COUNTY OF SAN DIEGO

MOSQUITO-BORNE VIRUS STRATEGIC RESPONSE PLAN

Department of Environmental Health and Quality
Vector Control Program

2023

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I. Authorization

This *Mosquito-borne Virus Strategic Response Plan* was developed in concurrence with Public Health Services and approved by the Director of Environmental Health and Quality and the Public Health Officer. The plan will be updated as new information becomes available and will be reauthorized biennially unless otherwise necessary.

Harbert, Amy Digitally signed by Harbert, Amy Date: 2023.02.08 15:56:12 -08'00' 2/8/23

Amy Harbert — Date
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Wilma Wooten, MD, MPH — Date
Public Health Officer, HHSA Department of Public Health Services

Signed original on file at the Vector Control Program.

II. Purpose

The County of San Diego *Mosquito-borne Virus Strategic Response Plan* provides the basis for implementing an integrated, risk-based response to limit the risk of disease from endemic mosquito-borne viruses (arboviruses), such as West Nile, Saint Louis, and Western Equine Encephalitis, as well as transmission of non-endemic diseases, such as dengue, chikungunya, Zika, and others.

III. Introduction

The County of San Diego Vector Control Program (VCP) is responsible for mosquito and vector-borne disease surveillance and control services in all 18 incorporated cities and the unincorporated area of San Diego County. The VCP has been reducing and controlling mosquitoes and other vectors and protecting the county against vector-borne diseases for over 40 years. A service charge and benefit assessment are used to fund the program. Annually, the benefit assessment is re-evaluated and set by the County Board of Supervisors. The

Culex Mosquitoes and Related Infections

The West Nile virus (WNV) was first detected in the United States in 1999 in New York when it caused an outbreak of encephalitis in people (Nash et al., 2001) and significant mortality in birds (Kilpatrick et at., 2007). Harbored in passerine birds and transmitted by mosquitoes, it rapidly spread westward until it reached San Diego County in 2003. Although 80% of people infected with WNV do not get ill, 20% of infections result in clinical signs including fever, headache, joint pains, vomiting, diarrhea, or rash. Less than 1% of infected people develop a severe illness that affects the brain and causes long-term sequelae or death. From 2003 to 2020, 7,255 human cases of WNV have been reported in CA with 320 deaths. There is no vaccine or specific treatment for people infected with WNV.

WNV is maintained in wild bird populations, especially passerine birds such as sparrows and finches, due to a wild bird-mosquito infection cycle. It has been found in more than 110 bird species, with corvids, like crows and jays, and raptors, being highly susceptible and frequently dying from infection. Monitoring dead corvids and raptors for WNV is a sensitive indicator of WNV activity and often precedes detection of WNV in mosquitoes and people. Infection can spill over into other species, such as people and horses, when infected crepuscular mosquitoes, like *Culex tarsalis, Culex quinquefasciatus, and Culex stigmatosoma*, feed on them (
Figure 1. WNV transmission cycle.

Although very effective horse vaccines have reduced the incidence of WNV-induced disease in horse populations, no human vaccine exists. Similarly, Saint Louis Encephalitis virus (SLEV) and Western Equine Encephalitis virus (WEEV) are also maintained in bird-mosquito infection cycles but do not cause bird mortality. They are largely monitored by detection in mosquito pools.

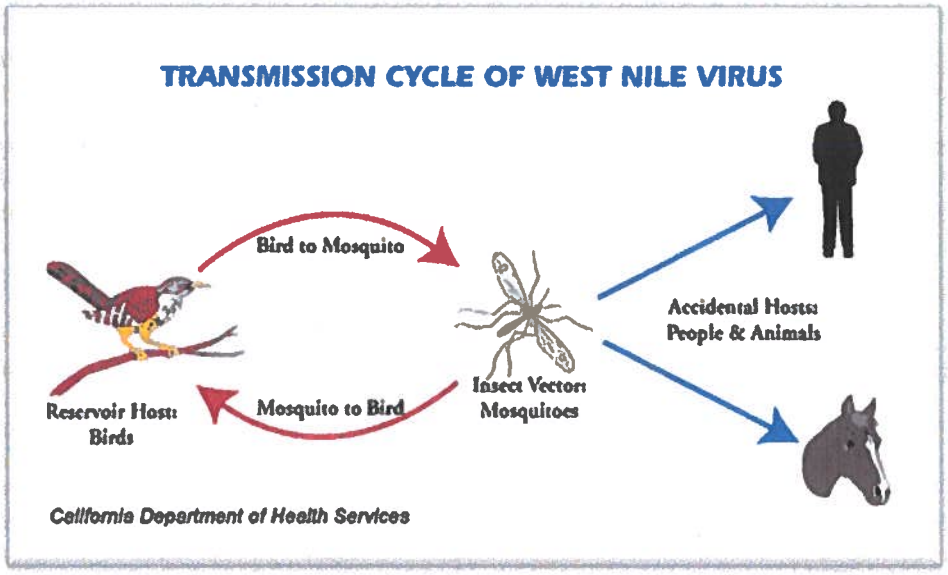

Figure 1. WNV transmission cycle.

SLEV was first recognized in California in 1937 and caused sporadic cases until 2003. Fewer than 10 cases of SLEV in people have been reported per year in California since 1990 and although not detected between 2003-2014, it reemerged in California in 2015. WEEV can cause infections in people and horses. Fortunately, it has not been detected in mosquitoes in San Diego County for over 20 years. However, monitoring for its reemergence is important as it is considered endemic in California. Since, currently, WNV is by far the most common of these viruses, this Plan focuses on response to WNV but applies to the other viruses as well if they are detected.

Invasive *Aedes* Mosquitoes and Related Infections

In 2014 and 2015, two non-native invasive mosquitoes, *Aedes aegypti* and *Aedes albopictus*, respectively, were detected in San Diego and a third invasive *Aedes* species, *Aedes notoscriptus*, was found in 2018. It is not known how *Aedes aegypti, Aedes albopictus, a*nd *Aedes notoscriptus* entered California; however, *Aedes aegypti* found in Los Angeles and San Diego counties are genetically similar to *Aedes* found in Arizona, New Mexico, and Mexico (Pless et al., 2016). In contrast, *Aedes aegypti* infestations in northern California match strains endemic in Texas (Gloria-Soria et al., 2014). Furthermore, *Aedes albopictus* infestations in Los Angeles County match the genetic profile of a previous *Aedes albopictus* infestation in Los Angeles in 2001 that arose from lucky bamboo shipments originating from China; thus, it is presumed that the infestation was not eradicated and remained undetected until 2011 (Zhong et al., 2013). The biology of invasive *Aedes* mosquitoes and the diseases they carry differ from the *Culex* mosquitoes that commonly transmit WNV. These *Aedes* species prefer to feed on people, breed in small stagnant water sources often found in and around homes, and aggressively bite during

the day (diurnal). *A. aegypti* and *A. albopictus* can transmit non-endemic viruses such as dengue, chikungunya, yellow fever, and Zika viruses (referred to as *Aedes*-transmitted diseases or ATD), and their eggs can survive without water for greater than one year (Faull and Williams, 2015). Although *A. notoscriptus* can transmit Ross River and Barmah Forest viruses, its ability to transmit dengue, chikungunya, Zika, West Nile, and yellow fever viruses is thought to be limited (reviewed by Metzger et al., 2022) . Furthermore, *A. aegypti* and *A. albopictus* have been found infected with WNV, however, because they prefer human hosts over bird hosts, the latter being reservoirs of WNV, they are not considered to be significant vectors of WNV.

In California, *Aedes aegypti* and/or *Aedes albopictus* have been found from San Diego and Imperial Counties in the south to Shasta County in the north (Figure 1). The most current map of *A. aegypti* and *A. albopictus* infestations in California is available here.

