State of Maine Department of Agriculture, Conservation and Forestry

Plan to Protect the Public Health from Mosquito-Borne Diseases

Pursuant to Resolve 2013, Chapter 13

Presented by the Maine Department of Agriculture, Conservation and Forestry in Cooperation with the Maine Department of Health and Human Services

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Executive Summary

The threat of mosquito-borne illness is on the rise in Maine and is predicted to increase in the near future. However, the State has a very limited capacity for monitoring threat levels or taking action to reduce those disease threats. Responsibility for managing this public health risk falls primarily to municipalities, most of which lack resources and capacity for monitoring or controlling mosquitoes. Two towns in York County contract with private companies to monitor and control mosquitoes. A few schools rescheduled fall sports games in 2013 to avoid peak mosquito activity when EEE risk was high but the vast majority of Maine's communities are doing very little and are unprepared to address this risk.

Individual landowners can and do purchase and apply pesticides on their properties or they can hire a pest control company to do applications. As mosquito-borne illness threats increase, the potential for pesticide misuse and overuse is also likely to increase. There are more than 1,300 pesticide products, including repellents, currently registered in Maine for use against mosquitoes. The amount and extent to which these pesticides are applied on private properties is not known.

The purpose of this plan is to describe the Maine Department of Agriculture, Conservation and Forestry responsibilities and proposed actions within existing resource levels and authorities, to protect public health from mosquito-borne diseases. Improving Maine's readiness to respond to the increasing threat of mosquito-borne illness will reduce the incidence of serious, sometimes debilitating disease and ultimately save lives.

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About This Plan

This plan was developed by the Maine Department of Agriculture, Conservation and Forestry (DACF) in cooperation with the Maine Department of Health and Human Services, Center for Disease Control and Prevention (ME CDC) as directed by State Legislative Resolve 2013, Chapter 13. The purpose of this plan is to describe the DACF responsibilities and proposed actions, within existing resource levels and authorities and in collaboration with other appropriate agencies and entities, to protect public health from mosquito-borne diseases. This plan addresses specific considerations as directed by the Resolve including 1) ecological and economic impacts of proposed methods for controlling mosquitoes and preventing mosquito breeding, 2) integrated pest management (IPM) techniques, 3) description of the criteria for declaring a mosquito-borne disease public health threat, 4) elements of a response to such a public health threat, and 5) the responsibilities and lines of authority during a public health threat.

This DACF plan is based on a thorough review of information from other states, federal agencies and other reliable sources, as well as scientific research findings including authoritative guidance published by the Association of State and Territorial Health Officials[1] and U.S. Centers for Disease Control and Prevention (US CDC)[2]. This plan complements the State of Maine Arboviral (Mosquito-Borne) Illness Surveillance, Prevention and Response Plan[3] (hereafter referred to as the ME CDC Arboviral Plan) developed and updated annually by ME CDC (appendix 4). Because Resolve 2013, Chapter 13 directs DACF to develop a plan "within existing resources," the Department constructed the DACF plan based on currently existing resources and commitments. Accordingly, it primarily explores opportunities to leverage existing Department expertise to assist ME CDC in its disease prevention efforts. It must be noted that current resource levels and lines of authority significantly limit the State's capabilities to plan, prepare and effectively respond to a mosquito-borne illness outbreak.

Why This Plan is Needed

The threat of mosquito-borne illness is on the rise in Maine and the rest of the continental U.S. There has been a dramatic increase in the prevalence of arboviruses (arthropod-

borne viruses) in the past decade, beginning with the first reported West Nile Virus (WNV) outbreaks in the U.S. in 1999. WNV is now found in all 48 continental states. In the U.S. there were 5,674 human cases of WNV with 286 deaths in 2012 and 2,300 human cases with 105 deaths in 2013. Maine had its first human case of WNV in 2012.

