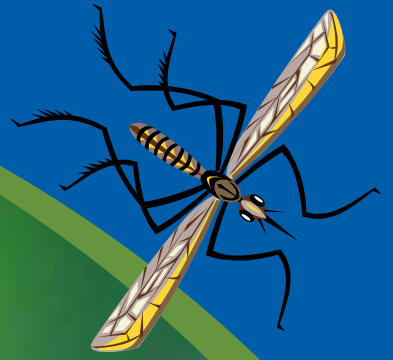


2019 ANNUAL REPORT

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL



SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

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Dear Residents, Colleagues & Friends

It is our pleasure to present to you the 2019 Annual Report for the Sacramento-Yolo Mosquito and Vector Control District. The District successfully protected the residents of Sacramento and Yolo counties against mosquitoes, West Nile virus (WNV) and other threats to public health using a comprehensive Integrated Pest Management (IPM) approach. This report describes the work performed by the District.

2019 was a memorable year due to the first detection of the invasive mosquito *Aedes aegypti* within District boundaries. The invasive mosquitoes were found in different areas of Citrus Heights. We immediately initiated our *Aedes* response plan when neighboring Placer Mosquito & Vector Control District first found the mosquitoes at a location near our shared northern border. As our field technicians conducted door-to-door inspections, immature and adult mosquitoes were found to be breeding in a watering can at a residence. This first detection was made on August 29th on the east side of Interstate 80 near the Twin Oaks area. A second site, west of the freeway was detected in September. Immediately after finding the invasive mosquitoes, public outreach efforts were directed to area residents. In addition, surveillance efforts were heightened and hundreds of traps were set out to determine the extent of the infestation in the area. District control technicians also conducted ongoing door-to-door inspections canvassing various neighborhoods looking for larval sources and conducted localized ground treatments as necessary, targeting immature and adult mosquitoes. As temperatures cooled, mosquito populations declined and the last time *Aedes aegypti* mosquitoes were detected was in October.

The 2019 mosquito season was a mild one for WNV activity with significantly lower levels than in previous years. Ongoing public information and outreach campaigns disseminated mosquito prevention messages encouraging public participation in reporting dead birds and common mosquito breeding sources. The laboratory closely monitored all mosquito activity by trapping, sorting and collecting mosquito samples to determine WNV activity and where it was concentrated. When the disease reached levels that posed a threat for increased virus transmission to the public, control operations responded by conducting ground spraying to quickly and effectively decrease the abundance of mosquitoes. Field technicians also spent time looking for and treating routine mosquito breeding sources, inspecting thousands of catch basins throughout our two counties and responding to service requests from the public. Mosquitofish were utilized in various urban, rural and agricultural areas as a natural method of controlling mosquitoes and our ecological management department worked closely with various entities and residents to reduce mosquito populations.


Our commitment stands firm to provide the best mosquito control services to the residents we serve. If you have any questions please visit our website at www.FIGHTtheBITE.net or call us at 1-800-429-1022.

Sincerely,



Gary Goodman
District Manager

Sincerely,



Raymond LaTorre
2019 President, Board of Trustees

History



In 1915, the California Legislature adopted the “Mosquito Abatement Act” (now incorporated into the California Health and Safety Code, Division 3) which formed the basis for the creation, function and governing powers of Mosquito Abatement Districts.

On June 18, 1946, the Sacramento County-Yolo County Mosquito Abatement District was formed by joint resolution of the Board of Supervisors for Sacramento and Yolo counties. The driving force behind the formation of the District was the public’s need for protection against mosquito-borne diseases and relief from serious pest nuisance.



In July of 1990, the District Board voted by resolution to change the name of the District to the Sacramento-Yolo Mosquito and Vector Control District to better reflect the expanded services and responsibilities the District assumed regarding ticks, yellow jackets and other vectors.

The District is governed by a Board of Trustees, each appointed by one of the incorporated cities or one of the counties within the District’s boundaries. Board meetings are held at 10:00 am on the third Tuesday of each month in Elk Grove.

2019 Board of Trustees Officers

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Administrative Office, Public Information, Control Operations, Fisheries and Laboratory Sacramento County

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Phone: 1-800-429-1022
Fax: 916-685-5464

Control Operations Yolo County

1234 Fortna Avenue
Woodland, CA 95776
Phone: 1-800-429-1022
Fax: 530-668-3403

Personnel

Manager: Gary Goodman
Assistant Manager: Samer Elkashef
Administrative Manager: Janna McLeod
Program Coordinator: Steve Ramos
Senior Administrative Assistant:
Raj Badhan
Administrative Assistant: Kellee Prasad

Laboratory

Laboratory Director: Marcia Reed
Biologist: Sarah Wheeler
Vector Ecologist: Debbie Dritz
Microbiologist: Kara Kelley
Laboratory Technicians: Courtney Chagolla, Joy Drake, Paula Matney, Stanley Roberts, Marilou Thomas, Marti Towery, Nicholas Tremblay
Laboratory Assistant: Kylie Letamendi

Fisheries

Fisheries Supervisor: Tony Hedley
Field Technicians: Vincent Luu,
Grant White

Public Information & Education

Public Information Officer:
Luz Maria Robles

Ecological Management

Ecological Management Supervisor:
Marty Scholl
Ecological Management Technicians:
Robert Fowler, Guy Kachadorian

Mapping & Information Technology

Mapping/Systems Coordinator:
Ruben Rosas
Information Technology Administrator:
Dan Fisher

Shop

Supervisor: Tom Price
Mechanics: Ben Weisenberg, Don Henson

Mosquito Control Operations North Sacramento County

Supervisor: Kevin Combo
Field Technicians: Nick Ascarrunz,
Ron Burkhouse, Henry Estrada,
John Fendick, Lisa FitzGerald, Ken Harris,
David Smith, Timothy Yuen

Mosquito Control Operations South Sacramento County

Supervisor: Demetri Dokos
Field Technicians: Jeff Anderson,
Brian McGee, Phillip Merritt, Jacob
Pascual, John Snell, Richard Speakman,
Kevin Valone

Mosquito Control Operations North Yolo County

Supervisor: Michael Fike
Field Technicians: Garrett Bell, Tim Gee,
Jason Lloyd, Zeb Middleton, Mark Pipkin,
Jake Vigna

Mosquito Control Operations South Yolo County

Supervisor: Garth Ehrke
Field Technicians: Dan Bickel, Brett Day,
Will Hayes, Frank Mendez, Soda
Sanouvong, George Santiago

Mosquito Control Operations Catch Basin Crew

Supervisor: Randy Burkhalter,
Ryan Wagner
Field Technicians: Shan Badhan,
Douglas Camero, Max Fike, Jay Geigle,
Ben Guimont, Eric Guimont

Integrated Pest Management



Mosquito and vector control are based on scientifically planned management tactics and control strategies that reduce the abundance of target pests in a timely manner. This method is commonly referred to as “Integrated Pest Management” (IPM). This comprehensive program incorporates five basic methods: public information and education, mosquito and vector surveillance, biological control, physical control, and microbial and chemical control.

Public Information & Education

The District’s outreach program educates and informs the public about mosquito and West Nile virus prevention methods through an extensive advertising and media campaign. District messages are also disseminated to the public by participating in a variety of community events, health fairs, presentations to schools and community organizations as well as partnerships with local groups.



Mosquito & Vector Surveillance

The District closely monitors mosquito activity, climate change and arbovirus activity by testing mosquitoes, sentinel chickens, wild birds and ticks for the presence of pathogens, parasites or arboviruses. This research and surveillance information helps guide efficient control of vectors and vector-borne diseases in Sacramento and Yolo Counties.

Biological Control

Biological control is the use of specially chosen living organisms to control a particular pest. This chosen organism might be a predator, parasite, or pathogen which will attack the harmful insect resulting in a desired reduction of pest population levels. The most common biological tool against immature mosquitoes in California are mosquito-eating fish such as the mosquitofish, *Gambusia affinis* and the Guppy, *Poecilia reticulata*. When introduced to a mosquito breeding source, these fish quickly adapt, multiply and become numerically capable of sustaining an effective control level.

Physical Control

Physical control (environmental management) is achieved by altering the ecological components of the pest’s environment such as: promoting effective drainage, controlling emergent vegetation, promoting appropriate timing of irrigation, and encouraging mosquito reduction best management practices in urban, agricultural, and conservation areas. By managing aquatic sources, opportunity for mosquitoes to develop is eliminated.



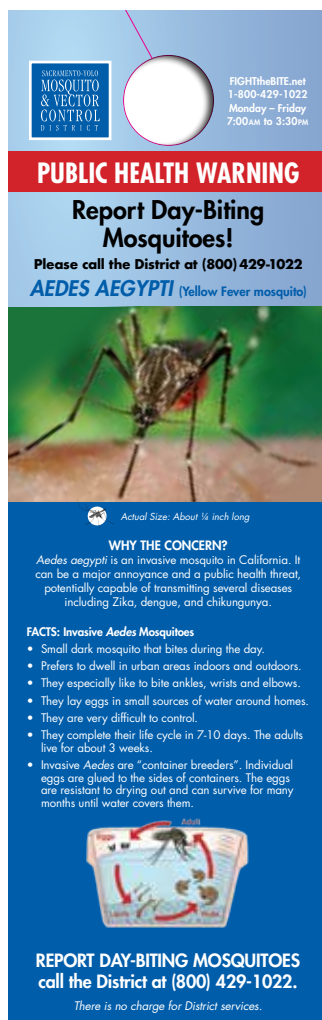
Microbial & Chemical Control

Microbial and chemical control are the prudent use of specific microbials and chemical compounds (insect growth regulators and insecticides) that reduce mosquito populations. These materials are applied when other methods are unable to maintain mosquito numbers below a level that is considered tolerable or when emergency control measures are needed to rapidly disrupt or terminate the transmission of disease to humans and animals. These products and application methods used are registered for public health use by the California Department of Pesticide Regulation, as well as California Environmental Protection Agency, and are designed to minimize non-target effects. Larvicides target immature mosquitoes; adulticides are chemicals that reduce adult mosquito populations.

