EEEV surveillance was conducted in West Peabody and nearby Lynnfield. Two sites were selected in southwest Peabody, the Oak Grove cemetery off Pine Street and the wooded area outside the Peabody YMCA on Lynnfield Street, for resting box surveillance; the Beaver Dam Brook Reservation in Lynnfield was selected as a resting box station as well. The sites were visited twice a week and the few mosquitoes collected were identified and the even fewer vector species, namely ***Culiseta melanura***, were sent to DPH/ASL for testing. None were found infected with either EEEV or WNV. As discussed in the previous section, the drought had a profound effect on the depressing the populations of ***Cs. melanura***; since their populations were very low, potential transmission of EEEV was very low as well and no infected mosquito pools, animals, or humans were found infected with EEEV. However, 2011 may exhibit a complete change in rainfall patterns leading to increases in populations of the EEEV vectors so, we will again have resting box surveillance at the same locations in 2011.

Focus of Operations

The District's 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.

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. CO_2 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 circum-stance warrant.

To supplement ***Culex*** collections from fixed gravid trap locations, the District will deploy additional gravid traps at multiple random location in communities with a history of WNV activity as conditions and circumstances warrant .

The District will operate 128 resting boxes at 15 sites. 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 as well as other communities considered to be at risk. The District will collect and identify samples from each trap twice a week and the specimens will be tested for virus.

In the event ***Cs. melanura*** mosquitoes collected from resting box sites test positive for EEE the District will deploy portable CO_2 traps at those sites. Whereas ***Cs. melanura*** rarely bites humans they serve as an early indication of the presences of EEE in the environment. CO_2 traps attract human biting mosquitoes and mosquitoes testing positive from CO_2 traps indicated heightened risk.

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.

Regional Vector/Virus Intervention: Control efforts will focus on early intervention strategies in municipalities that have shown a greater risk to mosquito borne virus based on events of the previous season and surveillance data. This approach is in the best interest of all member municipalities as focused early intervention strategies seem to demonstrate containment of WNV, and may reduce the risk of exposure to humans and the spread of this disease to other municipalities.

Control Measures Specific to Peabody

Surveillance: The District will operate 12 to 16 resting boxes in two locations in Peabody. Resting boxes are designed to collecting blood fed female ***Culiseta melanura*** mosquitoes relevant to EEE transmission. In the event mosquitoes collected from resting boxes are found to be positive for EEE a portable CO_2 trap will be temporarily placed in the immediate vicinity of the resting boxes to determine if virus has spread to bridge vectors which will feed on birds and humans.

Catch Basins: Catch Basins will be treated first in those communities prioritized in the District's VMP, otherwise catch basins, retention ponds, detention basins, etc. will be checked and treated as necessary, not to exceed one day per week from June 1st to August 31st.

Ground Larviciding: Larviciding sites will be treated first in those communities prioritized in the District's 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.

Manual Ditch Maintenance: In the course of larviciding and in lieu of 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 the potential for breeding habitat.

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 municipalities public and animal health and human annoyance concerns relative to mosquito breeding, potential breeding 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 under construction. Upon inspection of a site the District will make written recommendations, submit these recommendations to the Board of Health and "cc" a copy to 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 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.

Wetlands Management: The City may petition the District to undertake larger scale ditch maintenance projects, wetlands enhancement and restoration projects requiring specialized mechanized equipment and expertise. 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 municipality's assessment and may require separate and additional appropriation.

Adulticiding: Selective adulticiding of specific areas will be provided As follows; by request of the Board of Health, by request of three or more residence of a given area, not to exceed one day per week from June 1st to August 31st and beyond if circumstances warrant and conditions allow.

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 will 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.

Research and Development: Evaluate the efficacy and efficiency of current control methods. Investigate new methods, procedures and technologies in mosquito control and wetlands management and evaluate their implications for use in Peabody.

Education: Present educational displays and programs on mosquito control and related wetland management programs at the request of health officials, schools or civic organizations.

Appendix 2: District Vector Management Plan - 2011

Commonwealth of Massachusetts
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

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2011 VECTOR MANAGEMENT PLAN

Introduction: The U.S. Department of Health and Human Services' Centers for Disease Control and Prevention (CDC) declared that the introduction of West Nile Virus (WNV) to the United States in 1999 raised the issue of how prepared are public health agencies to identify and respond quickly to outbreaks of vector-borne disease. The CDC concluded that "mosquito control is the most effective way to prevent transmission of West Nile" and "the most effective and economical way to control mosquitoes is .... through locally funded abatement programs" (1).

Mosquito control projects and districts in Massachusetts, although considered state agencies, are unique in that they are **accountable directly to the subscribing member communities**. As such, the needs and concerns of those communities drive operational policy and strategies. That is the operational "mantra" that has presided over the Northeast Massachusetts Mosquito Control District for almost twenty years. As the needs of our member communities have changed and evolved, so have the services we've provided. With the invasion and establishments of new arthropod-borne viruses ("arboviruses") threatening our communities in the past decade, we have transformed our operational strategy from primarily nuisance mosquito control to protecting public health. Consider the World Health Organization (WHO) definition of 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 of the imagination to say that high numbers of mosquitoes affecting quality of life is not only a nuisance, but is 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). Therefore, by this definition, all mosquitoes are potential vectors and all mosquito control activities are in the interest of public health.

The purpose of this Vector Management Plan (VMP), updated for 2011, is to present both our current and revised mosquito and arbovirus surveillance strategies, 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 operate its surveillance of mosquito vectors based on protocols established by the CDC and Massachusetts Department of Public Health (DPH). The District's Surveillance Program will operate and maintain 32 historical trapping stations (HTS) across the region at fixed locations. There will be one HTS in each subscribing municipality and each HTS will have two traps. The first is the CO_2-baited "New Jersey trap", designed to attract nearly all species of host-seeking female mosquitoes. All mosquitoes collected are identified and tallied. CO_2 traps are used to sample the general adult mosquito population to determine dominant human-biting and disease-carrying mosquito species. Because the traps are at the same location every year, population trends can be studied and compared between years as well as during a single year. The other trap is the gravid trap

designed to attract bloodfed females that lay their eggs in containers of some sort, either natural or artificial. These traps are baited with aged organic material-filled water to attract primarily ***Culex*** species mosquitoes that are most responsible for West Nile Virus transmission. Gravid traps have been our most successful tool in identifying WNV-infected mosquitoes. Egg-laying mosquitoes have already fed on blood and thus have a higher probability of being infected with WNV they acquired from biting infected birds. Additional portable gravid traps may be deployed, as necessary, in areas with disturbing ***Culex*** 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 September and all specimens of key vector species (principally from ***Culex*** and ***Culiseta*** species, described below) will be submitted to DPH for virus testing.

In addition, the District will enhance gravid trap surveillance in communities that have demonstrated a higher risk for WNV. Five additional pre-chosen stations will be established in each of these communities and portable gravid traps will be set there in a random rotation pattern. In the short term, this will provide us with a broader view of ***Culex*** mosquito population distributions and densities in these communities; over the long term, better historical data for background on vector populations and viral activity trends will be recorded.