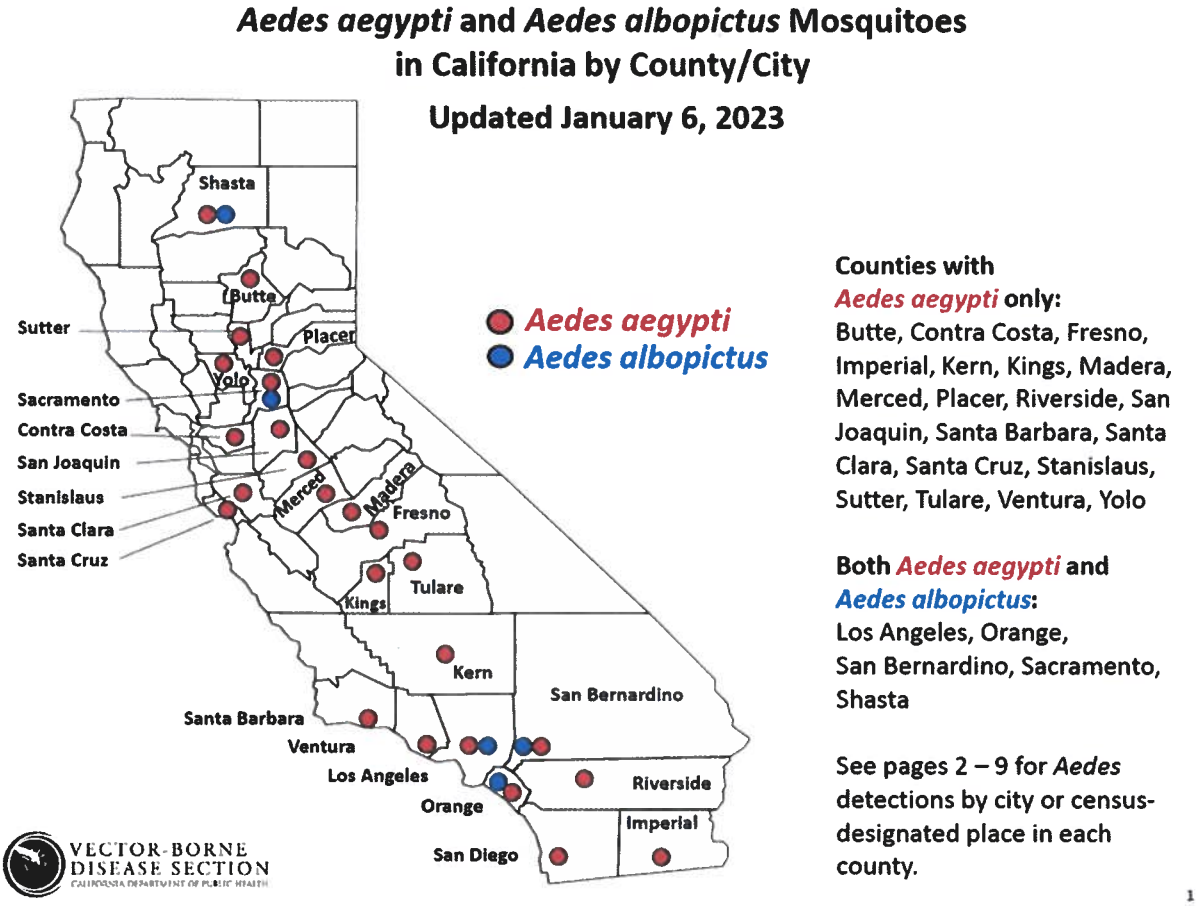

Figure 2. Aedes aegypti and Aedes albopictus mosquitoes detected 2011-2021.

There is no simple solution to eradicating *Aedes* or preventing all ATDs. Fortunately, the VCP has employed integrated vector management strategies for many decades to thwart other mosquitoes and the diseases they carry.

This *Mosquito-borne Virus Strategic Response Plan* was created to mitigate these arbovirus effects on people and to protect the public's health. It is based on published research, state and federal guidelines, and VCP experience, and is updated as new information becomes available.

IV. Response to WNV

Response to WNV is based on a risk-based continuum of three graduated levels in response to increasing risks of WNV (CDPH, 2022). The response levels are:

1. Level 1: Endemic conditions with low risk to human health;
2. Level 2: Conditions conducive to above average circulation of WNV with medium risk to human health; and
3. Level 3: Conditions highly conducive to spread of WNV with high risk to human health.

Specific thresholds for each response level are contained in Appendix A. Furthermore, the time-of-year also influences risk levels. For example, a high calculated risk level at the end of the mosquito season would warrant a more tempered response due to declining transmission risk as temperatures and photoperiod decrease and, conversely, a low calculated risk level at the beginning of the season could warrant a more aggressive response if conditions are forecast to elevate mosquito levels and risk to public health.

Goals

The VCP's goals are to mitigate the impacts of WNV to the health, well-being, and economy of San Diego County by: 1) limiting mosquito numbers in critical areas; 2) educating residents how to prevent mosquitoes from breeding at their homes and to protect themselves from getting bitten; and 3) mobilizing residents to report mosquito breeding sites and sentinel dead bird species to the VCP. These goals are met using an integrated pest management approach that encompasses:

1. **Surveillance** of mosquitoes, dead birds, and human WNV cases;
2. **Testing** of appropriate mosquito and bird species for WNV;
3. **Control** of mosquito populations; and
4. **Outreach** on how to prevent WNV infection, prevent mosquito breeding, and report mosquito breeding and dead birds.

Surveillance

Goal: *To monitor levels of vector mosquito populations and virus activity in San Diego County to mitigate the spread of WNV*

Birds

Dead corvid and raptor birds is often one of the earliest indicators of WNV activity and precedes human WNV cases. Consequently, the VCP operates a year-round program for collecting and testing dead corvids and raptors for WNV. The public is encouraged to report these species of dead birds to the VCP. Birds meeting appropriate testing criteria are collected from throughout the county 7 days a week, tested at the Vector Disease and Diagnostic Laboratory (VDDL) for the presence of WNV, SLEV, and WEEV, and are used by the VCP to help direct surveillance, control, and outreach efforts.

Mosquitoes

The VCP monitors over 1,600 mosquito-breeding locations throughout the county. Monitoring involves visual observation, trapping adult mosquitoes, and/or larval collection from water sources. In addition, the VCP investigates reports and complaints of mosquito activity from the public. An increase in mosquito abundance and the presence of specific species that can transmit WNV help direct appropriate control measures and outreach efforts. In addition, mosquitoes are tested by the VDDL for WNV, SLEV, and WEEV. If mosquitoes test positively for one of these viruses or a human or equine case is reported, additional traps are set to determine the level of risk to public health (appendix A).

In addition, mosquito populations are periodically monitored for susceptibility to pesticides that kill larvae (larvicides) and adults (adulticides) so that optimal mosquito control products can be used.

Horses

Local equine WNV cases are reported to the VCP or to the California Department of Food and Agriculture, which in turn, reports the cases to the VCP. Since horses are stabled and their travel histories can be determined, the location of their exposure to mosquitoes can be pinpointed. The VCP uses this information to find additional sources of mosquitoes that can transmit WNV, assess the risk to public health, and direct control efforts to reduce these risks (Appendix A).

Humans

In accordance with Title 17 of the California Code of Regulations (Section 2500 and 2505), physicians, diagnostic laboratories, blood and tissue banks are required to report suspected or confirmed cases of human WNV infection (i.e., any positive laboratory finding of WNV) within one (1) working day of identification to the local public health department, which is the Public Health Services department, in the County of San Diego Health and Human Services Agency. Suspect human WNV cases (i.e., presumptive WNV IgM antibody positive, nucleic acid-amplification test (NAAT) reactive, or physician-diagnosed) are interviewed by Public Health Services Epidemiology staff using a standardized risk history questionnaire. The questionnaire documents illness onset, signs and symptoms, travel history, mosquito exposure, whether the infection was acquired locally or imported from a region outside the patient's residence or acquired by a non-mosquito route of transmission, such as blood transfusion or organ transplantation. Symptomatic cases that meet the national surveillance case definition for acute WNV infection, as well as asymptomatic WNV-positive blood

donors are reported to the California Department of Public Health (CDPH) and the Centers for Disease Control and Prevention (CDC). In addition, the VCP is immediately notified and staff members investigate the property and neighborhood of locally-acquired WNV-positive cases that are reported within 30 days of local mosquito exposure unless conditions warrant more prolonged times (such as prevailing response levels 2 or 3 in the county). The investigation will include efforts to trap and test mosquitoes and to identify, eliminate, or treat mosquito breeding sites. After determination by PHS of whether the infection(s) was acquired within or outside of the county (locally and non-locally acquired, respectively), the VCP staff posts human case counts on the VCP web page and indicates if the infection was acquired locally or non-locally. If applicable, a news article is published and specific health alert notices are sent to residents located in at-risk areas to inform/alert these residents to take actions to prevent mosquitoes from breeding on their properties and to protect themselves from mosquito bites.

Testing

Goal: *To rapidly detect WNV in surveillance specimens and to confirm human cases*

Mosquitoes and Birds

The VDDL tests field-caught mosquitoes and dead birds for WNV, SLEV, and WEEV. It uses highly sensitive and accurate advanced molecular tests, such as *real-time* reverse transcriptase Polymerase Chain Reaction (RT-PCR) and genetic sequencing, to detect these viruses and performs an annual proficiency examination administered by the UC Davis DART laboratory. Timely test results enable VCP surveillance, control, and outreach groups to rapidly respond and reduce the spread of WNV. Additionally, new emerging diseases are analyzed by the VDDL to better prepare and protect the public.

Humans

Identification of WNV cases is important to assess the burden of human illness and to target mosquito control and public education activities to reduce exposure risk. During the WNV season, testing is recommended for individuals with aseptic meningitis, encephalitis, acute flaccid paralysis, atypical Guillain-Barré Syndrome, transverse myelitis, and febrile illness lasting $\geq$ 7 days.

Residual serum and cerebrospinal fluid (CSF) specimens (if available) from suspect WNV cases are requested from non-public health diagnostic laboratories for submittal through the San Diego County Public Health Laboratory (SDCPHL) or directly to the California Department of Public Health Viral and Rickettsial Disease Laboratory (CDPH VRDL) for confirmatory testing.

WNV testing capacities available through CDPH VRDL include the following:

- IgM and IgG enzyme immunoassay (EIA) testing;

- IgM and IgG immunofluorescent assay (IFA) testing;
- Plaque Reduction Neutralization Test (PRNT), which is a virus-specific neutralizing antibody test for distinguishing between arthropod flaviviruses; and
- Reverse Transcriptase – Polymerase Chain Reaction (RT-PCR).

Control

Goal: *To decrease the risk of WNV transmission by reducing mosquito populations*

The VCP uses integrated pest management (IPM) practices to limit mosquito numbers and protect the public's health and the environment from WNV. This approach reduces the amount of insecticides required. IPM practices include reducing and eliminating mosquito breeding sources, biological and chemical larval control, and chemical control of adult mosquitoes. Specific actions include:

- Responding to customer service requests to find, eliminate, and/or treat mosquito breeding sources and educate customers how to prevent mosquito breeding;
- Using aerial reconnaissance to find unmaintained swimming pools, ponds, and fountains that could be breeding mosquitoes;
- Using mosquitofish to consume larvae where appropriate;
- Applying highly specific larvicidal bacteria or mosquito growth regulators to water to kill mosquito larvae;
- Using helicopters to apply larvicide to waterways that are inaccessible or inefficiently treated from land;
- Applying insecticides that kill adult mosquitoes when an elevated risk to public health exists that cannot be mitigated by other means; and
- Ordering abatement of mosquito breeding sources.

