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## Invasive *Aedes* Mosquito Response Plan

September 2017

### 1. Overview

The purpose of this document is to guide the Alameda County Mosquito Abatement District (ACMAD) in responding to invasive container breeding mosquitoes, *Aedes aegypti* (yellow fever mosquito) and *Aedes albopictus* (tiger mosquito), that have the potential to breed and become established in Alameda County (County). These two species of mosquito are known to transmit arboviruses that cause dengue, chikungunya, yellow fever, and Zika in people. Plans are needed to survey the County for invasive *Aedes*, confirm the identification of a mosquito specimen as an invasive *Aedes*, and act to limit the dispersal of invasive *Aedes* in the County. Because the breeding, dispersion, and control of invasive *Aedes* mosquitoes differ substantially from that of mosquito species which transmit West Nile virus, a distinct response plan is needed for invasive *Aedes*. The City of Albany is excluded from this response plan because mosquito control for the city is provided by Alameda County Vector Control Services District. The ACMAD Invasive *Aedes* Mosquito Response Plan that is outlined herein was developed using the California Department of Public Health (CDPH) "Guidance for Surveillance of and Response to Invasive *Aedes* Mosquitoes and Locally Acquired Exotic Mosquito-borne Infections Transmitted by These Mosquitoes in California" published in June 2014 and revised February 2017, response plans published by other vector control entities, and knowledge of the environmental factors that drive mosquito abundance in Alameda County. This plan supplements the mosquito control and surveillance activities that are described in the ACMAD Mosquito-Borne Arbovirus Response Plan.

### 2. Annual Training

Training will focus upon invasive mosquito species currently present in California. Upon completion of training, Operations and Lab Staff should be able to:

- Identify all life stages of invasive mosquito species.
- Have knowledge of the biology and ecology of invasive mosquito species and of the arboviruses they transmit.
- Be current on latest surveillance and control methods used for invasive mosquitoes in California.

### 3. Pre-Detection of Invasive *Aedes* Mosquito Response Plan

- A. ***Aedes* Surveillance.** Oviposition traps are placed throughout Alameda County, with a focus on sites where invasive *Aedes* mosquitoes are more likely to be introduced or have habitats that are more supportive of *Aedes* mosquito breeding (e.g. cemeteries, nurseries, US Customs inspection sites).
- B. **Service Requests.** If a service request indicates daytime biting mosquitoes, and a native *Aedes* mosquito sample is not provided, Operations Staff will inspect the site for all life stages of invasive *Aedes* mosquitoes.
- C. **Human Case Surveillance.** When local public health agencies notify ACMAD of a suspected case of invasive mosquito-vectored disease, Lab Staff may place mosquito traps near to where the individual resided while they were potentially viremic.
- D. **Public Outreach.** The goal is to educate the community on the differences between invasive *Aedes* and mosquitoes that are native to Alameda County. The focus is on prevention and detection by encouraging residents to reduce potential invasive *Aedes* breeding sources, and to report daytime biting mosquitoes to ACMAD.

### 4. Plan for Confirmation of an Invasive *Aedes* Mosquito in the County

- A. **Mosquito Specimen Documentation.** ACMAD Staff that collect mosquito specimens suspected to be invasive *Aedes* will document the location at which the specimen was collected (address or GPS coordinates are required), the date and time of collection, and the name of the Staff that collected the specimen.
- B. **Mosquito Sample Transport.** All suspected invasive *Aedes* specimens will be transported to the ACMAD Lab for identification. Suspected adult invasive mosquitoes that are collected by Staff should be immediately killed without damaging the specimen, and subsequently placed into a container for transport to the ACMAD Lab for identification. Larval specimens should be collected in a specimen container using the water in which the larvae were found, and efforts made to keep the specimens alive. Suspected invasive *Aedes* eggs should be collected in a manner that does not damage or desiccate the eggs, preferably by placing the container that contains the eggs into a moistened plastic bag for transport.
- C. **Identification of Suspected Invasive *Aedes*.** ACMAD Staff will identify the specimen using taxonomic keys and verified photographs of invasive *Aedes* and local mosquito species. If the specimen keys to an invasive *Aedes*, two additional ACMAD Staff members having extensive expertise in identifying mosquitoes will independently confirm the identification (e.g. Laboratory Director, Biological Specialist, or Operations Supervisor).
- D. **External Confirmation of Invasive *Aedes*.** If ACMAD Staff members concur that the specimen is likely invasive *Aedes*, external experts will be consulted for confirmation. All specimens will be photographed before being transported for external confirmation. Eggs will be sent to the UC Davis Arbovirus Research and Training (DART) facility for identification. Larvae should be reared to adult in a contained insectary and identified to species. For adults, the Supervising

Public Health Biologist and Senior Public Health Biologist for Alameda County at CDPH will be advised of the identification. The specimens may be preserved for genotype analysis.

