Massachusetts Emergency Operations Response Plan for Mosquito-Borne Illness

Last Revised: October 2017

State Reclamation and Mosquito Control Board

Massachusetts Department of Agricultural Resources (MDAR)

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Revision Tracking (substantial changes made to this plan)

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Introduction

In Massachusetts, there are several mosquito-borne viruses present that present a threat to human health or the health of domestic or wild animals. These insect-borne viruses (arboviruses), particularly Eastern Equine Encephalitis virus (EEEv) and West Nile virus (WNV), have a history of causing disease outbreaks in our state. Efforts to reduce the risk of the arbovirus transmission that occurs through mosquitoes typically encompass the following:

- Routine treatment of adult and larval mosquitoes, and management of mosquito habitat, done by established mosquito control projects/districts
- Educational outreach to increase public awareness and encourage the public to protect themselves from mosquito bites and to do their part to reduce mosquito habitat

Through cooperative efforts between state agencies and regional mosquito control programs, the state has performed these functions for decades, and is well-informed about techniques to reduce mosquito populations. However, regardless of the efforts as described above, factors sometimes combine to create elevated levels of arbovirus, and it is sometimes deemed necessary in these cases to perform intensified ground-based or aerial larviciding treatments, or in some cases, aerial adulticide applications. This document is meant to be a guide to the process by which stakeholders prepare for, discuss, and, if needed, execute a plan to perform an emergency arbovirus intervention.

Emergency interventions related to mosquito-borne illness are overseen at the state level by the State Reclamation and Mosquito Control Board (SRB), housed within the Massachusetts Department of Agricultural Resources. All mosquito control activities are performed pursuant to the provisions of Chapter 252 of the Massachusetts General Laws and special legislation, along with all other applicable federal, state, and local statutes and regulations.

Goals of this document

Objectives

The objectives of this plan are to:

- Identify in detail all stakeholders involved in assessing and responding to elevated risk of mosquito-borne disease, including the SRB, Mosquito Control Districts/Projects (MCDs), partner agencies, and associated organizations
- Outline the process for preparation, planning, and response to the risk presented by mosquito-borne disease
- Provide protocols for evaluating efficacy and environmental impact of an arbovirus intervention such as an aerial adulticiding event

Scope

This plan establishes a framework for operations within Massachusetts in response to the elevated risk of mosquito-borne disease. The scope of this framework includes:

- Listing all stakeholders and outlining their roles in arbovirus response. This includes but is not limited to the SRB, MCDs, and any other associated state or municipal agencies and partner organizations involved in the process.
- Acting as a companion document to the current version of the Massachusetts Department of Public Health ("DPH") Arbovirus Surveillance and Response Plan (see http://www.mass.gov/eohhs/docs/dph/cdc/arbovirus/arbovirus-surveillance-plan.pdf).
- Summarization of the multi-agency response that occurs when a public health emergency warrants mosquito control through the aerial and/or ground application(s) of pesticide.
- Descriptions of the specific activities that are conducted during a mosquito-related public health emergency.

This document is subject to changes as needed. For details, see the Revision Tracking page.

Legislative Authority

The authority of participating state and local agencies to respond to projected or current outbreaks of mosquito-borne disease, and to exercise powers where necessary, includes the following Chapters (c.) of Massachusetts General Law (M.G.L.):

- M.G.L. c. 252: Establishes the SRB and sets forth statutory requirements and oversight procedures for managing mosquito populations in infested areas throughout the Commonwealth, whenever the SRB considers such activities to be necessary or useful. This includes oversight of MCDs as well as areas throughout the Commonwealth that are not part of an established MCD. Under M.G.L. c. 252, Section 8, if the SRB concludes that certain improvements will benefit public health, the costs will be paid by the Commonwealth, and the SRB must separately estimate that part of the expense, to be included with other estimates under MGL Chapter 29, Section 4.
- M.G.L. c. 17, Section 2A: Provides that upon declaration by the governor of a public health emergency, the Commissioner of DPH may, subject to the approval of the governor and the public health council, take action to assure the maintenance of public health and the prevention of disease. This declaration requires that the DPH, SRB, and Massachusetts Department of Agricultural Resources ("MDAR"), with the assistance of other designated state agencies, take action to address the public health concern. This includes, among other things, the ability for the SRB and MCDs, with the assistance of MDAR, to engage in emergency aerial applications of pesticides.
- M.G.L. c. 132B, Massachusetts Pesticide Control Act: Incorporates the Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA") and further designates MDAR as the state's lead agency for implementing and administrating pesticide laws within the Commonwealth. Under M.G.L. c. 132B, MDAR is responsible for registering all pesticides for use in the Commonwealth as well as issuing all certifications and/or licenses in their legal use. MDAR is also charged with enforcement regarding this use, which includes transportation, sales, and application of all pesticides within the Commonwealth.

Roles and Responsibilities

DPH, the SRB/MDAR, and the MCDs are the principal entities responsible for the monitoring, detection and analysis of mosquito activity, as well as the implementation of interventions to protect the public from mosquito-borne disease (see Appendix 3). The MCDs provide further mosquito surveillance and control for member municipalities across the state. The Mosquito Advisory Group (MAG) is a non-governmental partner that provides expert technical advice to the SRB and DPH. Other key agencies and entities involved in mosquito surveillance and emergency response are listed and described below:

State

- Executive Office of Energy and Environmental Affairs (EOEEA or "EEA")
    - State Reclamation and Mosquito Control Board (SRB)
        - Mosquito Control Projects/Districts (MCDs)
    - Massachusetts Department of Agricultural Resources (MDAR)
    - Massachusetts Department of Environmental Protection (DEP)
    - Massachusetts Department of Conservation and Recreation (DCR)
    - Division of Fisheries & Wildlife, Natural Heritage and Endangered Species Program (Massachusetts Department of Fish & Game)
- Massachusetts Department of Public Health (DPH) (under the Executive Office of Health and Human Services)
    - Bureau of Environmental Health (BEH)
    - Bureau of Infectious Disease and Laboratory Sciences (BIDLS)

Federal

- Environmental Protection Agency (EPA)

Other

- Mosquito Advisory Group (MAG)

Agency Roles: Detailed Descriptions

Executive Office of Energy and Environmental Affairs (EEA)
EEA's Public Relations Office participates as needed in aspects of planning and facilitating emergency mosquito control operations that relate to public relations.

State Reclamation and Mosquito Control Board (SRB)
The SRB oversees mosquito control operations in Massachusetts. It acts as a resource for municipalities for all mosquito-associated concerns, whether in response to a public health situation or to the overall nuisance caused by mosquitoes. This oversight applies not only to existing MCDs but also to any mosquito surveillance or arbovirus testing, or any mosquito control efforts provided by a municipality (including contractors employed by the municipality). The SRB establishes administrative and technical policy, guidelines, and best management practices to ensure that mosquito control programs are effective and safe. The SRB also works cooperatively with DPH regarding all aspects of planning and response with regard to mosquito-borne diseases that pose a risk to human health.

While SRB is housed within MDAR, the 3-person Board is actually made up of representatives from 3 different agencies: MDAR, DCR, and DEP. The SRB also funds support staff, housed within MDAR, to provide assistance with various mosquito control-related tasks, including:

- SRB Operations Coordinator (manages business activities on behalf of the SRB and MCDs, assists with financial and legal reports, works closely with the MCDs and MDAR and provides a communication link between MCDs, SRB, MDAR and other partners)
- Accountants (assist with procurement, vendor payments, etc.)

Information about current SRB staff can be found in Appendix 2.

Mosquito Control Districts (MCDs)
The eleven organized mosquito control districts/projects (hereafter referred to as "districts" or "MCDs") are located throughout the eastern portion of Massachusetts and also in Berkshire County (Figure 1). They include nine fully functional districts, plus Dukes County (surveillance only) and Nantucket County (surveillance plus source reduction and limited larviciding). They operate under the aegis of the SRB pursuant to the provisions of M.G.L. c. 252 and enabling legislation, as amended. Each MCD also operates under the direction of a Commission appointed by the SRB (with the exception of the Dukes County Mosquito Control District, which contracts out for mosquito surveillance and is managed by the Dukes County Manager). The MCD Commissions represent the interests of their member communities, their residents, and the SRB, by providing oversight of MCD activities and ensuring that member communities receive services that are consistent with applicable laws and justified by tenets of Integrated

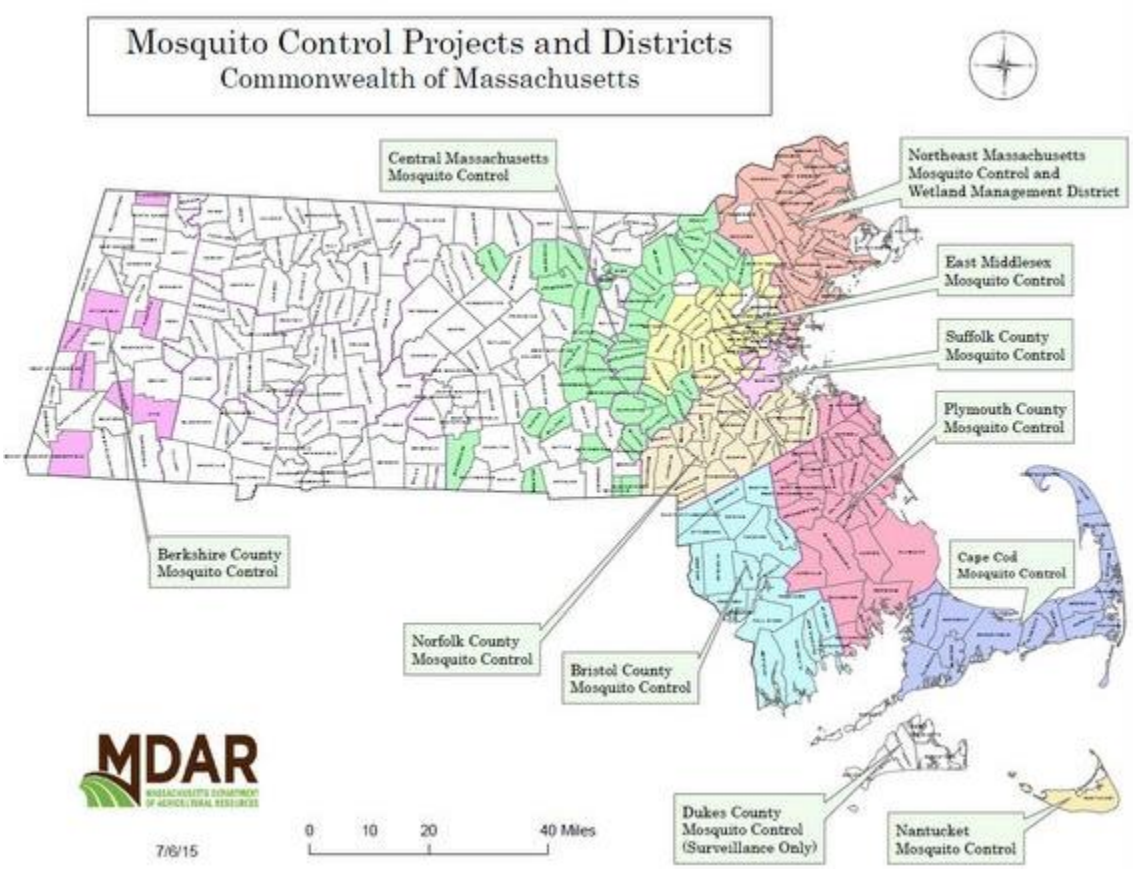
Pest Management (IPM), public health, vector control, environmental safety, and fiscal responsibility.

The MCD Commissions represent the interests of their member communities, their residents, and the SRB, by providing oversight of MCD activities and ensuring that member communities receive services that are consistent with applicable laws and justified by tenets of Integrated Pest Management (IPM), public health, vector control, environmental safety, and fiscal responsibility. A current list of MCD superintendents and Commissioners can be found at http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/mosquito-control-projects-and-districts.html.

MCDs serve as critical components in the surveillance network, performing mosquito management activities in order to reduce mosquito populations as well as reduce the risk of mosquito-borne diseases. MCDs cooperate with DPH by coordinating mosquito surveillance, including the placement of traps, collecting and identifying trap catches, and submitting mosquitoes and associated data in a timely manner to DPH so that arbovirus testing can be performed. MCD personnel have knowledge of local habitats and understanding of management techniques that are a key part of reducing mosquito populations, and consequently, the transmission of mosquito-borne viruses. The MCDs provide weekly summaries to the SRB about mosquito abundance and diversity, local weather conditions, and mosquito control activities in their region. This information is incorporated into the weekly MDAR report and is an important part of SRB data analyses. Each MCD also provides an annual summary of mosquito control activities, which can be viewed at http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/annual-operation-reports.html

The regional programs of the MCDs currently cover 205 municipalities (see Figure 1). MCDs are typically managed by a director or superintendent, and have staff to manage day-to-day mosquito control operations. In addition to these MCDs, three municipalities (as of 2017: Deerfield, Greenfield, Northampton) are currently working with an outside contractor to perform mosquito surveillance. Mosquito control activities performed by or for non-member municipalities (including regional mosquito control programs that are limited to surveillance only) are also subject to the provisions of M.G.L. c. 252, along with other applicable federal, state, and local statutes and regulations. However, the municipalities or private contractors performing this work do not operate as state entities. The SRB and DPH have connections to the local Boards of Health and the contractor in each community, but in the case of an arbovirus emergency, there is not currently a fully functional MCD available to assist with coordination of mosquito control activities in those communities.

