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Non-native *Aedes* Mosquito Response Plan

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1. Overview

This response plan provides updated strategies and protocols for managing non-native *Aedes* mosquitoes, including *Aedes aegypti* (yellow fever mosquito) and *Aedes albopictus* (tiger mosquito), that rely on artificial water-holding containers for reproduction. These species are major public health concerns because they can spread diseases like dengue, chikungunya, yellow fever, and Zika to people. The plan integrates best practices, resource enhancements, and FEMA's four phases of disaster response—mitigation, preparedness, response, and recovery—into its framework.

The response plan is a guide for the Alameda County Mosquito Abatement District (ACMAD) to address the potential establishment and spread of *Aedes aegypti* or *Aedes albopictus* in Alameda County. It outlines ACMAD's plans to survey the County for non-native *Aedes*, confirm the identification of a mosquito specimen as a non-native *Aedes*, and limit the dispersal of non-native *Aedes* in the County. Because the reproduction, dispersion, and control of non-native *Aedes* mosquitoes differ substantially from that of mosquito species which transmit West Nile virus, a distinct response plan is needed for non-native *Aedes*.

The ACMAD Non-native *Aedes* Mosquito Response Plan that is outlined herein was developed using: "Guidance for Surveillance of and Response to Invasive *Aedes* Mosquitoes and Dengue, Chikungunya and Zika in California" published by the California Department of Public Health (CDPH) in January 2024, "Surveillance and Control of *Aedes aegypti* and *Aedes albopictus* in the United States" by the US Centers for Disease Control and Prevention (CDC), 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

Annual training focuses on building preparedness by enhancing the ability to identify and respond to non-native mosquito species in California. Field Staff will be trained to identify all life stages of non-native mosquito species, understand their biology and ecology, and stay current on the latest monitoring and control methods. Office Staff will receive training in asking targeted questions when fielding reports of biting mosquitoes and to recognize when the information provided warrants generating a Service Request for inspection by Field Staff. At the end of each year, team leads will convene to conduct after-action reviews of response efforts, focusing on identifying lessons learned, improving future response plans, and ensuring alignment with recovery goals.

3. Pre-detection Monitoring Plan for Non-native *Aedes* Mosquitoes

A. **Pre-Detection Monitoring.** The pre-detection stage is defined as having no invasive *Aedes* detections or up to two years of detections. As part of preparedness efforts, oviposition traps are strategically placed throughout Alameda County, targeting locations where non-native *Aedes* mosquitoes are more likely to be introduced or where habitats may support their growth (e.g., cemeteries, nurseries, recycling or waste transfer sites). Additionally, adult mosquito traps, such as Encephalitis Virus Survey (EVS) traps, are examined for the presence of non-native *Aedes* mosquitoes to establish baseline abundance data. Property inspections that arise from Service Requests should include examinations for immature *Aedes aegypti*, with a focus on *Aedes*-shaped eggs attached to containers and sampling for larvae at the bottom of containers.

B. **Specimen Handling and Documentation.** Proper specimen handling and accurate documentation are critical to ensure an effective response. For any mosquito specimens suspected to be non-native *Aedes*, Staff will record the location (address or GPS coordinates), date and time of collection, and the name of the collector. Suspected adult specimens will be immediately killed to preserve their integrity and transported to the ACMAD Lab for identification. Larval specimens will be transported alive in their original water source, while suspected eggs will be carefully preserved in a moistened plastic bag to avoid damage. These measures support mitigation efforts by preventing the unintentional spread of mosquitoes during transport.

C. **Identification and Confirmation.** Suspected specimens will be identified using taxonomic keys and verified photographs. If identified as non-native *Aedes*, a second ACMAD expert will independently verify the finding, and all specimens will be photographed for record-keeping. When further confirmation is required, external experts (e.g., CDPH Public Health Biologist) may be consulted, and molecular tests, such as the *Aedes aegypti* genotyping quantitative PCR assay, may be conducted. Once confirmed, the Supervising Public Health Biologist and the Public Health Biologist for Alameda County at CDPH will be notified. Specimens will also be preserved for genome sequencing to determine their geographic origin, supporting both response and recovery phases by informing future mitigation strategies.