Another mosquito-borne disease, Eastern Equine Encephalitis (EEE), found primarily in the eastern U.S. (including Maine), is rarer but more lethal. In 2008 a fatal case of EEE was diagnosed in a Massachusetts resident who may have acquired the infection while vacationing in Maine. From 2001 to 2012, evidence of EEE infection in animals and mosquitoes was found in 15 of our 16 counties[3]. In 2012, there were 15 human cases in the U.S., including seven cases, three of them fatal, in Massachusetts, and two cases, both fatal, in Vermont. In 2013, six human cases and three deaths have been reported in five states. In Maine EEE killed 15 animals (horses and llamas) in 2009. Three horses and a flock of pheasants died of EEE in Maine in 2013. Although Maine has a limited arbovirus surveillance program, mosquito sampling and testing indicate that both EEE and WNV activity were high in 2012 and 2013.

In states where mosquitoes have been a historical disease threat, regional and/or local governmental authorities administer both local and wide-area mosquito control programs. There are no state-, county- or district-level mosquito control programs in Maine, and there is not an established process for coordinating mosquito surveillance or control efforts among communities. No state or regional agencies have financial resources or authority to conduct mosquito management activities. Public agency involvement is limited to coordinating a minimal mosquito and wildlife surveillance program, tracking reports of mosquito-borne illness in humans and domestic animals, and disseminating public information. Individual towns are responsible for developing, maintaining and financing local mosquito control actions. With increasing prevalence of EEE and WNV, it is imperative that the State of Maine critically review and assess resources, programs and policies for protecting Maine citizens from these public health threats. This plan is intended to describe DACF capabilities, authorities and responsibilities and to assess our preparedness for a rapid and effective response in the event of disease outbreak. Criteria,

response elements and lines of authority for a phased response to increasing arbovirus illness threats are described below and summarized in Table 1.

Integrated Pest Management

Integrated Pest Management (IPM) is a systematic, science-based approach to managing pests, globally recognized as the most effective means of protecting people, our food supply, and other resources from pests while minimizing environmental and economic impacts. When applied to management of mosquitoes, IPM is sometimes referred to as Integrated Vector Management (IVM) or Integrated Mosquito Management (IMM). The key elements of public health IPM are a) education and outreach, b) pest surveillance and threat assessment, c) combinations of pest prevention and control measures when warranted, and d) evaluation of outcomes. The US CDC guidelines[2] highlight the importance of IPM for protecting humans from mosquito-borne illness. This DACF plan, and the ME CDC Arboviral Plan, are based on IPM principles and practices.

Public Health Threat Criteria, Phased Response and Responsibilities

As called for by Resolve 2013, Chapter 13, this plan describes actions DACF will take to protect public health from mosquito-borne illness threats. Table 1 shows the specific steps DACF will take in a phased response to arboviral illness threat levels. The criteria, elements of the proposed phased response, and description of the lines of authority and responsibilities in Table 1 were taken directly from the ME CDC Arboviral Plan. No state entity has explicit authority to declare a 'public health threat', however, as described in the ME CDC Arboviral Plan, 'If risk of outbreak is widespread and covers multiple jurisdictions, ME CDC will confer with local health officials and VBWG to discuss the use of intensive mosquito control methods. A State of Emergency may be declared by the governor pursuant to Title 37-B Chapter 13 Subchapter 2 § 742.' Additional 'critical threat level' criteria described in the ME CDC Arboviral Plan are 1) more than one confirmed human case of EEE or WNV in a community or focal area or, 2) multiple non-human mammal cases of EEE or WNV. Other quantitative measures considered in the

determination of human risk levels include early season positive surveillance indicators, sustained elevated mosquito infection rates, high mosquito abundance in key bridge vector species, surveillance indicators from neighboring areas and other states in our region, and current and predicted weather and seasonal conditions (including time to expected mosquito-killing frosts).

Mosquito and Domestic Animal Surveillance

As described in the ME CDC Arboviral Plan[3], ME CDC is the lead agency for arboviral surveillance in mosquitoes, non-human mammals, birds and human illness cases. Testing of domestic animals and birds showing symptoms of arbovirus disease is conducted under the auspices of the DACF State Veterinarian.