Outreach

Goal: *To educate the public how to prevent mosquito breeding, to prevent mosquito bites and to report mosquito breeding sites and dead birds to the VCP*

The VCP Outreach Group educates county residents how to protect against mosquito bites, prevent mosquito breeding and report dead birds and locations of breeding mosquitoes. Outreach staff members give presentations and attend events to educate the public about WNV and mosquitoes. The website www.SDFightTheBite.com is kept current with the latest county WNV information and can be translated into over 100 languages using a Google Translate menu. A 24-hour phone line with recorded information about WNV is also accessible at (858) 694-2888. In addition, educational brochures are created and distributed, and public service information campaigns are created that utilize TV, radio, outdoor displays, mobile devices, social media, and internet distribution media. Brochures and media campaign content are translated into County of San Diego threshold languages.

Notification letters are sent to residents within a 1/4-mile radius of where WNV-positive mosquitoes or infections are detected. Outreach also works with city and County storm water management programs to protect rain barrels from breeding mosquitoes. Education about backyard sources of mosquito breeding (unmaintained pools, overwatered plants/saucers) and how to prevent mosquito breeding is also provided to groups such as realtors, tire dealers, nurseries, cemeteries, apartment associations, schools, and other organizations. Information is provided in multiple languages as needed.

V. Response to Aedes-Transmitted Diseases

Response to *Aedes* is structured as a phased, risk-based continuum that is based on parameters described in the Zika Centers for Disease Control and Prevention (CDC) Interim Response Plan (May 2017) and the California Department of Public Health's Guidance for Surveillance of and Response to Invasive *Aedes* Mosquitoes and Dengue, Chikungunya and Zika in California (June 2021). The continuum includes mosquito season preparedness and graduated action in response to the following:

1. Detection of *Aedes* mosquitoes;
2. Detection of imported cases of *Aedes*-transmitted diseases;
3. Confirmed local transmission of a single, or focal cluster of *Aedes*-transmitted disease; and
4. Confirmed multi-person local transmission and propagation of *Aedes*-transmitted disease.

Because *Aedes* breed in small, cryptic locations, many of which cannot be found, reached, or treated by the VCP, eradication of *Aedes* mosquitoes from San Diego County is unlikely. However, control of *Aedes* breeding in urban and man-made water sources is possible with the participation of County residents through elimination or treatment of *Aedes* breeding sources from their properties.

Goals

The VCP goals are to mitigate the impacts of *Aedes* to the health, well-being, and economy of the County by: 1) limiting *Aedes* numbers, 2) educating residents how to prevent *Aedes* from breeding in their homes, 3) preventing local mosquito transmission of ATD, and 4) preventing sustained transmission of ATD. These goals are met using an integrated pest management approach that encompasses the following:

1. **Surveillance** of *Aedes* and human cases of diseases transmitted by *Aedes*
2. **Testing** *Aedes* for pathogenic viruses and assessing *Aedes* susceptibility to insecticides
3. **Control** of *Aedes* populations and elimination of small stagnant water sources so that they no longer breed mosquitoes
4. **Outreach** to the public on how to prevent infection and mosquito breeding

Surveillance

Goal: *To monitor the levels and distribution of Aedes and Aedes-transmitted diseases in San Diego County and to ascertain their genetic predisposition and/or susceptibility to insecticides.*

The VCP surveillance group sets mosquito traps (Biogent sentinel mosquito trap, Autocidal gravid mosquito trap, Encephalitis virus surveillance mosquito trap+lure, etc.) to monitor at-risk areas of the County for *Aedes* activity. During disease investigations, it set traps within an approximately 150-meter radius from highly suspect and confirmed ATD cases to test for presence of *Aedes* mosquitoes.

Testing

Goal: *To rapidly detect dengue, chikungunya, Zika and other viruses in Aedes populations so that the VCP can rapidly respond to elevated health risks.*

The VDDL tests female *Aedes* via real-time reverse transcriptase-polymerase chain reaction (RT-PCR) for ATDs. *Aedes* collected from the vicinity of a viremic case are tested for the same virus that the case is infected with. Due to the rarity of these viruses, RNA from positive samples are sent to the UC Davis Arbovirus Research and Training laboratory for confirmation. In addition, periodically *Aedes* are tested for genetic predisposition and/or susceptibility to insecticides used by the VCP so that appropriate chemical control methods can be used, if needed.

Control

Goal: *To find and eliminate Aedes breeding sources, to decrease the number of immature and adult Aedes and to prevent local mosquito transmission of ATDs.*

Vector Control Technicians respond to complaints of daytime or indoor biting by mosquitoes by assessing properties for breeding locations, eliminating small stagnant water sources, applying larvicide to breeding locations that cannot be eliminated; and, in cases of an elevated health risk, using adulticidal pesticides to kill adult mosquitoes.

Outreach

Goal: *To educate the public about Aedes mosquitoes and the diseases they can transmit, how to prevent their breeding, and how to protect oneself from mosquito bites.*

The Outreach group maintains the website SDFightTheBite.com with information on *Aedes* and VCP operations to prevent ATD transmission and provides updated maps of where *Aedes* has been detected in the county. The website can be automatically translated into

over 100 languages using a Google Translate menu. The Group also develops brochures, gives presentations, and conducts media campaigns to educate the public about *Aedes* and how to prevent them from breeding at homes. Brochures, presentations, and media campaigns are translated into County of San Diego core languages where relevant and feasible. When required, the group helps to inform residents within areas that are scheduled to be treated to control adult mosquitoes by preparing informational door hangers and sandwich boards including procuring translations, posting up-to-date informational web pages and social media, and staffing a phone line to answer questions regarding mosquito control operations, (858) 694-2888.

VI. Communication

Communication and transparency of operations are of paramount importance to prevent the spread of WNV and ATDs. The County employs a wide spectrum of media and staff to inform the public about the risk of WNV and ATDs and County operations to control these infections. In the event of mosquito-borne virus detections that necessitate aerosol adulticide treatments, the County will communicate information using the following methods:

- Press releases on the County News Center: http://www.countynewscenter.com/
- Situation updates and information on the VCP website www.SDFightTheBite.com
    - Maps and descriptions of areas that will be treated, and
    - Insecticide information-Safety Data Sheets, FAQs, product labels
- Posts on information on social media platforms, such as Nextdoor, Facebook, and Twitter
- Staffed phone line to answer questions (858) 694-2888, during regular business hours and additional days and hours, as appropriate

Additional communication measures and notifications that may also be utilized include:

- Informational door hangers and free inspections of all residences that will be treated at least 48 hours prior to treatment as well as follow up door hangers after treatment to confirm that treatment occurred. These will be made available in multiple languages, especially those used in the affected communities.
- Informational sandwich boards listing date and time range of treatment at street intersections in neighborhoods where ULV treatment will occur at least 48 hrs. prior to treatment.
- Communications with other governmental and non-governmental agencies where operations will occur including city governments, USPS, schools, daycare centers, and healthcare facilities. The VCP will work with these entities, as well as homeowners to resolve potential problems or concerns.

VII. Conclusion

The VCP strives to safeguard the public's health from mosquito-borne viruses, as well as to minimize harmful effects to the environment by using an integrated pest management, data-driven approach to controlling the spread of diseases. Public communication, education, and transparency are cornerstones of its strategy to protect against arboviruses. As new information develops, this *Mosquito-borne Virus Strategic Response Plan* will be updated to reflect new technologies and best practices. The latest information on VCP operations can be found at www.SDFightTheBite.com.

Appendix A. Mosquito Control

Larvae

Eliminating mosquito larvae reduces the number of biting adult females capable of transmitting disease, causing discomfort, and ultimately producing another generation of mosquitoes. Larval mosquito control has three key components: 1) breeding source reduction /environmental management; 2) biological control; and 3) larvicides.

1. Breeding source reduction/environmental management involves eliminating stagnant water in and around homes, storm drains, flood control channels, and underground utility vaults so that mosquitoes cannot breed. Breeding sources can be anything that collects ¼ inch or more of standing water for 1 week including common household items like pots, saucers, vases, pet bowls, unused tires, tire swings, buckets, rain barrels, wheelbarrows, bird baths, non-circulating fountains, toys, garbage cans, hollow uncapped fence posts, landscape drains, clogged rain gutters, and many others. Dumping out, tipping over, covering, screening and/or cleaning up these water collection sources weekly are effective and inexpensive ways to prevent mosquitoes from breeding in them. Environmental management includes steps to prevent water accumulation such as proper storm water management and controlling irrigation to avoid overwatering of the landscape, and vegetation management to reduce emergent vegetation that provides habitat and refuge for mosquito larvae.

2. Biological control entails the use of natural predators, parasites, or pathogens to reduce immature mosquito numbers. Mosquitofish, *Gambusia affinis*, is the most widely used biological control agent in California. This fish can be placed in standing water sources that cannot be drained, such as fountains, ponds, and unused pools. The County provides these fish free of charge to the public to prevent mosquito breeding on their property.