D. **Service Requests and Human Case Response.** Reports of daytime or ankle-biting mosquitoes, without confirmation of native *Aedes* species, will prompt Field Staff to inspect the site for all life stages of non-native *Aedes* mosquitoes. If multiple service requests are received within a 1000-foot radius or involving 15 households, the response may escalate to include teams of two Field Staff conducting inspections. To enhance situational awareness, additional traps, such as oviposition, EVS, or BG-Sentinel traps, may be deployed in affected areas. In the event of a suspected or confirmed human case of a mosquito-vectored tropical disease reported by local public health agencies, non-native *Aedes* traps may be placed near the case's residence during the viremic period as part of the response phase.

E. **Public Outreach.** To bolster preparedness and prevention, ACMAD will conduct proactive community outreach to inform affected communities about the public health threat of non - native mosquitoes. ACMAD will work with local agencies, schools, community-based organizations and beyond to hone messages that resonate with specific communities. ACMAD will use social and paid media to amplify accurate information about mosquitoes and vector borne diseases. Outreach efforts will aim to educate the public, fostering greater awareness and support for controlling non-native mosquitoes.

4. Post-Detection of Confirmed Non-native *Aedes* Mosquito Response Plan

A. **Community Notifications (Post-Detection).**
Upon confirmation of a non-native *Aedes* detection, the following actions will be taken as part of the response phase:

- **Partner Notifications**: Notify the Public Health Emergency Committee of the ACMAD Board of Trustees, nearby mosquito and vector control districts, local public health departments, and the Emergency Operations Center (EOC) of each affected and neighboring city.
- **Reporting**: Report the confirmed detection to VectorSurv for transmission to CDC's MosquitoNET.
- **Public Outreach** : Increase the awareness of non-native *Aedes* in the affected areas to encourage residents to report daytime biting mosquitoes to ACMAD, and to inspect and sanitize their own properties. Issue a press release to the ACMAD Board of Trustees, media outlets, and local agencies to inform the public about the detection.
- **Community Emergency Response Teams (CERT).** CERT within and adjacent to the Response Area may be activated to aid ACMAD Staff in distributing information related to the non-native *Aedes* response.

B. **Mosquito Control and Outreach Response (Post-Detection).** The overarching goal is to mitigate the intensity and spread of non-native *Aedes* mosquitoes while increasing community engagement. Responses will escalate in alignment with the level of risk posed by the infestation. During recovery, efforts will shift toward reprioritizing the control of native mosquitoes and responding to service requests.

1. **Response to a First Detection.** A first detection is defined as a confirmed non-native *Aedes* finding with no additional detections within a 1/8-mile radius of the initial site. Actions include:

a. **Area Assessment and Community Engagement.** *Aedes* response teams will work in pairs, with one conducting the inspection while the other provides educational outreach and answers resident questions. The priority is to determine the presence or absence of non-native *Aedes* without requiring multiple confirmations per property. Request permission from residents to place a mosquito trap on their property and inspect it in their absence. Residents should be provided with a report on the findings of the property inspection.
b. **Water Container Sanitization.** Water containers within the response area will be treated with larvicide or drained to reduce mosquito abundance. Residents will be encouraged to dispose of or store containers indoors if they can hold enough water to support mosquito growth.
c. **Catch Basin Applications.** Apply larvicide to catch basins in and around the response area to reduce the abundance of all mosquitoes in the area.
d. **Specimen Collection and Transport.** Collect all life stages of suspected non-native *Aedes* mosquitoes for lab identification. Implement strict containment measures: inspect and sanitize vehicles and equipment before leaving the response area, and seal mosquito specimens in containers to prevent accidental spread.
e. **Broader Mitigation Efforts.** Continue larvicide applications and address service requests outside the response area, potentially at reduced service intervals to allocate staff resources within the non-native *Aedes* response area.

2. **Response to Multiple Detections Across a Broad Area.** In the event of multiple detections, the coordination phase will focus on scaling operations, ensuring efficiency, and maintaining community trust. In addition to actions outlined for a first detection, the following actions may also be taken:
   a. **Tabletop Exercises.** Facilitated tabletop exercises may be conducted to identify gaps, streamline workflows, and enhance preparedness for escalating situations.
   b. **Resource Scaling.** Allocate additional staff, vehicles, and equipment as needed to support expanded response activities. Mutual aid agreements may be activated for resource sharing.
   c. **Technology Integration.** An AI-enabled automated service request system may be temporarily activated to manage public service requests, provide real-time updates on response activities, and enhance operational transparency.
   d. **Enhanced Tracking and Inspections.** Implement detailed tracking of service requests, linking them to property inspections to ensure comprehensive coverage and situational awareness.