Figure 1: Map showing Mosquito Control Districts/Projects



Massachusetts Department of Agricultural Resources (MDAR)

In addition to housing the SRB, MDAR also provides a support staff that assists with mosquito control-related projects, including:

- One staff member (the Commissioner or a designee) to serve as the Chair of the SRB. Currently, the MDAR representative is the Director of the Division of Crop and Pest Services
- Environmental Biologist (analyzes mosquito surveillance and disease testing data and provides stakeholders with weekly and annual reports, reviews operational response plan and other policy documents to ensure sound science policy)
- Legal Counsel (advises SRB and MCDs on all legal issues, provides assistance with understanding the nuances of all legislation that governs mosquito control activities in the state)
- Financial Staff (assist with processing of internal service agreements with DPH for testing fees, budget management for MCDs, work with EEA Fiscal and the Executive

Office of Administration and Finance (ANF) on emergency supplemental request for funds during an arbovirus emergency)
- GIS Lead (provides mapping of aerial spray areas, acquisition and compilation of exclusion information for organic farms, aquaculture facilities, etc.)
- IT Lead (oversees website management, including assisting GIS Lead with development of tools to share mapping data online)
- Legislative Director (currently MDAR's Assistant Commissioner; performs outreach to Legislators in impacted areas during an arbovirus emergency)

Information about current MDAR staff working on mosquito-related issues can be found in Appendix 2.

Massachusetts Department of Environmental Protection (DEP)

- Oversees protocols for surface water protections
- Provides GIS shapefiles of drinking water supply reservoirs for use in establishing aerial spray exclusion zones
- Assists with assessments of surface water done pre- and post- application in the event of an emergency wide-area pesticide application
- Provides one staff member (the Commissioner or a designee) to serve on the SRB.

Massachusetts Department of Conservation and Recreation (DCR)

- Provides one staff member (the Commissioner or a designee) to serve on the SRB.

Division of Fisheries & Wildlife, Natural Heritage and Endangered Species Program (Massachusetts Department of Fish & Game) (DFG)

- Works with the SRB/MCDs to outline protocols to protect rare and endangered species during mosquito control activities, using the designation of Priority Habitat for these flora and fauna.
- Provides GIS shapefiles of Priority Habitat to the SRB and MCDs for use in planning emergency arbovirus interventions.
- Responds to all reports of potential fish kills following an aerial spray or other emergency mosquito control operation.

Massachusetts Department of Public Health (DPH)

The responsibilities of DPH include mosquito surveillance and arbovirus testing, development of risk assessments, dissemination of public information relating to mosquito-borne disease, and providing advice to the SRB on appropriate risk management for arboviruses. This work is performed through the Bureau of Infectious Disease and Laboratory Sciences (hereafter referred to as DPH). DPH's central responsibility is to characterize the severity of risk associated with mosquito-borne diseases such as EEEv and WNV, based on the most current DPH State

Surveillance and Response Plan (http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/arbovirus-response-plans.html), which describes the protocols for collecting and analyzing data for evidence of mosquito-related public health issues. DPH staff analyzes surveillance data and issues weekly summaries that include a current risk level map for both EEEv and WNV. Detailed versions of these reports are communicated to key state agency and MCD staff as well as MAG members; an online summary can be accessed at http://www.mosquitoresults.com. DPH also alerts the public to risk level changes over the course of the season.

DPH is also responsible for addressing health concerns related to mosquito control pesticide applications. If an aerial adulticide application is undertaken, DPH implements a surveillance system for possible pesticide-related illnesses as reported by emergency departments in the area of application, the Poison Control Center, or local health officials and individuals contacting DPH directly. DPH also works with toxicologists at DAR, DEP, and within DPH to develop recommendations for which pesticide products should be used in emergency arbovirus response, including aerial adulticide applications, and develops questions and answers about health concerns related to each product. For more information, see http://www.mass.gov/eohhs/docs/dph/environmental/exposure/aerial-spraying-faq-july-2012.pdf

Environmental Protection Agency (EPA)

In the event that it is determined that application of an aerial adulticide is needed, MDAR must provide a 'Notice of Intent' to the EPA within 30 days of the aerial adulticide event in order to obtain a National Pollutant Discharge Elimination System (NPDES) permit. MDAR may also contact the EPA, in the event of a public health emergency, to request a Federal exemption to use a pesticide not registered for use over crops. The requirement for this exemption depends on the pesticide selected for this application.

Mosquito Advisory Group (MAG)

The SRB established the Mosquito Advisory Group (MAG) to provide independent scientific advice regarding the justification, timing, location and options for intervention tactics that aim to prevent and/or suppress and contain infected mosquito populations that may otherwise result in an outbreak of disease in people and animals. Members of the MAG, who serve voluntarily on an as needed basis, are selected for their expertise primarily by the SRB, with input and approval from DPH. Each of the 6 MAG members is a recognized expert in their field, and provides independent assessments and advice to the SRB. MAG members may also attend SRB meetings and other mosquito-related meetings, or participate in workgroups established by DPH or SRB. A current list of MAG members can be found in Appendix 5.

Concept of Operations

The Concept of Operations is the system by which emergency operations are conducted. The plan outlined in this document is activated when a mosquito-borne disease threat or establishment of a new high-risk mosquito species is already occurring or imminent.

This system includes any ongoing mosquito surveillance, regardless of whether it is part of the response operation. The MCDs and DPH each conduct surveillance in order to 1) determine what mosquito species are present, and at what population levels and 2) capture mosquitoes in order to test them for the presence of mosquito-borne virus. This process is part of normal operations and takes place both prior to and concurrently with any response operations. While the mosquito season typically spans June through October, regular operations may involve surveillance (for mosquito larvae) as early as March. For detailed information about determination of arbovirus risk levels and associated activities, see Appendix 3. For a graphical representation of the process that leads to determination that an aerial spray or other emergency operation is necessary, see Appendix 4. For a checklist of tasks to be completed during emergency operations, see Appendix 13. For a quick reference chart, see Appendix 14.

Both DPH and MDAR produce weekly reports during the standard mosquito season, in order to communicate findings from surveillance and testing, along with any adjustments to the risk level for mosquito-borne illness. The MCDs provide updates to MDAR to include in those weekly reports, and several MCDs also produce their own separate reports. Please reference the **Notifications** section for additional reporting requirements.

Ongoing activities (Pre-Activation)

These activities continue through the mosquito season, and correspond to a DPH risk level of REMOTE or LOW. Responsible party is indicated at the end of each bullet in parentheses:

- Surveillance of mosquito population levels (MCDs, DPH, or private contractors working directly with municipalities)
- Implementation of Best Management Practices (BMPs), such as Integrated Pest Management (IPM), to reduce populations of immature and adult mosquitoes (MCDs or private contractors)
- Testing of mosquitoes for the presence of mosquito-borne disease (DPH)
- Larvicide and adulticide applications, where deemed necessary, based on surveillance, the guidelines set in the General Environmental Impact Report (GEIR), available at http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/generic-environmental-impact-report-geir.html, and other relevant data (MCDs or private contractors).

  This includes but is not limited to:

    - Hand application of larvicide to catch basins, culverts, ditches, abandoned swimming pools, etc.
    - Aerial application, by plane or helicopter, of larvicide to open water sources
    - Adulticide treatments via backpack sprayer or ground-based truck-mounted Ultra-Low-Volume (ULV) equipment
- Habitat management, when deemed necessary, to maintain larval control or reduce adult mosquito habitat (occurs year-round) (MCDs).

  This includes but is not limited to:
    - Cleaning of culverts
    - Ditch management
    - Tire removal

Elevated awareness/preparedness

This corresponds to a DPH risk level of MODERATE. Operations expand or intensify over the course of the mosquito season where needed (including areas near positive virus findings, areas where high concentrations of mosquitoes known to carry mosquito-borne illnesses occur, areas where disease outbreaks occurred in previous years, or areas where new high-risk mosquito species have been discovered but are not established).

During this stage, MCDs (or in cases where no MCD is present, DPH, or the local Board of Health working through a contractor) typically proceed with supplemental trapping to monitor mosquito populations*. MCDs may also perform ground-level adulticiding and/or ground-level or aerial larviciding of mosquitoes, to reduce nuisance-level populations or to suppress disease risk in affected areas. An affected area typically encompasses a "focal area" of a multiple-mile radius circle or larger around positive virus findings, and could incorporate multiple municipalities. The delineation of this area depends on a number of factors, including:

- Location and frequency of arbovirus finds from the previous season
- Timing of current virus activity
- The species of mosquitoes found to be arbovirus-positive
- Location and density of residences near positive findings
- Types of habitat that would need to be targeted in order for treatment to be most effective
- Seasonal conditions present that may be conducive to risk of human cases of arbovirus (precipitation, heat, etc.)

*Note that verification of the presence of arbovirus-positive mosquito pools, or human or animal cases of arbovirus, is done by DPH and is therefore subject to their protocols regarding the surveillance and testing process.

Initial Response

This corresponds to a DPH risk level of HIGH, typically for EEEv, but potentially for other arboviruses or for significant finds of a new high-risk mosquito species (such as Asian tiger mosquito), if the situation warrants. The designation of this risk level prompts discussion of possible next steps between the SRB/MDAR, DPH, and MAG because of the potential of declaring a public health emergency. Triggers include but are not limited to:

- Presence of a significant number of arbovirus-positive mosquito pools (typically EEEv-positive pools, but not limited to this arbovirus)
- Presence of arbovirus-positive mosquito pools (typically EEEv-positive pools, but not necessarily limited to this arbovirus) in an area not typically known to have a high risk
- Human or animal cases of arbovirus (particularly EEEv) within or in direct proximity to Massachusetts
- Occurrence of weather conditions conducive to rapid or massive increases in populations of the mosquitoes known to carry arboviruses such as EEEv. This includes significant rainfall events, flooding, and/or high temperatures
- Significant finds of a new, high-risk mosquito species, including established populations

At this point, DPH, the SRB/MDAR, impacted MCDs, and MAG should begin formal discussions to determine the necessity of an aerial adulticide application or other emergency mosquito control intervention. A notification process also begins, to ensure that all stakeholders are kept in the loop about these discussions:

- SRB members should notify their respective commissioners, their contacts at EEA and the Department of Fish and Game (DFG), and the appropriate MCD(s)
- DPH will inform local Boards of Health (BOH) and may also touch base with the appropriate MCD(s)
- MCD superintendents should notify their own Boards, and may also be in contact with other stakeholders (including local BOH in the potentially impacted areas, and other town officials)
- MDAR will notify the Secretary of the EEA, and keep EEA updated, and will also bring MAG into the discussions

MDAR then needs to review any vendor contracts (for emergency response, pesticide procurement, and efficacy testing), check in with these contractors to confirm availability, and also confirm availability of any needed staging areas (see Appendix 7 and Appendix 12). MDAR should also review documentation regarding appropriate pesticide selection, extent

and method of treatment, and treatment areas to target, and should advise Commissioners of any impacted agencies as to whether an approach such as an aerial adulticide application or other emergency response is prudent.

Determination of Risk Area

Upon agreement between MDAR/SRB, DPH, the appropriate MCDs, and MAG that an aerial pesticide application or other emergency arbovirus intervention is warranted for a declared public health emergency, DPH will characterize the area of risk based on current surveillance information, habitat, areas of historical activity likely to contribute to current risk, and known patterns of virus spread. MDAR GIS staff will then work with GIS staff from DPH to produce a perimeter map that delineates the perimeter of the proposed area for pesticide application. Any relevant map layers needed in case an aerial spray or other emergency pesticide application were to occur should also be prepared and/or updated. GIS staff at MDAR, DPH, DFG, and DEP participate in this process, and are given access to a SharePoint site in order to have a secure way to share mapping files and other data related to emergency response (see the Notifications/Communications section for details).

Pesticide Use Approval

Upon a declaration of a public health emergency, DPH requests that the Commissioner of Public Health issue a "Certification of Public Health Hazard That Requires Pesticide Application To Protect Public Health" in order for the Commonwealth agencies to be able to use pesticides for the emergency operations. An approved list of pesticides that can be used for aerial applications will be determined in advance through meetings between staff from MDAR, DPH, DCR, and DEP, as well as MAG. The SRB Operations Coordinator will also file a request for a NPDES permit in advance and keep this permit current and on file.

Securing of Emergency Funding

Upon a declaration of a Public Health Emergency, the SRB/MDAR will reach out to EEA (through the Executive Office for Administration and Finance) to secure emergency funding to cover operations costs. While emergency contractors are activated as soon a public health emergency is declared, securing the supplemental funding is done concurrently with emergency response preparations, and total costs are often not obtained until after the operation is complete.

Key actions that need to occur alongside operational emergency preparations include:

- MDAR and SRB staff work to determine all estimated costs of the emergency response operation
- MDAR's Fiscal Office works with EEA Fiscal and ANF on an emergency supplemental request for funds

- MDAR's Legislative Officer (currently the Assistant Commissioner) keeps legislators in the impacted areas informed

Delineation of Area of Operations

The risk area map must be combined with the following GIS layers to produce the final working map:

a. **Determination of Potential No-Spray Zones/Waivers**
   - Certified organic farms
     - In early spring of each year, MDAR's GIS lead updates the list of certified organic growers, using data from the USDA and from Bay State Organic Certifiers. These growers are contacted by MDAR and asked to either provide a map or to use an online GIS app to map out their parcels. A map layer is then created containing the location information for organic farms.
     - Note that the USDA National Organic Program (NOP) does not prohibit the application of pesticides for a public health emergency on certified organic farms (see Section 205.672 of Title 7 of the Code of Federal Regulations, Emergency pest or disease treatment, National Organic Program), though any crop or plant part to be harvested that has contact with a prohibited pesticide cannot be sold, labeled, or represented as organic. Organic farms sprayed with pesticides as part of a public health emergency do not lose their certification, only the ability to market the current year's crop as organic. However, certified organic farms typically represent a small percentage of land targeted for a possible emergency mosquito control operation and do not typically include prime mosquito habitat. As such, the SRB will make every effort to exclude these properties from any emergency mosquito control efforts that could impact the organic status of their crops.
     - If the property is excluded, a buffer zone of 500ft is set from the edge of any organic farm, to account for spray drift that could occur.
   - Commercial fish hatcheries/aquaculture
     - In early spring of each year, MDAR's GIS lead updates the list of licensed commercial, state, and federal fish hatcheries/aquaculture facilities, using data from DFG. These entities are contacted by MDAR and asked to update their information. A map layer is then created from this information.
     - Location data is provided to MDAR via GIS data layer, built from data held by MDAR.
     - A buffer zone of 500ft is set from the edge of any aquaculture facility, to account for spray drift that could occur.
   - Priority habitats for federally listed endangered and threatened species

    - Map shapefiles are provided by DFG; they do not set an additional buffer zone.
- Surface drinking water supply resource areas
    - Map shapefiles are provided by DEP; they do not set a buffer zone provided the pesticide being applied is one that was previously reviewed and approved (i.e. Anvil 10+10, see Appendix 8).