3. Larvicides are products that selectively kill mosquito larvae but are nontoxic to other insects, fish, mammals, birds, people, or the environment (Attachment C, Table 1). They are applied to water where mosquito larvae are found. The VCP only uses EPA-registered larvicides. There are several larvicides that are highly specific and thus have minimal impact on non-target organisms. These include microbial control agents, such as *Bacillus thuringiensis* ssp. *israelensis* (Bti) and *Lysinibacillus* (*Bacillus) sphaericus* (Bs), as well as natural insecticides like Spinosad that is derived from a microbial fermentation process. Other larvicides include insect growth regulators and surface films. Insect growth regulators, such as methoprene, prevent immature mosquitoes from developing into adults and are sometimes used in shallow, standing water sources like shallow ponds and areas subject to periodic flooding. Surface films prevent larvae and pupae from breathing at the surface of the water. They are very effective but may suffocate other surface breathing aquatic insects; therefore, they are used judiciously and only with small pockets of calm water. Because larvicides prevent mosquito larvae from becoming adult mosquitoes, their effects are most noticeable several days to weeks after they are applied. During the mosquito-breeding season, aerial applications of larvicide are conducted to mosquito-breeding sites throughout San Diego County that are inaccessible or inefficiently

treated by other means. These applications are performed using a contracted helicopter service with a granular spreading applicator. Treatments are conducted approximately every three to four weeks from April through October. Application equipment is calibrated to assure the delivery of the correct amount of larvicides consistent with label amounts. Aerial application locations and application dates can be found at www.SDFightTheBite.com.

Adults

When adult mosquito populations must be rapidly suppressed to reduce a condition that may cause an elevated risk to human health, insecticides that kill adult mosquitoes may be used. Insecticides that kill adult mosquitoes are called "adulticides" and, by nature, are less specific than larvicide products; therefore, whenever possible, they are applied in a restricted manner (limited time and space) to maximize the impact on mosquitoes and minimize the effect on other insects. They are applied as regular or ultralow volume sprays (ULV) that are delivered via ground-based spray equipment (hand-held, backpack, watercraft, or truck mounted spray equipment) or by aircraft. The ULV sprays create microscopic aerosolized droplets that kill mosquitoes that fly into them. Other adulticide sprays can be applied directly to breeding sites or resting sites to create a barrier so that when mosquitoes land on these areas they absorb the adulticide and are killed. Adulticide products include pyrethrins, which are derived from the chrysanthemum flower, pyrethroids, which are synthetic versions of pyrethrins, organophosphates as well as other products (Attachment C, Table 2). Additional chemicals that act as synergists with the pyrethrins and permethrins may also be used and have the effect of *lowering* the amount of insecticide needed while *increasing* the efficacy of the treatment. The VCP contracts with a certified pesticide applicator to provide aerial applications of mosquito adulticides for mosquito control if needed. A link to FAQs regarding adulticides can be found at www.SDFightTheBite.com.

All insecticide applications are performed in accordance with EPA-label instructions in conformance with all environmental and pesticide use laws and regulations and are regulated by the Department of Agriculture, Weights and Measures - Pesticide Regulation Program.

WNV Risk Analysis and Response

The Vector Control Program evaluates the overall countywide WNV risk level to public health based on the 2021 California mosquito-borne virus surveillance and response plan and by using the CalSurv risk assessment tool operated by the UC Davis Arbovirus Research and Teaching laboratory (DART) (https://gateway.calsurv.org/). This risk assessment incorporates data from temperature, mosquito abundance, minimum infection rate, human cases, and dead bird infections to assign a risk and response level from 1-3 (Table 1).

Table 1. WNV response levels.

Level	Description	Response
1	Endemic conditions with low risk to	• Conduct routine mosquito and virus

	human health	surveillance activities • Conduct routine mosquito larvae control • Evaluate pesticide resistance in mosquitoes • Release routine press notices • Monitor for neglected pools • Conduct routine public education and awareness messaging
2	Above average circulation of WNV with medium risk to human health	Continue with Level 1 response activities plus: • Increase surveillance, testing, and control of mosquito larvae; continue aerial green pool surveillance; increase mosquito trapping at high mosquito county areas, aerial and/or ground larvicide applications, and source reduction • Notify Public Health Services (PHS) of WNV risk level • Enhance educational outreach to affected communities • Alert physicians (via PHS) • Conduct site investigations of all locally acquired human and equine cases and WNV-pos mosquito pools to find mosquito breeding sources • Alert neighborhoods where WNV-pos mosquito pools, horses, or people are detected • Alert executive management of WNV activity • Apply adulticides in localized areas to prevent or control an elevated risk to public health, if necessary • Conduct focused outreach to communities in which adulticide activities occur
3	Conditions highly conducive to spread of WNV with high potential risk to human health	Increase Level 2 response activities as appropriate plus: • Consider wider use of adulticides including truck and/or aerial delivery methods to reduce public health risk

		(see adulticide use below) • Determine if additional resources needed and/or local health emergency or public health crisis declaration is required

Additional factors, such as season and others, are used to gauge which response level is appropriate for given conditions. For example, a high calculated risk level at the end of the mosquito season could warrant a more tempered response due to declining transmission risk as temperatures and photoperiod decrease; conversely, low overall calculated risk levels with several high individual risk factors may warrant a higher level response to avert future public health risks.

Whenever a mosquito pool or person tests positive for WNV the localized risk to public health is further assessed and a comprehensive response that involves additional surveillance trapping for infected mosquitoes, breeding source reduction, larvicides, outreach, and adulticide, if necessary, is used (Figure 3).

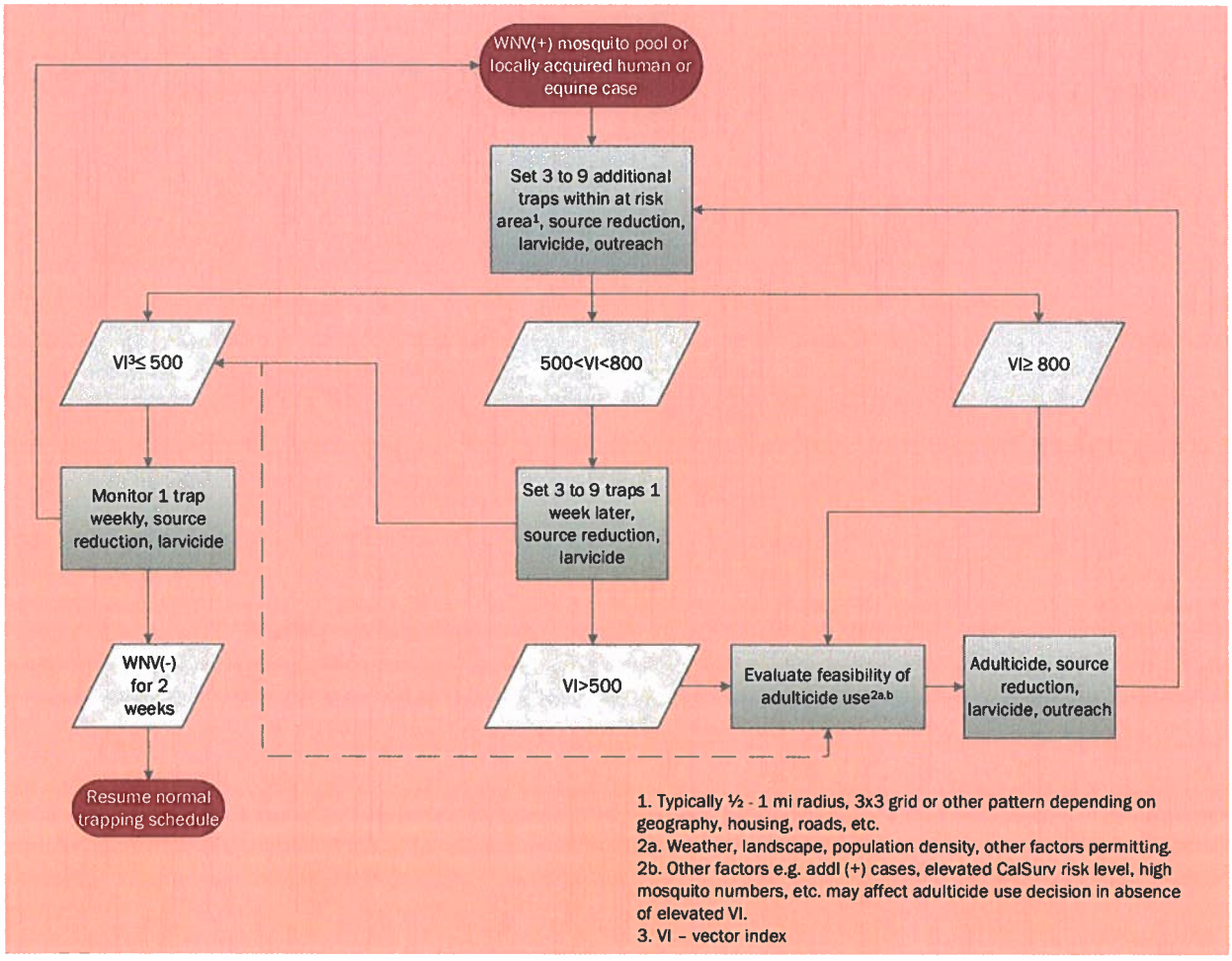

Figure 3. WNV response decision tree

The Vector Index (VI) is a single value that incorporates virus infection rates in each species of vector mosquito and the number of vector mosquitoes present. It is the estimated average number of infected mosquitoes collected per trap night summed for the key vector species in the area. Summing the VI for the key vector species incorporates the contribution of more than one species and recognizes the fact that WNV transmission may involve one or more primary vectors and several accessory or bridge vectors in an area. In this analysis, it is multiplied by 1000 to align with calculation via MIR or MLE (see below).

The Vector Index is: $\frac{\text{Average mosquitoes caught per trap night X \# WNV-positive mosq pools X 1000}}{\text{Total \# mosquitoes caught}}$

It can also be calculated from the minimum infection rate (MIR) as: $\sum_{i=\text{species}} N_i P_i$

N= Average vector species mosquitoes/trap night
P= MIR or MLE (number of infected mosquitoes per 1,000 tested)

a. MIR = number of infected batches/total mosquitoes x 1000; (50 female mosquitoes/pool)

MLE is more accurate than MIR at high infection prevalence and incorporates variably sized mosquito pools. The Excel plugin to calculate MLE can be found at: http://www.cdc.gov/westnile/resourcepages/mosqsurvsoft.html.