Public Information & Education

The District's award winning public information and education department strives to raise awareness of mosquitoes and of vector-borne diseases such as WNV, Zika, dengue and chikungunya. This is done through extensive media coverage obtained on television, radio, print and various news websites using an aggressive advertising campaign which includes radio and television advertisements in English and Spanish, extensive social media, outdoor creative ads and online digital ads. The District's media strategy also includes participation in various radio and television public affairs shows and television programs used to disseminate District messages. Two additional elements important to the department are community outreach and the school program. The District hosts information booths at several community events throughout Sacramento and Yolo counties where educational materials are disseminated and the public receives information about available District services. Another element of outreach is the school program which includes year round classroom presentations and an annual spring Fight the Bite Contest for all students and schools within Sacramento and Yolo counties.

In 2019, with the detection of the invasive mosquito species *Aedes aegypti* in the city of Citrus Heights in Sacramento County, there was additional outreach performed in this community. Upon the initial detection, a door to door response was initiated where District staff talked to and educated residents extensively about preventing these and other mosquitoes on their property. All residents within the detection area received a postcard in the mail with information about reporting day time biting mosquitoes and prevention tips. In addition, staff left door hangers at every residence and distributed mosquito repellent wipes. Immediately after the detection, a press release was issued which resulted in heightened media attention and news stories about the problem. In addition, District staff gave a presentation to the Citrus Heights city council, meetings were set up with representatives from the Sacramento County Board of Supervisors and elected officials received ongoing District updates.



SACRAMENTO YOLA MOSQUITO & VECTOR CONTROL DISTRICT

FIGHTtheBITE.net
1-800-429-1022
Monday - Friday
7:00AM to 3:30PM

PUBLIC HEALTH WARNING

Report Day-Biting Mosquitoes!

Please call the District at (800) 429-1022

AEDES AEGYPTI (Yellow Fever Mosquito)

Actual Size: About 1/4 inch long

WHY THE CONCERN?
Aedes aegypti is an invasive mosquito in California. It can be a major annoyance and a public health threat, potentially capable of transmitting several diseases including Zika, dengue, and chikungunya.

FACTS: Invasive Aedes Mosquitoes

- Small dark mosquito that bites during the day.
- Prefers to dwell in urban areas indoors and outdoors.
- They especially like to bite ankles, wrists and elbows.
- They lay eggs in small sources of water around homes.
- They are very difficult to control.
- They complete their life cycle in 7-10 days. The adults live for about 3 weeks.
- Invasive Aedes are "container breeders". Individual eggs are glued to the sides of containers. The eggs are resistant to drying out and can survive for many months until water covers them.

REPORT DAY-BITING MOSQUITOES
call the District at (800) 429-1022.

There is no charge for District services.

Community Events Attended in 2019

A Walk on the Wildside
Ag Day
CAL OES Emergency Preparedness Day
California Department of Social
California Lottery Health and Safety
Canoemobile (4 days)
Citrus Heights Fall Festival
Citrus Heights Spooktacular
Citrus Heights Sunday Funday
City of Sacramento District Food Truck Event
City of Sacramento Earth Day
City of Sacramento Latino Festival
Costco Health & Safety Fair
Country in the Park
Courtland Pear Fair
Creek Week
Davis Picnic Day
DMV Health Fair
Duck Days
Earth Day at the Sacramento Zoo
ECOS Earth Day
Elk Grove Giant Pumpkin/Harvest Festival
Elk Grove Multicultural Festival
Elk Grove Safety Day
Emergency Preparedness Festival in
Family Safety Day at Safetyville
Farm to Fork
Filipino Fiesta
Fish Fest
Folsom Family Expo
Galt Bird Festival
Galt Hot Air Balloon
Galt Hot Air Balloon Festival
Healthy Kids Expo
iFest Rancho Cordova
Independence Day Celebration at the
International Kids day
Kaiser Outreach Day
Kidtopia
National Night Out (2 events)
Old Sacramento
Pet-a-palooza
Rivercats Fight the Bite Night
Sacramento County Fair (5 days)
Sacramento Earth Day
Services Health Day
SOAR Senior Health Fair
State Capitol
Sunrise Marketplace Farmers Market (3)
Univision Dia de Donar Sangre
West Sacramento Back to School Festival
Winters Youth Day
Yolo County Fair (5 days)



Further Outreach Activities

SCHOOL AND COMMUNITY PRESENTATIONS

In order to keep the public informed, the District offered presentations to school classrooms and local community groups. This program consisted of visual presentations, practical demonstrations and a question-and-answer session. In 2019 a total of **28 presentations** were made to local classrooms and community groups reaching almost **3,000 people**. In addition, the District provided informational pamphlets and brochures on topics ranging from mosquitoes, West Nile virus, yellowjackets, wasps, and all of our District programs.

COMMUNITY EVENTS

The District participates in a variety of community events throughout the year. An educational and engaging booth is set up that includes live mosquito and mosquitofish displays, a bug box, a repellent display, free individual repellent packets and a variety of message reinforcement items. Staff is available to answer questions on District activities and to promote our various services. In 2019 we participated in **53 community events** reaching close to **35,000 people**.

FIGHT THE BITE CONTEST

In an effort to continue educating and informing our community about mosquitoes and WNV, the District hosted a Fight the Bite Contest for Sacramento and Yolo county students in grades K-12. Students were asked to create artwork encouraging the audience to practice one or all of the District D's of Mosquito Prevention. Twelve winners were selected from **1,154 entries** and were announced during Mosquito Awareness Week. Individual winners and their schools received a cash prize for educational materials. Winning artwork was featured on social media, displayed on the District website and used for advertising purposes. In addition, each school received framed artwork for display and to showcase their winners.

MOSQUITO AND WEST NILE VIRUS AWARENESS WEEK

In coordination with mosquito control districts throughout the state, the Sacramento-Yolo Mosquito and Vector Control District hosted several events during **Mosquito and West Nile virus Awareness Week April 21-27**. This week marked the official launch of the advertising and public education campaign for the season. Various events to disseminate District messages also took place, some of them included repellent distribution at Loaves and Fishes and Communicare Health clinics. These are two local agencies that serve homeless residents who are at high risk for mosquito bites and West Nile virus. Winners of the annual Fight the Bite Contest were announced and awarded prizes at their school. Lastly, presentations to various community groups were also made.

REPELLENT DISTRIBUTION

An important component of the education and outreach program is to promote the use of mosquito repellent as a way to have the public protect themselves from mosquito bites. The District offers free mosquito repellent wipes for agencies and community organizations to use during outdoor evening activities and events such as National Night Out, summer concerts in the park, outdoor movies and various activities sponsored by parks and recreation and council districts. To request mosquito repellent you may send an email to info@fightthebite.net.



Mosquito & Vector Surveillance

The laboratory provides the following technical information to help guide efficient control of vectors of diseases in Sacramento and Yolo Counties:

- Surveillance of mosquitoes
- Encephalitis virus surveillance
- Surveillance for other mosquito-borne diseases
- Tick and Lyme disease surveillance
- Surveillance of bees and wasps
- Identification of arthropods of public health significance
- Pesticide resistance testing and management
- Research and special projects

Surveillance of Mosquitoes

Mosquito surveillance is an essential component of the District's Integrated Vector Management (IVM) program and a considerable amount of effort is devoted to it. The District's surveillance program consists of a systematic approach for locating areas with high mosquito abundance and mosquito-borne disease activity over time and space. The laboratory collects and analyzes data on seasonal changes in relative abundances of mosquito species, monitors geographic and environmental distribution patterns of mosquito species, determines maximum and minimum risk periods of public exposure to mosquito-borne diseases, and evaluates mosquito control activities. The data collected are combined with data from previous years and provide information on the dynamics of mosquitoes and mosquito-borne diseases within the District's surveillance area.

In 2019, our District collected over 142,752 mosquitoes during 16,205 trap nights in fixed sites throughout Sacramento and Yolo Counties for mosquito abundance calculations. The mosquitoes collected were identified to species and counted by our laboratory technicians. The District used three types of traps for collection of abundance data — American Light traps, District "Locker" trap and Gravid traps. All three trap types were set in representative sites in both counties and were used to gather information on the distribution of all mosquito species and to monitor populations of mosquito species of concern. Data was interpreted in the context of historical records and mosquito abundance and compared to a 5-year average.

The American Light trap collects mosquitoes as well as other insects, which are attracted to the light produced by this trap, regardless of the physiological or behavioral state of the insect. This trap type has been used by the District for many years and it has provided historical data since before the introduction of West Nile virus in our area. The District Locker traps capture host-seeking mosquitoes that are attracted to carbon dioxide emissions. The third type, the Gravid female trap, attracts female mosquitoes that are seeking to lay eggs in water rich in organic material. The organic water mixture is made of ground alfalfa, hog chow pellets and Brewer's yeast and is allowed to ferment before being used in the trap.

In addition to the mosquito species found in Sacramento and Yolo Counties, District technicians are also trained to recognize any exotic or introduced species, if present, in any of the thousands of samples they collect each year.

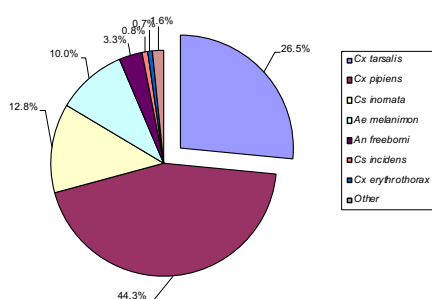




AMERICAN LIGHT TRAPS

In 2019 the District used 11 American Light traps in fixed sites within Sacramento and Yolo Counties for a total of 5,566 trap nights. The total number of mosquitoes collected with those traps was 70,584. Of these, 52,309 (74.1%) were females. The most abundant mosquito species captured by the American Light traps were *Culex pipiens*, followed by *Aedes melanion*, *Culex tarsalis*, *Culiseta inornata*, *Anopheles freeborni*, and *Culiseta incidens*. Other mosquito species were collected in smaller numbers and accounted for less than 1% of the total collection.