MDAR may also contact the EPA, in the event of a public health emergency, to request a Federal exemption to use a pesticide not registered for use over crops. The requirement for this exemption depends on the pesticide selected for application.

b. Exclusion/Inclusion of Priority Habitats

DPH will determine, in consultation with SRB, MDAR, DFW, DEP, and MAG, if spraying in Priority Habitats (defined as the known geographical extent of habitat for all state-listed rare species) is necessary to protect public health.

If spraying in these areas is deemed necessary, DPH requests a permit from DFW be issued to MDAR for the "taking" of endangered, threatened, or special concern species.

MDAR GIS staff coordinates the compilation of exclusion areas (no-spray zones) developed by MDAR, DFW, and DEP, and combines this with the determined spray area to produce the final map. The map/GIS map layers are then shared with DPH, DEP, and DFG; each agency will then indicate approval to the GIS lead who will notify the SRB. Further discussions may be held with these agencies as well as MAG, as new mosquito and arbovirus data becomes available and environmental conditions change.

Following an official consensus (between MDAR/SRB, DPH, the appropriate MCDs, and MAG) that an emergency mosquito control intervention should occur, MDAR will transfer the final geographic data to the contractors performing the aerial pesticide application or other emergency operation, and also to the contractor performing the efficacy testing.

Public Notification

MDAR and DPH will provide public notices regarding the locations, dates, and times of aerial spraying or other wide-area emergency operations as required. MDAR maintains the SRB website, and in the event that emergency mosquito control operations are planned, this website (http://www.mass.gov/eea/agencies/agr/pesticides/mosquito) will provide links to relevant information. A current map of the treatment area(s) will also be displayed at http://massnrc.org/spray-map to be updated at least once daily during operations.

The SRB Operations Coordinator will provide Standard Written Notification for schools, day care centers, and school-age child care programs, as defined under 333 CMR 14.00 (see https://www.massnrc.org/ipm/schools-daycare/child-protection-act-2000/full-text/written-notification.html). This notification will be posted to the SRB website as well as the MDAR School IPM website (https://www.massnrc.org/ipm), and will be sent by email to the Massachusetts Department of Education and Massachusetts Department of Early Education. If at least 2 days advance notice is not possible prior to an emergency response, the SRB will also complete an emergency waiver (https://www.massnrc.org/ipm/schools-daycare/ipm-tools-resources/emergencies.html) and include it with the notification.

The DPH 24/7 Epidemiology Program Hotline (617-983-6800) can be used to provide information regarding the spray area, precautionary measures, and additional telephone numbers to report fish kills or other environmental impacts.

Please refer to the Notifications/Communications section below for a detailed explanation of the SRB communication protocol.

Operational Procedures: Emergency Arbovirus Intervention

Once MDAR/SRB initiates an aerial spray or other emergency response operations involving wide-area pesticide application, the SRB Operations Coordinator will verify that a 'Notice of Intent' was submitted to the EPA to obtain an NPDES permit (see section 4 above). If not, it must be submitted within 30 days of an emergency response.

If the emergency arbovirus response encompasses a geographic area that requires several treatments over more than one night, MDAR's GIS lead will provide the SRB with a GIS map of the areas that were sprayed by 8AM the day following the application (or as soon as the information is available from the contractor), so that this information is readily available once queries from the public, legislators, or other concerned parties begin to come in. A link to the map of the application area will also be posted on the SRB website (http://www.mass.gov/eea/agencies/agr/pesticides/mosquito).

Monitoring

- **Environmental Monitoring**
  Environmental monitoring in treated areas will be pursued directly following an aerial adulticide application or other emergency arbovirus response to determine whether there are any impacts on the following:
  - Drinking water supplies and surface waters (DEP, Appendix 9)
  - Apiaries (MDAR, Appendix 11)
  - Cranberry bogs (DPH, Bureau of Environmental Health)
  - Rare Invertebrates (DFG, Appendix 10)
  - Potential fish kills (DFG oversees this, any observations of potential fish kills should be reported through the Environmental Law Enforcement radio room (800-632-8075, available 24/7))
- **Treatment Efficacy Monitoring**
  MDAR/SRB and DPH will initiate plans for standardized monitoring of pre- and post-spray mosquito activity in order to determine the efficacy of the emergency arbovirus response.

  If the emergency response is aerial adulticiding, all agencies will follow procedures as outlined in the SRB/Massachusetts Mosquito Control Surveillance Protocol for Evaluation of Efficacy of Aerial Adulticide Application Regarding Mosquito-Borne Disease (Appendix 6).

  Other agencies (DFG, DEP, DPH) typically assist MDAR/SRB in GIS mapping and data calculations needed for this monitoring.

Notifications/Communications

Chain of Communication

In the event of a mosquito-borne disease event or emergency, the SRB will reach out to key MDAR staff who will assist in notifying entities such as beekeepers, cranberry growers, certified organic farms, and aquaculture facilities:

- MDAR's Chief Apiary Inspector will contact County Beekeeping Associations and other related stakeholders concerning the timing and location of aerial application activities, so that beekeepers are properly informed.
- The SRB Operations Coordinator will notify any potentially impacted cranberry growers, organic farms, and aquaculture facilities.

In addition, each of the SRB members will report significant findings and concerns to the Commissioner of their respective state agency and/or other designated officials within their respective agency to ensure that important mosquito-borne disease risk information is reported. The Chair of the SRB will also notify MDAR Chief of Staff, who will ensure that EEA is kept informed. DEP should notify the managers of any potentially impacted surface water supplies.

Communication of Public Information

In the event of a Public Health Emergency, the SRB will designate a point of contact to work with the EEA Press Office and the DPH Office of Health Communication. Public information will be developed in collaboration with DPH and others in order to communicate timely and accurate information to the public during any mosquito-borne disease threat. The target audiences for these messages will be the media, BOHs, and the public, and the information provided will include:

- The kind, location, and extent of any incident related to mosquito-borne illness
- Instructions to the public (what to do during an aerial spray, recommendations to practice personal protection to avoid mosquito bites, avoiding areas prone to mosquito activity, etc.)
- The benefits and risks of the planned aerial adulticiding or other emergency operation
- Fact sheets, frequently asked question lists, and contact lists for further information

Information/File-Sharing

Files that could be useful during an emergency operational response but are typically only updated annually, such as lists of organic farms, beekeeper contacts, and staff contact lists, will each be overseen by the designated staff person listed in this plan. Each staff person should

also keep a current version of any files they oversee on the Mosquito Control SharePoint site. Staff can request permission to access this site through MDAR's GIS Lead, or can alternately pass on files for upload to MDAR's Environmental Biologist if they do not need access on their own. If neither of these staff is available, a document in the SRB folder of MDAR's share drive has the URL of the SharePoint site and instructions for requesting access.

The SharePoint site is also the home for GIS shapefiles and other files being prepped during an emergency response by MDAR, DEP, DFW, and DPH.

Health Emergency-Related Communications

To ensure that all stakeholders are properly prepared for the possible scenario where accidental exposure to a pesticide is reported during an aerial spray, DPH will contact emergency departments, hospitals, poison control centers, and local health departments, and provides these entities with pesticide illness surveillance protocols.

Scheduled Reporting

During the season that mosquitoes are active (generally April through October), partner agencies and organizations provide regular communications and notifications of conditions relative to mosquito activity. These reports are important for communicating arbovirus risk levels and also for understanding both short-term and long-term trends in mosquito activity.

1. DPH Weekly Reporting

The DPH Arbovirus Program generates and distributes weekly Arbovirus Surveillance Program Reports that summarize the results of mosquito trap collections from the prior week and other pertinent data. This information is forwarded to key personnel including but not limited to members of the SRB, MCDs, MAG, state Commissioners from DAR, DCR, DEP, and others within EEA. The DPH Arbovirus Program also convenes occasional meetings and conference calls during the mosquito season to provide current status and updates of arbovirus activity, including summaries of isolations or cases in adjoining states.

The weekly reports summarize current data including:

- Reporting of human or animal cases of arbovirus (focused on but not limited to EEEv and WNV)
- Any key public communication messages regarding arbovirus risk
- Results of weekly arbovirus testing of mosquito samples sent in by the MCDs or collected by DPH
- Current Risk Classifications for EEEv and WNV by municipality (maps)
- Mosquito Surveillance at DPH long-term trap sites (including how *Culiseta melanura* abundance compares to previous weeks and previous years, and current and historical data on how this impacts arbovirus infection rates)

DPH also uses the publicly accessible website http://www.mosquitoresults.com to provide up-to-date information about town/city arbovirus risk levels, the number of human and animal arbovirus cases, and the number of mosquitoes (statewide) testing positive for arbovirus.

2. SRB/MDAR Reporting

During mosquito season (June-October), the MDAR environmental biologist produces a weekly report that provides information on current trends of mosquito activity, arbovirus levels, and any mosquito-related issues of concern. The report is compiled using information provided by the MCDs, mosquito collection and arbovirus data from current and previous mosquito seasons, weather and climate updates, the DPH-generated Arbovirus Surveillance Program Report, and arbovirus reports from other states. It is then sent out to the SRB, MCDs, MAG members, staff from MDAR, DCR, DEP, and others within EEA, and key DPH personnel. When and if risk levels become a concern, more frequent briefings may be distributed by email to key personnel.

The information from each season of weekly reports is also compiled into an annual report that is provided to the above contacts each winter and posted on the SRB website (http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/annual-operation-reports.html).

3. MCD reports

The SRB asks each MCD and any municipality performing regular mosquito surveillance/treatment to provide a weekly report to MDAR's Environmental Biologist for use in the SRB/MDAR weekly reports. Several of the MCDs already produce weekly reports and some also make these available to the public on their websites. Other MCDs provide MDAR with a weekly email update.

All MCDs, any municipality performing regular mosquito surveillance (including contractors performing this work for a municipality), or anyone doing a mosquito control project outside of an MCD is required to file an annual report with the SRB, due by January 31st of the year following when the work was done. These reports are posted on the SRB website (http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/annual-operation-reports.html).

4. MAG/SRB Analysis

If an emerging arbovirus risk appears imminent, MDAR's Environmental Biologist will contact MAG, who will be asked to evaluate available data sets, prioritize strategies for intervention (method, location, timing), and provide the SRB and key DPH staff with recommendations. SRB will take these recommendations under advisement, and may seek further comment and clarification from DPH, the MCDs, and other officials or senior managers within their respective state agencies.

Administration

Fiscal Considerations

The cost of an emergency arbovirus response will be dependent on conditions identified as the mosquito season progresses, including but not limited to the number of acres needing treatment, the kind and amount of chemical necessary to cover the area of risk, need for aerial adulticide application and the calibration and characterization of delivery apparatus of aircraft, environmental monitoring expenses, aircraft software (AGNAV) and Mapping Tech support, post-operations analysis, personnel expenses, and established contingency contracts for aerial application services. Since the SRB does not maintain resources to respond to a large emergency operation, this will be outlined as part of contractor expenses.

Plan Review and Maintenance

MDAR and SRB staff will update this Plan as needed in coordination with the stakeholders listed within the Roles and Responsibilities section of the Plan. Updates may include changes in legislative direction, resources, and processes, as well as updates in standards prior to or as a result of an activation of the Plan.

Conclusion

The overall goal of reducing the transmission risk of mosquito-borne diseases within Massachusetts is ultimately achieved by having an operations plan in place prior to an arbovirus emergency. This includes formalizing contracts covering aerial adulticide application and other emergency operations, pre- and post-treatment monitoring, efficacy testing, securing pesticide vendors, and verifying contact lists for essential personnel. The plan ensures that personnel, products, aircraft, and other supports are available for a rapid and timely response.

This plan ensures that the Commonwealth is ready to provide, as quickly as is feasible, an appropriate and meaningful response based on entomological, epidemiological, meteorological, and ecological data, backed up by both practical and scientific evaluation of this data by the SRB, DPH, MDAR, MAG, and other state agencies including DCR, DEP, and DFG.

Appendix 1: Acronyms

ANF = Massachusetts Executive Office of Administration and Finance

BEH = Bureau of Environmental Health (housed within DPH)

BIDLS = Bureau of Infectious Disease and Laboratory Sciences (housed within DPH)

BMPs = Best Management Practices

BOH = Board of Health (a municipal entity)

C. = Chapter (in reference to Massachusetts General Law)

CONOPS = Concept of Operations

DCR = Massachusetts Department of Conservation and Recreation

DEP = Massachusetts Department of Environmental Protection

DFG= Massachusetts Department of Fish and Game

DFW = Massachusetts Division of Fisheries and Wildlife (housed within DFG)

DMF = Massachusetts Division of Marine Fisheries

DPH = Massachusetts Department of Public Health

EEA or EOEEA =Executive Office of Energy and Environmental Affairs

EEEv = Eastern Equine Encephalitis virus

EHHS = Executive Office of Health and Human Services

EPA = Environmental Protection Agency

FIFRA = Federal Insecticide, Fungicide, and Rodenticide Act

GEIR = General Environmental Impact Report

GIS = Geographic Information System

MAG = Mosquito Advisory Group

MCD = Regional Mosquito Control Districts/Projects

MDAR = Department of Agricultural Resources

M.G.L. = Massachusetts General Law

NOP = National Organic Program

NPDES = National Pollutant Discharge Elimination System

SRB = State Reclamation and Mosquito Control Board

USDA = United States Department of Agriculture

WNV = West Nile Virus

Appendix 2: MDAR/SRB Staff Roles and Contact Info

A complete and current contact list of MDAR/SRB staff who have roles related to mosquito control, and are likely to be involved in emergency arbovirus response, is available on the MDAR share drive in the SRB's "ResponsePlanDocuments" folder. The SRB Operations Coordinator will update this list annually. If you do not have access to this folder, contact the SRB Operations Coordinator (see contact info at http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/).