If the VI signals adulticide use should be considered, the feasibility of using ULV adulticides is assessed by evaluating weather conditions, landscape, population density, and other operational factors. In addition, additional information such as CalSurv risk level and season are assessed to determine if adulticide is warranted, especially in borderline and mid-level VI results.

Aedes Transmitted Disease Risk Analysis and Response

Response to *Aedes* is structured as a phased, risk-based continuum that is based on parameters described in the Zika Centers for Disease Control and Prevention (CDC) Interim Response Plan (May 2017) and the California Department of Public Health's Guidance for Surveillance of and Response to Invasive *Aedes* Mosquitoes and Dengue, Chikungunya and Zika in California (June 2021). The continuum includes mosquito season preparedness and graduated action in response to the detection of Aedes, imported cases of ATDs, locally acquired ATDs, and continuing transmission of ATDs (Table 2).

Table 2. Phase, category, and response to Aedes-transmitted diseases (ATDs).

PHASE	*CATEGORY*	*RESPONSE*

0	Aedes detected	Determine extent of Aedes infestation by setting traps and performing outreach to potentially affected residences.
1	Aedes activity and imported ATD detected or suspect local transmission of ATD	Investigate ATD case residences and sites of possible exposure for presence of Aedes mosquitoes. If Aedes detected, eliminate and/or treat breeding sites, test female Aedes for ATD, notify neighbors, and treat for adult mosquitoes, if necessary.
2	Locally acquired case(s) clustered in a single household and occurring <14 days apart; or ATD detected in mosquito	Same as Phase 1 plus, Notify California Department of Public Health and CDC, determine if CDC Emergency Response Team is needed; determine area at risk for surveillance and treatment operations; and notify residents within the at-risk zone.
3	≥3 local transmission cases of Aedes-transmitted diseases with onsets ≥2 weeks apart but <45 days apart within 1 mile diameter area; or ATD detected ≥3 times in mosquitoes tested from the same area and timespan as delimited above	Same as Phase 2 plus, notify residents in active transmission and cautionary zones, (as set by Public Health Services) and implement area-wide application of larvicides and/or adulticides (truck or aerial), as needed.

ATD Risk Assessment and Response - Phase 1

A description of the phase categories is provided in Table 2. Phase, category, and response to Aedes-transmitted diseases (ATDs). An elevated risk or imminent threat to public health may occur in Phase 1 when the spread of an ATD could occur. The VCP continually evaluates the risk of ATD transmission and intervenes using the least invasive measures appropriate for a given risk. When PHS reports to the VCP that a person with a probable or confirmed travel associated ATD (case) was viremic in San Diego within the prior 30 days, the following actions are taken to assess the risk to the public's health:

1. A vector control technician (VCT) prioritizes and inspects locations where the case spent a significant amount of time and may have been exposed to mosquitoes, such as residence, work areas, schools, places of worship, and other frequented areas, for *Aedes* breeding sources, immature stages, and adults. The VCT sets two or more mosquito traps in the front and back of the properties that are suspected to harbor *Aedes*. If the VCP cannot make contact or enter a property, the VCT assesses surrounding properties for breeding sources and *Aedes* mosquitoes and sets two or more mosquito traps as close to the property as

possible. ATD transmission risk levels are set according to the following:

a. Low risk
    i. average 0-4 *Aedes* caught per trap, or
    ii. 0-4 adult *Aedes* observed[2] by the VCT on site.
b. Medium risk
    i. average 5-10 *Aedes* caught per trap, or
    ii. 5-10 adult *Aedes* observed by the VCT on site.
c. High risk
    i. average >10 *Aedes* caught per trap,[3] or
    ii. >10 adult *Aedes* observed by the VCT on site, or
    iii. *Aedes* test positively for an ATD.

2. Response Matrix: According to the transmission risk, the following response actions are taken (Table 3).

Table 3. Aedes response matrix.

RISK LEVEL	PUBLIC EDUCATION	SOURCE REDUCTION	LARVICIDE	ADULTICIDE
LOW	+	+	+	
MEDIUM	+	+	+	±
HIGH	+	+	+	+

These actions will be applied to different sized areas based on risk level as shown in Table 4. If necessary, the VCP will obtain warrants before entering properties.

Table 4. Aedes property access matrix.

RISK LEVEL	PROPERTY	ADJOINING PROPERTIES	RADIUS
LOW	+		
MEDIUM	+	±	
HIGH	+	+	up to 150 m

Modifiers: The Response Matrix above assumes that the case is in an urban or suburban area.

- If the case is in an area with low population density (e.g., rural or industrial area), the risk level may be reduced one category and the corresponding responses taken.
- Likewise, if weather conditions are predicted to negatively influence the ability of *Aedes* to fly or survive (e.g., rain, daytime high temperature ≤60 degrees Fahrenheit, sustained wind ≥10 miles per hour), the risk level may be reduced one level.

[2] Confirmed by Ecologist (specimens or photos).
[3] Modified from Grubaugh et al. 2017.

The time when the public's health may be at risk is dependent on the incubation periods of ATD in people (i.e., called the intrinsic incubation period) and mosquitoes (i.e., called the extrinsic incubation period). These incubation periods create a window of opportunity when vector control interventions will be most effective in reducing the potential for ATD spread (i.e., before infective mosquitoes are circulating). Exact incubation periods vary depending on multiple conditions including host factors and temperature. The following incubation periods are based on published studies[4, 5, 6] and are listed here as guidelines (Table 5).

Table 5. Intrinsic and extrinsic incubation periods of Aedes-transmitted diseases (ATDs).

VIRUS	VIREMIA POST-SYMPTOM ONSET (FROM PHS)	EXTRINSIC INCUBATION PERIOD (MOSQUITO)
ZIKA	Up to 7 days	10 days (Boorman, 1956)[2]
CHIKUNGUNYA	Up to 7 days	2 days (Dubrulle, 2009)[3]
DENGUE	2-12 days	7 days (Chan, 2012)[4]

Figure 4 below gives one possible Zika transmission timeline with vector control intervention to prevent Zika virus transmission. The timeline could change depending on the timing of infection, travel, mosquito exposure, temperature, and the virus of concern.

[4] Boorman JP, Porterfield JS. 1956. A simple technique for infection of mosquitoes with viruses; transmission of Zika virus. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 50:238-242

[5] Chan M, Johansson MA. 2012. The incubation periods of dengue viruses. *PLoS One*, doi.org/10.1371/journal.pone.0050972

[6] Dubrulle M, Mousson L, Moutailler S, Vazeille M, Failloux AB. 2009. Chikungunya virus and *Aedes* mosquitoes: saliva is infectious as soon as two days after oral infection. *PloS One*, doi.org/10.1371/journal.pone.0005895

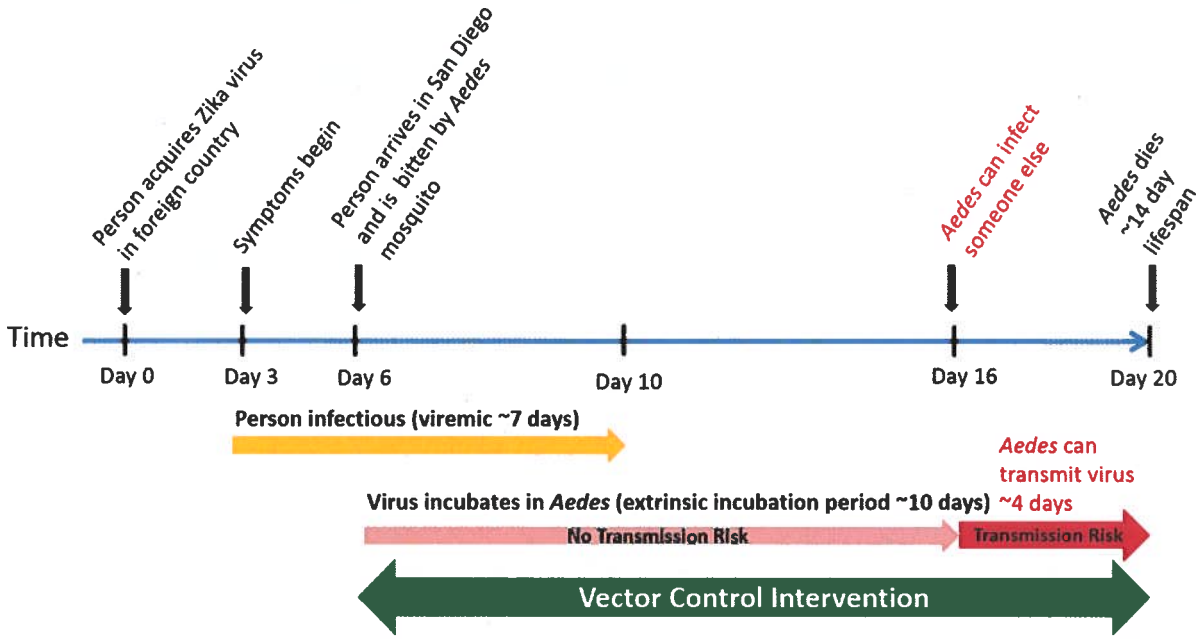

Figure 4. Example timeline of Zika virus transmission.

Optimal vector control intervention occurs during the extrinsic incubation period before an infected mosquito can transmit the virus to another person. The VCP makes all efforts to respond during this period; however, if this is not possible (due to late notification or delayed confirmation of cases), the VCP will respond as quickly as possible once the case has been confirmed and the VCP notified.