3. **Response to Human Case with Non-Native *Aedes* Nearby.** In addition to actions outlined for multiple detections, the following actions may also be taken:
   a. Implement broad-scale immature and adult mosquito control measures within a 1/8-mile radius of the case location.
   b. Household members where the case resides will be advised to take all steps to avoid mosquito bites to minimize the risk of local transmission.

c. Staff may not disclose any personal information related to the case. This includes but is not limited to the address where the case resides, the size of the area being inspected, the name of case, their travel history, or suspected disease.

4. **Local Tropical Disease Transmission by non-Native *Aedes*.** Building upon the above measures, the following actions may be taken:
   a. **Enhanced Adult Mosquito Control.** Deploy backpack or localized yard adult mosquito control treatments in the immediate area to reduce adult mosquito populations. Broadcast insecticide applications may be used to suppress immature and adult stages (e.g., WALS, aerosolizer or truck-mounted foggers).
   b. **Resource Scaling and Mutual Aid.** If needed, request additional equipment, personnel, and logistical support from nearby mosquito and vector control districts as part of mutual aid agreements to strengthen the response. Activate the Public Health Emergency Committee of the ACMAD Board of Trustees upon accessing the Public Emergency Fund.
   c. **Comprehensive Coordination.** Collaborate closely with the Alameda County Public Health Department, CDPH, and local community groups to ensure a unified and efficient response.
   d. **Healthcare Worker Engagement.** Educate healthcare workers on identifying and reporting potential additional cases of tropical diseases transmitted by non-native *Aedes*. Provide training on symptoms, case reporting procedures, and preventive measures.

C. **Monitoring Response Plan (Post-Detection).** The primary goal of the monitoring response plan is to quantify the intensity and geographic distribution of non-native *Aedes* mosquitoes, enabling focused control efforts where they are most needed. The emergency management approach follows a phased framework, beginning with an immediate response to the threat and transitioning efficiently into the recovery phase. During recovery, efforts will shift toward reprioritizing the monitoring of native mosquito abundance and West Nile virus prevalence.

1. **Monitoring Response to a First Detection.** Mosquito abundance in the response area will be monitored in coordination with *Aedes* response teams.
   a. **Trap types.** Specialized traps for non-native *Aedes* (e.g., oviposition, In2Care, and BG-Sentinel) alongside standard traps (e.g., EVS and gravid traps) will be deployed to assess the geographic distribution of mosquitoes within and around non-native *Aedes* response areas.
   b. **Trap Placement Strategy:** Initial trap sites will focus on the response area, with trap density highest within a 1/8-mile radius of the detection site. Trap density will gradually decrease with increasing distance from the detection site. To assess broader geographic spread, a smaller number of traps will be placed beyond the response area, extending up to ½ mile from the detection site.
      a. **Reevaluate Suitable Trap Locations**: Assess sites where residents grant permission to place traps for higher suitability compared to initial trap sites. Relocate traps to these more optimal locations as needed.

c. **Specimen Collection and Transport.** All mosquito specimens collected within a response area must be handled as if they contain non-native *Aedes* mosquitoes and must be managed to prevent unintentional spread to nearby areas.
    - **Adult Mosquitoes**: Mosquitoes captured in trap nets must be frozen before transport outside the response area.
    - **Immature Stages**: Eggs or larvae must be securely placed in sealed containers for transport. Traps used to collect immature stages must be thoroughly scrubbed and sanitized with bleach before being relocated to another site.
    - **Vehicles and Equipment**: All vehicles and equipment must be inspected for uncontained mosquitoes before exiting the response area.
    - **Long-Term Traps**: For traps left on properties for more than five days to collect immature stages, water must be treated with a larvicide. Larvicide applications must be replenished as directed on the product label and reported according to the guidelines provided by the Operations Supervisor.
d. **Specimen identification and reporting.** Rapid and thorough assessment of trap contents, followed by timely reporting to outreach and control staff, is critical to support operational and outreach responses.
    - **Adult and Larval Identification**: Adults and larvae collected from a response area must be identified using taxonomic keys within one day of collection.
        - If a specimen cannot be conclusively identified, a second opinion should be sought from ACMAD staff. If both attempts fail, the specimen should undergo molecular testing, such as with the *Aedes aegypti* genotyping quantitative PCR assay.
    - **Egg Identification**: The species of *Aedes* eggs collected from a response area should be identified using molecular testing within three days of collection.
    - **Oviposition Trap Water Analysis**. Water from ovibucket and In2Care traps should be analyzed using molecular tests to detect environmental DNA (eDNA) shed by non-native *Aedes* mosquitoes.
    - **Reporting Additional Detections**: Any additional detections of non-native *Aedes* must be reported via email within one hour to the Laboratory Director, Operations Supervisor, Regulatory and Public Affairs Director, and Public Outreach Coordinator. At least one of these individuals must also be notified verbally.
        - Traps that contain more than 5 adult *Aedes aegypti* mosquitoes should be reported promptly to *Aedes* response teams.
e. **Monitoring duration.** Sites where non-native *Aedes* mosquitoes are collected must be monitored with EVS traps every two weeks until six consecutive months of negative trap results are achieved. Additionally, each detection site should be monitored again for one month during the following year, once environmental conditions become favorable for mosquito reproduction.
f. **Mosquito control support.** Lab Staff may inspect, sanitize, and apply larvicide at properties where traps are placed.