Appendix 3: Risk Matrices and Response Activities for Mosquito-Borne Illness Prevention and Mosquito Suppression

The tables below show the SRB/MCD response that corresponds to the Phased Responses in the DPH 2017 Massachusetts Arbovirus Surveillance and Response Plan.

Guidelines for Phased Response to EEE Surveillance Data

DPH Risk Category	DPH	SRB/MCDs
1: Remote Must have: • No EEE activity detected in community or focal area in at least 10 years • No current surveillance findings indicating EEE activity in mosquitoes in the focal area • No confirmed animal or human EEE cases	• Staff provides educational materials and clinical specimen submission protocols to targeted groups involved in arbovirus surveillance, including, but not limited to, local boards of health, physicians, veterinarians, animal control officers, and stable owners. • Educational efforts directed to the general public on personal prevention steps and source reduction, particularly to those populations at higher risk for severe disease (e.g., children and the elderly). • Passive human and animal surveillance. • Public health alert sent out by MDPH in response to first EEE virus positive mosquito pool detected during the season. The alert will summarize current surveillance information and emphasize personal prevention strategies. • Emphasize the need for schools to comply with MA requirements for filing outdoor IPM plans. • Initiate source reduction; use larvicides at specific sites identified by entomologic survey. In making a decision to use larvicide consider the abundance of *Culex* larvae, intensity of prior virus activity and weather.	MCDs do the following: • Perform mosquito surveillance • Submit samples to DPH for arbovirus testing. • Carry out management techniques such as source reduction and other control methods, with the goal of reducing levels of immature and adult mosquitoes. • Maintain larvicide applications where necessary, and adulticide applications based on the Mosquito GEIR and GEIR updates, surveillance, and other relevant data. Factors determining larvicide use include abundance of Culex larvae, intensity of prior virus activity, and weather conditions
2: Low Must have **EITHER**: • Any EEE activity detected within the last 10 years **OR BOTH of the following:** • Sporadic EEE isolations in *Cs. melanura* in the	Response as in category 1, plus: • Expand community outreach and public education programs, particularly among high-risk populations, focused on risk potential and personal protection, emphasizing source reduction.	MCDs should: • Expand larval control and source reduction where necessary, as surveys or monitoring indicate need. • Maintain current adulticide applications based on Mosquito GEIR, surveillance,

community or focal area (1-2 isolates found in non-consecutive weeks) • **No** confirmed animal or human cases		and other relevant data.
3: Moderate Must have **EITHER**: • Within the prior year, sustained EEE activity in bird-biting mosquitoes, EEE isolate from mammal-biting mosquitoes or confirmation of one human or animal EEE case in the community or focal area **OR** no confirmed animal or human EEE cases in the current year, along with **ANY** of the following: • Sustained EEE activity in *Cs. melanura*, with minimum infection rates at or below mean levels for focal area trap sites • A single EEE isolate from mammal-biting mosquitoes (bridge vector species) • Sustained EEE activity plus at least one multiple meteorological or ecological condition (rainfall, temperature, seasonal conditions, or larval abundance) associated with elevated mosquito abundance and thus likely to increase the risk of human disease	Response as in category 2, plus: • Outreach and public health educational efforts are intensified including media alerts as needed. • Public health alert sent out by MDPH in response to first pool of EEE positive mammal-biting mosquitoes detected during the season. The alert will summarize current surveillance information and emphasize personal prevention strategies. • HHAN (Health and Homeland Alert Network) alerts or phone calls are provided to local boards of health upon confirmation of EEE in any specimen; advise health care facilities of increased risk status and corresponding needs to send specimens to DPH for testing. • Supplemental mosquito trapping and testing in areas with positive EEE findings if DPH resources allow. Notify all boards of health of positive findings.	MCDs respond as in category 2, plus: • Coordinate with DPH to set up and monitor supplemental trapping sites where hotspots of arbovirus activity is thought to occur • Targeted larviciding where feasible • Multiple adulticiding treatments via ground-based truck-mounted Ultra-Low-Volume (ULV) equipment, dependent on mosquito abundance, time of year, and weather conditions, and proximity of arbovirus activity to at-risk human populations. • Outreach to BoH and other municipal officials in the towns/cities within the MCD coverage area Authorized municipal officials may also choose to request that the DPH Commissioner issue a certification that pesticide application is necessary to protect public health, in order to preempt no-spray requests submitted by private property owners.

4: High
Must have **EITHER**:
• Sustained or increasing EEE activity in *Cs. melanura* with weekly mosquito minimum infection rates above the mean
OR:
• 2 or more EEE isolates in mammal-biting mosquitoes from 2 different traps.
AND/OR BOTH of the following:
• Sustained or increasing EEE activity in mosquitoes plus multiple meteorological or ecological conditions (rainfall, temperature, seasonal conditions, or larval abundance) that are associated with elevated mosquito abundance and thus very likely to increase the risk of human disease.
• No confirmed animal or human EEE cases in current year
	Response as in category 3, plus:
	Intensify public education on personal protection measures (avoid outdoor activity during peak mosquito hours, wear appropriate clothing, use repellents, employ source reduction):
	
	• Utilize multimedia messages including public health alerts from MDPH, press releases from local boards of health, local newspaper articles, cable channel interviews, etc.
	  ○ Encourage local boards of health to actively seek out high-risk populations in their communities (nursing homes, schools, workers employed in outdoor occupations, etc.) and educate them on personal protection
	  ○ Advisory information on pesticides provided by MDPH Bureau of Environmental Health
	  ○ Urge towns and schools to consider rescheduling outdoor, evening events
	• Active surveillance for human cases is intensified. Health care facilities are advised of increased risk status and corresponding needs to send specimens to DPH for testing
	• MDPH will confer with local health officials, SRB and MCDs to determine if the risk of disease transmission warrants classification as level 5
	• MDPH will confer with local health agencies, SRB and MCDs to discuss the use of intensive mosquito control methods. If elevated risk is assessed in multiple jurisdictions and evidence exists that risk is likely to either increase (based on time of season, weather patterns, etc.) or remain persistently elevated, the interventions may include state-funded aerial application of mosquito adulticide which, if conditions warrant, may be repeated as necessary to interrupt the virus transmission cycle and protect public health.
		MCDs continue response as in Category 3, expanding or intensifying where needed (around arbovirus-positive mosquito pools, location of residents near positive findings, and type(s) of wetland habitat where treatment would be most effective).
		
		MCDs/BOH/local officials may proceed with focal area larviciding or adulticiding in order to suppress risk in these areas. “Focal area” includes but not is not limited to a multiple mile radius circle or larger around positive virus findings, and could incorporate multiple communities, towns or cities. The delineation of a focal area depends on a number of factors such as prior year isolations, timing of current virus isolations, which mosquito species are arbovirus-positive, location and density of residents near positive findings, type(s) of wetland habitat to target where treatment would be most effective, general mosquito habitat, and the cyclical and seasonal conditions that represent conditions conducive to risk of human disease.
		
		If high health risk is declared, SRB should begin discussions regarding need for an aerial adulticiding or other emergency response. If Commissioners of MDAR, DEP, and DCR agree that aerial adulticide is necessary, MDAR Commissioner or Chief of Staff notifies Secretary of EEA.

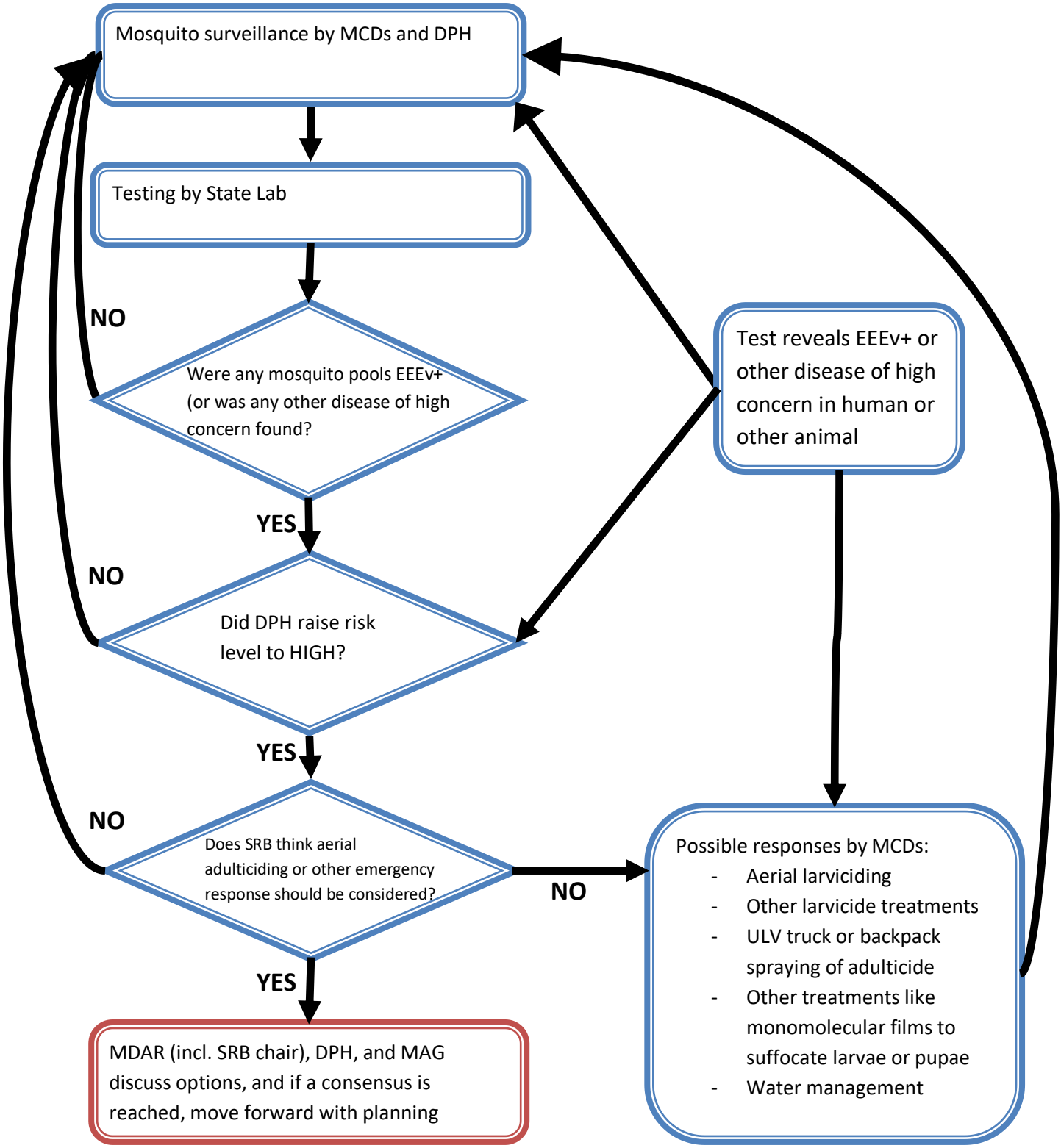
		SRB should also confer with DPH and BOH officials and determine if a classification of category 5 is warranted. • Authorized municipal officials may choose to request that the DPH Commissioner issue a certification that pesticide application is necessary to protect public health, in order to preempt no-spray requests submitted by private property owners. • Municipal officials may also consider proceeding with a focal area aerial adulticiding, with all proper notifications and permits (contact MDAR's Director of Crop & Pest Services). Note that, in recent years, such mosquito control activities have been handled at the state level.
5: Critical **Must have EITHER:** • Multiple quantitative measures indicating critical risk of human infection (early season positive surveillance indicators, sustained high mosquito infection rates, multiple meteorological or ecological conditions (rainfall, temperature, seasonal conditions, or larval abundance), etc., indicating rapidly escalating epizootic activity) **OR:** • A single confirmed EEE	Response as in category 4, plus: • Continued highly intensified public outreach messages on personal protective measures. Frequent media updates and intensified community level education and outreach. Strong recommendation for rescheduling of outdoor, evening events • MDPH will confer with local health agencies, SRB and MCDs to discuss the use of intensive mosquito control methods and determine the measures needed to be taken by the agencies to allow for and assure that the most appropriate mosquito control interventions are applied to reduce risk of human infection. These interventions may include state-funded aerial application of mosquito adulticide. Factors to be considered in making this decision include the seasonal and biological conditions needed to present a continuing high risk of EEE human disease and that those same conditions permit the effective use of an aerially applied pesticide. • Once critical human risk has been identified, the SRB	Continue response as in Category 4. Once critical human risk has been identified, the SRB will determine the emergency mosquito control response and will provide advice relative to: • Appropriate pesticide • Extent and route of treatment • Targeted treatment areas If critical health risk is characterized by DPH, MCDs or the SRB should notify respective agency officials of appropriate pesticide, extent and route of treatment, targeted treatment areas and advise commissioners

human or animal case	will determine the adulticide activities that should be implemented by making recommendations about: • Appropriate pesticide • Extent, route and means of treatment • Targeted treatment areas If aerial spraying commences, DPH will initiate active surveillance for pesticide-related illness via emergency departments and with health care providers. • DPH will designate high-risk areas where individual no spray requests may be preempted by local and state officials based on this risk level. If this becomes necessary, notification will be given to the public • DPH recommends restriction of group outdoor activities during peak mosquito activity hours, in areas of intensive virus activity • DPH will communicate with health care providers in the affected area regarding surveillance findings and encourage prompt sample submission from all clinically suspect cases	whether full scale adulticide aerial spraying is necessary. If State Commissioners of MDAR, DEP, DCR agree that aerial adulticide is necessary, the MDAR Commissioner notifies the Secretary of the EEA. The EEA Secretary and HHS/DPH jointly notify Governor. The Governor considers advisement to approve declaration of emergency to protect public health risk.