## 5. Post-Detection of Confirmed Invasive *Aedes* Mosquito Response Plan

- A. **Confirmed Invasive *Aedes*.** If CDPH or DART confirms the identification of a specimen as an invasive *Aedes*, the Public Health Emergency Committee of the ACMAD Board of Trustees, nearby Mosquito Abatement and Vector Control agencies, and the Emergency Operations Center (EOC) for each affected and nearby city will be notified. A press release will be distributed to the ACMAD Board of Trustees, the media, and local agencies to inform the public of the detection.
- B. **Operations Control Response.** The broad goal of the Operations Response is to limit the intensity and geographic distribution of invasive *Aedes*. All equipment that leave an area with invasive *Aedes* should first be inspected and sanitized (interior and exterior of the vehicle). Collected mosquito specimens will be placed within sealed containers before leaving the infested area to prevent the spread of mosquitoes. Residents where inspections are made should be provided with a Post Inspection Form, outreach materials, and be available to answer questions.
- i. **Catch Basin Treatment.** Catch basins in and around the area having invasive *Aedes* will be treated to reduce the abundance of all mosquitoes in the area.
  - ii. **Outside of the Invasive *Aedes* Response Area.** Vector Biologists and Mosquito Control Technicians will treat mosquito breeding sources and respond to service requests by County residents, although potentially at reduced intervals to permit increased staffing in the invasive *Aedes* Response Area.
  - iii. **Inspection and Treatment Inside the Invasive *Aedes* Response Area.** Operations Staff should work as groups that include a Vector Biologist or Mosquito Control Technician. Each group forms a field invasive *Aedes* response team, which will inspect and sanitize properties within the invasive *Aedes* Response Area, and educate residents on how to eliminate potential breeding sources. Treatments to suppress adult invasive *Aedes* mosquitoes may be made at properties after they have been sanitized to prevent mosquito breeding. Non-*Aedes* breeding sources will be treated within the invasive *Aedes* Response Area to reduce overall mosquito abundance. Home Invasive *Aedes* Surveillance Kits may be provided to residents within the invasive *Aedes* Response Areas. Instructions included with the Home Invasive *Aedes* Surveillance Kits will provide guidance for effective trap placement and the return of specimens to the ACMAD Lab for identification. Teams will encourage the voluntary removal of containers that may contain invasive *Aedes*, and return these to the ACMAD Lab for identification and external confirmation, if needed. Once containers are no longer needed for identification (preferably within a day of collection), they will be sanitized, damaged to prevent water accumulation and disposed of at a site that buries the waste underground. If the field invasive *Aedes* response teams are unable to gain permission to enter a property for inspection or treatment, a twenty-four hour notice to enter the property will be affixed to the entry door(s) on the property.
  - iv. **Treatment in Response to Travel-Related Patient-Case.** Operations or Lab Staff will work in groups to inspect properties around where the case-patient resided in the two weeks before the onset of illness and while viremic (at least a 150 m radius around the residence(s)), and other locations where exposure to invasive *Aedes* mosquitoes may have occurred (e.g. neighborhood and workplace). Patients should be advised to take all steps to avoid mosquito bites to minimize the risk of local transmission. If invasive

*Aedes* are observed within the inspection areas, efforts should be made by Operations Staff to eliminate all life stages of the mosquitoes from all properties in that area (*i.e.* eggs, larvae and adults). Particular attention should be made to identifying and treating cryptic breeding and adult resting sites. Residents within the inspection areas will be strongly encouraged to eliminate potential breeding sites and may be provided autocidal mosquito traps to reduce mosquito abundance. ACMAD Staff are prohibited from disclosing any personal information related to the case. This includes but is not limited to the address where the case-patient resides, the size of the area being inspected, the name of case, their travel history, or suspected disease.