Resting boxes form our third principal surveillance tool and are an effective tool of monitoring mosquitoes for EEEV. The boxes have proven to be invaluable as an early warning system for viral presence in the District. Since 2004 we have set out between 60 and 140 resting boxes in fixed historic locations in communities immediately bordering southeastern New Hampshire; these are our primary EEEV monitoring stations we call our "EEEV Front Line Surveillance". Southeastern NH is a new epicenter for EEEV and from here, the virus migrates south into our District. ***Culiseta melanura*** mosquitoes are primarily responsible for the transmission and amplification of EEEV in local bird populations. These mosquitoes, especially after bloodfeeding, rest in tree holes and cavities during the heat of the midday and resting boxes are designed to simulate this habitat. This arrangement allows for effective and abundant collecting. How the data collected is interpreted for response is discussed in the EEEV section below.

In 2011, the District will set up again resting boxes in the "Front Line" communities. Eight resting boxes will be placed at each fixed location, with two locations in each of Front Line community with the exception of Salisbury, which will have just one location. Resting boxes will again be visited twice weekly from June through the end of September; the contents will be collected, identified, and tallied, and vector species (***Cs. melanura*** and the closely related ***Cs. morsitans***) will be sent to DPH for virus testing. With the 72 boxes set in the "Front Line" sites, together with the supplemental sites described below containing 56 boxes, a total of at least 128 boxes will be used. Additional boxes are ready and sites already selected if resting box surveillance is needed to be expanded.

In an attempt to gain an understanding of the "infection status" of other mosquito species in established "EEEV-habitats", we will again place portable CO_2 traps at resting boxes locations where infected ***Cs. melanura*** mosquitoes have been collected. These traps will collect other species which upon identification, will be sent to DPH for testing. Whereas ***Cs. melanura*** rarely bites humans, they have been biting and infecting local birds which in turn serve as bloodmeal sources for other species. These other species can bite humans the next time they feed. These additional species with the potential of infecting humans are known as "bridge vectors".

While infected ***Cs. melanura*** specimens have compelled us to take action against them, it may be more prudent to target responses against infected bridge vectors. Knowing the "infection

status" of bridge vectors in EEEV-known habitats will thus result in more effective targeted adulticiding responses.

Risk Communications and Public Relations: Access to and effective dissemination of mosquito and arbovirus information is paramount to any mosquito control operation. With the speed which information, as well as rumors and even disinformation, can be conveyed in all public informational media, it is crucial that Boards of Health, as well as subscribing municipality residents, are kept correctly informed. To that end, the District has improved its methods of communication regarding mosquito species, potential arboviral threats, and details of larviciding and adulticiding operations.

At the end of every winter, the District sends detailed "Best Management Practice Plans" (BMP's) to each District subscribing municipality. Each BMP includes summaries of the previous year's mosquito and arbovirus activities, descriptions of current year control operations suggested and agreed-upon, as well as their costs. Every spring, the District conducts an "Arbovirus Surveillance Workshop" (at Endicott Park in Danvers), targeted to health agents and Board members of District subscribing communities. This workshop informs potential arboviral threats and how the District will plan to combat these threats. The District operates a website (http://www.northeastmassmosquito.com) with all relevant information on mosquitoes, arboviruses, and operations (both larvicidal and adulticidal) however, it is difficult to be updated regularly throughout the summer due to obligations by District personnel to the various control operations. Therefore, a "District Bulletin" is prepared periodically and sent electronically to all subscribing Boards of Health describing current mosquito and arboviral problems, both current and potential, as well as information on current control operations. And finally, our phones line remains open at all times and while we are often unable to respond immediately, being that we are all in the field, we return all our calls.

Emergent Exotic and Recent Immigrant Mosquito Species: Through our Surveillance Program, we will also be vigilant for the appearance of mosquito species new to the region. Within the past ten 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 that could become established in northeast Massachusetts is the "Asian Tiger Mosquito", ***Aëdes albopictus***. It was 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 New England; it has become the dominate mosquito species in New Jersey. ***Aë. albopictus*** is the principal vector of a Chikungunya pandemic in countries along the Indian Ocean basin and an outbreak in Northern Italy in 2007. Although this species has yet been readily 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 targeted surveillance was conducted in 2008 in the attempt to collect additional specimens and possibly locate breeding sites. Towards this endeavor, the District deployed a new type of surveillance trap called the "BG Sentinel trap" (BGS trap). While these traps have been reported being effective in attracting ***Aë. albopictus***, our experience with them was disappointing.

Subsequently we will survey for ***Aë. albopictus*** in potential breeding areas, namely those facilities that import and recycle used tires. Gravid traps will be deployed randomly at these facilities and collections will be carefully inspected. Imported used tires were the means by

which this species entered the US and facilitated its spread throughout the country. Discarded water-filled tires simulate tree-holes, the natural breeding site for this species, and after eggs are deposited inside the tires, the tires are collected and transported to new locations, they are then again left outside to become filled with water and the eggs subsequently hatch, facilitating the invasion! (4) Therefore, if ***Aë. albopictus*** becomes established in the District, it will most likely that the "beachhead" will be at recycled tire depositories.

The possibility of exotic mosquito species becoming established in our area cannot be dismissed. Some of these exotics may not be dangerous by themselves, but may be more effective at transmitting virus and other disease causing agents, than local species. Such ignorance of history and arrogance against reality had led to successful invasions and establishment of exotic species. Thus, our Surveillance Program will carefully monitor mosquitoes we collect, not only to measure unusually high populations or unusual distributions, but also to detect any new species.

Virus Testing: Specimens from our trap collections will be sent weekly to Arbovirus Surveillance Laboratories of the Department of Public Health in Jamaica Plain in Boston, to be tested for the presence of encephalitis viruses.

Emergent Virus: World-wide, the threat of mosquito-borne disease is on the rise and the possible introduction into our District of other exotic vector-borne disease can no longer be disregarded and deemed as heresy. After the experience of the introduction/invasion by West Nile Virus in 1999, potential viral introductions should now be seriously considered. The invasion, transmission, establishment and re-establishment of arboviruses in the United States is on the increase.

The most recent concern is Dengue fever. While health officials once believed that Dengue had vanished from the U.S., in September of 2009 it was confirmed that a New York resident visiting Key West Florida had contracted Dengue. Previous to this the last known case of domestically-acquired Dengue was in Florida in1934. Since the initial case in 2009, there have been 61 confirmed cases of locally-acquired Dengue (as of December 2010) in Key West (5). Dengue Fever virus is the greatest mosquito-borne virus circulating in the world today, affecting anywhere from 50 to 100 million people annual in about 100 countries (6). While Dengue is a disease of the tropics to the sub-tropics, the virus could mutate to a form easily acquired and transmitted by temperate mosquitoes; look at what happened with Chikungunya in Northern Italy in 2007 (4).

According to Dr. Jean-Paul Mutebi of the CDC, there are currently three circulating international arboviruses with the greatest potential of establishing themselves in the US, namely those causing Chikungunya, Rift Valley Fever, and Japanese Encephalitis (7). Mosquito species that can easily spread these viruses are all found in abundance in the US, most of these species are found in New England as well (7).