Guidelines for Phased Response to Asian Tiger Mosquito (*Aedes albopictus*)

DPH Risk Category	Recommended Response by DPH, SRB and MCDs
1: No identification of *Aedes albopictus* activity in a given area	• DPH, SRB and MCDs identify areas proven to serve as routes of entry for *A. albopictus* (shipping ports, tire recyclers, etc.) • DPH works with MCDs to coordinate surveillance in these areas
2: Isolated or intermittent Id of adult *Aedes albopictus* in a given area, likely to represent introduction or repeated reintroductions	• Continue or expand surveillance • Submit any adult mosquitoes to DPH for storage and possible testing, as the situation warrants • Work with BOH to identify possible habitat/potential breeding sites; initiate clean-up as necessary
3: Consistent findings of adult *Aedes albopictus*, or evidence of possible overwintering	• Expand surveillance to detect extent of geographic distribution • Submit any adult mosquitoes to DPH for storage and possible testing, as the situation warrants • Work with BOH to identify possible habitat/potential breeding sites; initiate clean-up as needed • Direct educational efforts to the general public, covering personal prevention steps and source reduction • DPH consults with MCDs, SRB, and MAG to assess and evaluate the need for larviciding or adulticiding interventions

Appendix 4: Emergency Operations Decision Process



Appendix 5: Mosquito Advisory Group (MAG) Members

The Mosquito and Advisory Group (MAG) is comprised of six independent experts:

Dr. Richard Pollack, MAG Chairman
Public Health Entomologist
Senior Environmental Public Health Officer, Harvard University
Instructor, Harvard School of Public Health
President & Chief Scientific Officer, IdentifyUS LLC
richard_pollack@harvard.edu, cimex57@gmail.com

Dr. Asim Ahmed (specializing in Pediatric Infectious Disease)
Division of Infectious Diseases, Children's Hospital Boston
Harvard Medical School
Asim.Ahmed@childrens.harvard.edu

Jere Downing, Entomologist
Executive Director of the Cranberry Institute (retired)
Former University of Massachusetts Biting Fly Specialist
jeredowning@gmail.com

Dr. Anthony (Tony) Kiszewski, Epidemiologist
Department of Natural and Applied Sciences, Bentley College
akiszewski@Bentley.edu

James Leach, Director
Bureau of Toxic Substance Assessment
New York State Department of Health
james.leach@health.ny.gov

Dr. Sam Telford, Epidemiologist (focusing on the public health burden of vector borne infections)
Professor, Tufts University, Dept of Infectious Disease and Global Health
Cummings School of Veterinary Medicine, Tufts University
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Appendix 6: SRB Protocol for Evaluating the Efficacy of Aerial Adulticide Application(s) or other Emergency Arbovirus Response

Introduction

Eastern Equine Encephalitis (EEEv) and West Nile Virus (ENV) are the most significant mosquito-borne public health threats in Massachusetts. In Massachusetts and elsewhere in the United States, organized regional mosquito control and surveillance programs operate using the principles of Integrated Pest Management (IPM) where action thresholds and intervention decisions are based on surveillance.

Mosquito-borne disease surveillance defines the local epidemiology of the disease: the presence, distribution, and prevalence of the causal agents and vectors. It therefore requires proper mosquito identification and quantification. Surveillance of mosquito populations, along with careful scrutiny of environmental influences, seasonal variations, and weather, facilitates the process of assessing risk of mosquito-borne disease, and provides a basis for intervention decisions.

In Massachusetts, surveillance is performed by the mosquito control districts/projects (MCDs) and the Massachusetts Department of Public Health (DPH). This surveillance includes monitoring of ecological and epidemiological parameters. DPH also assigns risk levels pertaining to EEEv and WNV transmission throughout the mosquito season.

The primary method for determining the efficacy of emergency mosquito control treatment is to compare abundance before and after the emergency treatment intervention. MDAR/SRB and DPH initiate plans for evaluation of pre- and post-spray mosquito activity as part of the emergency mosquito response plan. All agencies must follow procedures outlined in Appendix 6 of this plan. DPH may assist MDAR/SRB in GIS mapping and data calculations.

Purpose

This appendix establishes a standardized spray efficacy protocol to evaluate emergency aerial adult mosquito control intervention for use by the Board, its MCDs and DPH. The purpose of this protocol is to provide guidance on how to quantitatively document the impact of aerially applied adulticide on mosquito populations. The goal of the intervention is to reduce the risk to humans of contracting a mosquito- borne disease.

Although the protocol places emphasis on EEEv, there is also an established surveillance system for WNV and for Asian tiger mosquito (ATM). Both use different mosquito traps (gravid traps)

than the EEEv program (the WNV surveillance system uses gravid traps; the ATM surveillance system uses ovitraps and BG Sentinel traps). The gravid traps collect live *Culex spp.* adults (the primary vectors of WNV) for virus analysis, and could be used to quantitatively measure the efficacy of WNV interventions such as aerial adult mosquito control intervention. The ovitraps and Sentinel traps collect eggs and adults, respectively, and are used to gauge population levels of ATM though specimens may be collected and stored for arbovirus analysis later.

Mosquito Species

Just a few kinds of mosquitoes are of particular concern to public health authorities and mosquito control professionals in Massachusetts. For EEEv, these include the primary vector *Culiseta melanura*, and the likely bridge vectors *Coquillettidia perturbans*, *Aedes vexans,* and *Ochlerotatus canadensis.* For WNV, this includes the primary vector *Culex pipiens*.

Quantitative Measurement for Efficacy of Emergency Mosquito Control Intervention

Traps used for assessing the efficacy of emergency mosquito control intervention are selected and deployed to maximize the sampling of mosquitoes of the target species and their flight range. The larger the sample size, and the greater the proportion of the sample being composed of the target species, the greater the return on investment of time and labor. The evaluation of efficacy of an intervention can be measured in 3 ways:

1. **Document changes in the abundance of mosquitoes**

   Documenting a change in mosquito abundance is done by comparing populations before and after the application. Decreases in mosquito abundance support a conclusion that the intervention was successful, since the likelihood of humans acquiring bites by disease carrying mosquitoes has been reduced. This analysis of efficacy takes into consideration changes in the abundance of mosquitoes (pre- and post- application) in non-treated areas. The number of mosquitoes collected in a trap can vary significantly for a variety of reasons that have little to do with the efficacy of the application. In some cases mosquito abundance may even be observed to rise after a spray event. Such phenomena may be explicable on the basis of weather, the emergence of new adults and immigration of mosquitoes from beyond the treated area. Comparison of untreated areas with treated areas helps to account for these influences on collections. Calculations are typically done using the Henderson-Tilton formula (see end of this Appendix).

2. **Document changes in the infection rate of the mosquito population**

   Efficacy can also be measured by calculating changes in the minimum infection rate (MIR), an estimate of the number of mosquitoes in the environment that are infected with a virus. The number is calculated from the number of mosquitoes tested and the number of positive pools (# of positive pools/total # tested)*1000 = MIR). MIR is usually expressed as

the number of infected mosquitoes per 1000 mosquitoes. An effective intervention should be expected to reduce the MIR post-treatment, relative to the MIR pre-treatment. However, a conclusion based solely upon the MIR results (absent data pertaining to the corresponding abundance and population age structure) may compromise the level of assurance of any conclusion. An increase in the MIR post-treatment might be suggestive of an intervention failure, or be explained by a decrease in the abundance of young mosquitoes that had less opportunity to have acquired infection.

3. **Document changes in the age structure of the population (older mosquitoes are more likely to carry disease)**

The third method to determine efficacy documents changes in the age structure of the mosquito population. Mosquitoes infected with WNV or EEEv are mosquitoes that have blood fed at least once. In most cases this also means that they have laid eggs. The development of eggs causes changes in the ovarian tracheoles that can be seen through dissection. After a successful application, parity rates should decrease. Examining parity rates can help document the emergence of new mosquitoes. This method has not been employed in Massachusetts because of the significant resources needed (additional traps, trained personnel, and time). The dissection process also potentially decreases the number of mosquitoes that can be tested for disease.

Trap Types

Many different types of traps have been developed for mosquito surveillance. Each kind of trap has attributes that make it more or less useful for sampling certain kinds of mosquitoes. In Massachusetts, the traps used most often for surveillance of adult mosquitoes includes CDC light traps (with and without CO_2), UV light traps, gravid traps, New Jersey Light traps, BG-Sentinel traps, and resting boxes. Ovitraps/ovicups (including autocidal traps) are also employed to collect eggs, particularly in areas where surveillance for Asian tiger mosquito is being performed. Landing rate tests are also sometimes used.

<u>CDC light traps:</u> The CDC trap (even when augmented with CO_2) is the most efficient standard surveillance device for assessing the efficacy of an aerial application of adulticide, because of its relatively low cost, portability, widespread use, and tendency to maintain captured insects alive and in good condition. It is compact and portable, battery-powered, and can maintain sampled mosquitoes alive for the purpose of species id and arbovirus testing. A small incandescent lamp disorients flying insects, and a fan draws these into a collection chamber. The light may be augmented or replaced by a CO_2 source, where CO_2 is provided by a mass of sublimating dry ice, or as a metered flow from a pressurized cylinder. Several modifications to the basic design are available, including the UV light trap, which is

fitted with a blue-black light rather than the standard incandescent lamp. UV light traps can be deployed as a CO_2 or non-CO_2 option. Mosquitoes are attracted to the black light and collect similar species and numbers as the CDC light trap. If used to determine efficacy, collection data derived from UV traps operating in treated areas should be compared to data from UV traps operated in non-treated areas. However, the use of UV traps to analyze efficacy for the purpose of this protocol is **not recommended** since the numbers of mammal biting mosquitoes may be under represented by lack of CO_2 attractant.

This trap, baited with a CO_2 source, attracts the widest cross section of an existing, host seeking mosquito population. The primary enzootic vectors of EEEv (*Culiseta melanura)* and WNV (*Culex species*) are readily sampled with these devices.

Gravid traps: The Gravid trap is used almost exclusively to collect female *Culex pipiens and Culex restuans* that have already taken a blood meal and are seeking a site to deposit eggs. These portable battery-operated traps are particularly useful for surveillance of virus-infected mosquitoes because they tend to collect the older (and thus infected) portion of the vector populations, and maintain the captured mosquitoes alive and in good condition for laboratory assay. Gravid traps, therefore, are valuable for WNV monitoring efforts.

New Jersey light trap: The New Jersey (NJ) Light Trap is a large, robust device powered by 120V AC. Consequently, these traps are best deployed as permanent installations. These may be modified by substituting carbon dioxide for light, also released in a metered flow from a pressurized cylinder. Since the NJ traps are connected to an AC power source, electrical timers can be connected to these traps, allowing for automatic timed collections. Several collections per week can now be realized with trap visits limited to only collections and maintenance since the traps are set permanently for the duration of the season. The main drawback is that traps can only be set in habitats with easy access to electrical power. Because they are not as portable as CDC traps, they are less suitable for rapid deployment in temporary sites.

BG Sentinel trap: The BG-Sentinel traps are devices that have been shown to attract the Asian Tiger Mosquito (ATM), *Aedes albopictus*, more than other traps currently used in surveillance. Its design and use of a lure that mimics substances found on the human skin provided for a more effective trapping and monitoring tool. It mimics convection currents created by a human body, employs attractive visual cues, and releases an attractant through a large surface area. Originally developed to collect *Aedes* species for surveillance of arboviruses such as yellow fever and Dengue, it has been shown to be the most efficient at collecting human-biting mosquitoes.

Ovitraps/ovicups: Ovitraps are meant to attract adult mosquitoes to lay eggs that can then be reared in order to id the species. Autocidal versions of these traps kill the adults after they enter the trap. Ovitraps are baited with hay-infused water in order to attract gravid females. Ovicups are a very simple, inexpensive version of an ovitrap consisting of a plastic cup (typically a "stadium-style" cup) filled with hay-infused water and lined with filter paper or other substrate that encourages the females to pay eggs above the water line. Both of these traps are typically employed to detect populations of Asian tiger mosquito.

Resting boxes: The resting box is used almost exclusively to sample adult *Culiseta melanura*, particularly those that have already blood fed. Because few other kinds of mosquitoes or insects visit such boxes, this surveillance device tends to be a selective and sensitive indicator of EEEv transmission in the immediate area. Resting boxes require very little maintenance, and do not need an attractant or a power source. Depending on construction material (from fiber pulp to plywood), they can last for many years. Arrays of resting boxes are operated in focal areas by some MCDs. However, because resting boxes generally tend to sample relatively few mosquitoes, the sample sizes may not be sufficiently robust for statistical analyses and cannot be relied upon for evaluating efficacy of aerial applications of pesticides.

Each species of mosquito exhibits its own specific host seeking preferences. These preferences relate to, amongst other characteristics, the kind of hosts attacked, the habitats where they are most abundant, their vertical distribution (for questing, resting and ovipositing), the seasonality of their population dynamics, and their photoperiodicity (for questing and ovipositing). Vertical stratification of host-seeking behavior has been demonstrated, with several species (*Culiseta melanura*, *Culex restuans*) most frequently feeding high in the tree canopies. To assure standardization of trap placement in emergency efficacy evaluations, traps targeting adult mosquitoes should be suspended at a height of about 4 feet off the ground, except for BG Sentinel and ovitraps, which are placed directly on the ground.

Emergency Aerial Adult Mosquito Control Efficacy Protocol

The SRB will procure a contractor who can provide contingency service(s) to document changes in the abundance of mosquitoes pursuant to any emergency mosquito control intervention conducted in Massachusetts. Mosquito populations must be assessed before and after this emergency intervention. Decreases in mosquito abundance support a conclusion that the intervention was successful in reducing the likelihood of mosquito-host contact (reducing the chances of viral transmission to people) or reducing or eliminating new populations of ATM.

This analysis takes into consideration changes in the abundance of mosquitoes (pre- and post-emergency intervention) that may occur naturally in non-treated areas. The number of

mosquitoes collected in a trap can vary significantly for a variety of reasons that have little to do with the efficacy of the application. In some cases mosquito abundance may even be observed to rise after an emergency treatment intervention. Such phenomena may be explicable on the basis of weather, the emergence of new adults, and immigration of mosquitoes from beyond the treated area. Comparison of non-treated areas with treated areas helps to account for these influences when calculating the efficacy of an intervention.