Mosquito Surveillance: ME CDC conducts a small mosquito surveillance program through contracted services provided by Maine Medical Center Research Institute Vector-borne Disease Laboratory (MMCRI) and one or more private pest management companies. MMCRI may enlist additional cooperators to assist in mosquito trapping. In 2013, adult mosquitoes were monitored at just 25 sites located primarily in Cumberland and York counties. The monitoring protocol used by MMCRI is described in Table 2. Adult mosquitoes are collected from traps, sorted, and sent weekly from July through September, to ME CDC Health and Environmental Testing Laboratory (HETL) where they are tested for arboviruses. ME CDC tracks, records and disseminates weekly summaries of surveillance results from July through September and issues a final report at the end of the season. In addition, ME CDC tracks and shares arbovirus surveillance data reported from neighboring states and from US CDC reports.

Maine's current mosquito monitoring program, funded through federal grants to ME CDC, is not adequate for the purposes of characterizing the significance and the geographic distribution of a mosquito-borne disease threat. Nor is it adequate for utilizing mosquito surveillance software developed by US CDC[4] and recommended for use at the county or municipal level to provide predictive indicators associated with elevated human risk. Furthermore, ME CDC monitors adult mosquitoes only. Larval mosquito

surveillance can serve as an early indicator of population density and expected adult emergence time for the different vector species. Surveillance of larval mosquito populations also provides an opportunity for targeted application of lower risk larvicides. Elimination of human-made larval habitats (such as discarded tires and unmaintained backyard pools) has been shown to reduce risk of human illness.

A more robust mosquito monitoring effort is needed to enable Maine public health officials to provide accurate and timely information about the disease threat, thereby allowing the public to take common sense precautions when it's most important. DACF and ME CDC agree that the single most beneficial improvement that Maine should consider in connection with the mosquito-borne disease threat is expansion of the mosquito monitoring program. In the absence of additional funding, creative solutions are needed.

With current resource levels and authorities, DACF has the following capabilities for mosquito surveillance:

- DACF (including Board of Pesticides Control (BPC)) will collaborate with ME CDC and other experts to review and annually update recommended response action thresholds.

- DACF State Entomologist, in collaboration with ME CDC and other experts, will annually review and document planned mosquito and arboviral surveillance protocols.

- DACF will identify appropriate DACF field staff available to augment contracted mosquito surveillance services if needed when disease threat is critical. Note: at present, DACF entomologists are tasked with other responsibilities and are not routinely engaged in mosquito surveillance activities. Mosquito surveillance is done by service providers contracted by the ME CDC. However, DACF field staff could, with some training, be tasked with deployment and operation of mosquito traps if priorities were shifted away from current responsibilities.

- DACF will work with partners to identify resources to train DACF staff to assist with mosquito monitoring, identification and transport if rapid expansion of mosquito surveillance is needed when risk of arboviral illness is critical.

- DACF will collaborate with ME CDC and other organizations (eg. Maine Office of Geographical Information Services (MEGIS) and/or University of Maine Remote Sensing Laboratory) to identify and develop mapping tools to guide optimal placement of additional mosquito surveillance sites if warranted.

- DACF will partner with ME CDC, the Vector-Borne Working Group (VBWG) and other experts to stay abreast of new research findings, and developments in surveillance and management methods and technologies.

Domestic Animal Surveillance. Some domestic mammals and birds are susceptible to arboviruses. Passive surveillance (reporting and testing of animals showing symptoms of arboviral infection) can provide an additional measure of mosquito and arbovirus activity, thus is an important tool for public health protection.

With current resource levels and authorities, DACF has the following capabilities for passive surveillance of domestic animals:

- The DACF State Veterinarian will continue to collaborate with ME CDC HETL and US CDC to facilitate testing of horses and other domestic animals (including farm-raised birds such as emus and pheasants) displaying symptoms consistent with mosquito-borne disease.

- The DACF State Veterinarian will continue to communicate annually with all Maine-licensed veterinarians describing clinical signs of diseases, prevention measures and reporting processes for reportable vector-borne diseases, such as EEE and WNV. The State Veterinarian will continue to encourage vaccination of domestic animals where appropriate, i.e. in species where vaccines are available.

- The DACF State Veterinarian will continue to facilitate collection of appropriate specimens for diagnostic testing of mosquito-borne disease.

Public Education

Public education is a critical component of mosquito IPM. Residents and visitors should be informed about effective personal protection measures such as staying indoors at dawn and dusk, proper dress for outdoor activities and the use of repellents. Residents must also be informed to recognize and drain man-made mosquito breeding habitats such as toys, tarps, bird baths, and clogged gutters.