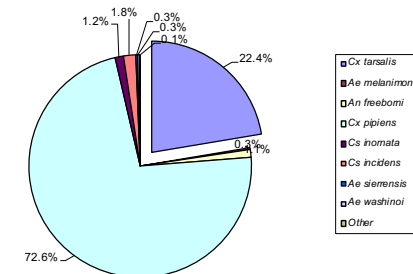
AMERICAN LIGHT TRAP COLLECTION



LOCKER TRAPS

The District used a total of 14 Mosquito Locker traps in 2019 in Sacramento and Yolo Counties during 5,096 trap nights. A total of 44,876 mosquitoes were collected by these traps, and most (98%) were females. The most abundant species collected were *Cx. pipiens*, *Cx. tarsalis*, *Cs. inornata*, *Cs. incidens*, and *An. freeborni*. Other species collected accounted for less than 1% of the total collection.

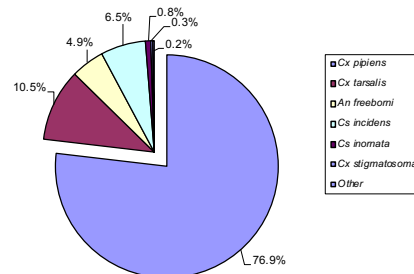
LOCKER TRAP COLLECTION



GRAVID TRAPS

A total of 24 Gravid traps were used in 2019 in Sacramento and Yolo Counties for adult mosquito abundance tracking during 8,736 trap nights. A total of 41,827 mosquitoes were collected by these traps, and most (81%) were females. The most abundant species, as expected, was *Cx. pipiens*, followed by *Cx. tarsalis*, *An. freeborni* and *Cs. incidens*. Other mosquito species constituted less than 1% of the total collection.

GRAVID LIGHT TRAP COLLECTION



ADULT MOSQUITO ABUNDANCE TRENDS

All mosquito species are monitored throughout the year, but the District is particularly interested in the abundance of certain species from the standpoint of disease transmission and nuisance. Two *Culex* species, namely *Cx. pipiens* and *Cx. tarsalis*, are considered the main vectors of West Nile virus in Sacramento and Yolo Counties. The abundance of these species is closely monitored and is used in the risk assessment for West Nile virus transmission. *Culex pipiens*, the northern house mosquito, is a medium-sized, brown mosquito, which usually breeds in foul or polluted waters, such as artificial containers, fish ponds, improperly maintained swimming pools, catch basins, septic tanks, dairy drains, waste treatment ponds, etc. It tends to bite in the dusk or early evening hours of the day and feeds mostly on birds, but will also readily bite mammals, including humans. This species peaks in June-July, with high populations maintained through October. Abundance for this species in 2019 was higher than the 5-year average for the entire season from May through October.

Culex tarsalis, the western encephalitis mosquito, is also a medium-sized and brownish mosquito, but has a distinctive median white band on the proboscis and white bands on the legs. This species commonly colonizes a wide variety of aquatic sources, such as wetlands, duck clubs, rice fields, and irrigated crops. However, in recent years, it has been commonly found in significant numbers breeding in abandoned or not maintained swimming pools in suburban and urban environments. It is also a bird feeding mosquito that may feed readily on humans, and it is most active at dusk and early hours of the evening. Abundance numbers for *Cx. tarsalis* in 2019 were also higher than the 5-year average in July and August.

Culex erythrothorax is a distinctive orange to light brown mosquito which inhabits tule pond areas. It does not fly long distances and usually stays near the location of its breeding source. Another *Culex* species, *Cx. stigmatosoma* is a foul water breeding mosquito and has banded legs like the *Cx. tarsalis* mosquito. These mosquitoes can vector West Nile virus, but are not particularly widespread. We also find *Cx.*

thriambus in our District's area, but in much smaller numbers. Abundance numbers for *Cx. erythrothorax* in 2019 were similar as to the 5-year average. *Culex stigmatosoma* abundance in 2019 was higher than the 5-year average from May through October.

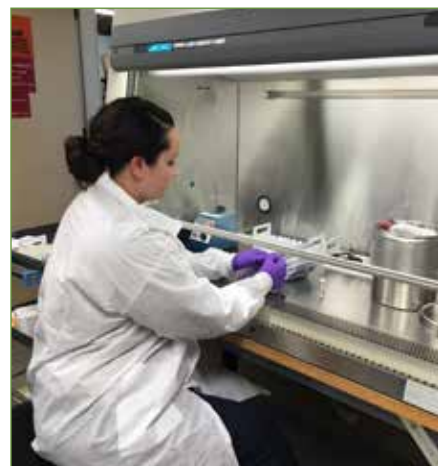
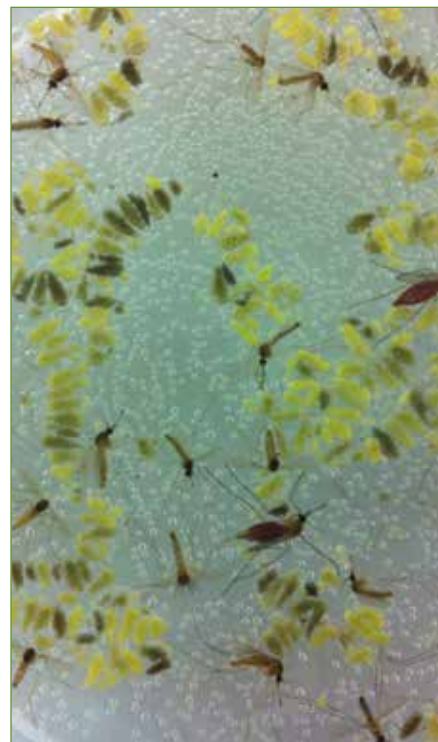
Anopheles freeborni, the western malaria mosquito, is a large mosquito which is most active at dusk, and will readily enter houses. It can be a significant nuisance during its peak population periods. Females feed on most mammals and are most active in the dusk and early evening hours. This species may be abundant in rice fields, and occurs in clear, seepage water in sunlit algae-laden pools. It usually has a bi-modal population trend with the first peak in early February and a second, much greater peak in August and September, when it can be considered a major pest due to its biting activity. In 2019, *An. freeborni* population counts were slightly lower than the 5-year average overall. Other *Anopheles* species found in our area are *An. franciscanus* and *An. punctipennis*.

There are several *Aedes* species of mosquitoes which are also of concern to the District. *Aedes melanimon* and *Ae. nigromaculis* are floodwater mosquitoes. They lay eggs on ground which will become flooded later, either by natural precipitation, flooding, or by agricultural practices. When the fields containing eggs are flooded, large numbers of larvae can emerge and develop rapidly to the adult stage. When this occurs the resulting biting activity on humans and other mammals in the area is significant. For this reason, even though these mosquitoes are not primarily involved in disease transmission, they are a nuisance concern. *Aedes* are day and dusk biting mosquitoes rather than the principally dusk biting type of the *Culex* and *Anopheles* species. Another *Aedes* mosquito of interest found in our District's area is *Ae. sierrensis*, the western treehole mosquito. Unlike *Ae. melanimon* and *Ae. nigromaculis*, this mosquito is involved in disease transmission and is the primary vector of canine heartworm in our area. It is unique in that its natural breeding source is treeholes. This species is difficult to control as there can be numerous trees with treeholes in a given wooded area. In addition, the treeholes can be at varying heights and are cryptic in nature, thus making treatment with mosquito control products difficult, even though the mosquito species itself has a limited flight range. This small black and white mosquito is active during the day as well as at dusk. All of these *Aedes* mosquitoes are primarily mammal biting mosquitoes and can become a significant nuisance. Other less common *Aedes* species that can be found in our area and can be a localized nuisance or concern include: *Ae. washinoi*, *Ae. vexans*, *Ae. sticticus*, and *Ae. bicristatus*. *Orthopodomyia signifera* is another mosquito species which can be found in treeholes and sometimes artificial wooden containers in our District's area, but it is not nearly as common as *Ae. sierrensis*.

In addition to the species mentioned above, which are all active primarily during the spring and summer months, the *Culiseta* species mosquitoes are active either primarily in the winter months (*Cs. inornata*) or all year long (*Cs. incidens*). These are large mosquitoes and are primarily mammal biters which commonly feed at dawn and dusk. *Culiseta inornata* and *Cs. incidens* breed in a variety of natural aquatic habitats, with *Cs. incidens* also being adapted to artificial containers and more polluted sources. These mosquitoes are primarily nuisance mosquitoes; however *Cs. incidens* has been suggested as a canine heartworm vector and is a secondary vector of West Nile virus. *Culiseta particeps* is also found in our District area, but is not as common in our traps as *Cs. inornata* and *Cs. incidens*.

Invasive mosquito species are becoming an increasing concern for Districts in California. *Aedes aegypti* (yellow fever mosquito) and *Ae. albopictus* (Asian tiger mosquito) are undergoing a range expansion in California. These mosquito species are container breeders that often make use of anthropogenic water-collecting materials (pots, tires, tarps, and discarded trash) for breeding. These species, like other *Aedes* species, lay desiccation resistant eggs and can be aggressive human biters. They are of special concern because they are often found in close proximity to humans and are known vectors of several important human viruses including: Yellow fever, Dengue, Chikungunya, and Zika. The District detected *Aedes aegypti* mosquitoes in two areas in Citrus Heights in August 2019.

In addition to adult mosquito surveillance, the District conducts an intensive immature mosquito surveillance program. Mosquito breeding sources are routinely inspected by field technicians, who are trained to identify the larvae in the field and also bring them to the District's laboratory for further species identification or confirmation. The data provided by this program is used for targeting control efforts and determining their efficacy.