Prior to Dengue, the arboviral disease generating the greatest concern for establishment in the US was Chikungunya (CHIK). While CHIK is rarely fatal, it has the potential to infect large numbers of people very quickly. It is a debilitating illness, causing excessive and prolonged fatigue and extreme pain in joints lasting up to several weeks. (8,9) 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 (9). There is still a CHIK pandemic in countries along the Indian Ocean basin (and with nearly 2 million people infected). However, and of alarming concern, was the outbreak of CHIK 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 (10). 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 US within the next five years (11).

Rift Valley fever virus (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 (12). 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 (13).

Japanese encephalitis virus is similar to St. Louis Encephalitis virus and whose infection causes signs and symptoms similar to that of West Nile Virus (encephalitis which can progress to paralysis, seizures, coma, and death). The case fatality rate averages about 30%. It is the leading cause of encephalitis in Asia (Japan west through Korea, eastern China to India and south through Indonesia to New Guinea) averaging between 30,000 to 50,000 cases annually (14). Although its vector is not found in the United States, several domestic species have shown the capacity to transmit this virus (7).

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 when required.

Endemic virus: West Nile Virus

Introduction: According to the CDC in the US since 1999, WNV has infected 30,551 people killing 1,196 as of 28 December 2010 (15). 12,659 have been inflicted with encephalitis and meningitis, 17,120 have suffered with serious and longer than normal fever, and 778 have manifested other clinical disorders. It was previously thought that WNV-associated neurological ailments were short-lived and affected only a small percentage of those infected. However, recent studies suggest that neurological disorders may be more prolonged and serious, affecting more victims then original thought (16). Another recent study has shown that renal disease can be manifested in patients several years after infection with WNV and thought to have recovered (17). WNV, primarily an avian virus, has been far deadlier for birds with dramatic declines in seven species (18). WNV has had a devastating ecological impact in North America and avian populations have yet to recover. West Nile Virus was introduced to New York City in 1999 and within five years spread to all 48 continental US states (19)! It was first isolated in Massachusetts in 2000 and is now endemic in Northeast MA, in particular the Boston metro area.

As indicated in last year's VMP, "A WNV isolation in North Andover late last season may indicate a potential for renewed WNV activity in the area in 2010". Indeed this was the case as there were multiple WNV-positive mosquitoes collected in North Andover in 2010 commencing

at the end of June. The circumstances that occurred in North Andover demonstrated the importance of early and targeted intervention. This is because WNV outbreaks often begin at a very specific localized source, then the problem spreads from this source. While we were able to locate the suspected original source of the WNV outbreak, the control measures implemented were less then satisfactory, due in part to extenuating circumstance. Control measures could not be effective implemented throughout the entire town and vector development proceeded beyond normal breeding habitats. Whereas multiple mosquito-positive pools were collected throughout the community through the summer, we were successful in containing the outbreak only to North Andover. Multiple random trap collection in bordering communities found no WNV positive mosquitoes. There were also WNV-positive mosquitoes collected in Methuen, Saugus, Winthrop, Lynn and Revere. There was also one human case in Revere.

Nationally in 2010, WNV is a still serious public health problem, with a total of 981 human cases, of which 601 were neuroinvasive (as of 28 December 2010; see 17). In particular, the two Long Island NY counties alone (Nassau & Suffolk) had 82 human cases (nearly 64% of all NYS cases) and 4 of the 5 WNV-associated deaths in the state (20).

Culex species are primarily responsible for the amplification of virus in birds and are vectors to humans in endemic areas. Dr. Ted Andreadis of the Connecticut Agriculture Experiment Station concluded that a WNV vector, ***Culex salinarius*** feed on mammals 55% of the time. This supports an earlier study by his group that suggested that ***Cx. salinarius*** may be the primary vector of WNV in the northeast U.S (21).

Catch Basin Treatments: Spraying against infected adult mosquitoes is the short-term approach for immediate risk reduction. However, the preferred long-term and more cost-effective strategy is to eliminate larvae before they become adults. ***Culex*** mosquitoes can develop in a variety of freshwater habitats, but the greatest concentration of ***Culex*** breeding in the District is in the estimated 80,000 catch basins. While ***Cx. salinarius*** can be present in catch basins, this is not its preferred breeding habitat. Instead, the basins are well populated by the two principal urban ***Culex*** mosquitoes, ***Cx. pipiens*** and ***Cx. restuans***. ***Cx. pipiens/restuans*** breed in highly organic or polluted water that collect in artificial containers such as catch basins; they can also breed in storm water structures including detention and retention ponds, as well as discarded tires, gutters, bird baths, etc. With their ability to proliferate in basins, their habits of biting both birds and humans, and their competency to transmit WNV, we are confident these are the principal vectors of WNV in our District, and thus the target of our long-term WNV control strategy.

Treating of catch basins consist of applying either bacteria or a “growth regulator”. The bacteria are effective towards killing exclusively mosquito larvae; the “growth regulator” retards or completely ceases development of larvae into adults. Short term 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 conditions do not deter breeding of ***Cx. pipiens /restuans*** but instead, may enhance it! In a drought, expansive wetlands dry becoming numerous smaller, shallow pools concentrated with more organic debris, providing ***Culex*** with far more breeding habitats. Equally importantly, catch basins continue to accumulate water during droughts from car washing, lawn watering and concentrated sheet flow from minor rainfall

events, etc. Therefore, breeding areas are always in abundance, even in the driest of circumstances! This is why human WNV-infections are at their highest during a drought. Targeting ***Culex*** in basins will eventually reduce adult ***Culex*** populations, reduce the transmission of virus from bird-to-bird, reduce the number of infected mosquitoes and ultimately, reduce risk of infection to humans.

Long term surveillance data has shown that the continued annual treatment of basins has gradually and significantly decreased ***Culex*** populations throughout the District. This translates to reduced risk of infection to District residents. 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 reducing virus amplification in birds and reducing risk to humans. This early-season basin-treatment strategy will continue in 2011.

Catch basin treatments will be prioritized as follows: Merrimac River valley area, specifically and in order of priority: North Andover, Andover, Methuen and Haverhill. The basins in these communities will be treated first, starting in May. Secondly, as WNV is endemic in the Boston metro area and we annually have WNV issues in the urban coastal communities, treated next will be Winthrop, Revere and Lynn. Next to be treated will be coastal urban communities with recent "sporadic" virus/vector population issues; these include Nahant, Saugus, Swampscott, Marblehead, Salem and occasionally Peabody, Danvers and Beverly.

Waste Water Treatment Facilities Inspection: An additional "preemptive strategy" to reduce WNV risk, the District will request to inspect, and treat where necessary, all wastewater treatment facilities. This way, actual or potential ***Culex*** breeding can be reduced or eliminated 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 wastewater 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.

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 there was a 276% increase in the number of human WNV cases in association with a 300% increase in home foreclosures (22). Within most foreclosed properties in Bakersfield (Kern County, CA) were neglected swimming pools which led to increased breeding and population increases of ***Cx. pipiens/restuans***.