With current resource levels and authorities, DACF has the following capabilities:

- DACF will continue to collaborate with ME CDC and other partners to promote public education on personal protection and elimination of man-made mosquito breeding habitat. DACF will continue to maintain the DACF website to ensure links to updated ME CDC information and announcements are readily available to the DACF audiences such as farmers, foresters, domestic animal owners, veterinarians, schools, pesticide applicators, visitors and the general public. DACF will continue to distribute ME CDC printed materials, when they are available, at DACF-sponsored events such as the Agricultural Trades Show, and DACF-staffed venues such as state parks.

- DACF will continue to participate with the VBWG, and to collaborate with ME CDC and other partners, in public education activities.

Mosquito Breeding Habitat Reduction

Communities and property owners can reduce the risk of arboviruses by eliminating and draining shallow sources of standing water such as bird baths, ditches, and clogged gutters. Tires used on farms to anchor tarps covering animal feed should be cut or drilled. Education campaigns and community events have been shown to be effective in addressing WNV. This approach is not as effective in reducing habitat of EEE vectors, which breed primarily in natural habitats that cannot be drained without ecological disruption. Research is needed to develop and demonstrate effective and environmentally

sound methods for reducing EEE mosquito habitat. With current resource levels and authorities, DACF has the following capabilities:

- DACF will collaborate with ME CDC and other state agencies to inform farmers, land-owners, land-managers and the general public about recommended habitat reduction methods proven to reduce human risk while minimizing environmental impacts.

- DACF will collaborate with ME CDC, other state agencies and the VBWG to stay abreast of research on effective habitat reduction methods for man-made and natural mosquito breeding sites.

Mosquito Management

Biological Methods. Published research and communication with mosquito managers in other states indicate that effective biological IPM methods for mosquito control are lacking. A pilot program conducted in New Jersey found the use of laboratory-bred copepods as a predator of mosquito larvae to have extremely limited utility, primarily in human-made temporary water sources which can be more effectively eliminated by simply draining or removing them (Mark Mayer, NJ Department of Agriculture, personal communication Sept. 2013). A similar study in New York City showed disappointing results and was abandoned[5]. Relocation of mosquito-eating fish to vector mosquito breeding sites, which are often inaccessible and shallow water around tree roots in maple swamps, is not likely to be feasible or effective. A study showed that stocking dragonflies in Maine wetlands was ineffective in reducing mosquito abundance[6]. This study further showed this practice is likely to result in introduction of non-native species which could negatively impact our ecosystems. However, research may identify effective and practical biological strategies in the future. DACF will stay abreast of developments in this area.

Chemical Control Methods: Although non-chemical methods, such as the elimination of temporary mosquito breeding habitats and public education, are important components of mosquito IPM, it has been demonstrated that well timed and targeted pesticide

applications may be critical to protecting people when mosquito-borne illness threats are high. Public health 'wide area' adulticide applications use trucks or aircraft equipped with ultra-low-volume (ULV) nozzles to apply very small volumes of a pesticide into the air to kill mosquitoes while they are flying. A product often used in our region is Anvil 10+10 applied at 0.62 fluid ounces (0.0036 lbs active ingredient) per acre. This product is regarded as the lowest risk choice for both humans and the environment because it is applied at such low volume and is very short lived.

The EPA has determined that the insecticides labeled nationally for this type of application do not pose unreasonable health risks to humans, wildlife, or the environment when used according to the label. Pesticides have been widely used to control mosquitoes throughout the U.S., providing ample opportunities to assess effectiveness and develop methods for minimizing negative impacts. Communities in Maine's neighboring New England states have found it necessary to occasionally conduct wide area adulticide applications when surveillance showed EEE threat was very high. Planning and preparation to enable the safest wide area use of pesticides if needed in the event of a mosquito-borne disease outbreak will save lives.

With current resource levels and authorities, DACF has the following capabilities:

- DACF will collaborate with the VBWG and other experts to stay informed of proven non-pesticide mosquito management methods as they become available and provide recommendations for their use to municipalities, residents, and property owners and -managers.