ATD Risk Assessment and Response - Phases 2 and 3

In Phases 2 and 3, local transmission has occurred, and the Risk Level is graded as high. Public education, source reduction, larvicide and adulticide treatments will occur in, at minimum, a 150-meter radius from the suspected area of transmission, weather permitting. In Phase 3, cautionary and active transmission zones will be designated by PHS in which public education, source reduction, and larvicide and adulticide treatments will be conducted. Wide area aerosol application of larvicides and/or adulticides, via ground or air, may be utilized to stop continued transmission of ATDs.

Public Health Declarations

Conditions that rise to a level 3 risk to public health by either WNV or ATDs may warrant declaration of a public health crisis, local health emergency (H&S Code S101080), or local emergency (Gov. Code S8558) to raise awareness (public health crisis) and bring legal and operational resources to protect public health (emergencies) (Association of State and Territorial Public Health Officers). Declaration of a public health crisis is made by a government

official and although has no legal definition or statutory powers it is used to raise awareness of a public health threat that affects a large number of people, threatens health over the long-term, and requires adoption of large-scale solutions. In contrast, a local health emergency is declared by the County Public Health Officer when an imminent and proximate threat of the introduction of infectious disease presents a risk to the public's health. Mutual and state aid ((H&S Code § 101085(b)(1)), H&S Code § 101085(b)(2)), respectively), are available during local health emergencies and reimbursement by the State of local costs may be approved by the Governor (H&S § 101085(b)(3)). If a local health emergency persists, it must be renewed every 30 days. A declaration of a local emergency is made by the County Administrative Officer under conditions of disaster or of extreme peril to the safety of persons and property within the county. Mutual and state aid are available (Gov. Code S8631, 8632, respectively) and County costs may be reimbursable by the State if approved by the Governor (S8633). Extension of a local emergency must be made after 60 days if the emergency persists. These declarations can be viewed as a spectrum of increasing risk and measures to protect public health. Any declaration will be determined in consultation with the Director of the Department of Environmental Health and Quality and the Public Health Officer and must be ratified by the County Board of Supervisors.

Appendix B. Legal Authority for Mosquito Control

The legal authority for the Vector Control Program within the Community Health Division of the Department of Environmental Health and Quality is derived from statutes and regulations in the California Government Code, California Health and Safety Code, California Civil Code, California Penal Code, San Diego County Code of Regulatory County Ordinances, and the California Environmental Quality Act. The legal authority of a vector control district such as routine surveillance, control, and access issues do not require obtaining a permit from regulatory agencies (e.g., California Department of Fish and Wildlife).

Under the requirements of the State Porter-Cologne Act and the Federal Clean Water Act, the State Water Resources Control Board is delegated authority for protection of surface and groundwater. The Vector Control Program is subject to: State Water Quality Order No. 2016-0039-DWQ, General Permit No. 990004; Statewide National Pollutant Discharge Elimination System Permit for Biological and Residual Pesticide Discharges to Waters of the United States from Vector Control Applications.
(County of San Diego Vector Control Program enrollee number: 937AP00009).

Statutory Exemptions
Actions in response to an imminent threat to public health, as determined by the County Health Officer (delegated to the Director of Environmental Health), are exempt from CEQA and other regulatory permits under the Public Resources Code 21080(b)(4). Vector control programs that have entered into a cooperative agreement with the California Department of Public Health (as San Diego County has) and that meet certain requirements are also exempt from certain pesticide-related requirements when applying approved pesticides for vector control purposes. Exemptions include employee certification requirements (but substitute training is required) and certain notification and permitting requirements (however, this plan retains equivalent notification protocols). See, Education Code § 17613, Food and Agriculture Code § 11408(e), Health and Safety Code § 25174.7(a)(3) and Title 3, California Code of Regulations, sections 6400(c)(2) and 6400(e), 6620, 6651, and 6760

California Government Code

- Title 3, Division 2 – Officers, Part 2, Board of Supervisors; and Chapter 8 Health and Safety, Article 3 Miscellaneous

California Health and Safety Code

- Division 3 – Pest Abatement, Chapter 2, Section 1800;
- Division 3 – Pest Abatement, Chapter 5 Mosquito Abatement Districts, Article 1 General Provisions, Section 2200;
- Division 3 Pest Abatement, Chapter 5 Mosquito Abatement District, Article 4 District Powers;
- Division 13 Housing, Part 1.5 Section 17920.3 Substandard Building Conditions

California Civil Code

- Sections 3479 and 3480

California Penal Code

- Sections 372 and 373 (a)

San Diego County Code of Regulatory County Ordinances

- Title 6 Health and Sanitation Division 4 Disease Control, Chapter 1 General Provisions Nuisances, Sections 64.101-64.106; and
- Division 4 Disease Control, Chapter 2 Mosquitoes and Flies Sections 64.201 *et seq.* Division 4 Disease Control, Chapter 3 Sections 64.301*et seq.*
- Municipal Codes for all 18 incorporated cities within San Diego County (e.g., City of San Diego Municipal Code)

California Environmental Quality Act

- Public Resources Code sections 21000-21004;
- California State CEQA Guidelines, California Administrative Code (Guidelines), sections 15002, 15086, and 15087

Appendix C. About the Vector Control Program

Introduction

The Vector Control Program (VCP) operates within the County of San Diego Department of Environmental Health and Quality (DEHQ) to protect the public from vector-borne diseases and mosquito nuisances while minimizing impacts to the environment through a coordinated set of activities collectively known as the Integrated Vector Management Program (IVMP). For all vectors, public education is one of the primary control strategies. The VCP also determines the abundance of vectors and the risk of vector-borne disease or discomfort through evaluation of public service requests, complaints, and field and laboratory surveillance activities. If the vector populations exceed or are anticipated to exceed the public threshold of tolerance, the VCP will employ the most efficient, effective, and environmentally sensitive means of vector control.

Program Operations

An Engineer's Report is prepared annually to establish the services to be funded by parcel assessments for the fiscal year, to determine the assessments for each parcel in the Assessment Area, and to make other findings. The VCP responds to service requests throughout the Assessment Area in San Diego County. Any property owner, business, or resident of a property in the Assessment Area may contact the VCP to request vector control related services or inspections. A VCP field technician will promptly respond to a service request to evaluate the situation and to provide appropriate surveillance and control services. Except in 2021, yearly requests for service and complaints have generally increased over the past five years (Figure 5). In 2020, the VCP responded to 3,586 complaints or service requests involving mosquito nuisance and breeding. Complaints involved major mosquito breeding sources and smaller or intermittent backyard sources, including those related to invasive *Aedes* mosquitoes. In addition, the VCP responded to 1,953 complaints or service requests relating to domestic rats and a total of 88 complaints or service requests regarding flies from private residences and poultry farms.

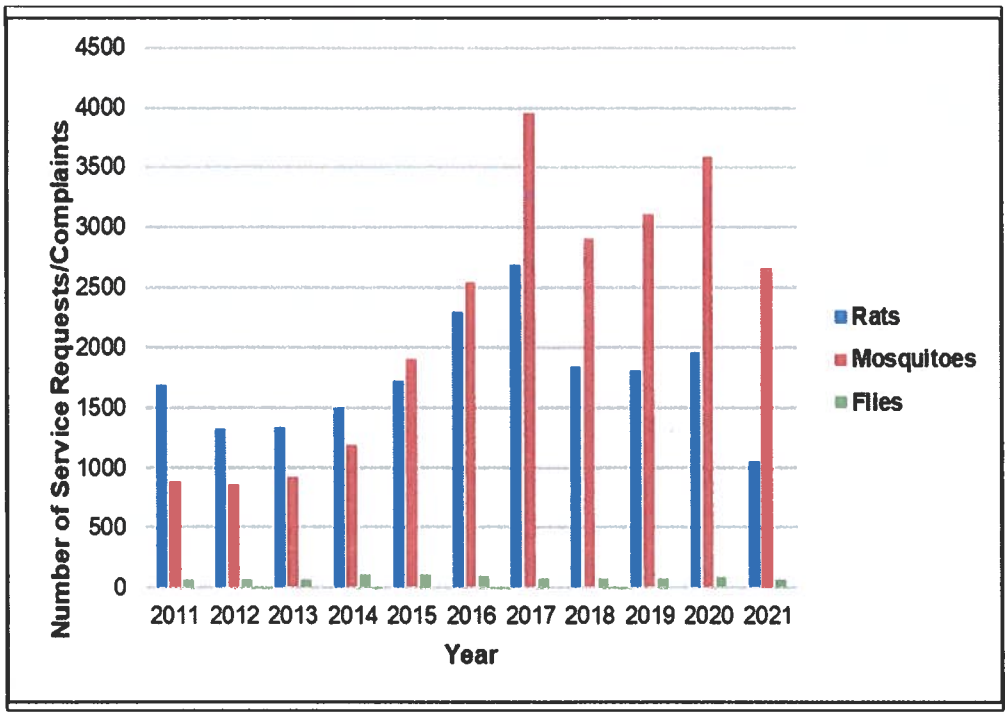

Figure 5. Yearly requests for Vector Control Program services

The VCP has identified more than 1,600 mosquito breeding sources throughout the county. It regularly monitors and treats these breeding sites throughout the year to control the number of mosquitoes produced. The number of regular mosquito breeding sites has increased over the past 7 years, from 784 in 2015 to over 1600 in 2021 (Figure 6).