In recent year we have received several requests from Boards of Health to inspect abandoned properties. The district has had a policy of property inspections, albeit a passive approach, at the requests of Boards of Health. Given the current economic climate and likelihood of increasing properties abandonment (with the potential for increased health risk associated with properties abandonment), the District in 2011 will continue a more aggressive approach to property inspections. In the course of our routine activities in your community, we will be "on the lookout" and report such properties to your Board of Health. We understand that addressing abandoned properties is a matter of time and process. In the long term, we will offer any support that may be appropriate to resolve mosquito problems related to such properties. In the short term, with the support of the Boards of Health, we will implement the necessary control measures to mitigate any immediate mosquito problem associated with such properties.

Selective Ground Adulticiding: As a final 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 which dispenses very small amounts of pesticides over a large area. The District may recommend a targeted application within a municipality based on the following criteria: two or more WNV-mosquito isolations in close proximity; one or more human cases of WNV. On occasions, when WNV has yet been recovered but ***Culex*** populations are seen increasing at higher-than-usual rates, we have recommended that adulticiding operations be commenced. These operations would only be recommended only during high WNV-transmission periods (late July through September) in communities with historical WNV activity.

Ground Adulticiding Exemption*:* Despite the fact that there is a legal process to request that their properties be excluded from ground adulticiding operations (i.e., truck-spraying), we've always allowed any resident to make such as request with just a telephone call. All they needed to supply was their name and address. We are requesting a change in this policy.

Beginning in 2011, those communities with a Best Management Practice Plan (BMP) allowing for adulticiding only as a virus intervention measure, we are making the follow requests to those communities' Boards of Health. We are requesting that residents who want their property excluded from truck sprays must comply with the legal process to exempt their property. **The process consists of sending a certified letter to the town or city clerk prior to March 1st of each year.** No exclusions will be allowed after March 1st for the rest of the year nor will they be allowed to be done by telephone.

The rational for this is as follows. While truck spray is done routinely in many communities without issue for decades, in communities that only allow spraying as a virus intervention measure, it becomes "an extraordinary event" often causing undue concern among residents in those communities. The announcement that spraying will take place often triggers "knee-jerk" responses from residents who are unfamiliar with the process, resulting in multiple requests to exclude their residential properties. The result is gaps in the adulticiding application operation ranging from sections of a street to entire streets and even neighborhoods. The most effective adulticiding application is a continuous application. Gaps result in a less effective adulticiding cover and which often means that additional applications become necessary to minimize the public health threat where one application may have been sufficient.

The District anticipates that those Boards of Health of communities that allow virus-intervention-only truck-sprays agree that this policy change is a necessary and prudent step. If these Boards do agree on this change, the District recommends that each Board hold a public hearing prior to March 1, 2011 to announce their intention to adopt such a policy and give those residents who wish to legally exclude their property ample notice to do so.

Barrier Treatment: While ULV is a cost-effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes active at the time of the application; repeated applications are sometimes necessary to sustain the initial reduction 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". This application would be made to public use areas such as schools (applications to schools must be in compliance with MGL Ch. 85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquito presence for up to two or more weeks. The District strongly recommends member municipalities take advantage of this service when offered.

Endemic virus: Eastern Equine Encephalitis Virus

Introduction: Prior to 2004 there were no serious concerns about Eastern Equine Encephalitis in the Essex County. Every year since 2004, EEEV-infected mosquitoes, birds, and horses have been reported from southeastern New Hampshire and the virus has been "spilling over" into our District. From what we have learned and experienced since 2004, EEEV has become an endemic public health threat in our area. It is clear that the current EEEV focus is Southern New Hampshire, in particular areas including 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 2009.

EEEV was first discovered in horses hence, the basis for the name "Equine Encephalitis". This however is a misnomer as horses are not the source of infection, but unsuspected innocent casualties. When it was later discovered that this same virus caused the same type of encephalitis in humans, the horse discovery superseded and the name "equine" stuck. Humans and horses are not sources of infection and are considered "dead end hosts", meaning that the virus cannot be transmitted from infected horses or humans (22). Like West Nile Virus, EEEV is an avian virus, transmitted from bird-to-bird principally by the Cedar Swamp mosquito, ***Culiseta melanura***. While ***Cs. melanura*** mosquitoes are primarily responsible the amplification of virus in bird populations, they typically do not bite humans. It is other mosquitoes that feed on both birds and humans, referred to as "bridges vectors", that are responsible for human infections. Nonetheless, it is our judgment that while risks to human from infected ***Cs. melanura*** are extremely low, we will continue to take preemptive protective operations when infected ***Cs. melanura*** are detected. Lack of early intervention activity can result in accelerated EEEV amplification which later in the season can increase human risk to infection.

Southeast Massachusetts experienced serious problems with EEEV in 2010, culminating in the necessity of an aerial adulticiding application in August. On the other hand, thanks to the season-long drought, there was no EEEV activity in our District and very little activity in southern New Hampshire.

Habitat Surveillance: While predictive models of EEEV cycles and distributions no longer reliable, one consistent observation still valid is that higher populations of ***Cs. melanura*** are a good indicator of EEEV activity. ***Cs. melanura*** is one of only a few mosquitoes that survive ("overwinter") in the larval stage. They develop not in open water, but in flooded root meshes, holes and tunnels ("crypts") under tree hummocks in Atlantic white cedar and red maple swamps. These habitats are relatively abundant in northeast MA, although they are remote, isolated and difficult to access. Since 2004 when EEEV first became a serious concern in our area, we have been searching for ***Cs. melanura*** habitat in the winter to be monitored. Trying to find ***Cs. melanura*** larvae breeding in crypts in cedar swamps is very much like trying to find a needle in a hay stack; to date we have been unsuccessful in locating such sites with consistency. In the winter of 2010/2011, we will continue to narrow our search for ***Cs. melanura*** breeding to areas within a one mile radius of our surveillance stations in communities bordering NH. The objective is to find these breeding locations from which we can monitor larval populations through the winter and make better projections of what we may happen and what we can do in 2011.

Selective Ground Adulticiding: Because of the elusive nature of ***Cs. melanura*** larval development, larviciding is not a viable option as a preemptive strategy. Therefore, 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 there are horse and human infections, other mosquito species, the "bridge vectors" are also transmitting the virus and are targeted for adulticiding. But it is late in the season when these intervention efforts are made and their effectiveness in reducing risk are limited at best and often nonexistent. The District will recommend a targeted adulticide application in a subscribing municipality (-ities) based on the following criteria: above average ***Cs. melanura*** populations in a year of anticipated EEEV activity; one or more EEEV isolations in ***Cs. melanura*** mosquitoes; one or more EEE virus isolations in horses; one or more human EEE cases. As with WNV intervention, the District uses Ultra Low Volume (ULV) for ground adulticiding applications.

Barrier Treatment: While ULV is a cost-effective means of reducing mosquito populations on a large scale, it only affects those mosquitoes active at the time of the application; repeated applications are sometimes necessary to sustain the initial reduction 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". This application would be made to public use areas such as schools (applications to schools must be in compliance with MGL Ch. 85), playgrounds, athletic fields, etc. A barrier spray may reduce mosquitoes for up to two or more weeks. The District strongly recommends member municipalities take advantage of this service when offered.