The Contractor will plan, set, collect, sort, analyze, and report the success of emergency intervention efficacy to the SRB. Specifically, the contractor will conduct pre- and post-treatment mosquito population surveillance using CO_2-baited portable light traps or other traps as agreed upon by the SRB in consultation with DPH and the Mosquito Advisory Group (MAG). Mosquito trapping shall be performed using current methodologies for trapping mosquitoes as described below. Once the collections are counted, the number of mosquitoes in each group for each species must be recorded, entered into a database for graphical presentation, or plotted manually so that changes in mosquito abundance can be readily examined and verified by MDAR and the SRB. The contractor shall provide maps and GPS coordinates for trap locations within the designated treatment polygon/zone and those outside the treatment polygon/zone. The contractor shall analyze and evaluate the intervention treatment, calculate the extent of population change (expressed as a percent reduction) attributable to the intervention, and provide a written report to the SRB within 5 business days of the emergency operation. This report will document the extent of any reduction and include an interpretation of the results.

Use the Henderson-Tilton formula for calculations, unless a different method is approved by the SRB:

$$\text{Corrected \%} = \frac{(1 - [\text{n in Co before treatment} \ * \ \text{n in T after treatment}]) * 100}{\text{n in Co after treatment} \ * \ \text{n in T before treatment}}$$

Where: n=Mosquito population, T=treatment sites, Co=control/non-treatment sites

(Online calculation for the Henderson-Tilton Formula is available at http://www.ehabsoft.com/ldpline/onlinecontrol.htm Source: Henderson, C.F. and E. W. Tilton, 1955. Tests with acaricides against the brow wheat mite, J. Econ. Entomol. 48:157-161)

The data used in the efficacy calculation shall be provided on an Excel spreadsheet and should include the following fields: Collection ID, Date trap set, Date trap collected, Zone ('TREATMENT' site or 'CONTROL/NON-TREATMENT' site), Type ('PRE' or 'POST''), Trap type, Species, Number of mosquitoes, Trap site name, Trap location (LAT/LONG coordinates), Town, and County. Traps shall be spaced to provide a reasonable representation of adult mosquitoes

or as specified below. The trap(s) shall be deployed well within the treatment polygon/zone to collect mosquitoes the night prior to the intervention, and when possible also for the preceding night. The traps should be removed from the field (or covered with an impenetrable bag) on the evening of the intervention. The traps will then be re-set to sample during each of two evenings post treatment. The Contractor will also provide access to the MDAR/SRB, the MCDs, and DPH to all sampled mosquitoes and associated data. Accordingly, the Contractor will retain each trap collection, frozen or otherwise suitably preserved, until directed by the SRB to submit it for further analysis, or to dispose of it 14 days after the contract period ends.

Guidelines for Trapping

- **Trap Type:** When an emergency aerial adult mosquito intervention is necessary to reduce elevated arbovirus risk such as EEEv, the contractor is to use the following trap type for pre- and post-efficacy evaluation, unless another trap type is agreed upon by the SRB:
  CDC miniature light trap(s) baited with CO_2

  Each trap is to be powered by a battery of appropriate capacity so that the trap will function during the sampling interval. It should also be fitted with a gate valve, such as an air actuated gate system, to protect trap failure, in order to retain the collection even if the battery has failed. Proper functioning of each light and fan is to be documented when each trap is activated, and again when the sample is collected.

  The light trap shall be baited using insulated vessels loaded with dry ice (2-5 lbs/trap/night) or enough dry ice to ensure it will last through the trapping period. The light trap can be baited using pressurized CO_2 tanks. If tanks are used, each shall be fitted with a regulator and flow restriction device. The flow rate of each shall be standardized and calibrated to achieve a set rate (+ or-25%), and measurements of flow be documented to be 500cc/min.
- **Trap Activation and Sample Collection:** The contractor will work with existing MCD entomologists if the adult mosquito control treatment intervention is occurring in municipalities that are serviced by that project. CDC traps should be placed at the designated location(s) no later than one hour before astronomical sunset, or set to activate automatically at the assigned time if the location is secure. Set the CDC trap(s) so that the collection period is no less than one full trapping night; that is, the trap will continue to sample at least after astronomical sunrise the following morning.

  Recover or pick up the sampled mosquitoes from CDC trap(s) the following calendar day, no earlier than 3 hours after astronomical sunrise, or set to automatically stop collecting (and retain the sample). Conduct at least one night of pre-trapping at least 1 day and, when possible, also at 2 days before the aerial adult mosquito intervention.

- **Trap Deployment:** The contractor will ensure that CDC miniature light trap(s) are suspended at a height (of trap intake) approximately 4 feet off the ground, installed away from competing light sources and obstructions such as buildings, and located along the intersection of differing habitats to maximize local diversity. The lat/long (GPS coordinates) should be recorded, and trap sites should be further identified by the name of the community, street address (if relevant) or other physical or ecological indicator.

  Traps should be used to compare treated and non-treated areas and be placed in similar habitats to the extent possible as coordinated by pre-planning efforts prior to an emergency mosquito control intervention. Set traps a minimum of 1 mile inside the spray/treatment zone and a minimum of 2 miles outside the spray/treatment zone to reduce interference from spray drift and influence of mosquito's immigration. Take into account "edge effect" to take advantage of host-seeking egress/ingress with respect to distinct habitat types. Traps should be placed in locations sufficiently distal to areas that are excluded from the application within a spray block.
- **Trap Density:** To evaluate efficacy, the contractor shall set a minimum of 5 CDC miniature light trap(s) baited with CO_2 in the designated spray/treatment zone, and 3 in the non-treatment or comparison block. If more than one trap is located within the same area, the traps should be placed at least 300-400 feet apart to avoid trap competition.

  Deploy the traps so that, to the extent possible, collection samples are representative of the density of adults of target species in geographically distinct areas. Distribute traps within the treatment site to avoid clustering and be representative of the various types of mosquito habitats that are being targeted.
- **Mosquito Identification:** The contractor shall store, chill, and sort collections (consistent with DPH protocol) on a chill table or on ice. All female specimens should be identified to species. Count all female mosquitoes including damaged individuals, and reported on standard collection forms.

Appendix 7: Vendor Information for Aerial Application or Other Emergency Response

As described in the Request for Response for Aerial and/or Ground Application of Insecticides for Mosquito Control (Emergency and Area-Wide Vector Control Services), vendor(s) must have the capacity to meet the needs of any recommended aerial intervention, including smaller, targeted, acreages and larger, wide-area treatments, both larviciding and adulticiding, and/or be able to provide assistance for other emergency response operations, including ground-level treatments to combat new species such as Asian tiger mosquito.

The SRB currently has an approved state contract for aerial adulticiding or other emergency response services with Clarke Environmental Mosquito Management (in partnership with Dynamic Aviation) through June 30, 2019. The contract covers the following:

- Limited wide-area aerial larviciding, by helicopter or rotary-wing aircraft, using an SRB-approved pesticide (currently one using the active ingredient Bti, such as Vectobac G), 300-25,000 acres, 48 hour response time.
- Limited or small-block wide-area adulticiding, using small, GPS-equipped, twin-engine, fixed-wing aircraft, using an SRB-approved pesticide (currently one using the active ingredient d-Phenothrin (Sumithrin), such as Anvil 10+10), 500-25,000 acres, 48 hour response time.
- Larger-scale wide-area adulticiding, using multi-engine, GPS-equipped, turbine powered, fixed-wing aircraft, using an SRB-approved pesticide (currently one using the active ingredient d-Phenothrin (Sumithrin), such as Anvil 10+10), 25,000-500,000 or more acres, 48 hour response time.

Contact of the vendor by SRB for an aerial adulticiding event triggers deployment and mobilization of aircraft (assessment of number of aircraft required, when the aircraft will arrive, and when operations will start and finish). Aerial adulticiding may take one or more evenings depending on the following:

- Weather conditions (high wind, low temperatures, or deteriorating weather conditions may delay treatment)
- Number of acres needing treatment
- Shape of treatment area (small or scattered blocks created by exclusions will extend treatment time needed)
- Number of aircraft available/needed

- Availability of an approved multi-hour spray window to treat large spray blocks (a minimum 6 hour window, from sunset to shortly after sunrise)

Aerial larviciding is typically done near dawn or dusk but may be done at other times of day depending on weather conditions and method of application. The optimum window for adulticiding depends upon the target species of mosquito and the hours during which that species is most active. However, a typical spray window would begin approximately at sunset and conclude after midnight, targeting adult mosquitoes in flight. The fewer blocks or zones that need to be excluded as "no spray," the more operational efficiency can be expected.

For More Information:

Clarke Mosquito Control Products, Inc.
675 Sidwell Court
Saint Charles, IL 60174
https://www.clarke.com

Further details regarding ground-level response will be provided as it becomes available.

Appendix 8: Information Sheet for the Pesticide Typically Employed in Aerial Spray Adulticiding

- Pesticide of Choice: ANVIL 10 + 10 ULV
- EPA Registration #: 1021-1688-8329
- Active Ingredients: d-Phenothrin (Sumithrin) 10.00% and Piperonyl Butoxide 10.00%
    - *Note: This product is a synthetic pyrethroid in the Anvil formulation that replicates the mosquito fighting properties of pyrethrum, an extract of the chrysanthemum flower. Sumithrin is synergized with piperonyl butoxide (PBO) providing a fast knockdown of adult mosquitoes.*
- Signal Word: Caution
- EPA Classification: Non-restricted or General Use
- Target: Adult Mosquitoes
- Use: Outdoor Residential and Recreational areas, woodlands, swamps, marshes, overgrown areas, and golf courses
- Manufacturer: Clarke Mosquito Control Products, Inc., 675 Sidwell Court, Saint Charles, IL 60174, Phone: 630-326-4633, email: info@clarke.com
- Max Rate of Application: 0.62 fluid ounces per acre
- Dosage Rate: 0.0036 pounds of active ingredient per acre
- Equipment: Ultra Low Volume (ULV) technology
- Droplet Sizes: Volume Median Diameter produced is less than 60 microns, with 90% of the spray contained in droplets smaller than 100 microns
- Period droplets are airborne: Depending on environmental conditions and treatment block size, spray droplets should move through the target area 30-60 minutes after application is completed
- Optimum Ground Application Wind Speed: No greater than 10 MPH
- Optimum Application Temperature Range: 65 degrees or greater are optimal, but a range of temperatures between 65 and 57 would be acceptable

Appendix 9: Surface Water Supply Monitoring Plan to Assess Potential Impact of Mosquito Control Spraying During a Public Health Emergency

In the event that DPH issues a "Certification that Pesticide Application is Necessary to Protect Public Health", the area(s) identified by DPH for coordinated mosquito control efforts under the direction of the SRB will be sampled to assess potential impact. The protocol described below will be used to ensure successful operational outcomes and avoidance of environmental impacts.

Coordination of surface water supply monitoring will involve the following programs and staff:

AGENCIES:

- Department of Environmental Protection (DEP)
    - Bureau of Water Resources (BWR)
    - Office of Research & Standards (ORS)
    - Drinking Water Program (DWP)
    - Division of Watershed Management (DWM)
    - Northeast Regional Office (NERO)
    - Southeast Regional Office (SERO)
    - Central Regional Office (CERO)
    - Western Regional Office (WERO)
- Massachusetts Department of Agricultural Resources (DAR)
- State Reclamation and Mosquito Control Board (SRB)
- University of Massachusetts
- Massachusetts Pesticide Analytical Laboratory (MPAL)
- Division of Fisheries and Wildlife (DFW)

STAFF:

- Gary Gonyea, BWR, SRMCB Member 617-556-1152 (O) 617-861-7888 (C)
- Steve McCurdy, DMS, Director 617-292-5779 (O) 617-259-0534 (C)
- Yvette DePeiza, DWP, Director 617-292-5857 (O) 617-921-2857 (C)
- Jonathan Hobill, DEP, SERO 508-946-2870
- Diane Manganaro, DEP, ORS 617-556-1158 (O)
- Richard Rondeau, DWP SERO 508-946-2816
- Thomas Mahin, NERO 978-694-3226
- Rachel Freed, NERO 978-694-3258
- James Persky, NERO 978-694-3227
- Marielle Stone, DWP CERO 508-767-2723
- Robert Bostwick, DWP, CERO 508-849-4036
- Andrea Lemerise, DWP, CERO 508-767-2723
- Kimberly Groff, DWM, CERO 508-767-2876

- Catherine Wanat, DWP, WERO 413-755-2216
- Deirdre Doherty, DWP WERO 413-755-2148
- Brian Harrington, BWR WERO 413-755-2291
- Eva Tor, DWP, WERO 413-755-2295
- Dave Slowick, WERO 413-755-2246

- Scott Sayers, DEP, SERO 508-946-2780 (O) 508-498-7466 (C)
- Jennifer Sheppard, DEP, SERO 508-946-2701 (O) 401-536-3274 (C)
- Greg DeCesare, DEP, SERO 508-946-2762 (O) 781-831-0459 (C)
- David Johnston, DEP, SERO 508-946-2708
- James McLaughlin, BWR, SERO 508-946-2805

- Taryn LaScola, SRB, MDAR 617-828-3793
- Mike McClean, MDAR 617-828-3792
- Jeffery Doherty, MPAL Lab Manager 413-545-4369 413-658-5352 (C)

Design protocol for collection, storage, and transport of surface water supply samples

The design of the field sampling program and analysis sequence is being slightly modified for the next round of field sampling after an aerial spraying event. Previous sampling events involved analyzing filtered water samples for Sumithrin and PBO, which provided estimates of dissolved concentrations of these two analytes in water samples. Going forward, the program will be switching to analyzing whole, unfiltered water samples in order to provide a picture of the total amount of the analytes in water samples. In order to provide a bridge between the two measures of the analytes in water, this next sampling round will include the collection and analysis of up to 12 duplicate samples from raw source waters on the morning after spraying. One of the samples will be analyzed whole (unfiltered) using the UMASS PAL's modification of the USGS Method for these two compounds employing solid phase extraction (SPE). Its duplicate will be filtered as practiced in past years, extracted with SPE and analyzed using the USGS Method. The suspended particulate matter on the filters will also be analyzed to provide estimates of the particulate concentrations of the analytes in the water samples. Samples should only be collected from active surface drinking water supplies. This sampling protocol also does not apply to surface waters that contribute to groundwater under the influence of surface water sources or to emergency drinking water supplies.