Encephalitis virus surveillance

SENTINEL CHICKENS

In an effort to use all available surveillance tools and increase the chances of early detection of arbovirus activity, the District uses sentinel chickens as part of the encephalitis virus surveillance program. Chickens usually do not develop symptoms of disease when infected with West Nile virus and are considered dead-end hosts for it, meaning they do not produce sufficient viremia to infect mosquitoes when subsequently bitten by them. More significant to our program, chickens stay inside a coop in a fixed area and the presence of antibodies in their blood indicates local virus transmission. Therefore, they are often used by mosquito control agencies in their surveillance programs and may serve as an early indicator of local arbovirus activity in an area.

In 2019, the District maintained a total of 40 chickens distributed in 5 flock sites within Sacramento and Yolo Counties and an additional flock kept for replacement of positive chickens during the season. Five chickens were kept per flock at a time, and they were replaced whenever their test showed antibodies towards Saint Louis Encephalitis (SLE), Western Equine Encephalitis (WEE), or West Nile virus (WNV). Blood samples were collected from April 15 through October 15. Samples were tested for the presence of antibodies towards SLE, WEE, and WN viruses. The first West Nile virus-positive chicken sample was detected on a collection made on August 19, 2019. At the end of the sampling period, antibody conversions had been found in two of the five flocks with a total of 5 chickens positive for antibodies towards West Nile virus. No seroconversion for other viruses was detected.

2019 SENTINEL CHICKEN TESTS

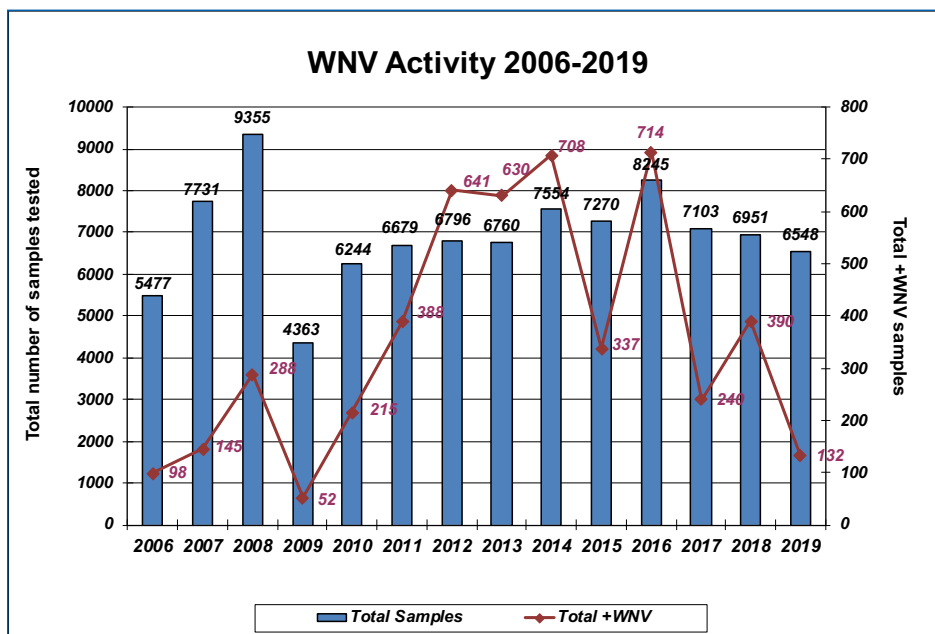
SACRAMENTO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Tyler Island	0	0	0
Gibson Ranch	0	0	4
Rancho Murieta	0	0	0

YOLO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Dunnigan	0	0	0
Knights Landing	0	0	1

ENCEPHALITIS VIRUS SURVEILLANCE TRAPS

The District uses two types of traps for Encephalitis Virus Surveillance (EVS): dry ice-baited traps and Gravid female traps. These traps are battery-operated and are placed in each specific site and collected the following morning. Samples are then brought to the District's laboratory for processing and the collected female mosquitoes are grouped by species in vials containing one to 50 mosquitoes. Samples of the species of concern are then tested for the presence of SLE, WEE, and WNV viruses by TaqMan real-time polymerase chain reaction (RT-PCR). The testing is performed by our District's laboratory staff and takes place at the Sacramento County Public Health Laboratory in accordance to an interagency partnership established in 2005 to enhance the cooperation and communication on vectorborne diseases and to increase public awareness of potential risk.

A total of 213,165 mosquitoes were captured during 4,367 trap nights with the two trap types in 2019. Most of the mosquitoes captured were females (95%) and 81% of them were captured in the dry ice-baited traps. A total of 6,548 mosquito samples (of one to 50 female mosquitoes each) were tested by the District in 2019. The first West Nile virus-positive mosquito sample was a sample of *Cx. pipiens* mosquitoes collected on July 9, 2019 from Sacramento County. The last positive sample was collected on September 27, 2019 also from Sacramento County. A total of 132 mosquito samples tested positive for West Nile virus in 2019 – 73 from Sacramento County and 59 from Yolo County. No seroconversion for other viruses was detected.



2013-2019 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2013	2014	2015	2016	2017	2018	2019
Mosquito pools	Total tested	6760	7554	7270	8245	7103	6951	6548
	WNV-positive	630	708	337	714	240	390	132
Chicken samples	Total tested (Total no. chickens)	518 (50)	516 (50)	420 (30)	278 (30)	230 (30)	375 (25)	350 (25)
	Seropositive	18	19	8	7	4	10	5



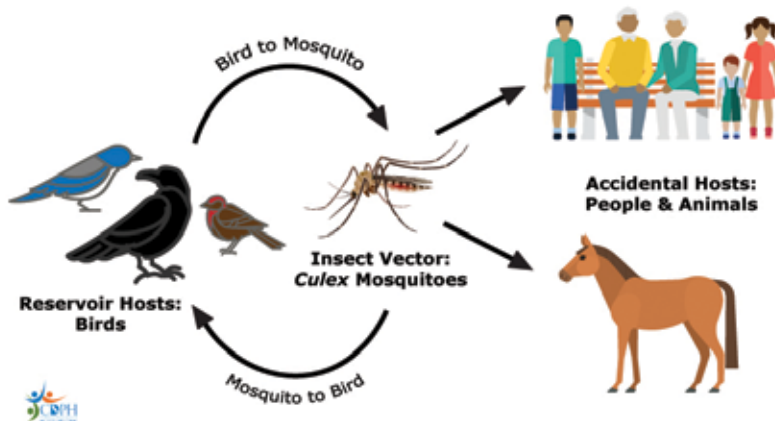
DEAD BIRDS

The dead bird surveillance program was established in 2000 by the California Department of Public Health (CDPH) in collaboration with local agencies. Bird mortality can be a sensitive indicator of West Nile virus activity. Dead birds are reported by the public to the WNV hotline (1-877-WNV BIRD, or online at westnile.ca.gov), and are then collected and identified by the local agencies. Our technicians try to collect every dead bird reported to our District. Samples are collected from suitable specimens and tested for the presence of SLE, WEE, and WN viruses by TaqMan real-time polymerase chain reaction (RT-PCR). Often the first indication of virus activity in a certain area comes from reported dead birds, therefore this program is a very important component of our laboratory's surveillance program because it helps the District better allocate resources and focus on areas where virus activity has been detected.

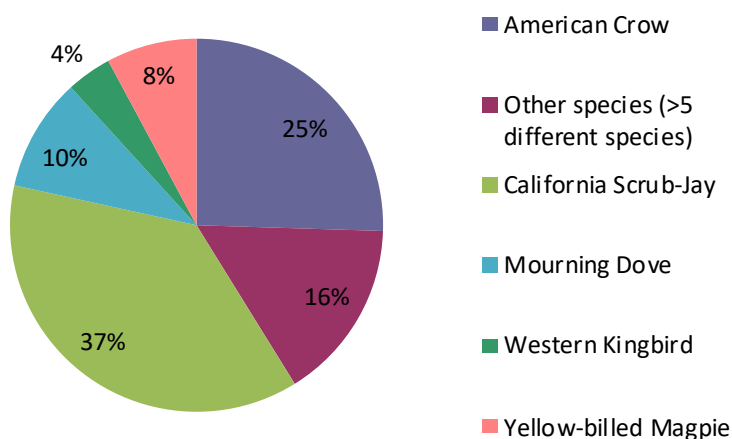
In 2019, 919 dead birds from Sacramento and Yolo Counties were reported to the WNV hotline. A total of 385 dead birds were tested for WN, WEE and SLE viruses and 51 were found positive for WNV (44 from Sacramento County and 7 from Yolo County). Most of the positive dead birds were California Scrub-Jays (37%) and American Crows (25%), followed by Mourning Doves (10%), Yellow-billed Magpies (8%), Western Kingbirds (4%). Various other bird species constituted the remaining 16% of the total WNV-positive birds tested.



West Nile Virus Transmission Cycle



2019 WNV Positive Dead Birds

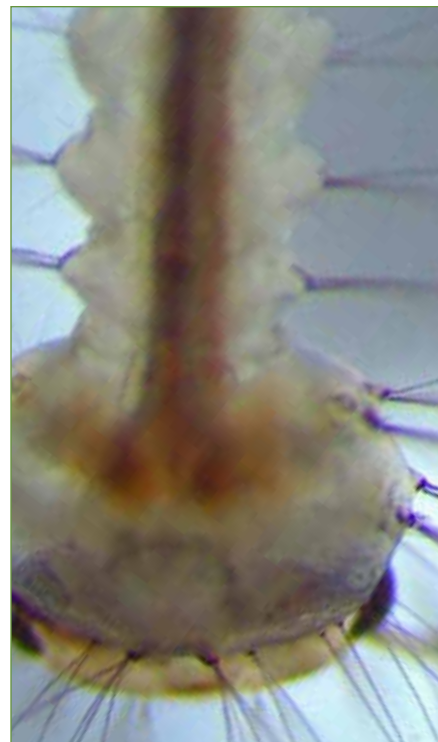


Surveillance for Other Mosquito-Borne Diseases

In addition to encephalitis virus surveillance, the District's laboratory conducts surveillance for other mosquito-borne diseases, such as Canine heartworm, Malaria, Dengue, Chikungunya, Zika, and others. Canine heartworm is a filarial nematode (*Dirofilaria immitis*) primarily vectored in this region by *Ae. sierrensis*, the western treehole mosquito. The District's field technicians inspect all known sources of this species, but they may be very difficult to find, inspect and treat. In a wooded area there may be hundreds of hidden treeholes at many different heights. The District's laboratory conducts regular surveillance for *Ae. sierrensis* in its routine adult mosquito trapping.