Emergency Response Aerial Adulticiding Plan: In the event that the risk level escalates to a point 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 the window of opportunity is short. It is imperative that the complex logistics of executing the application are already in place. There are four components to this plan; 1) Global Positioning Satellite (GPS) mapping; 2) Securing airport facilities and use; 3) Availability of aircraft and pesticides; 4) Last but not least, availability of necessary funds.

1. The District has in place and continually revises a Global Positioning Satellite (GPS) mapping program that designates areas to be excluded from an aerial adulticide operation, such as reservoirs, endangered species areas, etc. The areas to be sprayed would be determined by the current mosquito and risk data and circumstances; the GPS program would be supplemented immediately prior to the operation. This data can be quickly downloaded into an aircraft's navigation system to direct the aircraft and pilot to areas to be sprayed and areas to be avoided.

2. The District has in place and annually revises a "Memorandum of Understanding" (MOU) with the Lawrence and Beverly Airports. In the event an aerial adulticiding application is necessary, Lawrence airport would be closest to the likely target area. In the event Lawrence airport is unavailable or the target area has broadened, then Beverly Airport would be used.

3. Through the state's procurement program, contracts are in place for the acquirement of aircraft and pesticides. If events warrant, the District will communicate with aircraft and pesticide contractors to inform them that an aerial adulticiding application may be necessary and equipment and materials are to be made available for our use.

4. The District has resources in its stabilization fund to conduct an aerial adulticiding application in the communities bordering the New Hampshire most likely to be treated to contain EEEV spread. In the event further applications are needed, additional funding would be necessary.

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Appendix 3: Vehicle and Sprayer Inventory Information

Vehicle Inventory
Vehicle Equipment Check List
Example Sprayer Calibration Certification

NE MA Mosquito Control and Wetlands Management District - Vehicle Inventory: May 2011

Truck	Year	Model	VIN	Driver	Plate	Status	Mileage	Sprayer	Calibrated
1	2007	Ranger X-Cab (4x4)	1FTYR15E77PA74486	Bill	118 P	Seasonal	32,953	ULV-1	2011-05-03
2	2010	Ranger X-Cab (4x4)	1FTLR4FEXAPA5152	*Misc.*	507G	Available	651	BAR-2	
3	2001	Ranger: X-Cab	1FTYR14V31TA82326	Richard	886F	Seasonal	72,450		
4	1999	F-800 Rack Body	3FEWF8011XMA0990	*Misc.*	128C	Available	53,001		
5	2007	Ranger X-Cab (4x4)	1FTYR15E97PA74487	Monty	118 N	Seasonal	40,525		
6	2010	Ranger X-Cab (4x4)	1FTLR4FE8APA40106	Tim	A626	Available	11,197	ULV-6	2011-05-03
7	2007	Ranger X-Cab (4x4)	1FTYR15E07PA74488	*Misc.*	118 M	Seasonal	33,712		
8	2005	F350 Utility (4x4)	1FDWF37P45EDO599	Dennis	4635	Seasonal	43,840		
9	2001	Ranger X-Cab	1FTYR14V11TA82325	Ted	883F	Seasonal	86,050		
10	2001	Ranger X-Cab	1FTYR14VX1TA8232	*Misc.*	885F	In Use	71,642		
11	2006	E150 Van	1FTRE14W36DA4797	Esteban	696L	Seasonal	41,861		
12	2003	Explorer SUV	1FMZU73K83UA4156	Anthony	1371	In Use	158,600		
13	2000	Ranger X-Cab (4x4)	1FTZR15V7YTB29306	Hawk	811G	Seasonal	107,187	ULV-13	2011-05-03
14	2002	Ranger X-Cab (4x4)	1FTZR15E92PB10644	Ross	677H	In Use	107,514	ULV-14	2011-05-03
15	2003	F350 Utility (4x4)	1FDWF37P43ED84056	Bill	434B	Seasonal	61,407		
16	2002	Ranger X-Cab (4x4)	1FTZR15E02PB10645	Dennis	678H	Seasonal	81,819	ULV-16	2011-05-03
17	2003	F150 X-Cab (4x4)	2FTRX18W03CB1087	Robyn	475J	In Use	84,257		
18	2003	F150 X-Cab (4x4)	2FTRX18W23CB1087	Tim	499J	Seasonal	61,718	BAR-18	
19	2006	F150 X-Cab (4x4)	1FTRX14W26FB0915	Jack	695L	In Use	44,933		
20	1995	Blazer (4x4)	1GKCT18WOS254728		4625	**Shop**			
21	2008	Ranger X-Cab (4x4)	1FTYR15E18PA85775	Emily	179B	In Use	18,072		
22	2008	Ranger X-Cab (4x4)	1FTYR15EX8PA85774	Jack	170N	Seasonal	20,514	ULV-22	2011-05-03
23	2009	Explorer	1FMEU73E09UA3372	Walter	A201	In Use	35,642		
Old #2	1999	F150 X-Cab (4x4)	1FTRX18W2XNC3128		507G	Surplus			
Old #6	1997	F350 Pickup (4x4)	3FTH36HXVMA42356		4633	Surplus			

VEHICLE EQUIPMENT CHECK LIST

All District personnel are issued a complete set of keys: Headquarters/ Main Office, Garage, Andover barn/Office, a 2001 and all necessary equipment.

Personal and Protective Equipment	Other Safety Equipment	Repair Equipment	Seasonal Equipment
First Aid Kit*	Flashlight	Tire Pressure Gauge	Work Gloves (Extra)
Eye Wash	Power Converter	Tool Kit*	Wheel
Spill Kit*	Hide-a-Key	Tow Chain	Hook
Rubber Gloves	Disposable Camera	Rope	Shovel
Safety Glasses	Safety Vest	Jumper Cables	Broom
Respirator	Work Gloves	Road Cones or	Rope
Hard Hat	Tie-Down Straps	Safety Triangle	Trash bags
Ear Plugs	Fire Extinguisher	Tire iron and jack	Loppers
Tyvek Suit	Sun-block	Spare tire	Sledge hammer
Socks (Extra)	Bug Spray	Motor Oil	Staple Gun
Uniform Shirt (Extra)	Hand Wipes	Transmission Fluid	Oak Stakes
Boots (Extra)	Orange Flagging	Washer Fluid	Dipper
Latex Disposable Gloves	Rain Gear	Gas Can	Lander's Ladle
	Trailer Ball(s)	Blue tarp	Sample Vials
	Phone / 2-Way	Booster Pack	Aspirator
	Sunglasses		Ice Scraper