- DACF will collaborate with ME CDC and other experts to develop guidance for municipalities and the general public on the use of pesticides for management of mosquitoes. BPC will develop and annually update the list of wide area public health ultra-low-volume mosquito adulticide products registered in Maine. The list will be annotated to highlight strategies to mitigate any environmental impacts or human health risks according to product labels and EPA risk assessments and will reflect any EPA-mandated label changes.

- DACF will collaborate with other agencies and experts to develop recommended protocols to assess impacts and efficacy of adulticide applications.

- DACF BPC will explore opportunities with Maine DEP to facilitate permitting processes allowing treatment of mosquito breeding habitats if needed to reduce threats to human health.

- DACF will develop guidance for municipalities seeking to contract for wide area ground or aerial pesticide applicators to enable swift, effective and targeted pesticide applications aimed at protecting human health and minimizing non-target impacts. This will also include updated lists of licensed applicators.

- DACF will explore opportunities for piggy-backing surveillance and outreach activities such as mosquito monitoring, mapping, wildlife disease surveillance and weather monitoring with existing DACF programs.

- DACF will collaborate with other agencies and non-governmental organizations (NGOs) to develop protocols and processes for identifying exclusion zones, such as organic farms and fish hatcheries, from any planned wide area adulticide applications.

- DACF State Apiculturist will cooperate with any planned wide area mosquito adulticide application operations to mitigate adverse effects on managed honey bee colonies.

- DACF will collaborate with other agencies and NGOs and emergency preparedness and response personnel and programs to develop notification procedures to be used to notify farmers, registered apiaries, municipalities, schools, and the Pesticide Notification Registry list in advance of any planned wide area mosquito adulticide applications.

Assessment and Reporting

Ecological Impacts

Natural resources are an important part of Maine's heritage and economy, so it is essential that methods and materials used for mosquito control be evaluated for possible environmental impacts. If pesticide applications are needed to protect human health, priority should be given to use of methods and materials that minimize risks of unintended ecological impacts.

Biological methods of mosquito control also have the potential for negative ecological impacts. For instance, a study conducted in York County showed that stocking dragonflies purchased from commercial suppliers has the potential for introducing non-native dragonfly species[6], which could be ecologically disruptive. Stocking or relocating fish, copepods, or other mosquito predators carries the same risk.

- DACF will continue to network and collaborate with agencies and programs within Maine and across the U.S. to stay abreast of current research on environmental and ecological impacts of mosquito management methods.

- DACF BPC Toxicologist will evaluate available chemical mosquito management methods and materials for their efficacy and potential ecological and human health impacts. BPC will provide an updated list of approved mosquito control pesticide products and recommendations for their use. Guidance will include methods for assessing efficacy of mosquito management activities and assessing and mitigating ecological impacts.

- DACF will collaborate with other appropriate experts and agencies to develop protocols for assessing efficacy and environmental impacts of any planned wide area mosquito control program.

- DACF will collaborate with ME CDC to provide the Joint Standing Committee on Agriculture, Conservation and Forestry an annual mosquito-borne disease surveillance report including records and assessments of any mosquito management actions taken by the State.

Economic Impacts

In 2013, the towns of York and Kittery, ME spent approximately $50,000 to $70,000 per town for contracted mosquito management services including mosquito surveillance, larviciding and adulticiding (Kimberly Foss, Swamp, Inc. personal communication). The cost of aerial pesticide applications conducted in Vermont in 2012 (20,000 acres) and 2013 (8,500 acres) for control of EEE vector mosquitoes (following two fatal human cases in 2012 and mosquito surveillance showing high disease threat in 2013) was approximately $2 per acre.

There are also economic considerations associated with mosquito-borne illness. For instance, it is estimated that medical costs associated with a single case of EEE ranges from $21,000 for mild, transient illness to as much as $3 million for individuals who suffer permanent neurologic damage[3]. An economic analysis of a WNV outbreak in California showed average WNV-associated medical costs were $19,500 per patient. This study compared the number of WNV cases reported inside versus outside an area treated to control mosquitoes and found that approximately 48 cases of WNV were averted by the spray, resulting in an estimated savings of $702,000 after factoring in the cost of the spray operation[7].

Planning ahead for mosquito management improves efficiency and effectiveness, saving money and avoiding the strain placed on local emergency response staffing, equipment and budgets by an emergency mosquito management response[1].