Malaria is a mosquito-borne infectious disease, caused by a protozoan parasite and transmitted to people primarily by Anopheline mosquitoes. In Sacramento and Yolo Counties, there are two species that can transmit the malaria parasite: *Anopheles freeborni* (the western malaria mosquito) and *An. punctipennis* (the woodland malaria mosquito). Malaria cases are reported to the District by the Sacramento and Yolo County Health and Human Services Departments. After receiving the report, the District laboratory responds by trapping mosquitoes in the area surrounding each malaria case. The captured mosquitoes are then brought to the laboratory for identification, and all female Anopheline mosquitoes are tested for malaria parasites. In 2019, the District received nine reported malaria cases, and in all of them the person had traveled outside of the United States. After the initial discovery of each malaria case and subsequent trapping and testing of any Anopheline mosquitoes captured, there was no evidence of local transmission.

Dengue, chikungunya, and zika are also diseases caused by viruses transmitted to people by mosquitoes, specifically the invasive species; *Aedes aegypti* and *Ae. albopictus*. Whenever the District receives a report of a case, the laboratory initiates trapping for any of these invasive *Aedes* species around the reported location. Fifteen dengue cases, one chikungunya and one zika case were reported to the District by the Sacramento and Yolo County Health and Human Services Departments in 2019 and all were related to travel outside of the United States. There were no mosquitoes of concern trapped near these reported cases.





Tick and Lyme Disease Surveillance

Lyme disease, caused by the bacterium *Borrelia burgdorferi*, is primarily vectored in Sacramento and Yolo Counties by the tick *Ixodes pacificus*, also known as the western blacklegged tick. The District's laboratory collects tick specimens from twenty fixed locations from November to May, using a technique called tick-flagging, where a flannel sheet is dragged along the side of a trail. The District also identifies tick samples brought to the laboratory by the public. Ticks are tested by polymerase chain reaction (PCR) with a specific primer and probe set for *B. burgdorferi*. Results are communicated to the surveillance locations and signs are posted to create public awareness of the potential presence of Lyme disease agent and vectors in the area.

2019 LYME DISEASE SURVEILLANCE DATA

YOLO COUNTY	Total Ticks	Pools Tested	Positive Pools	% Positive
Cache Creek – site 1	12	3	0	0
Cache Creek – site 2	262	53	1	0.4
Camp Haswell	37	9	0	0
Putah Creek – site 1	13	5	0	0
Putah Creek – site 2	90	21	0	0
SACRAMENTO COUNTY	Total Ticks	Pools Tested	Positive Pools	% Positive
Ancil Hoffman Park	3	3	0	0
Bannister Park	46	12	0	0
East Lake Natoma	264	55	1	0.4
Folsom Zoo Trail	12	5	0	0
Hinkle Creek	4	3	0	0
Humbug Trail	65	15	0	0
Lower Sunrise	24	8	0	0
Mississippi Bar	109	26	0	0
Negro Bar	93	21	2	2
Nimbus Dam	40	11	4	10
Sailor Bar	35	11	1	0
Snipes Park	134	29	1	0.7
Upper Sunrise	18	9	0	0
Willow Creek	209	42	11	5
TOTALS	1470	341	21	

Surveillance of Bees and Wasps

The District maintains honey bee swarm traps with swarm trap lures in locations which may give an early indication of arrival of the Africanized honey bees to our counties. The program currently consists of several locations in Yolo County and Sacramento County. No swarms of concern were noted in 2019.

The District's yellowjacket monitoring and control programs were established due to nuisance and safety issues associated with high yellowjacket populations. The program consists of trapping at different times of the year to target different populations of yellowjackets. In the spring, the District initiates apple juice-baited trapping to capture queens before nests can be established. In addition to queen traps, worker traps are set throughout the year. These are baited with heptyl butyrate as the attractant. These traps are set in numerous locations throughout Sacramento and Yolo Counties.

Identification of Arthropods of Public Health Significance

Mosquitoes are vectors of various diseases such as the ones mentioned above, while ticks serve as the main vectors of Lyme disease, Babesiosis and Ehrlichiosis among others, and fleas are potential vectors of the plague. Besides identifying mosquitoes and ticks collected through our surveillance program, our laboratory receives and identifies many other arthropods brought in by the public, such as ants, termites, springtails, mites, solitary and carpenter bees, long-horned beetles, honey bees, yellowjackets and other wasps, spiders, stored product pest beetles, moths, bedbugs, midges and other species of flies.

Pesticide Resistance Management

Pesticides play an important role in mosquito and vector control Integrated Vector Management (IVM) programs. We have to remain wary of resistance to pesticides, which may threaten the efficacy of our current control programs and allow the potential for new and reemerging vector-borne diseases. Therefore, our laboratory performs resistance testing on mosquito samples collected from areas of concern throughout both counties. In order to do that, our laboratory maintains mosquito colonies that have been tested and are susceptible to the active ingredients in the products used by our District. These susceptible reference colonies are used as comparison when testing mosquitoes collected from the field, following resistance testing protocols from the Centers for Disease Control and Prevention (CDC) and recommendations from the Mosquito and Vector Control Association of California.

Research and Special Projects

The laboratory is responsible for performing analyses of the effectiveness of ULV treatments in Sacramento and Yolo Counties. Bioassay cages with live adult mosquitoes and slide spinners that collect pesticide droplets for analysis are used to monitor select spraying events. In addition, our District is involved in many research projects that may directly affect some aspect of our operations, such as ongoing evaluation of control methods and products, and alternative materials and control methods. The District also works closely with researchers from academia and the industry sector on collaborative research projects involving the ecology of West Nile virus in California, effectiveness of treatments, pesticide deposition, evaluation of different products and formulations for mosquito control, and tick-borne diseases.

The District provides immature and adult mosquitoes from the colonies kept on its premises or wild-caught, upon request, to a variety of researchers from the National Institutes of Health (NIH), the California Department of Public Health (CDPH), the University of California, California State University, Industry sector, public schools, and other Mosquito Control Districts throughout the country.



Biological Control



Biological control elements are natural predators, parasites or pathogens that can be used to achieve desired reductions in pest population levels. The Fisheries Department is responsible for breeding mosquitofish and other fish species that prey on mosquito larvae. Mosquito-eating fish are readily available for the District's field technicians and to the general public through the service request program.

The District maintains 22 ponds which produce 2,500 to 5,000 pounds of fish annually. Today, the District is one of the largest mosquitofish producing facilities in the nation.

MOSQUITOFISH, *Gambusia affinis*

The most successful biological tool against immature mosquitoes in California is the mosquitofish, *Gambusia affinis*. When introduced to a mosquito breeding source, the mosquitofish quickly adapts, multiplies and becomes numerically capable of sustaining an effective control level.



The mosquitofish, a live-bearing American fish, is utilized as a predator of mosquito larvae in many diverse aquatic habitats throughout the world. A comparatively small species, the full-grown females are usually less than 2½ inches in total length, while males are typically under 1½ inches. The muted silver and light olive green body color is common to both sexes. In addition, they are able to lighten or darken their body color pigmentation to more closely match their immediate environment.



GUPPIES, *Poecilia reticulata*

The guppy, *Poecilia reticulata*, has been used for biological mosquito control since World War I. It has been introduced almost all over the world from the areas of tropical South America to which it is indigenous. In many areas, the guppy has provided good control of mosquitoes in highly polluted sources, such as sewage pools, dairy lagoons, chicken ranch ditches and slightly acidic sources. Unlike the mosquitofish, the guppy's ability to reproduce or control mosquitoes is not reduced by low levels of dissolved oxygen and thrive in areas where mosquitofish cannot successfully develop.



Biological Control Distribution

SYMVCD's state-certified mosquito and vector control technicians provided mosquitofish and guppies to residents of Sacramento and Yolo Counties free of charge.

BIOLOGICAL CONTROL DATA FOR 2019

RICE FIELDS STOCKED WITH MOSQUITOFISH

Number of Fields.....	140
Pounds of Fish*	2,159.65
Acres Stocked	9,566.08

WILDLIFE REFUGES AND DUCK CLUBS STOCKED WITH MOSQUITOFISH

Number of Fields.....	80
Pounds of Fish.....	881
Acres Stocked	4,337.56

SOURCES STOCKED WITH GUPPIES

Number of Sources	25
Pounds of Guppies	0.85
Acres Stocked	0.10

MOSQUITOFISH SUPPLIED TO TECHNICIANS

Woodland Facility	150.0
Elk Grove Facility	480.0

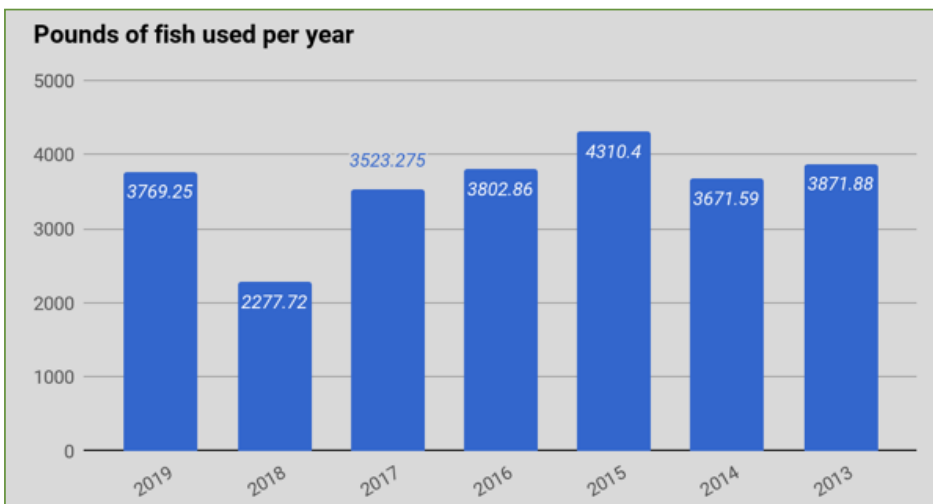
SUMMARY OF ALL MOSQUITOFISH PLANTS IN 2019

Number of Sources	3,669
Pounds of Fish.....	3,769.25
Acres Stocked	16,304

* 1 pound of fish equals approximately 450 fish.