Public Water Supplies: Post aerial spray surface water supply samples will be collected in the manner described below:

- The raw water sample, at the tap of the intake of the surface water supply to the treatment/distribution facility (prior to treatment)
- The finished water sample, following all treatment/filtration steps and prior to the first consumer intake

All Public Water Systems with Surface Water Supply sources in areas that might be sprayed will each collect two sets of water samples:

1. From both the raw and finished water taps, the morning before the possible spray operations in those areas, with samples to be brought to the appropriate DEP Regional Office
2. From both the raw and finished water taps, by 8:00 AM the morning after the spray operation in that region. By 8:30 AM the DEP Regional Office will be notified of the preceding evening's exact spray area and will call by 9:00 AM only those Water Suppliers whose area was sprayed the evening before, to request that they bring their samples to the DEP Regional Office. Water suppliers not contacted by 9:00 AM can discard their "post-spray" samples.

Only those Public Water Systems that have been notified that their area was sprayed and who sampled at 8:00 AM the first morning after spraying will sample from both the raw and finished water taps by 8:00 AM on the day after the first set of post-spray samples were taken. The DEP Regional Office may request that the Water Supplier also collect a duplicate raw water sample. Both raw untreated surface water and finished treated water samples will be collected and analyzed for pesticides and the synergist piperonyl butoxide (PBO) to assess if source water was contaminated and if that contamination was successfully removed during treatment. If mosquito and virus levels continue to meet DPH criteria for a critical level of concern, a 2nd aerial spray operation may take place within 3 to 5 days after the first spraying. The DPH decision to conduct a 2nd spray operation will consider abundance, species composition, the infection rate, % newly emergent mosquitoes, and age composition of the mosquito population. DEP and public drinking water suppliers should make provisions for a 2nd spraying that could occur immediately after the end of the first spraying.

<u>Non Public Water Supply Surface Waters:</u>
In addition to the Public Water Supply sampling, a water quality grab sample will be collected by DEP Regional or MDAR staff by 8:00 AM the morning after an aerial spray event from up to six stations on non-Public Water Supply surface water bodies, primarily lakes and ponds within the spray zone. One additional water quality grab sample should be collected from a surface water body outside the spray zone. These surface water samples will be kept on ice and transported to a DEP Regional office for shipment to UMass MPAL. The surface water samples will be analyzed for both pesticides and PBO by UMass MAPL.

Sample Collection, Preservation, and Handling Procedures
Both the Water Supply reservoir sampler and DEP field Crews will use a one liter or 1 quart grab sample bottle, amber glass, fitted with a screw cap lined with Teflon. To minimize contamination, the bottle and cap liner must be acid-washed, rinsed with acetone or methylene chloride, and dried before use. The Water Supply reservoir sampler should fill two sample bottles to capacity, in order to eliminate any air entrapment or "head space" from both the raw and finished water taps. If so directed by DEP, the regional Water Supply Reservoir sampler will also collect a duplicate sample from the raw water intake tap.

The DEP field sampler should wade into appropriately deep enough water in order to fill the sample bottle to capacity, and cap it below the water surface to eliminate any air entrapment or "head space". One duplicate sample should be collected per sampling round and the two sample bottles should be simultaneously immersed and capped in ambient water. Duplicate samples will be identified on the Field Sample Collection Form as such but will have unique Sample Field IDs on the Chain of Custody Form so that these samples are "blind" to the laboratory.

The DEP field coordinator will provide enough deionized water to produce one blank sample per sampling round. At the field crew's first sampling station, crews should decant the deionized water into a sample bottle labeled with a Sample Field ID and treat it the same as a routine sample. Sample Field IDs will be assigned by a field coordinator for consistency on both the DEP Field Sample Collection Form and the Chain of Custody Forms attached. All water supply reservoir and DEP field samples must be labeled and kept on ice for transport to a DEP Regional Office and MPAL.

DEP Staff will:

- Ensure acid-washed sample collection bottles (1L brown, Teflon capped glass bottles) are available in timely fashion to a DWP Regional Office staff for pickup/and or delivery to water systems, and for collection of surface water samples
- Contact water systems, coordinate distribution of sample collection bottles, and coordinate collection of water samples
- Randomly select one water supplier to collect a duplicate raw water sample and notify the supplier
- Identify and collect water quality samples from up to 6 non-PWS surface water bodies within the spray zone and deliver to a DEP Regional Office
- Ensure that ice chest(s) and ice/cold packs are available for use by each DEP Regional Office for transportation and storage of water samples
- Identify available staff from either MDAR's Pesticide Bureau or DEP offices that will be responsible for picking up water sample from the DEP Regional Offices and delivering them to the Massachusetts Pesticide Analysis Laboratory (MPAL) at the University of Massachusetts (UMASS) Amherst, for analysis
- Pick up ice chests at 11 A.M. for transport to UMASS each morning, if more than one day of spraying is planned. MDAR staff may substitute.

UMASS PAL will:

- Conduct laboratory analyses of water samples using standard QA/QC procedures with analytical costs assessed to DEP. An Intergovernmental Service Agreement (ISA) was established between DEP and the UMASS PAL to cover the costs of the water quality analysis. This ISA is effective for three years and will need to be renewed in 2019.
- Samples will be analyzed using gas chromatography (GC) at a limit of detection of 0.1 ug/L (micrograms/liter) (parts per billion). The detection of the chemical with GC will be reconfirmed using GC/mass spectroscopy (GC/Mass Spec). If PBO is a component of the pesticide product,

the samples will also be analyzed for PBO at a limit of detection of 0.1 ug/L (micrograms/liter) (parts per billion).

Decision making hierarchy for sampling, collection, storage, and transportation

The DEP member of the SRB (or an SRB alternate), contacts the BWR Division Director regarding the decision to spray. The DEP member of the SRB then does the following:

- Contacts the following:
    - DEP Regional Office, with information on what areas will be sprayed and approximate spray dates. That person will also call Richard Hartley, DFW (508) 389-6330, Steve Hurley, DFW (508) 759-3406, and Paul Caruso, DWM (508) 990-2860 x107 to alert fisheries biologists.
    - Pesticide Enforcement personnel (Chief Pesticide Inspector, Division of Crop and Pest Services, MDAR), prior to spraying, to make sure both agencies have an adequate supply of sample bottles on hand or in case bottles need to be ordered so that sample bottles shipped to DEP Regional Offices at the appropriate time.
    - Pesticide Enforcement personnel (Chief Pesticide Inspector, Division of Crop and Pest Services, MDAR), to coordinate with the DEP Regions for the collection and transport of sample bottles between the DEP Regions and the UMASS-Amherst Pesticide Analytical Laboratory.
- Makes the necessary arrangements with the UMASS Pesticide Laboratory (MPAL) to provide the analytical testing.
- Ensures that MPAL performs the appropriate QA/QCs on the analytical results, including recovery results on spiked samples.
- Reports the results of water analyses to DEP/ORS for review within 1 business day of when the reports are received by DEP. Note: Anticipated turnaround time for test results is three days.

The Regional Contacts & Sample Collection Coordinators (currently Jon Hobill & Scott Sayers (SERO), Tom Mahin & James Persky (NERO), Andrea Lemerise & Robert Bostwick (DWP/CERO), and Catherine Wanat DWP/WERO)) will then:

- Establish standardized sample identification for samples collected from the program (use DEP/DWP source IDs and, if available, established sample location IDs)
- Identify up to six surface water bodies within spray zone for collection of surface water samples.
- Coordinate and educate water systems on the sampling, labeling and transportation procedures.
- Contact all surface water systems at least a week prior to any spraying to have them pick up the bottles and to prepare them for collecting water samples.
- Inform water systems within two days of spraying to be ready to collect (1) Pre-Spray samples and (2) two Post-Spray samples by 8:00 AM the morning after and by 8:00 AM 24 hours later. Pass along sample number scheme to MDAR.

- Check MDAR website to confirm area sprayed (http://www.mass.gov/eea/agencies/agr/spray-map.html) and contact water systems within spray zone to bring samples to a DEP Regional Office.
- Coordinate collection of up to 6 samples from non-PWS water bodies within the spray zone by 8:00AM the morning after an aerial spray event and transport samples to a DEP Regional Office. Assign Sample Field IDs and provides field sheets with IDs pre-assigned.
- Contact the Director of MDAR's Division of Crop and Pest Services, or responsible DEP staff, to make sure that PWS and non-PWS water samples are picked up each morning at 11 A.M. for transport to the Pesticide Lab at UMASS Amherst.
- Inform water systems re: the standard way of filling out chain of custody and bottle labels (Date/Time of Collection/location of sample/Name of Surface Water Source Water; PWS ID number).
- Identify a central location for the ice chest and provides ice for storing sample bottles after they have been delivered to DEP. Contact MDAR, and the water systems about any matters related to the sample-bottle pickup and delivery logistics during pre and post spraying activities.
- Provide the chain of custody paperwork for shipping all water samples.

WATER QUALITY SAMPLE COLLECTION SCHEDULE

Water Quality Samples within Aerial Spray Zone	**Day before Aerial Spraying**	**Morning After Aerial Spraying (By 8 AM)**	**Second Day After Aerial Spraying (24 hrs after 1st sample)**
Water Supplier	• 1 Raw Water Intake • 1 Finished Water • No Duplicate	• 1 Raw Water Intake per water supplier • 1 Finished Water per water supplier • **1 Duplicate raw water intake sample as requested of specific water suppliers (up to a total of 12 suppliers)**	• 1 Raw Water Intake per water supplier • 1 Finished Water per water supplier • **1 Duplicate raw water intake sample as requested of specific water suppliers (up to a total of 12 suppliers)**
DEP Field Crew	None	• 1 surface water sample + **1 duplicate** per location • 1 Blank per sampling round	None

Appendix 10: Monitoring the Effects of Aerial Applications of Adulticide on State-Listed Invertebrates

Goal: To determine whether aerial applications of adulticide insecticides for controlling arbovirus vector mosquitoes result in the taking of state listed invertebrates.

Agency Roles:

- MDAR, via the SRB and DPH, based on the results of arbovirus surveillance protocols, determines whether aerial adulticide applications are necessary and where applications need to be conducted.
- NHESP (housed within DFG) selects areas to be excluded from aerial adulticide applications, based on high concentrations of vulnerable state listed species.

Methods:

Direct measurement of state listed populations is not feasible due to the low numbers of individuals comprising these populations. Common invertebrates, especially Lepidopterans (butterflies and moths), having a body size similar to the body sizes of state listed species, are used to determine effects of aerial applications of insecticides on protected species.

NHESP determines whether state protected species are at risk. If a species flight time coincides with the application period within priority habitat the species may be at risk. If a species is pupating or otherwise rendered unlikely to be at risk during the application period or if no vulnerable invertebrate priority habitats are scheduled for aerial applications no monitoring is necessary.

NHESP also determines whether monitoring is required. NHESP contracts with pre-qualified vendor(s) selected from the state Master Service Agreement. Contractor(s) in consultation with NHESP select comparable sites and treatment sites for sampling nocturnal insects with ultraviolet light traps. Traps are to be deployed at least 2 nights (preferably 3) immediately prior and 2 nights (preferably 3) immediately post application or as soon as weather conditions allow. Contractor sorts, identifies and stores Lepidoptera of appropriate sizes to species level.

Each Contractor then prepares a report according to an agreed upon timeline. The report presents findings on the ratio of species recovered in traps prior to applications to those recovered after the applications are completed.

Appendix 11: Honeybee Monitoring Protocol for Aerial Mosquito Adulticide Application

Honey bees and other insect pollinators generally forage when temperatures are above 55-60°F during daylight hours. Honey bees, bumblebees, and solitary bees do not forage at night or during very cool weather. Insecticides applied during the day near pollen or nectar producing plants, at temperatures optimal for pollinator activity, could inadvertently impact pollinator populations. Treatments made to areas during the night or very early morning are the safest for pollinators.

Mosquito Adulticide Applications and Honey bees

Mosquito adulticiding can progress from sunset to sunrise with little honey bee mortality, due to the inactivity of the insects and the short half-life of Sumithrin. Regardless, MDAR will carry out the following protocol as a part of any SRB-supervised aerial mosquito adulticide operation:

- In the event aerial adulticiding is necessary, MDAR's Chief Apiary Inspector will oversee the monitoring of selected beehives in proximity to proposed application areas in order to evaluate hive health prior to application of an aerial adulticide.
- Approximately 10-20 colonies will be inspected, with 5-10 selected within a 5-mile radius of the spray area (treatment group), and 5-10 selected from a distance greater than 5 miles from the outer limits of the area (control group). County beekeeping associations will be contacted to solicit participation from beekeepers in either the treatment or control area who are interested in having their colonies evaluated. These associations will also be notified of the potential aerial mosquito treatment and of the monitoring process through the MDAR website and through email to the beekeeper listserv.
- Pre-spray health inspections of honey bee colonies will be made as close to the timing of the spray event as possible, although if time does not permit, MDAR may rely on data from inspections made earlier in the season. Inspections typically include an evaluation of the worker population, brood, colony development, food stores and equipment conditions. If deemed necessary, samples may also be taken during these inspections in order to test for the presence of pesticides, pests, parasites, and pathogens.
- Post-spray inspections of honey bee colonies will occur during two time periods (1-3 days post-spray, and then again at 7-10 days post-spray) to evaluate both acute and delayed impacts on colonies. These inspections will be conducted in the same manner as the pre-spray inspections. Samples will be collected as necessary to evaluate for other potential health issues in addition to pesticides.
- MDAR will issue a report 30-45 days after the spray operation is completed. The report will be posted on the MDAR website (http://www.mass.gov/agr).

Appendix 12: Base of Operations for Conducting Mosquito Control Activities

The decision to conduct an emergency mosquito control operation triggers the immediate contact of any company approved on the current state contract to provide mosquito control, including ground and aerial larviciding and adulticiding. The company currently under contract to provide these services is referenced in Appendix 7. The product of choice for any emergency operational response is contained in Appendix 8.