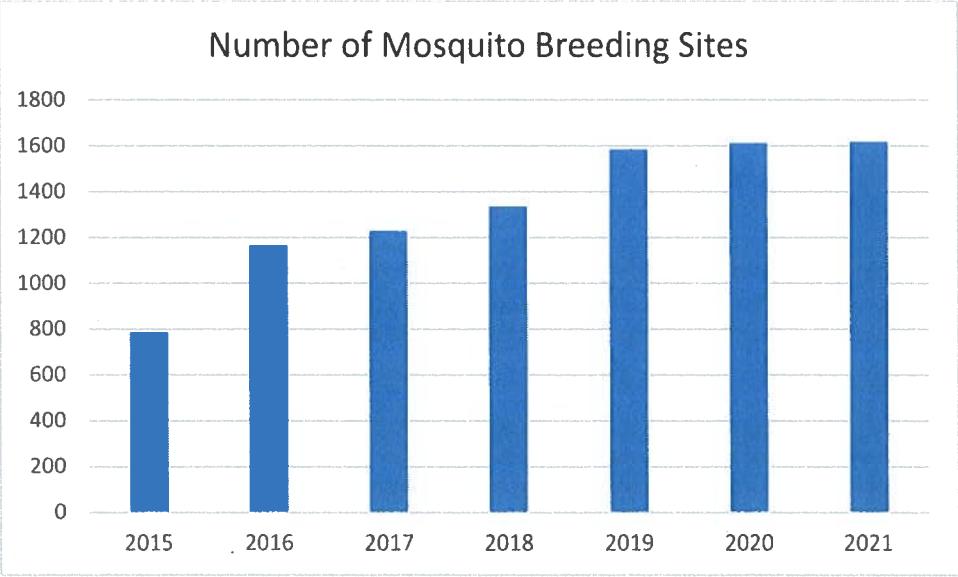

Figure 6. Number of chronic mosquito breeding sites monitored per year

Similarly, the total number of adult mosquitoes trapped per year has shown a marked increase in 2019-2021 over prior years (Figure 7). Many factors contributed to this shift including increased monitoring of problematic sites to achieve better mosquito control.

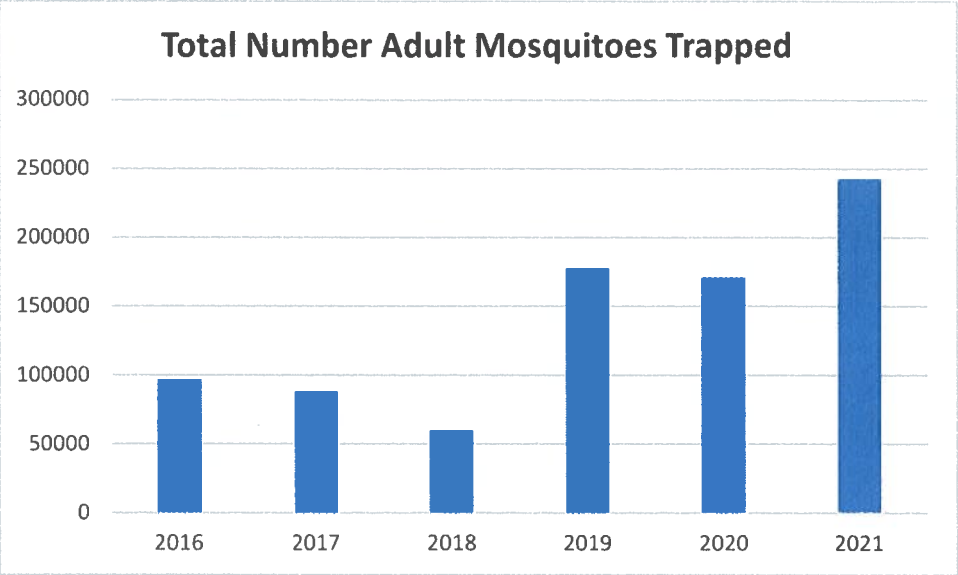

Figure 7. Total number of mosquitoes trapped each year by all mosquito traps set by VCP

Climate Change

Climate can affect the incidence of vector-borne diseases. In San Diego County, increasing temperature is positively correlated with the number of WNV detections in mosquitoes and people (Figure 8). In contrast, precipitation has little correlation. This differs from other areas in the country where high precipitation is correlated with increased numbers of WNV cases. The cause(s) of this dichotomy is not fully understood but biological, environmental, and behavioral factors are important elements that contribute to these trends. Although correlation does not necessarily imply causation, as average temperatures continue rising in San Diego and across the globe, WNV and other mosquito-borne viruses are expected to increase in frequency in San Diego County.

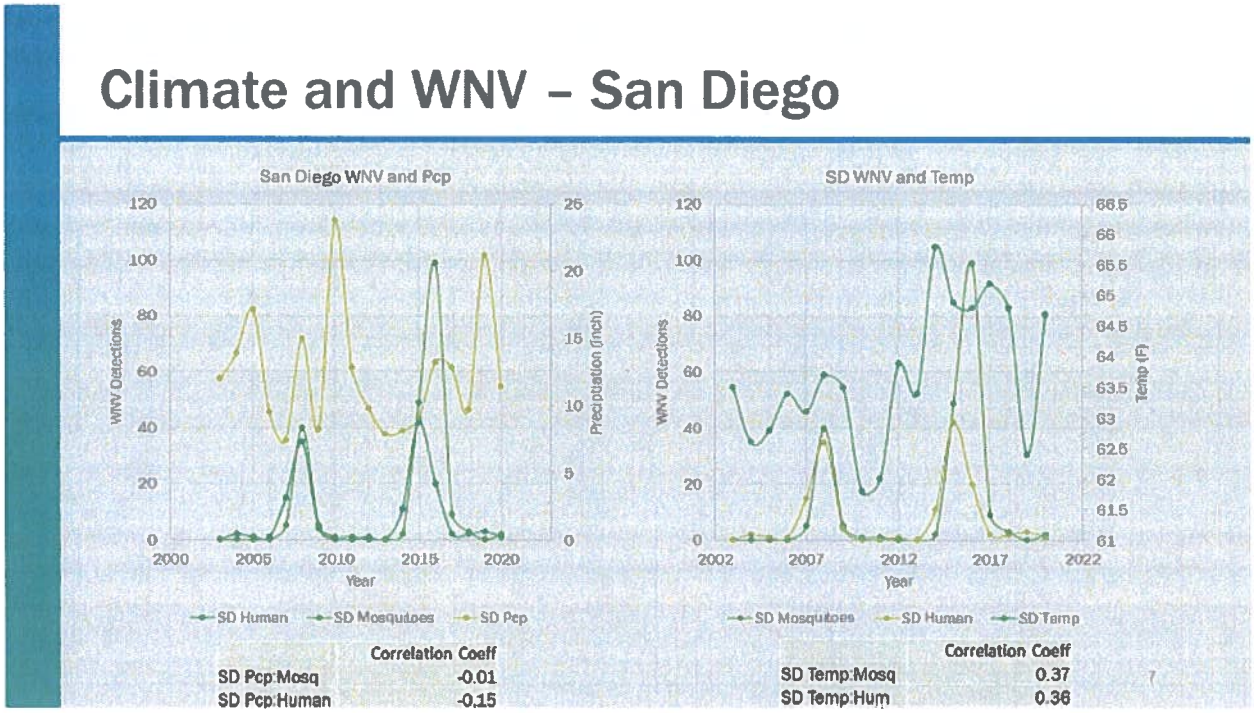

Figure 8. Temperature, precipitation, and WNV detections in San Diego County

Conclusion

The VCP continues to reduce the potential for the spread of diseases and the impact that vectors have on property through ongoing educational outreach, vector surveillance activities, source reduction, source treatment, and abatement. These efforts also minimize the nuisance impact that vectors can have on property and residents. To fulfill this purpose, the VCP employs comprehensive integrated vector management strategies to control mosquitoes, to monitor other vectors, and to perform other related vector control services.

Appendix D. Larvicide and Adulticide Products Used by the VCP

Table 6. Products used for larva and adult mosquito control

Type	Active Ingredient/Product Name	Use/ Action
Larvicide	*Bacillus thuringiensis* subsp. *israelensis* Trade names: Vectobac®, Teknar®, Fourstar®	Use: Approved for most permanent and temporary bodies of water. Limitations: Only works on actively feeding stages. Does not persist well in the water column.
Larvicide	Spinosad (spinosyn A and D compounds derived from a fermentation process by certain microbes) Trade name: Natular®	Use: Approved for most water bodies. Good penetration into vegetated areas. Works predominantly on feeding stages. Limitations: limited contact activity unless extended release form used.
Larvicide	*Bacillus sphaericus* Trade name: Vectolex®	Use: Approved for most permanent and temporary bodies of water. Limitations: Only works on actively feeding stages. Does not work well on all species. May persist and have residual activity in some sites.
Larvicide	*Bacillus sphaericus* and *Bacillus thuringiensis* subsp. *israelensis* combined. Trade name: Vectomax®	Use: Approved for most permanent and temporary bodies of water. Only works on actively feeding stages. May persist and have residual activity in some sites.
Larvicide	*Bacillus thuringiensis* subsp. *israelensis* and methoprene combined. Trade name: VectoPrime®	Use: Approved for most permanent and temporary bodies of water. Effective against all four levels of instars. Can be used in pre-flood environments and best against single brood.
Larvicide	Methoprene Trade names: Metalarv S-PT, Altosid®	Use: Approved for most permanent and temporary bodies of water. Limitations: Works best on older instars. Some populations of mosquitoes may show some resistance.
Larvicide	Larvicide oils Trade names: Golden Bear Oil (GB-1111), BVA Chrysalin	Use: Ditches, dairy lagoons, floodwater. Effective against all immature stages, including pupae. Limitations: Consult California Department of Fish and Wildlife for local restrictions.
Larvicide	Monomolecular Films Trade name: Agnique® MMF	Use: Most standing water including certain crops. Limitations: Does not work well in areas with unidirectional winds in excess of 10 mph.