A COMPARISON OF MOSQUITOFISH USED 2013-2019





Physical Control

The Ecological Management Department manages the physical and cultural control aspects of the District's Integrated Pest Management Program by actively pursuing opportunities to eliminate mosquito development sites. This is accomplished through the implementation of ecologically-based, site specific Mosquito Reduction Best Management Practices (BMPs) that reduce or eliminate the need for chemical control measures and initiates the abatement process in instances of continued Health and Safety Code section §2060 violations. The Department also provides assistance to all District departments on an as needed basis, including additional field and evening ULV applications.

MOSQUITO REDUCTION BEST MANAGEMENT PRACTICES (BMP) MANUAL

In 2019 The Ecological Management Department aggressively pursued landowner implementation of the Best Management Practices (BMP) as outlined in the District's Mosquito Reduction Best Management Practices Manual. This manual provided specific information regarding the District BMP policies, mosquito biology, and various BMPs that can be useful in reducing mosquito populations. Land-use specific sections provided guidance for landowners and land-managers who dealt with programs such as: managed wetlands, stormwater and wastewater systems, irrigated agriculture, rice production, dairies, swimming pools, cemeteries, and tire storage facilities. The Ecological Management Department provided detailed guidance to property owners on how to best implement the BMPs, and in some cases assisted with physical improvements. The BMP manual is available for download at: www.fightthebite.net/programs/ecological-management/.



The BMP manual serves as the basis for all Ecological Management Department programs which fall under four main BMP categories. All projects strive to reduce or eliminate mosquito breeding in Stormwater, Managed Wetlands, Agriculture, or Urban and Industrial sources. Technician zone project requests remain a Department priority; however environmental and regulatory development policies have also become a driving force of project and planning development.

ECOLOGICAL MANAGEMENT PROJECTS IN 2019

The Ecological Management Department handled twelve individual work requests in addition to sixteen annual mowing projects. The mowing projects are designed to improve site access for the technician and in many cases provide the necessary base maintenance required for the property owner to continue the required maintenance for the remainder of the year. Each work request was evaluated for implementation of BMPs as outlined in the District Mosquito Reduction Best Management Practices Manual. Landowners were contacted and worked directly with the Department to reduce standing water, mosquito breeding, improve mosquito control product efficacy, and ensured safe technician access. A few sites required the District to perform access projects involving removal of brush and debris to secure safe access to mosquito sources. These mowing and access projects were designed to keep access routes open for mosquito control operations around dairies and other water sources. All projects improved cooperative relationships and site conditions that resulted in mutually acceptable courses of action while upholding the District's responsibilities to protect public health.



PLANNING REVIEW PROGRAM

In 2019, the Ecological Management Department reviewed twenty one development projects from cities, counties, federal and state agencies, requesting the District to offer comments relating to mosquito production. The Department evaluated each plan or project for areas of concerns, and responded to the appropriate agencies with comments where appropriate.

Staff attended multiple stakeholder meetings over the year on a variety of local and statewide policy and restoration concerns.

STORMWATER/DRAINAGE PROGRAM

The Department's Stormwater Program continues to monitor the various types of storm water conveyance and treatment facilities. In addition to new development issues, The Department continued to address numerous drainage blockages, access issues associated with dense riparian or vegetated stream banks, and upland mosquito breeding within drainage corridors. Department staff responded to multiple West Nile virus hotspots near stormwater conveyance or stream corridors in 2019.

Flooding due to beaver dams has been an on-going problem for several years and causes significant mosquito breeding development sites to form in flooded pastures or other nearby dry grassy land. While direct population reduction methods (e.g. depredation) are the standard for beaver control, the Ecological Management Department utilizes an integrated approach to reducing the mosquitoes associated with beaver activity. Regular inspection and removal of beaver dams by hand or with equipment is typically the first approach. Clemson Pond Leveler (CPL) leveling devices were installed or maintained in various locations to help manage pulse flows to keep water contained in existing low flow channels.

The Ecological Management Department worked closely with numerous Federal, State, and local Agencies to remove blockages and vegetation to prevent water from backing up into areas where mosquito breeding would occur.

MANAGED WETLAND PROGRAM

The practice of flooding previously dry land, during the early fall season for the purposes of attracting waterfowl for conservation and recreational purposes creates favorable mosquito development habitat. High temperatures may promote rapid mosquito development as well as amplification of some vector-borne viruses (e.g. West Nile Virus). In addition, dense emergent vegetation and relatively slow speed of flooding during the fall may also increase the numbers of mosquitoes produced, and impede the success of other mosquito control practices such as the use of larvicides and mosquito fish. The District works throughout the year with public and private landowners of waterfowl hunted and other preserved properties to implement BMPs that will reduce mosquito breeding or enhance mosquito control activities during major water events such as early flooding. The District meets annually with wetland managers to develop annual management plans and to coordinate all irrigation and flooding activities. In addition to implementing BMPs, the Department administered the tiered fall flooding cost share program designed to discourage early flooding prior to October 1st of each year.

In 2019 eleven private and agency owned wetland properties flooded prior to October 1st and where appropriate were billed for mosquito control costs under the cost share program. The wetland program requires a significant amount of staff time to properly monitor and respond to site changes that zone technicians experience on a weekly basis throughout the season. Wetland managers routinely request advice from the Ecological Management Department to assist with maintaining their habitat goals while reducing mosquito production.



AGRICULTURE PROGRAM

The Department responded to four technician requests to reduce standing water or improve access in or around irrigated agricultural lands. Often off-site drainage issues are resolved by reducing irrigation runoff, and encouraging sound BMP implementation as outlined in the District's BMP Manual. The department provided spring time mowing of key agricultural sumps and access roads and organized wintertime brush cutting projects to enhance District technician safety and product efficacy. The Department continued to develop and implement the UAS mapping and topographic modeling of agricultural fields and drainages.

PROPERTY ACCESS AND UNMAINTAINED SWIMMING POOL ENFORCEMENT PROGRAM

The District's swimming pool enforcement program involves the Department making numerous attempts to contact pool owners to gain access for the purpose of treating the pool with mosquito larvicides and mosquito fish that offer long term mosquito control. Within this program, District policies direct the Ecological Management Department to pursue legal access and enforcement when all other communication attempts have failed. The Department responded to ninety four pool access and enforcement requests from zone supervisors. While most pool entry requests were resolved by contacting the property owners, forty nine Final Notices were still sent via US certified Mail. The Final Notice letter typically resolves the access issue; however access can sometimes only be gained with the use of a Search and Inspection warrant. In 2019, ten warrants were executed to gain access and treat the backyard swimming pools.

In late August 2019 invasive *Aedes aegypti* were found in the northern portion of Sacramento County. Similar to the pool enforcement program, as Control Operations attempted to perform inspections by going door to door, a handful of residents refused access. In response to the immediate public health threat the Department applied for and received a small area blanket warrant to help gain lawful entrance to the backyards in the immediate area of the initial detections. This was the first blanket warrant awarded to the District and will serve as a template for future warrants if needed in future years. The blanket warrant was executed for seven properties that had not responded to or had denied the technicians request for access.

UAS (DRONE) PROGRAM

The District's Unmanned Aerial Systems(UAS) program consists of four FAA Licensed UAS pilots, five imaging UAS units, and one heavy lift larvicide spraying unit. The program provides aerial imagery, precision mapping, surveying, wind speed monitoring, BMP project design analysis, topographic modeling, and UAS based mosquito control application support. The Department works closely with the FAA to conduct safe and legal flights throughout the District, and holds numerous airspace and flight waivers.

Departmental staff conducted more than twenty five imagery flights for a variety of operational needs including the mapping of standing water, analyzing contractor applications, trials, and topographic

modeling for BMP projects with additional analytical support provided by the GIS Department. Staff also assisted the District with hosting numerous on-site demonstrations for various agency officials and educational groups by demonstrating the UAS program and flight capabilities. In addition to providing imagery support, the Department conducted many test flights using the District's survey UAS to help define survey grade BMP projects as well as developing precise spray block polygons for UAS treatments.

In addition to aerial imagery, staff assisted a private contractor to complete forty two separate aerial application orders for a total of three thousand, six hundred sixty three acres treated by UAS. Applications were conducted using liquid as well as granular larvicides. The majority of the applications were conducted with autonomous flights over flooded pastures, organic rice fields, fall flooded wetland areas, re-flooded wild rice, re-flooded rice check perimeters, and urban riparian areas.

Late in the season, the Department Supervisor was one of the first in the State of California to take and pass California Department of Pesticide Regulation's new Unmanned Aircraft Vector Control Technician license test, authorizing the District to perform in-house UAS pesticide applications. Before the season ended three separate mosquito control applications were conducted using the District's larger heavy lift UAS.

The Department partnered with a variety of State agencies, organizations, and software companies to test new UAS technologies over the course of the year. The District conducted flights and software analysis' to test technologies that may provide beneficial to District operations if implemented. Staff participated in multiple panel discussions at the Interdrone Commercial Exposition and Conference regarding the use of UAS technologies in mosquito control and will continue to be involved with industry venues.