With Current Resource Levels and Authorities, DACF has the following capabilities:

- DACF will collaborate with other appropriate experts and agencies to develop protocols for assessing efficacy (a measure of cost/benefit) and economic impacts of any planned wide area mosquito control program.

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Table 1. Role of DACF in ME CDC Phased Response Plan for a West Nile Virus (Adapted from State of Maine Arboviral Illness Surveillance, Prevention and Response Plan 2013. DACF roles highlighted).

Risk Category	**Probability of Human Outbreak**	**Definition for a Focal Area***	**Recommended Response**
1	Remote	All of the following conditions must be met: Prior Year No activity detected in a community or focal area. AND Current Year No current surveillance findings indicating EEE or WNV activity in the focal area.	1. Educational efforts directed to the general public on personal protection, such as use of repellents, and source reduction. DACF disseminates information via websites and DACF-sponsored events and other venues as staff time and resources permits. 2. Routine human and non-human mammal surveillance;. DACF State Veterinarian annually communicates with all ME-licensed veterinarians describing clinical signs of diseases, prevention measures and reporting processes for reportable vector-borne diseases, such as EEE and WNV. DACF Animal Welfare Program assists in outreach to domestic animal owners and municipalities through outreach to animal control officers. 3. Assess local ecology for mosquito abundance. DACF program will assist ME CDC by providing maps, GIS layers and expertise. 4. Consider larval and adult mosquito monitoring with routine collection and testing of mosquitoes. DACF will a develop and maintain a contact list of appropriate field staff who can be tasked with deploying and operating additional mosquito traps if ME CDC determines that disease threat warrants enhanced mosquito surveillance.
2	Low	Prior Year (WNV) Virus activity detected in mosquitoes. Prior 2 Years (EEE) Virus activity detected in mosquitoes during either of both of the past two years. OR Current Year	Incorporates previous category response, plus: 1. Expand community outreach and public education programs focused on risk potential and personal protection, emphasizing source reduction. DACF disseminates information via websites and DACF-sponsored events and other venues as staff time and resources permits. 2. Assess mosquito populations, monitor larval and adult mosquito abundance, submit samples to HETL for virus

* Focal area: May incorporate multiple towns or cities. Designation based on factors including mosquito habitat, current and historic virus activity, timing of current virus activity, current weather and seasonal conditions. Known/suspected location of exposure is used for human and non-human animal cases and not necessarily town of residence.

		EEE or WNV identified in a single mosquito trap location AND No non-human mammal or human cases	testing. 3. Use larvicides at specific sources identified by entomologic survey and targeted at vector species. If appropriate, consider source reduction techniques. DACF BPC will assess currently available mosquito control methods and materials and will provide guidance on use of pesticides, including methods for minimizing environmental impacts to municipalities, land-owners, schools and the general public on selection and use of pesticide products. 4. Enhance surveillance of human and non-human mammal surveillance. State Veterinarian collaborates with ME CDC HETL and US CDC to facilitate testing of horses and other domestic animals displaying symptoms consistent with mosquito-borne disease.
3	Moderate	Prior Year Confirmation of human and/or non-human mammal case(s) OR Sustained EEE or WNV activity in mosquitoes. OR Current Year Multiple EEE or WNV mosquito isolates AND No non-human mammal or human cases.	Incorporates previous category response, plus: 1. Increase larval control, source reduction, and public education emphasizing personal protection measures. 2. Actions to prevent disease may include targeted larviciding at likely vectors, and if current year activity, possibly ground adulticiding targeted at likely bridge vector species. DACF will assess currently available methods and materials and will provide guidance on use of pesticides, including methods for minimizing human and environmental impacts. 3. Enhance human surveillance and activities to further quantify epizootic activity. 4. DACF field staff may be directed to assist ME CDC with supplemental mosquito trapping by deploying and operating mosquito traps using predetermined protocols if needed.
4	High	Current Year Surveillance of increasing EEE or WNV activity in mosquitoes OR A single confirmed non-human mammal case of EEE or WNV OR A single confirmed human case of EEE or WNV.	Incorporates previous category response, plus: 1. Intensify public education on personal protection measures a. Utilize multimedia messages including press releases, local newspaper articles, cable channel interviews, etc. b. Actively seek out high-risk populations (nursing homes, schools, etc.) and educate them on personal protection. DACF School IPM Program assists in outreach to schools c. Issue advisory information on adulticide spraying. DACF assists in 2. Consider intensifying larviciding and/or adulticiding control measures as indicated by surveillance. DACF will intensify guidance and training to local officials on selection and use of pesticides.