*** DETAILS ***

Tool Kit	First Aid Kit	Spill Kit	Paper Work
screwdriver	Bandaids (all sizes)	PDMP Team Contact #	District Manual
tape measure	Antiseptic wipes	Other Emergency #s	MSDS and Labels
sockets	Antibiotic ointmnent	Disposable Coveralls	No Spray List
vice-grips	benedryl	Safety Glasses	All District Forms
pliers	tourniquet	Rubber Gloves	Pens, highlighters
water-pump pliers	eyewash	2 lbs speedy dry	Calendar/Planner
bolt cutters	wraps	Absorbent Pads	Map Book
bungee cords	Sterile guaze	Dust Pan / Brush	Blank Paper
duct tape	Sterile pads	2 Contractor Trash Bags	Truck Registration
electrical tape	Motrin (analgesic)	Label marker (sharpie)	MA Driver's License
zip ties	Sun-block	Secure Container / Cover	MA Pesticide License
tie-down straps	Bug spray		Fleet Card / Business Cards
WD-40	scizzors		Adverse Incident Report
Paper towels / tp	Ice-pak		Uniform and District ID
Starting fluid	Anti-itch cream		Tide Chart
Lighter	First aid book		Emergency Numbers/ Phone

DC-IV Report: 11north6.txt

Statistic Summary

Mass Median Diameter (microns): 22.6804
Sauter Mean Diameter (microns): 15.5283
Volume Mean Diameter (microns): 5.6499
Area Mean Diameter (microns): 3.4080
Number Mean Diameter (microns): 1.9888
VmeD 90% (microns): 29.9742
VmeD 10% (microns): 10.0228
VmeD Span 90% - 10% (microns): 0.8797
Number Median Diameter (microns): 1.9730
NMD over VMD (microns): 0.0870
Droplets over 32 microns: 4
Droplets over 48 microns: 0
Total Count: 610
Droplet Type: Oil
Collection Time: 30

Environment

Collected By: wterrill
Comments:
Humidity:
Test Number: 1
DateTime: Tue May 03 13:33:43 2011
CustomerName: Northeast Ma
DistanceToNozzle:
Flow: .62oz/acre
SprayerType: Beecomist
SprayerID: 170n
AmbientTemperature:
ProductTemperature:
Product: Anvil 10/10
Pressure:
WindSpeed:
Weather:
Rpm:
Formulation:
Diluent:

Statistic Detail

Diameter (microns)	Count	Volume	% of Volume	Cumulative Volume	Cumulative % of Volume
1	000161	000000000167	0.337540	000000000167	0.34
2	000148	000000000562	1.135670	000000000728	1.47
3	000056	000000000445	0.899510	000000001173	2.37
4	000023	000000000306	0.618540	000000001479	2.99
5	000023	000000000454	0.918661	000000001933	3.91
6	000015	000000000408	0.826009	000000002342	4.74
7	000018	000000000642	1.299150	000000002984	6.04
8	000015	000000000676	1.367993	000000003661	7.40
9	000012	000000000665	1.345130	000000004326	8.75
10	000009	000000000600	1.213422	000000004926	9.96
11	000010	000000000832	1.682359	000000005758	11.64
12	000007	000000000712	1.438976	000000006469	13.08
13	000008	000000000976	1.974732	000000007446	15.06
14	000005	000000000722	1.460364	000000008168	16.52
15	000006	000000001013	2.047649	000000009180	18.57
16	000008	000000001560	3.155667	000000010741	21.72
17	000009	000000002010	4.064687	000000012750	25.79
18	000010	000000002536	5.128026	000000015286	30.91
19	000008	000000002286	4.623811	000000017572	35.54
20	000006	000000001920	3.882950	000000019492	39.42
21	000005	000000001781	3.601763	000000021273	43.02
22	000005	000000001972	3.987814	000000023245	47.01
23	000005	000000002173	4.393959	000000025418	51.40
24	000008	000000003814	7.712342	000000029231	59.12
25	000006	000000003125	6.319906	000000032356	65.44
26	000006	000000003402	6.879711	000000035758	72.32
27	000005	000000003075	6.219735	000000038834	78.54
28	000002	000000001330	2.690610	000000040164	81.23
29	000005	000000003587	7.253467	000000043751	88.48
30	000001	000000000771	1.560114	000000044522	90.04
31	000001	000000000828	1.673567	000000045350	91.71
32	000000	000000000000	0.000000	000000045350	91.71
33	000001	000000000946	1.912576	000000046295	93.63
34	000001	000000001008	2.038134	000000047303	95.66
35	000002	000000002144	4.335455	000000049447	100.00

Diameter (microns)	Count	Volume	% of Volume	Cumulative Volume	Cumulative % of Volume

Appendix 4: Example Pesticide Record Reports

Adverse Incident Report

Larval Control Records

- Service Request Record
- Property Inspection Record
- Larval Site Data Base Record
- Pesticide Applied Record – Vectobac G
- General Ground/Catch Basin Record
- Pesticide Applied Record – Vectolex WSP
- Aerial Larviciding Pre-treatment Record
- Aerial Larviciding Post-treatment Record
- Aerial Larviciding Efficacy Record
- Pesticide Applied Record - Aerial Larviciding

Adult Control Records

- Pesticide Applied Record – Anvil 10 + 10
- Adulticiding Record – Street Sheet
- Ground ULV Mosquito Adulticiding Report and Data Master Map
- Pesticide Applied Record – Suspend SC

Commonwealth of Massachusetts
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT
261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Phone: (978) 463-6630 / Fax: (978) 463-6631
www.northeastmassmosquito.com

Adverse Incident Report

Complaint ☐ Accident ☐ Emergency ☐ Spill ☐ (See Below) Other ☐

Date: ____/____/____ Time: ___:___ Municipality: _____

Location: _____

NEMMC Personnel Involved: _____Other:_____

Mailing Address: _____

NEMMC Personnel Reporting: _____Phone#:_____

Adulticiding ☐ Larviciding ☐ Wet Management ☐ Surveillance☐ Other ☐

Description of Incident:_____

_____

_____

_____

How and When Noticed Incident: _____

_____

Course of Action: _____

_____

_____

Spill Incident: Yes ☐ No ☐ NOI NPDES Permit Tracking Number: _____

Applicator(s):_____ Pesticide License #(s): _____

Material(s): _____ EPA Registration #(s): _____

Toxic Effects Noted: _____

Exposure Noted: _____

Required Call Notification: <24 Hours		**Required Written Notification**: < 30 Days	
George Papdopoulos: EPA (617) 918-1579	☐	**EPA**	☐
MA Pesticide Bureau 617-626-1785	☐	**MA Pesticide Bureau**	☐
Parker River Wildlife Refuge: (978) 465-5753	☐	NHESP: (508) 389-6300	☐
MA FWS: (617) 626-1500	☐	NMFS: (978) 281-9300	☐

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Northeast Massachusetts Mosquito Control and Wetlands Management District
Service Request

TOWN: _____ NAME: _____

ADDRESS: _____ PHONE: _____

DATE CALLED: _____ CALL TAKEN BY: _____ VOICEMAIL ☐

Service Requested:

Adulticiding	☐	Wetlands MGT	Freshwater	☐
No Spray	☐		Salt Marsh	☐
Larviciding	☐		Beaver	☐
Greenhead Traps	☐		Information	☐
Inspection	☐		Education	☐

Other ☐ _____

Comments: _____

_____

Date Service Performed: _____ Service Performed By: _____

Commonwealth of Massachusetts

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Property Inspection Record

Property owner _____ Date _____
Location _____ Collector _____
City/Town _____ N _____ W _____ Start _____
Conditions _____ End _____
Surrounding environment _____