- v. **Treatment in Response to Locally Acquired Human Transmission.** ACMAD will coordinate response and public notification activities with CDPH, Alameda County Public Health Department, and the governance of affected cities. The EOC of the affected and nearby cities will be notified of Operations activities. In addition to processes described for Treatment in Response to Travel-Related Patient-Case (section 5.B.iv), ACMAD will continue monitoring the identified areas of concern for 45 days (three virus replication cycles in mosquitoes), and enact additional control measures if indicated. Female mosquitoes that are collected in traps will be sent to DART for arbovirus testing.
- C. **Laboratory Surveillance Response.** The broad goal of the Lab Response is to quantify the intensity and geographic distribution of invasive *Aedes* so that Operations can focus control efforts where they are most needed. Lab Staff will also continue surveillance of non-*Aedes* mosquito abundance and West Nile virus in the County. As with Operations, all equipment that leave invasive *Aedes* Response Areas should first be inspected and sanitized, and collected mosquito specimens contained before leaving that area to prevent the spread of mosquitoes.
- i. **Surveillance Overview.** Lab Staff will conduct surveillance for invasive *Aedes* mosquitoes by forming invasive *Aedes* surveillance teams, each of which should be led by the Laboratory Director or Biological Specialist. Invasive *Aedes* surveillance teams may also inspect and sanitize properties, and treat sources of breeding mosquitoes. They will employ a range of specialized invasive *Aedes* traps and standard mosquito traps to quantify mosquito abundance, the relative proportion of invasive to native mosquitoes, and geographic distribution of mosquitoes within and around the invasive *Aedes* Response Area. Lab Staff will generate mosquito abundance maps for each invasive *Aedes* Response Area that document the location and abundance of invasive *Aedes* and native mosquitoes. Adult invasive *Aedes* mosquitoes that are collected should be sent to DART for arbovirus testing.
  - ii. **Surveillance in a Newly-Identified Invasive *Aedes* Response Area.** Mosquito specimens that are collected from sites outside of a current invasive *Aedes* Response Area and are likely to be invasive *Aedes*, will be identified to species by the ACMAD Lab and confirmed using external experts.
  - iii. **Surveillance in an Ongoing Invasive *Aedes* Response Area.** Mosquito specimens that are collected within a current invasive *Aedes* Response Area, and are likely to be invasive *Aedes*, should be identified to species by ACMAD Lab Staff. Surveillance in an invasive *Aedes* detection area should be conducted for at least two years after the last detection. If multiple and sustained detections are made in an area, long-term invasive *Aedes* monitoring sites should be established for that area.
  - iv. **Surveillance for a Human Case of an Arbovirus Transmitted by Invasive *Aedes*.** ACMAD will activate the Laboratory Surveillance Response (Section C). Additionally, all *Culex* and *Aedes* mosquitoes that are collected in traps will be sent to DART for arbovirus testing. If invasive *Aedes* are detected near a person that is infected with an arbovirus,

ACMAD will activate the Treatment in Response to Travel-Related Patient-Case or Treatment in Response to Locally Acquired Human Transmission (Sections 5. B. vi. and 5. B. v.).

- D. **Office Response.** The goal of the Office Response is to inform County residents and relevant entities of the invasive *Aedes* Response Area, coordinate the Operations and Lab Responses, and engage in public outreach to encourage County-wide efforts to suppress the breeding and dispersion of invasive *Aedes* mosquitoes.
- i. **Service Request Script for Invasive *Aedes*.** For service request calls, the Office Staff will employ a script and reporting form that is designed to identify calls with a higher likelihood of being initiated by invasive *Aedes*.
  - ii. **Coordination of Operations and Lab Responses.** Inspection maps will be generated by Office Staff for guiding Operations Staff to sites in and around the invasive *Aedes* Response Area that have been sanitized, need inspection, or have twenty-four hour entry notices placed at the property. Office Staff will integrate inspection and mosquito abundance maps for coordinating Operations and Lab Staff efforts. The Office Staff will coordinate the meetings of the ACMAD Staff.
  - iii. **Public Outreach Response.** The goal of the Public Outreach Response is to increase the awareness of invasive *Aedes* in the community to encourage residents to report daytime biting mosquitoes to ACMAD, and inspect and sanitize properties in the County so that the spread of invasive *Aedes* can be curtailed. Outreach to the elected representatives, government agencies, and community officials in the affected areas are also included in this response.
  - iv. **Community Engagement.** Community groups (e.g. Community Emergency Response Teams (CERT), Home Owners Associations (HOAs), and volunteer groups) within and adjacent to the Response Area may be activated to aid ACMAD Staff in distributing information related to the invasive *Aedes* response. The public should be reassured that the risks of arbovirus transmission is low if no locally acquired human infections have been confirmed.