			3. ME CDC will confer with local health officials to determine if the risk of disease transmission threatens to cause multiple human cases. If surveillance indicates a continuing risk of human disease and potential for an outbreak, intensified ground-based adult mosquito control may be recommended. DACF will assist ME CDC in evaluating disease surveillance indicators and meteorological information in consideration of the biological and ecological factors influencing human disease threats.
5	Critical	Current Year More than 1 confirmed human case of EEE or WNV in a community or focal area OR Multiple confirmed EEE or WNV non-human mammal cases.	Incorporates previous category response, plus: 1. Continued highly intensified public outreach messages through community leaders and the media emphasizing the urgency of personal protection. DACF will assist with messaging to people engaged in agriculture, conservation and forestry activities and the general public. 2. If risk of outbreak is widespread and covers multiple jurisdictions, ME CDC will confer with local health officials and Vectorborne Work Group to discuss the use of intensive mosquito control methods. A State of Emergency may be declared pursuant to Title 37-B Chapter 13 Subchapter 2 §742. DACF staff will participate in these discussions as members of the Vector-borne Work Group The declaration of an emergency may trigger application of mosquito adulticide. ME CDC may define targeted treatment areas for vector control following the declaration of an emergency. DACF will provide guidance in the selection and use of pesticides. 3. Ground-based adulticide applications may be repeated as necessary to achieve adequate control. DACF will provide guidance in the selection and use of pesticides.

Table 2. Field Methods Used for Mosquito Surveillance in Maine.

Light Trapping Adult mosquitoes are trapped using CDC miniature light traps (John W. Hoch Company, Gainesville, Florida) with a 6-volt lead battery. Approximately 5 pounds of dry ice are hung in an insulated cooler above the trap and vented at the bottom so that CO_2 gas drifted slowly from the cooler over the trap. Traps generally are hung in the late afternoon or early evening and situated so that the trap is always out of direct sunlight. Trap locations are chosen in secure places with habitats likely to have mosquitoes (adjacent to wetland habitat). Traps are retrieved in the early morning hours of the following day. Air temperature is recorded on a field data form at the time of trap placement and retrieval. Mosquitoes remain in the mesh and plastic trap and are stored in a cooler with either wet or dry ice for delivery to the laboratory. Mosquitoes from a trap are assigned an accession number and all collection data entered on a laboratory sheet with that number. Each collection site is geo-referenced with latitude and longitude either by GPS, by locating the site on DeLorme 3-D TopoQuads, or through the use of Google Earth.
Resting Boxes Resting boxes are rectangular wooden boxes measuring approximately 12" x 12" x 12",open on one end and painted flat black on the outside and either red or rust brown on the inside. Boxes are placed on the ground in wooded habitats. Mosquitoes utilizing these boxes as resting sites can be collected, identified and tested for arbovirus and serve as a useful indicator, particularly for EEE vector mosquitoes.
Gravid Trapping Gravid trapping is done with Hoch traps (Gainesville. Florida) powered by a 6-volt lead battery. The trap basin is filled with a standard seven-day hay infusion* to within 2 inches of the bottom of the trap. Traps are placed in the late afternoon or early evening and are collected during the early morning of the next day. They are placed so that they would not be in direct sunlight at any time during the trapping session. Air temperature is recorded at the time of trap placement and collection. Site locations are geo-referenced with latitude and longitude coordinates with a Garmin 12 GPS. Trapped mosquitoes are transported to the laboratory in the nets, in coolers with blue ice packets. **Seven-day hay infusion:* Approximately 2.5 ounces (about one small handful) of hay are submerged in a 5-gallon bucket filled with well water. The bucket is covered and left at ambient temperature for seven days. The resulting infusion is decanted and used in restaurant "bus" tubs and gravid trap basins for attracting gravid *Culex* species mosquitoes.