Land Use	Habitat	Drainage Type
☐ Industrial	☐ Salt Marsh	☐ Reflood
☐ Residential	☐ Fresh Water	☐ SWCS
☐ Conservation/Reservation	☐ Beaver	☐ Agricultural
☐ Agricultural	☐ Vernal Pool	☐ NEMMCWMD Ditch
☐ Municipal	☐ Pond	☐ Maintenance Project Site # _____
☐ Other _____	☐ Swamp	☐ Other _____

Location	Larvae per dip 1	2	3	4	5	Insecticide & amount	Comments

Aspiration vial # _____ Landing rate _____
Larval sample vial #s _____

Requested by _____ from _____ Date _____
Info relayed to _____ at _____ Date _____

Comments & recommendations on back

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Commonwealth of Massachusetts

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

261 Northern Boulevard, Plum Island
Newburyport, MA 01950

Town Beverly
Date
Vehicle

Technician Tech ID
Assistant Tech ID
Assistant Tech ID

Loc #	Address	Location	Time in	Time out	Insecticide & amount	Area	Larvae / dip 1	2	3	4	5	Post larvae / dip 1	2	3	4	5	Effi-cacy
003-017	Alcan Rd	end of rd															
003-061	Beach St # 1	behind house															
003-038	Brimbal Ave # R41	end of parking lot on left															
003-053	Brookwood Rd # 1	either side of entrance to Brookwook sch.															
	Cavendish Sq	off Cross St, end of rd															
	Cavendish Sq	Between # 4 and # 6															
003-036	Cole st	south of RR track, at Foster															
003-033	Cole St # 1	behind house															
003-001	Common Ln	behind pole 21															
003-002	Common Ln	behind pole 24															
003-003	Common Ln	behind pole 26/27															
003-004	Common Ln	after pole 20															
003-005	Common Ln # 220	from 220 to pole 19															
003-006	Common Ln	across from Greenwood ave															
003-008	Common Ln	corner common ln and foster															
003-007	Common Ln # 206																
003-044	Common Ln # 210	SE side															
003-055	Conant St # 84	across rd															
003-054	Conant St. # 80	80-84															
003-035	Conner Rd # 20	end of road															
003-040	Conners Rd	end of road															
	Cross Ln # 75																
003-063	Cross Ln # 119	back of house															
003-010	Cross St	across from 115 by soccer fields															
003-042	Cross St # 25	across st															
003-060	Cross St. # 69																
003-037	Dunham Rd # 50	end of parking lot															

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www.northeastmassmosquito.com

Pesticide Applied Record

Date: _____ City/Town: _____ Vehicle # : _____

Technician's name: _____

Technician's Certification # : _____ Technician's ID # : _____

Application authorized by: Jack A. Card, Jr.

Authorizer certification # : 02971 ID # : 04

Insurer: Commonwealth of Massachusetts (exempt)

Registered name of pesticide applied: Vectobac G

EPA registration # : 73049-10 Diluent: N/A

Formulation: 2.5 - 10 pounds / acre

Technician responsible for formulation: _____ Tech cert. # : _____

Method of application: Hand

Total finished pesticide applied: _____

Pesticide applied for control of: _____

Additional personnel involved in application:

Name:	Title:	Cert # :	ID # :

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NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

261 Northern Boulevard, Plum Island

Newburyport, MA 01950

Date ____________ Pre-treatment technician ______________________________ ID ______ Pest. Cert ____________ Vehicle ________

Start ____________ Treatment technician ______________________________ ID ______ Pest. Cert ____________ Vehicle ________

End ____________ Post-treatment technician ______________________________ ID ______ Pest. Cert ____________ Vehicle ________

Town code	Street	Dates			Insecticide & rate		# CB treated	Pre - Live				Pre - Dead				CB Temp	Post - Live				Post - Dead				CB Temp	Effi-cacy
		Pre	Treat	Post				1st	2nd	3rd	4th	1st	2nd	3rd	4th		1st	2nd	3rd	4th	1st	2nd	3rd	4th		

Totals

Daily Catch Basin Report

Commonwealth of Massachusetts

STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Phone: (978) 463-6630 / Fax: (978) 463-6631
www.northeastmassmosquito.com

Pesticide Applied Record

Date: _____ City/Town: _____ Vehicle # : _____

Technician's name: _____

Technician's Certification # : _____ Technician's ID # : _____

Application authorized by: Jack A. Card, Jr.

Authorizer certification # : 02971 ID # : 04

Insurer: Commonwealth of Massachusetts (exempt)

Registered name of pesticide applied: VectoLex WSP

EPA registration # : 73049-20 Diluent: N/A

Formulation: 1 WSP/Catch Basin = 10 Grams

Technician responsible for formulation: _____ Tech cert. # : _____

Method of application: Hand

Total finished pesticide applied: _____

Pesticide applied for control of: _____

Additional personnel involved in application:

Name:	Title:	Cert # :	ID # :

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AERIAL LARVICIDING SURVEY
PRETREATMENT

Date: _____ City/Town: _____ Conditions: _____

Tech Name: _____ Tech Certification #: _____ Tech I.D. #: _____

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

AERIAL LARVICIDING SURVEY
POST-TREATMENT

Date: _____ City/Town: _____ Conditions: _____

Tech Name: _____ Tech Certification #: _____ Tech I.D. #: _____

Date Surveyed: _____ Date Sprayed: _____ Spray Conditions: _____

Dip Station # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

n # and Location:

Dip #	Total per	Alive 1st	Alive 2nd	Alive 3rd	Alive 4th	Alive pup	Moribund 1st	Moribund 2nd	Moribund 3rd	Moribund 4th	Moribund pup	Dead 1st	Dead 2nd	Dead 3rd	Dead 4th	Dead pup	Comments
1																	
2																	
3																	

Commonwealth of Massachusetts

State Reclamation Board

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

261 Northern Boulevard, Plum Island
Newburyport, MA 01950
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www.northeastmassmosquito.com

Aerial Larviciding Efficacy Report

City/Town: _____ Date sprayed: _____

Pre-treatment dates: _____ Tech name & ID: _____

Post-treatment date: _____ Tech name & ID: _____

Dip station # and Location	Pre-treatment Live Larvae	Post-treatment Live Larvae
Total live larvae:		

% Live (Post/Pre total): _____

% Efficacy (100% - % Live): _____

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Commonwealth of Massachusetts

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Pesticide Applied Record– Aerial Larviciding

Date: _____ City/Town: _____
Registered Name of Pesticide Applied: _____
EPA Registration #: _____ Diluent: _____
Formulation: _____ Application Rate: _____

Totals

		0	0				0	0

Tank Mix #	Water	Pesticide	Finish Spray	Ship Tank	Time Up	Time Down	Time Out	Acres Sprayed

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www.northeastmassmosquito.com

Pesticide Applied Record

Date: _____ City/Town: _____ Vehicle # : _____

Technician's name: _____ Sprayer #: _____

Technician's Certification # : _____ Technician's ID # : _____

Application authorized by: Jack A. Card, Jr.