Identification and Pre-designation of Bases of Operations

- Aerial operations: Bases of Operations for the purpose of aerial adulticide application treatments have been established at airports in Essex, Norfolk, and Plymouth counties (where EEEv infection has historically occurred). Due to the recent western expansion of EEEv during 2012, a base of operation was added in Central MA.
    - If aerial adulticiding operations are necessary in Essex County, the SRB, through the Northeast Mosquito Management and Wetlands District, has pre-designated both Lawrence Airport and Beverly Airport as potential bases of operation. A Memorandum of Understanding was developed for both of these airports, addressing the specific needs and requirements of the MCD and the airports. The SRB would contact both the Director of the MCD and the airport managers, depending on suitability of location of operation.
    - If aerial adulticiding operations are necessary in Norfolk County, the only functioning airport in Norfolk County is the Norwood Municipal Airport. The SRB would contact the Director of the Norfolk County Mosquito Control Project and the airport manager. The Norfolk County Mosquito Control Project has also identified several sites that can be used for landing zones for helicopters that are town-owned (mostly old dumps that can be utilized if necessary).
    - If aerial adulticiding operations are necessary in Bristol or Plymouth Counties, the SRB, through the Plymouth County Mosquito Control Project and a contractor has pre-designated Plymouth Airport as a base of operation. The Plymouth County Mosquito Control Project Headquarters could be used as necessary for equipment and insecticide delivery.
    - If aerial adulticiding operations are necessary in Central MA, the SRB, through the Central MA Mosquito Control Project, may be able to use Minuteman Airfield in Stow, depending on the requirements of the operation. Marlboro Airport, a much larger facility in the town of Marlborough, is currently up for sale and may no longer be an option. The other large airfield in the area is Worcester Airport, though this location is not directly in an MCD and the SRB has not worked with this facility before.

    - Note that during 2010, the Westfield-Barnes Airport in Westfield was utilized for characterization of spray equipment, due to unfavorable conditions at the Plymouth Airport.
- Ground-based operations: Bases of Operations for the purpose of ground-level adulticide or larvicide application treatments (using trucks or backpack sprayers) will be established as needed.

The SRB Operations Coordinator is working on an updated list of sites that can be used as staging areas for both aerial and ground emergency operations.

Appendix 13: SRB Emergency Response Checklist

(For additional information, please see the Concept of Operations)

	Time Frame	Task	Objectives/Details	Collaborators	Done
1	Whenever mosquito-borne virus is detected (in mosquitoes, humans, or other animals)	Advise state agency stakeholders when necessary	• Determine what mosquito control intervention will be most effective to prevent or suppress arbovirus risk, including but not limited maintaining standard surveillance activities, increasing surveillance activities, intensifying and increasing localized control of immature (where practical) and/or adult mosquitoes, and/or acceleration and expansion of control of adult mosquitoes in larger geographical areas.	MCDs, SRB, MDAR, DPH, and MAG	☐
2	January – December	Review, select and approve pesticide product of choice	• Select and approve the specific pesticide product to be used in an emergency response	DPH, SRB, DEP, MDAR	☐
3	January – December	File application to EPA for public health emergency exemption (if required)	• If a new product is selected above, file and obtain Federal authorization to use a pesticide not registered for use over crops.		☐
4	June - October	Classify risk as Level 5 or (Critical)	• DPH will determine human risk levels as outlined in their response plan, and will confer with local health agencies, SRB, MCDs and MAG to discuss possible responses.	DPH, MDAR, SRB, and MAG	☐
5	When Level 5 (Critical) risk level is declared by DPH	Notify stakeholders	• Advise the respective state agencies that make up the SRB. MDAR Commissioner or Chief of Staff notifies the Secretary of the EEA. DPH notifies municipalities. Confer with MAG and MCDs. See response plan for details.	SRB, MDAR, DEP, DCR, MCDs, MAG	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
6	When Level 5 (Critical) risk level is declared by DPH	Discuss potential responses	• Initiate emergency conference calls and meetings with state agency stakeholders including but not limited to DPH, MDAR, MCDs, SRB, DFG, and also MAG, in order to reach consensus on most effective way to prevent or suppress human risk. Keep respective state agency Commissioners of SRB informed as well as EEA. Reach out to emergency mosquito control vendors on contract, as well as BOHs.	DPH, MDAR, SRB, MAG, EEA, and DFG	☐
7	Before declaration of Public Health Emergency	Activate vendors on contract	• Contact emergency aerial applicator (or other emergency response contractor) and pesticide provider to ensure the timely deployment of aircraft/other vehicles and pesticides required, if needed.	MDAR, SRB, contractor(s)	☐
8	Upon declaration of Public Health Emergency by the Governor	IMPLEMENT OPERATION Send letter to vendors on contract	• Draft letter from MDAR authorizing vendor to apply pesticides	MDAR, SRB, contractor(s)	☐
9	Upon declaration of Public Health Emergency	IMPLEMENT OPERATION Send formal authorization to both applicator and pesticide contractor	• Authorize both aerial applicator (or other emergency operations contractor) and pesticide contractor to proceed for the purpose of making pesticide applications over the areas identified	MDAR, SRB	☐
10	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) If aerial adulticide application is to be performed, confirm federal authorization of pesticide product to be used	• Ensure compliance with state and federal pesticide laws.	SRB, MDAR	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
11	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Delimit area to be treated	• MDAR GIS lead will work with DPH, DEP and DFG to produce map layers delimiting proposed treatment area	SRB, MDAR, DPH, DEP, DFG	☐
12	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) If aerial adulticide application is to be performed, notify the Federal Aviation Administration (FAA) to assure compliance with state and federal aviation rules and regulations	• Contractor will notify FAA that an aerial intervention will be performed • MDAR will provide letter to contractor indicating that contractor has authorization to do aerial application (use template) • Contractor will obtain approval from FAA to apply pesticides for the purpose of mosquito control over Congested Areas (CAP), citing geographic area and beginning and end dates of treatments. A list of media contacts and map of spray area will be required.	Aerial Operations Contractor, SRB, MDAR	☐
13	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Notify pre-designated airport of intent to conduct operations, or procure new site as needed	• Obtain approval to use facilities needed to perform operations using pre-designated list • If operations are too far from existing selected sites, work to secure a new site • Ensure staging site will be secure during operations, for aircraft or other vehicles, as well as pesticide inventory	SRB, MDAR	☐
14	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Request Detail from Mass. Environmental Police	• Provide security for emergency mosquito control operations, particularly any aerial adulticiding operation	SRB, MDAR	☐
15	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Establish base of operations	• Supervise the operation and facilitate communication and decision-making in accord with the operational plans	SRB, MDAR	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
16	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Verify equipment is properly calibrated and characterized	• Ensure any equipment used in emergency operations is in good working condition and in compliance with product labeling and other operational parameters	SRB/MDAR, Contractor	☐
17	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Follow Memorandum of Understanding (MOU) with DFG	• Notify DFG of emergency operations and request "Certification of Emergency for the purpose of mosquito control" in accordance with MOU	SRB, MDAR, DFG	☐
18	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Notify MPAL that samples will be delivered	• Arrange for the analyses of all environmental monitoring samples collected pre- and post-application by MPAL (University of Massachusetts Pesticide Analysis Laboratory)	SRB, MDAR, UMass	☐
19	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Activate notification protocols for beekeepers, cranberry growers, aquaculture facilities, certified organic farmers, and surface water supply managers	• MDAR Chief Apiary Inspector should notify beekeepers in potential treatment area • SRB Operations Coordinator should notify organic farms and aquaculture facilities in potential treatment area • MDAR should notify any cranberry growers in potential treatment area • DEP should notify any surface water supply managers	SRB, MDAR, DEP	☐
20	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Activate SRB efficacy trapping protocol and convene meeting of efficacy-evaluation workgroup	• Have efficacy-evaluation workgroup confirm trap type, trap placement, target species, and distance from spray perimeter, in accordance with SRB Efficacy protocol • Review GIS maps to determine specific trap sites, both inside and outside of the application area, that will be used for efficacy testing	SRB, DPH, MAG, MCDs	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
21	Upon declaration of public health emergency	IMPLEMENT OPERATION (Cont'd) Notify and coordinate activities of Public Relations Office of EEA, and DPH Office of Public Health Strategies and Communications	• Ensure coordination between Public Relations Office of respective state agency secretariat responsible to conduct media campaign for dissemination of public health risk information (specific areas that will be treated, timing of application, choice of pesticide, and information to mitigate personal and environmental risks). In the past, DPH has taken the lead on the public health angle.	MDAR, DPH Office of Public Health Strategies and Communications, Contractor PR services	☐
22	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Assign MCDs personnel to observe and note aerial application characteristics and weather.	• Assign MCD personnel to observe flight paths, pesticide applications, conduct pre- and post- application sampling of mosquitoes to determine efficacy and evaluate and document weather conditions, including wind and temperatures, during the applications • Report any potential fish kills to DFG via Environmental Law Enforcement	SRB, MDAR, MCDs	☐
23	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Establish integrated communication strategy	• Ensure interoperability of communication equipment such as cell phones, radios, etc. such that all divisions within the operation maintain communication with each other and provide necessary and otherwise important information in a timely manner	SRB and MDAR	☐
24	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Designate official(s) who will communicate with the aerial pilot.	• Designate state official(s) who will supervise the aerial spray operation and communicate with pilot(s) prior to, during, and after spraying operations	SRB, MDAR	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
25	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Assign state personnel for on-site inspection and monitoring	• Designate state officials, in addition to contractor personnel, to inspect airplanes and spray equipment, monitor calibration and characterization of droplets, monitor pesticides being loaded into the aircraft.	SRB, MDAR	☐
26	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Notify media relative to treatment areas	• Provide the media with maps detailing proposed treatment areas • Provide the media with public health risk communication information, information regarding the choice of pesticide to be used, the timing of applications, and information to help mitigate environmental health risks in the specific towns to be treated • Make the above information available via the MDAR/SRB website	DPH Office of Public Health, EEA, MDAR, SRB, Contractor PR services	☐
27	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Notify local Police Departments in treatment areas	• Help prepare local Police Departments in treatment area such that they are aware of the spray operation to occur in their community and are able to direct individuals calling them to the State's informational resources via established informational hotlines, websites, etc.	SRB, MCDs	☐
28	Upon confirmation of pending aerial adulticiding or other emergency operations	IMPLEMENT OPERATION (Cont'd) Activate SRB surveillance protocol to evaluate efficacy and monitor environmental impacts	• Activate pre-application protocols to evaluate efficacy and perform monitoring • This includes apiaries, surface water, cranberry bogs (environmental monitoring) • This also includes efficacy testing (performed by contractor)	SRB, MDAR, contractor, DEP, DPH	☐

	Time Frame	Task	Objectives/Details	Collaborators	Done
29	Upon confirmation of pending aerial adulticiding or other emergency operations	Determine Notifications needed and provide them as appropriate	• If 2 days' notice is possible, provide Standard Written Notification to public and schools/day care facilities in operations area • If less than 2 days' notice is available, MDAR should provide declaration that a waiver is needed to bypass Standard Written Notification • Follow rules as described in the Communications section of this plan	SRB, MDAR	☐
30	Upon confirmation of pending aerial adulticiding or other emergency operations	Determine security clearance list	• Create security clearance list of staff (MDAR, SRB, MCDs, etc.) if required for staging area • Determine who at the staging area this list should be provided to and ensure a copy is received before operations commence	SRB	☐
31	Upon confirmation of pending aerial adulticiding or other emergency operations	Commence Aerial Adulticide Spraying Operation (weather-dependent)	• Commence Aerial Spraying Operation	SRB, Contractors	☐
32	Within two weeks of concluded operations or as soon after operation as practical	ASSESS OPERATIONS	• Provide 1-2 page summary report to respective state agency commissioners and other key state agency stakeholders	SRB, MDAR	☐
33	Within 6 months of concluded operations	Provide completed final report within six months of receipt of all documentation and data analysis from operation	• Produce full report of operations • Include review of operations, final number of acres treated, efficacy results, environmental impact results, complaints, etc.	SRB, MDAR	☐

Appendix 14: Quick Reference Chart for Plan Activation

Mosquito monitoring and data collection by the MCDs and DPH proceeds throughout the mosquito season. DPH performs routine arbovirus testing and characterizes the risk level (on a weekly basis, or more frequently if the situation warrants). DPH, MDAR, and the MCDs also collect and analyze data on mosquito populations, medical and veterinary data, and weather/climate data. The chart below summarizes the steps that occur once arbovirus risk (typically for EEEv) is set to "HIGH" or higher:

Arbovirus risk is set to HIGH and a need for aerial adulticide application (or other emergency operation) is anticipated. DPH and MDAR work with impacted MCDs to delineate spray area.

↓

DPH Commissioner approves "Certification of Public Health Hazard That Requires Pesticide Application To Protect Public Health" (may be requested by MDAR).

↓

SRB members advise their respective Commissioners (MDAR, DEP, & DCR), notify EEA officials, and contact MAG. An emergency SRB meeting may occur.

↓

SRB requests a "Certification of Emergency for the purpose of mosquito control" from DFG to cover "taking" of rare species.

↓

MDAR coordinates with relevant state agencies (DEP, DPH, DFG), impacted MCDs, and impacted municipalities, to build a GIS data layer of the potential spray area.

↓

SRB notifies any impacted MCDs of emergency response timing and location, with reminder to track any related expenses.

↓

MDAR/SRB ensures pre-application efficacy testing and impact assessment protocols are in place (contractors, MDAR, DPH, DEP, DFG).

↓

Final GIS map is produced, consensus of relevant agencies is provided, and map layers are distributed to the contractor(s). MDAR authorizes contractor to do work.

↓

SRB provides all required notifications (to impacted MCDs and municipalities, schools, public) and posts all relevant information online, including maps of spray area.

↓

Emergency mosquito control operation commences. Map of area sprayed is provided to cooperators, and posted online. Monitoring and efficacy testing activities commence.

↓

Feedback/Assessment of operation (efficacy of treatment, environmental impact) occurs.

Appendix 15: Reference List

The following are online resources relevant to this plan or reference this plan:

- SRB Website
  http://www.mass.gov/eea/agencies/agr/pesticides/mosquito/
- Massachusetts Department of Public Health's 2017 Massachusetts Arbovirus Surveillance and Response Plan
  http://www.mass.gov/eohhs/docs/dph/cdc/arbovirus/arbovirus-surveillance-plan.pdf