Adulticide	Pesticides containing natural pyrethrin Trade names: Pyrenone®, Pyrocide®	Use: Wetlands, floodwater, residential areas, some crops. Limitations: Do not apply to drinking water, milking areas; may be toxic to bees, fish, and some wildlife. Some formulations with synergists have greater limitations.
Adulticide	Pyrethroids - synthetic pyrethrin products containing resmethrin, sumithrin, prallethrin, lambda-cyhalothrin, deltamethrin, or permethrin Trade name: Scourge, AquaDUET®, Demand® CS, DeltaGard®, AquaReslin®, Suspend SC®	Use: All non-crop areas including wetlands and floodwater. Limitations: May be toxic to bees, fish, and some wildlife; avoid treating food crops, drinking water or milk production.

Appendix E. FAQs for Ultra-low Volume Insecticide Use

What is ULV?

"ULV," "fogging," "adulticiding," and "spraying" are terms used for a method of controlling adult mosquitoes using ultra-low volume pesticides that kill adult mosquitoes on contact. The delivery apparatus is a spray that may be mounted on a backpack, truck or aircraft. The spray nozzle emits very small droplets that spread approximately 300 feet creating a mist that the mosquitoes fly into. Spraying is done only in the areas that are at risk for disease outbreak, and will be conducted by certified and licensed applicators.

Why do we need to spray?

The County of San Diego Vector Control Program sprays specific areas to prevent human illness and control disease-transmitting mosquitoes. Mosquitoes may transmit many diseases including West Nile virus, dengue, chikungunya, yellow fever, and Zika. The decision to spray an area is based on finding *Aedes* mosquitoes in an area at a level that indicates a threat to human health. Spraying will be concentrated in areas most at risk for disease.

When is spraying done?

Spraying will be done when adult mosquitoes are most likely to be active. Depending on the mosquito species being targeted, this may be during the day or at night. Spraying will not be done if it is windy or raining. Spraying events may need to occur multiple times to effectively reduce the adult mosquito populations.

What are the benefits of ULV sprays?

ULV sprays work very quickly to reduce adult mosquito numbers. They kill adult mosquitoes on contact. This can often provide immediate relief from mosquito infestations and stop the spread of disease.

What chemicals might be used?

- Pyrenone 25-5 Public Health (EPA registration no.: 432-1050) MSDS #147
- Scourge Insecticide with Resmethrin/Piperonyl Butoxide 4%+12% MF Formula II (EPA registration no.: 432-716) MSDS #191
- Demand CS Insecticide with Lambda-cyhalothrin 9.7% (CAS No. 91465-08-6) (EPA Reg. No. 100-1066) MSDS #A12690A

These chemicals are all approved by the U.S. Environmental Protection Agency for killing adult mosquitoes. Pesticide products that land on surfaces as part of a mosquito control program (e.g., grass, outdoor toys, furniture), degrade quickly, particularly once exposed to sunlight.

How effective are ULVs at reducing the number of adult mosquitoes?

The effectiveness of ULV depends on a number of variables that include species/types of mosquitoes present; chemicals used; when and how often the chemicals are applied; current weather conditions; and the density of homes and streets in a community. Under certain

conditions, ULVs can be an effective means of temporarily reducing adult mosquito populations and have been used in the U.S. and other countries for reducing and preventing mosquito-borne diseases.

Why might I see mosquitoes on my street the day after ULV insecticide spraying was done?

There are several reasons why you might see mosquitoes the day after ULV insecticide spraying: 1) The mist of the insecticide cannot reach all mosquitoes, so you could be seeing ones that were active at the time of spraying, but did not come in contact with the droplets of insecticide; 2) some of the mosquitoes you see may have just emerged from their breeding sites; 3) different kinds of mosquitoes are active at different times of the day. ULV insecticide treatments are targeted against specific species of mosquitoes and may be repeated several times in order to maximize their effectiveness.

What is my risk of exposure with spraying?

The risks to the public and the environment are very low. Mosquito insecticides are applied as ULV sprays that create a fine mist. ULV insecticide applications involve small quantities of active ingredient in relation to the size of the area treated, about 3 ounces per acre, which minimizes exposure and risk to people and the environment.

Can some people experience health effects from ULV?

Most people will not experience any adverse health effects after ULV insecticide sprays. However, for some individuals that are highly sensitive to ingredients within the product, short-term effects might be eye, skin, nose, and/or throat irritation; breathing problems; and nausea. Contact your healthcare provider if you believe you are experiencing health problems for any reason.

Can ULVs harm other animals or wildlife?

The U.S. Environmental Protection Agency has evaluated the chemicals used in ULVs for their safety and has determined that they do not pose an unreasonable risk to birds or mammals if used according to the product label directions. These chemicals can kill other insects they contact, not just mosquitoes. Pyrethroid ULVs are also considered highly toxic to fish and bees and would not be applied to or near open water bodies or in sensitive environments such as wetlands unless they posed a high risk to public health. State-approved vector control programs can use these pesticides without direct notice to and consent by affected property owners, but some public notice would be provided prior to any use. If you are in an area that will be treated and you have a fishpond or beehive, you should cover them to protect your fish and bees from exposure. State law also contains a requirement for direct notification to nearby beekeepers prior to most uses of these pesticides, but use by an approved vector control program is not subject to this requirement. These notice requirements are reduced for vector control programs so that action can be taken quickly when needed to protect public health.

Should I be concerned about covering the swimming pool in my yard?
All types of pesticides used in spraying operations for adult mosquito control break down quickly in sunlight and water. Therefore, no special precautions or waiting periods are recommended for outdoor swimming pools. However, if a pool is not being used during the summer months (e.g., if it not being chlorinated or filtered), it should be covered or drained. Any standing body of water is a potential breeding ground for mosquitoes.

Will ULV insecticides hurt the paint on my car?
No. Adult mosquito insecticides are applied as ULV sprays. ULV insecticide applications involve small quantities of active ingredient in relation to the size of the area treated, typically less than 3 ounces per acre, which minimizes exposure and risk to people and the environment, including the paint on your car. For more information, refer to the U.S. Environmental Protection Agency's website at:
https://www3.epa.gov/pesticides/chem_search/ppls/000432-01050-20130509.pdf

How will I know if a ULV spray is going to take place in my neighborhood?
Press releases and public notifications will be provided prior to any ULV insecticide application. Door hanger notifications will be placed on affected premises 1 day prior to treatment. Treatment schedules and maps will be posted on the www.SDFightTheBite.com website. Additional information is available by calling the County of San Diego Vector Control Program at 858.694.2888.

What kinds of precautions should I take when ULV application is scheduled for my street?
You can reduce your exposure to the insecticide by staying indoors during spraying. The droplets will dissolve after about 20 minutes.

Other things that you can do to reduce exposure are:

- Keep windows closed and fans off. Shut off air conditioners unless they have a setting for recirculating indoor air. If it is very hot weather, make sure you open the windows and/or turn fans and air conditioners back on about 1 hour after the truck passes through your neighborhood.
- Rinse homegrown fruits and vegetables with water as you would typically do before cooking or eating them.
- Keep pets indoors during ULV spraying.
- Cover ornamental fishponds to avoid direct exposure.
- If skin and/or clothes or other items are exposed to the ULV insecticide, wash with soap and water.
- If the mist gets in your eyes, immediately rinse them with cool, clean water for 15 minutes, and call your healthcare provider.
- Do not allow children to play in areas that are still wet from insecticide spraying, wait at least 1 hour.

Who can I call if I have more questions?

For more information about mosquito control please call the County of San Diego Vector Control Program at (858) 694-2888 or email us at: vector@sdcounty.ca.gov. Please visit our website at www.SDFightTheBite.com for more announcements about ULV insecticide treatments and the areas where it will occur.

What are some other sources of information on pesticides?

You may find additional information at your local library or by searching the following websites. For more information about pesticides:

- U.S. Environmental Protection Agency
- National Pesticides Telecommunications Network,
- National Institute for Occupational Safety and Health, Center for Disease Control and Prevention
- Adapco
- Bayer
- MGK

Appendix F. Glossary

AEDES	*Aedes aegypti, Aedes albopictus, Aedes notoscriptus, invasive Aedes mosquitoes*
ATD	*Aedes-transmitted disease*
BS	*Lysinibacillus (Bacillus) sphaericus*
BTI	*Bacillus thuringiensis* subsp. *israelensis*
CCR	California Code of Regulations
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CHD	Community Health Division
CMR	Confidential Morbidity Report
DART	UC Davis Arbovirus Research and Training laboratory
DEHQ	Department of Environmental Health and Quality
EIA	Enzyme-linked immunoassay
EPA	Environmental Protection Agency
FAQ	Frequently Asked Questions
HHSA	Health and Human Services Agency
IFA	Indirect fluorescent antibody
IPM	Integrated Pest Management
MIR	Minimum infection rate
MLE	Maximum likelihood estimate
NPDES	National Pollutant Discharge Elimination System
PHL	Public Health Laboratory
PHO	Public Health Officer
PHS	Public Health Services
PRNT	Plaque reduction neutralization test
RT-PCR	Reverse transcription polymerase chain reaction
SDCCAO	San Diego County Code of Administrative Ordinances
SLEV	Saint Louis Encephalitis virus
SWRCB	State Water Resources Control Board
ULV	Ultralow volume insecticide spray or mist
VCT	Vector Control Technician
VCP	Vector Control Program
VDDL	Vector Disease and Diagnostic Laboratory
VRDL	Viral and Rickettsial Disease Laboratory
WEEV	Western Equine Encephalitis virus
WNCH	West Nile virus case history
WNV	West Nile virus

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Appendix H. Revision History

Date	Author	Revision Summary
8/9/2024	N. Gurfield	Adjusted ATD adulticide response thresholds (p.19-20); see addendum A.