Authorizer certification # : 02971 ID # : 04

Insurer: Commonwealth of Massachusetts (exempt)

Registered name of pesticide applied: Anvil 10 + 10

EPA registration # : 1021-1688-8329 Diluent: N/A

Formulation: _____

Technician responsible for formulation: _____ Tech cert. # : _____

Method of application: Ultra Low Volume (non thermal) Aerosol Fog

Total finished pesticide applied: _____

Pesticide applied for control of: Adult Mosquitoes

Additional personnel involved in application:

Name: Title: Cert # : ID # :

Spray Equipment Inspection

Pre	Signature	Post	Signature	Comment

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Commonwealth of Massachusetts

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AND
WETLANDS MANAGEMENT DISTRICT
261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Telephone: 978.463.6630 ~ Fax: 978.463.6631

www.northeastmassmosquito.com

Adulticiding Record – Street Sheet

Date: _____ City/Town: _____Vehicle #: _____

Technician: _____ Certification #: _____ ID #: ____

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Ground ULV Adulticiding Report

GROUND ULV MOSQUITO ADULTICIDING REPORT

Georgetown 07/28/10 #01

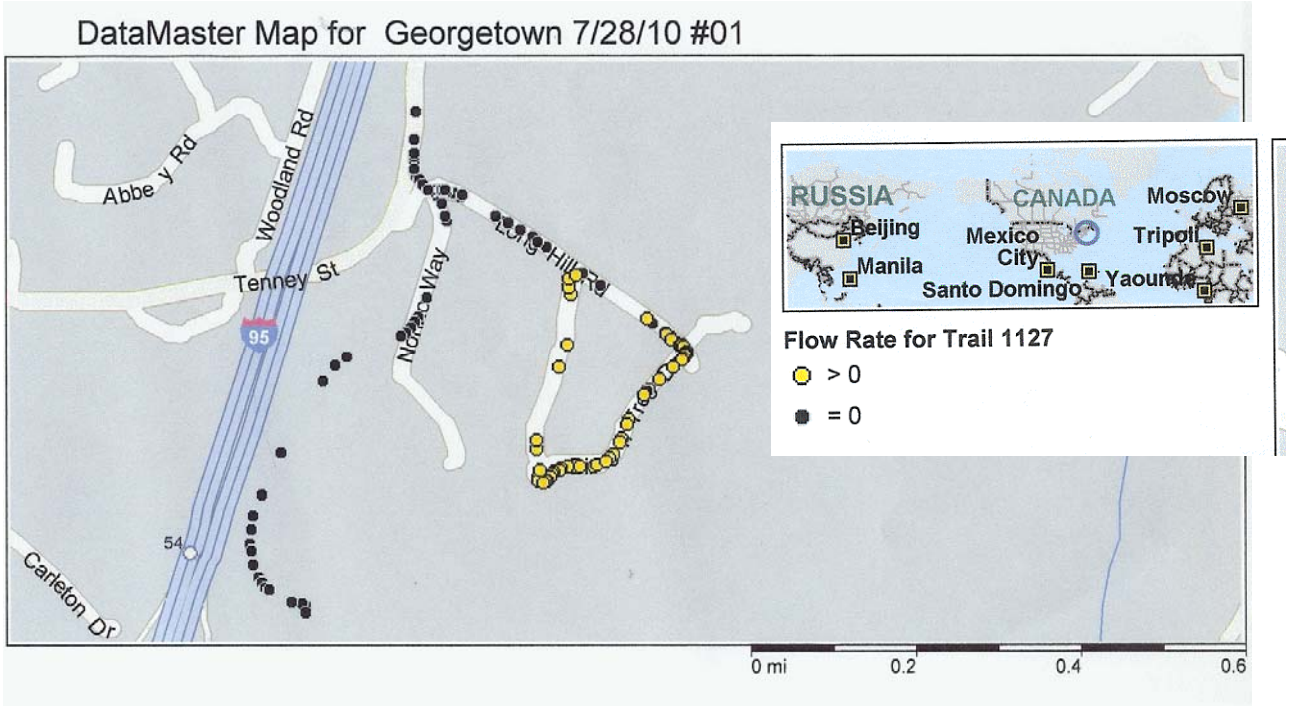
Product: **Anvil®**
EPA Registration Number:
Target Application Rate #1: **0.42**
Target Application Rate #2: **0.62**
Target Application Rate #3: **0.21**

Vehicle: **Truck_01**
Driver: **21**
Route: **Georgetown**

Start: **7/28/2010 8:59:06PM**
End: **7/28/2010 10:31:31PM**
Trip Min: **92.42**
Mileage: **25.28** Max. Speed: **42.2** Stops: **0**

Spray Miles: **3.14**
Gallons Sprayed: **0.62**
Spray Acres: **114.20**
Spray Time (min): **17.60**
Average Spray Speed: **10.7**

Data Master Map



Commonwealth of Massachusetts

State Reclamation Board

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261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Telephone: 978.463.6630 ~ Fax: 978.463.6631

www.northeastmassmosquito.com

Pesticide Applied Record

Date: _____ City/Town: _____ Vehicle # : _____

Technician's name: _____ Sprayer #: _____

Technician's Certification # : _____ Technician's ID # : _____

Application authorized by: Jack A. Card, Jr.

Authorizer certification # : 02971 ID # : 04

Insurer: Commonwealth of Massachusetts (exempt)

Registered name of pesticide applied: Suspend SC

EPA registration # : 432-763 Diluent: Water

Formulation: 1 ounce / 1 gallon water

Technician responsible for formulation: _____ Tech cert. # : _____

Method of application: Barrier Sprayer

Total finished pesticide applied: _____

Pesticide applied for control of: Adult Mosquitoes

Additional personnel involved in application:

Name: Title: Cert # : ID # :

Spray Equipment Inspection

Pre	Signature	Post	Signature	Comment

Committed to a partnership of the principles of mosquito control and wetlands management

Commonwealth of Massachusetts

STATE RECLAMATION AND MOSQUITO CONTROL BOARD

NORTHEAST MASSACHUSETTS MOSQUITO CONTROL AND WETLANDS MANAGEMENT DISTRICT

261 Northern Boulevard, Plum Island
Newburyport, MA 01950
Phone: (978) 463-6630 / Fax: (978) 463-6631
www.northeastmassmosquito.com

Record of Pesticides Applied

Date: _____ City/Town: _____ Vehicle # : _____

Technician's name: _____

Technician's Certification # : _____ Technician's ID # : _____

Application authorized by: Walter G. Montgomery

Authorizer certification # : 03337 ID # : 03

Insurer: Commonwealth of Massachusetts (exempt)

Registered name of pesticide applied: Accord Concentrate

EPA registration # : 62179-324 Diluent: water

Formulation: 4-6pts/25 gallons of water- 1.5% solution

Technician responsible for formulation: _____ Tech cert. # : _____

Method of application: Back pack sprayer

Total finished pesticide applied: _____

Pesticide applied for control of: Phragmites

Additional personnel involved in application:

Name:	Title:	Cert # :	ID # :

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2011 Pepperweed Spray: Plum Island Airport - Horton's

0 130 260 520 Feet