2. **Monitoring Response to Multiple Detections across a Broad Area.** With multiple detections, the coordination phase will focus on distributing resources to ensure efficient and effective monitoring of the non-native *Aedes* response areas and native mosquito habitats. Actions include:
    a. **Prioritize High-Risk Sites.** Focus native mosquito monitoring efforts on high-priority and essential sites. Defer medium-priority trap sites until resources allow for their reassessment.
    b. **Emphasize Adult Mosquito Monitoring.** Prioritize monitoring adult mosquito abundance by deferring routine inspections of oviposition and In2Care traps. Apply long acting larvicides in these traps to prevent mosquito reproduction until resources permit further inspection.
    c. **Postpone eDNA Testing.** Defer analysis of eDNA from trap water during this phase to reallocate laboratory capacity to higher-priority tasks.
    d. **Streamline Specimen Identification.** Focus adult mosquito identification efforts on WNV vectors (*Culex* spp.) and non-native urban *Aedes* mosquitoes. *Culiseta* species should be identified to species level only when time permits.
    e. **Optimize WNV Testing.** For traps containing more than 100 individuals of a particular WNV-vector species, limit quantitative PCR testing to no more than two mosquito pools per species.
    f. **Pause Research Projects.** Temporarily suspend all ongoing research projects that are not directly related to the response effort.

3. **Monitoring Response to Human Case with Non-Native *Aedes* Nearby.** In response to a human case near non-native *Aedes* detections, monitoring efforts will escalate to improve precision in identifying the locations of non-native *Aedes* mosquitoes. These measures build upon the actions outlined for multiple detections and include the following:
    a. Place Mosquito Magnet Traps at strategic locations to reduce non-native *Aedes* abundance. Do not place these traps within 200 feet of where the human case resides to prevent additional mosquitoes from coming near and potentially biting the individual.
    b. Expand trapping efforts near the human case by transferring traps from sites where no non-native *Aedes* mosquitoes have been detected for at least six weeks.
    c. Limit native mosquito monitoring to essential priority sites, deferring high- and medium-priority monitoring to allocate resources for the human case response.
    d. Non-native *Aedes* mosquitoes collected near the case's residence may be tested for tropical diseases at the DART Lab at UC Davis

4. **Monitoring Response for Locally-Acquired Human Case.** All monitoring resources and efforts will be transferred to the response area.

D. **Office Response.** The goal of the Office Response is to inform County residents and relevant entities of the non-native *Aedes* Response Area, coordinate the Operations and Lab

Responses, and engage in public outreach to encourage County-wide efforts to suppress non-native *Aedes* mosquitoes.

1. **Service Requests and Property Inspections.**
    - Determine the language(s) needed for the affected area.
    - Translate outreach materials into needed languages.
    - 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 non-native *Aedes*.
    - Contact any restricted areas that will need to be inspected.
    - Enact an efficient communication system between field and office staff to facilitate door-to-door inspections.
2. **Coordinating Operations and Lab Responses.**
    - Inspection maps will be generated by Office Staff for guiding Field Staff to sites in and around the non-native *Aedes* Response Area that have been inspected, need inspection, or have return 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 staff meetings related to the non-native *Aedes* response.