***Culex* species Egg Raft Collection**

Egg rafts of *Culex* species are collected using a different method. Black restaurant "bus" tubs 19"x15"x7" are placed in sites out of direct sunlight during the late afternoon or early evening and filled with one gallon of seven-day hay infusion. The tubs are inspected the following morning for egg rafts. The total number of egg rafts is recorded. Up to twenty-four egg rafts from each tub are collected into separate wells of polystyrene tissue culture plates with a small amount of infusion, and are covered and carefully transported to the lab. Air temperature and infusion temperatures are recorded at the time the tubs are placed and in the morning when egg rafts are collected. Each plate of egg rafts is assigned an accession number upon arrival at the lab and all collection data are recorded on a data sheet with that accession number. The rafts are kept at room temperature and first instar larvae are inspected to determine the species of *Culex*.

Adult Mosquito Identification

All female mosquitoes captured in light or gravid traps are identified by one person using a binocular dissecting microscope. Staff of the Maine Medical Center research Institute received training in mosquito identification from Drs. Howard Ginsberg and Roger LeBrun at the University of Rhode Island in 2005. Standard dichotomous identification keys for mosquitoes of North America and an unpublished key to the mosquitoes of New Hampshire provided by Dr. John Burger of the University of New Hampshire are utilized to aid in mosquito identification. Mosquitoes are frozen at -20^0C and identified as promptly as possible after collection. All collected mosquitoes that are not sent to the HETL for testing are either pinned as reference specimens or saved in pools by species and accession number for future reference. All environmental data for each trapping and mosquito species identified are entered into a Microsoft Access database for retrieval, manipulation and further study.

Rapid Response Monitoring

Rapid response monitoring is employed after an arbovirus-positive event occurs. This consists of setting multiple CDC mini-light traps with CO2 in the late afternoon, at the site where the positive animal had been found and at several nearby sites where mosquitoes are likely to be trapped. Captured mosquitoes are collected in the early morning and transported to the laboratory in a cooler on blue ice packets. After being briefly exposed to –150C to arrest movement, the mosquitoes are quickly identified alive on pre-chilled plaster of Paris or blue ice packets. Pools of up to 50 mosquitoes of the same species are placed in microcentrifuge tubes and immediately frozen at -70oC. Mosquito pools are then packed on dry ice and shipped overnight by FedEx to the ME CDC HETL for testing.

Appendix I

Low Risk Aquatic Pesticides

Pursuant to Maine Department of Environmental Protection *General Permit for the Application of Aquatic Pesticides for the Control of Mosquito-Borne Diseases,*

Special Conditions, D(1)a NOI submission not required:

> "…an entity seeking coverage under this General Permit for aquatic pesticide treatments using low risk aquatic pesticides as identified in the Maine Department of Agriculture, Conservation and Forestry's Plan to Protect the Public health from Mosquito-borne Diseases is not required to submit a Notice of Intent form to the Department to discharge under this General Permit…"

Products containing the following active ingredients are considered "low risk aquatic pesticides" for this purpose, provided that:

1. They are the only active ingredients contained in a pesticide product that is registered by both the United States Environmental Protection Agency and the Maine Board of Pesticides Control;
2. The product label allows for use as an aquatic mosquito larvicide on the sites where it will be applied; and
3. The use of the product is in accordance with the Maine Center for Disease Control and Prevention *Arboviral Illness, Surveillance, Prevention and Response Plan* (current version), and the Maine Department of Agriculture, Conservation and Forestry *Plan to Protect the Public Health from Mosquito-borne Diseases* (current version).

Active Ingredient	Chemical Abstract Number	EPA Chemcode
Bacillus thuringiensis israelensis (*Bti*)[1]	68038-71-1	Multiple
Bacillus sphaericus (*Bs*)[1]	143447-72-7	Multiple
Mineral Oil[2]	Multiple	63502
Poly (oxy-1,2-ethanediyl), α-(C16-20 branched and linear alkyl)-ω-hydroxy (POE)	52292-17-8	Multiple

1. All strains registered for aquatic mosquito adulticiding
2. Not to be confused with horticultural oil

August 10, 2015