Microbial & Chemical Control

Microbial and chemical control are the use of specific microbials and chemical compounds (insect growth regulators and insecticides) that eliminate immature and adult mosquitoes. They are applied when biological and physical control methods are unable to maintain mosquito numbers below a level that is considered tolerable or when emergency control measures are needed to rapidly disrupt or terminate the transmission of disease to humans. Larvicides target immature mosquitoes. Adulticides are insecticides that reduce adult mosquito populations. All products applied by the District are registered with the California Environmental Protection Agency.

MOSQUITO AND VECTOR CONTROL OPERATIONS

The Sacramento-Yolo Mosquito and Vector Control District provides year-round mosquito and vector control services to the residents of Sacramento and Yolo Counties. The two counties combined comprise 2,013 square miles of urban, commercial and agricultural land. The District is divided into 27 geographical zones, with state-certified technicians responsible for all aspects of mosquito and vector control in each zone, from larval surveillance to treatment.

The primary goal of field technicians is to manage mosquito populations so they do not pose a significant health risk to the public. To achieve this, field staff conduct year round inspections of various types of mosquito breeding sources. When breeding sources are found, the technicians will apply a larvicide or mosquitofish to take care of the problem. When WNV activity or high abundance numbers are detected in any given area, technicians conduct ground treatments with truck mounted foggers and back packs in order to quickly reduce adult mosquito populations. When WNV activity is spread over large urban areas, aerial applications may also be conducted in order to protect public health. Aerial spraying over known agricultural sources that produce mosquitoes are also performed in order to reduce nuisance mosquitoes and/or respond to WNV activity.

Technicians respond to year-round home service requests which include general inspections, treating neglected swimming pools, delivering and stocking mosquitofish where they are needed, and looking for and treating yellowjacket and paper wasp nests.

Control operations staff work closely with all other District departments. Field technicians assist with education and outreach efforts by participating in community events and giving classroom presentations. They support the Laboratory surveillance program by picking up dead birds and collecting larvae. They lend a hand to the Ecological Management program by completing brush cutting projects and ditch cleaning whenever necessary. Staff also update zone work books, calibrate field vehicles and winterize all necessary equipment.

The District's primary goal is to protect public health by managing immature and adult mosquitoes so they do not present a significant health risk to our community. In the event mosquito populations pose a threat or become a significant public nuisance, the District will respond by implementing its Mosquito and Mosquito-borne Disease Management Plan. This plan has been approved by the District's Board of Trustees. The following page outlines the District's response plan.






DETECTION OF INVASIVE *Aedes aegypti* MOSQUITOES

In August 2019, the invasive mosquito *Aedes aegypti*, was found in three different areas of Citrus Heights. The first detection was on August 29th on the east side of Interstate 80 near the Twin Oaks area. A second site, west of the freeway near Antelope Villa was detected on September 20th. Upon detection, District control technicians conducted door to door inspections looking for larval sources throughout the affected areas. The response was augmented with localized treatments to control the adult mosquito populations. Additional control operations measures included wide area larviciding (WALS) using truck mounted equipment. Moving forward, if invasive mosquitoes continue to be detected, aside from traditional control methods the District will explore the use of innovative techniques that include releasing sterile males infected with a natural bacteria called *Wolbachia*. When these released males mate with wild females the resulting eggs do not hatch which leads to a decline in the population.

PUBLIC HEALTH WARNING: REPORT DAY-BITING MOSQUITOES
 Please call the **SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT**
 to schedule an inspection at **(800) 429-1022**

INVASIVE MOSQUITOES FOUND IN YOUR AREA




Aedes aegypti
Yellow Fever mosquito

Actual Size: About 1/4 inch long

WHY THE CONCERN?
Aedes aegypti is an invasive mosquito in California that is capable of transmitting several diseases including Zika, dengue, and chikungunya. While there have been no local transmissions detected to date, the identification and control of this invasive mosquito is important to protect public health.

About *Aedes aegypti* mosquitoes

- Small dark mosquito that bites during the day.
- Prefers to dwell in urban areas indoors and outdoors.
- They especially like to bite ankles, wrists and elbows.
- They lay eggs in small sources of water around homes.
- They are very difficult to control.
- They complete their life cycle in 7-10 days. The adults live for about 3 weeks.
- Invasive *Aedes* are "container breeders". Individual eggs are glued to the sides of containers. Eggs are resistant to drying out and can survive for many months until water covers them.





MOSQUITO AND MOSQUITO-BORNE DISEASE MANAGEMENT PLAN

Level I – Normal Season

The District performs routine mosquito, mosquito-borne disease and public health pesticide efficacy surveillance activities. The District also attends community events, provides presentations and distributes outreach material to various community organizations.

Level II – Positive Dead Birds and/or Mosquito Pools

Response is initiated when the District's Laboratory detects a mosquito-borne virus [i.e., West Nile virus (WNV), Western Equine Encephalomyelitis (WEE), St. Louis Encephalitis (SLE)] in mosquito pools or dead birds within the District's boundaries.

Level III – Positive Sentinel Chickens/Animals

A response is initiated when the District's Laboratory detects a seroconversion to a mosquito-borne virus (i.e., WNV, WEE, or SLE) in a sentinel chicken(s) or when the District is notified of a mosquito-borne infected horse or other animal within the District's boundaries.

Level IV – Positive Human Case

A response is initiated when the Sacramento/Yolo County Public Health Laboratory officials notifies the District that a human has locally acquired a mosquito-borne virus (i.e., WNV, WEE, SLE) disease within the District's boundaries.

Level V – Multiple Human Cases, Epidemic Conditions

A response is initiated when County Public Health Laboratory or CDPH officials notifies the District that multiple mosquito-borne virus (i.e., WNV, WEE, or SLE) infections have occurred in humans within a specific area or there is evidence that epidemic conditions exist. The epidemic area is defined as the geographic region in which human cases are clustered (incorporated city, community, neighborhood, or zip code).



CATCH BASIN PROGRAM

The Catch Basin Program was formed in 2005 to address the high volume of catch basins in Sacramento and Yolo counties and the potentially disease-spreading mosquito that prefers to breed in them: the *Culex pipiens*. A catch basin is a chamber, well, or inlet designed to collect water from storm events and urban runoff while also collecting debris to prevent the clogging of sewer systems. The Catch Basin Program's technicians monitor and treat over 300,000 storm drains each year, many of which are only a few feet in front of a residence or place of business and are capable of producing thousands of mosquitoes in a single day.

In the fall of 2019, the department's staff devoted time to create and edit proprietary catch basin maps, making them ready for the shift to paper-free application in 2020. Information gathered from each year's course of treatments - like contact information, access codes, and useful geographic points of reference - increase efficiency for the next round of applications.

The Catch Basin Program was also involved in both a product efficacy study as well as a study to determine the composition of the storm drain water throughout both counties. Evaluating the efficacy and residual life of larvicide products ensures that the appropriate amount of material is applied at the right intervals.

In addition to applications made by truck and on foot, the department regularly uses bikes as a means to better navigate dense urban areas. This has proven to be both a great public relations implement as well as a cost-effective endeavor, cutting down on fuel expenses and maintenance while simultaneously forwarding an environmentally-friendly approach to mosquito control.



SWIMMING POOL PROGRAM

In 2019, the swimming pool program continued to be a large focus of the District's urban larval control efforts. Stagnant water in swimming pools was a major concern as one pool alone can produce thousands of mosquitoes and put an entire neighborhood at risk for West Nile virus. Many neglected pool reports came from the general public as well as from aerial images.



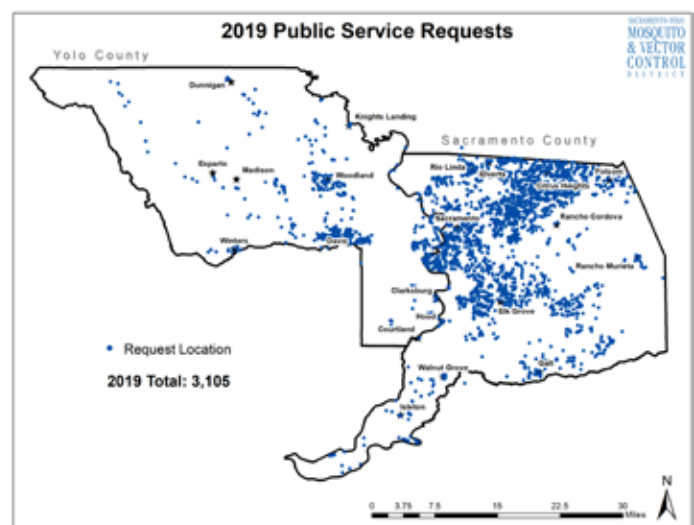
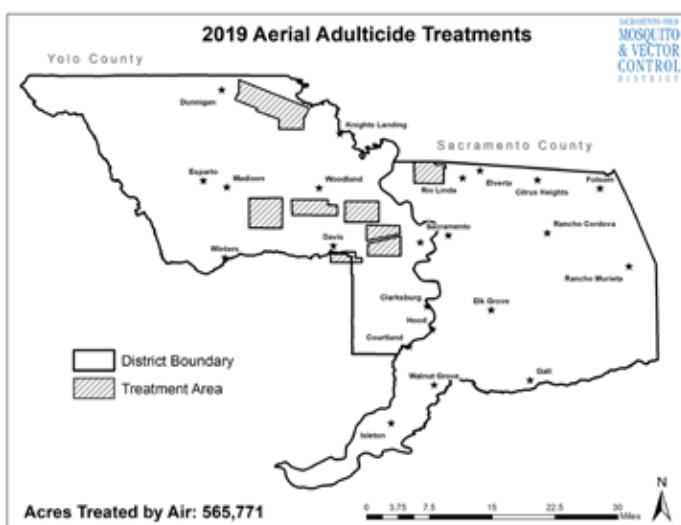
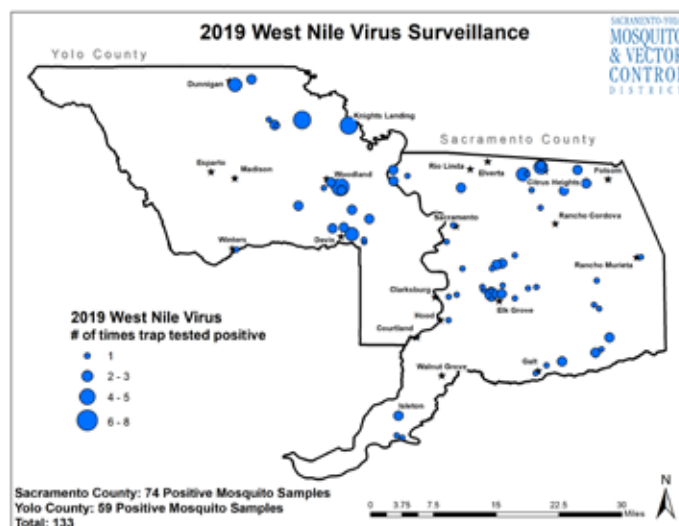
2019 MATERIALS USAGE

LARVICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
AGNIQUE MMF	7	7 gal	141
AGNIQUE MMF G	<1	<1 lbs	13
Agnique MMF G Pak35	<1	5.5 lbs	43
Altosid Briquete	<1	<1 lbs	19
Altosid Liquid and Liquid Concentrate	2,344	27 gal	633
Altosid P35	2,385	11,991 lbs	839
Altosid Pellets	812	4,073 lbs	260
Altosid XR Briquets	<1	10 lbs	48
Altosid XR-G	7,070	35,855 lbs	159
Lambda 9.7 CS	6.5	2 gal	129
Mosq oil BVA2/Cocobear/Kontrol	265	1,261 gal	841
Natular G	152	568 lbs	3
Natular G30	2,954	15,384 lbs	849
Natular G30 WSP	<1	<1 lbs	4
Natular XRT	6	203 lbs	2,302
Natular2EC	2,950	34 gal	982
OneGuard	3	1 gal	26
Sumilarv 0.5G	5.6	75 lbs	8
Suspend Polyzone/SC	23	6 gal	319
Vectobac 12AS	13,907	998 gal	1,585
VectoBac GR	13,173	66,098 lbs	145
VectoBac GS	89,000	445,053 lbs	1,467
Vectobac WDG	8,447	3,636 lbs	197
VectoLex FG	1	5 lbs	2
VectoMax FG	218	2,267 lbs	337
Vectomax WSP	7	141 lbs	775
LARVICIDE MATERIALS CATCH BASIN	BASINS TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Agnique MMFG DWSP	18	1.5 lbs	18
Altosid Briquets	2,631	31 lbs	2,631
Altosid XR-B	16,246	1307 lbs	16,246
Natular G30 DWSP	25,972	570 lbs	25,972
Natular XRT	20,841	1,837 lbs	20,841
Sumilarv 0.5g	21,268	472 lbs	21,268
Vectomax FG DWSP	22,859	502 lbs	22,859
Vectomax WSP	12,626	<1 lbs	12,626
ADULTICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Organophosphates (Naled)	280,479	1,374 gal	41
Pyrethrins	305,238	1,928 gal	78
Deltamethrin (Adult Mosquito)	111,315	593 gal	460
YELLOWJACKET CONTROL MATERIAL	AREA TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
DRIONE	9	6.5 pt	78
PT 565+ XLO	<1	<1 gal	41

Geographic Information Systems & Information Technology

In 2019 the GIS Department recorded mosquito control treatments to 845,292 acres, which included 19,461 known mosquito breeding sources, 186,224 catch basins, 3,105 requests for service from the public, and 39,299 acres of rice. Besides the EPA registered products, mosquito eating fish were used in 16,304 acres of mosquito breeding habitat. The GIS Department continues to provide spatial analytics to evaluate and improve District operations.

The IT Department is responsible for aligning existing and future District goals with cost-effective scalable technology solutions. The Department maintains servers, wired and wireless networks and equipment, workstations, mobile devices, laptops and projectors for District meetings and public presentations. It also oversees web-based database programming, software and peripherals, as well as a virtual private data network and VoIP phone system connecting offices in Elk Grove and Woodland. Each field technician is equipped with truck-mounted laptops with mobile data and custom GIS software.



Administration

The tasks of the administrative personnel of the Sacramento-Yolo Mosquito and Vector Control District involve serving the residents of Sacramento and Yolo Counties as well as the employees of the District. Some of the many duties performed by the department include financial accounting, coordinating the annual audit, accounts payable/receivable, administering staff training programs, maintaining public records, responding to telephone inquiries and reporting to the Board of Trustees. The department strives to provide quality professional service to the public and the employees of the District.

CONTINUING EDUCATION

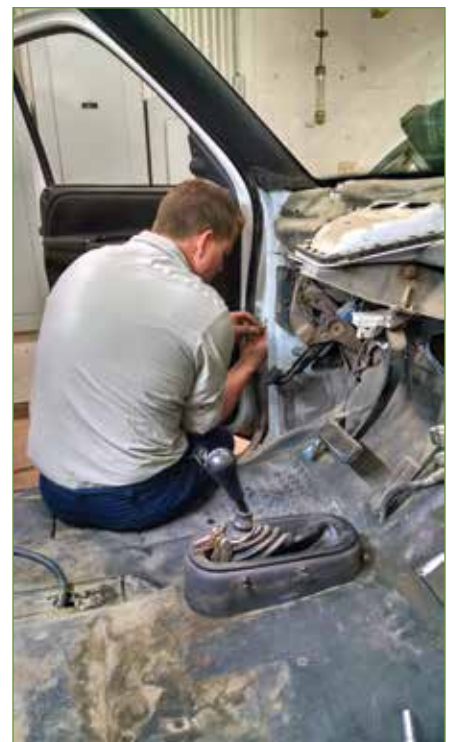
The District employs vector control technicians certified by the California Department of Public Health. Certificates are renewed every two years after established continuing education requirements are met. The Administrative Department tracks employees' continuing education units and helps organize the District's regional continuing education programs and workshops.



Shop

The District employs three Automotive Service Excellence–certified mechanics at the Elk Grove facility. The shop maintains 95 vehicles, 2 forklifts, 3 Argo all terrain vehicles, 17 quad-runners, 5 John Deere Gator utility vehicles, 14 utility trailers, 2 low-bed trailers, 2 wheel tractors, 1 back hoe tractor, 17 London ULV foggers, 5 Curtis Dyna foggers, 3 Electramist foggers, 2 turbine sprayers, and 1 Acrease 57" mower.

The shop is also responsible for repairing and installing various types of equipment, including chainsaws, pole saws, weed eaters, hand cans, edge-trimmer, backpacks, spray guns, lab traps, pumps, and other items in need of repair.



Financial Statements

Sacramento–Yolo Mosquito & Vector Control District Statement of Net Position June 30, 2019

	GOVERNMENTAL ACTIVITIES
ASSETS	
Cash and investments	\$ 10,128,721
Cash with fiscal agent	1,520,371
Accounts receivable	616,876
Interest receivable	33,370
Inventory	933,042
Capital assets, net of accumulated depreciation	4,575,352
Total Assets	\$ 17,807,732
Deferred outflows of resources	
Related to net other post employment benefits (OPEB) liability	427,109
Related to net pension liability	7,419,528
Total Deferred Outflows of Resources	\$ 7,846,637
Total Assets and Deferred Outflows of Resources	\$ 25,654,369
LIABILITIES	
Accounts payable and other accrued liabilities	\$ 237,530
Compensated absences	
Due within one year	238,351
Due in more than one year	179,415
Net other post employment benefits (OPEB) liability	
Due in more than one year	1,151,973
Net pension liability	
Due in more than one year	13,470,191
Total Liabilities	\$ 15,277,460
Deferred inflows of resources	
Related to net other post employment benefits (OPEB) liability	101,685
Related to net pension liability	1,197,703
Total Deferred Inflows of Resources	\$ 1,299,388
Total Liabilities and Deferred Inflows of Resources	\$ 16,576,848
NET POSITION	
Net investment in capital assets	\$ 4,575,352
Unrestricted	4,502,169
Total Net Position	\$ 9,077,521
Total Liabilities, Deferred Inflows of Resources and Net Position	\$ 25,654,369

Sacramento–Yolo Mosquito & Vector Control District
Statement of Revenues, Expenditures and Changes in Fund Balance
FOR THE YEAR ENDED JUNE 30, 2019

	GENERAL FUND	
REVENUES		
Property taxes	\$	13,921,516
Interest		283,388
Other tax revenue		896,954
Other revenues		342,574
Total Revenues	\$	15,444,432
EXPENDITURES		
Aircraft services		865,212
Auditing/Fiscal		17,750
Capital outlay		181,851
Communications		73,534
Control operations		29,334
District office expenses		14,845
Ecological management		11,812
Fisheries		23,842
Gas and petroleum		137,558
Geographic information systems		7,467
Information technology		37,371
Insecticides		933,975
Insect growth regulator		799,434
Laboratory services		152,631
Liability insurance		132,199
Materials and supplies		9,464
Member/Training		91,028
Microbial		1,200,536
Professional services		185,113
Public information		402,602
Research		50,000
Rents and leases		11,355
Safety program		2,392
Salaries and benefits		11,876,787
Structure and grounds		69,795
Utilities		92,250
Vehicle parts and labor		100,068
Total Expenditures	\$	17,510,205
Change in Fund Balance		(2,065,773)
Fund Balance - July 1, 2018		15,060,623
Fund Balance – June 30, 2019	\$	12,994,850

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

FIGHT THE
BITE

Sacramento County	Yolo County
8631 Bond Road	1234 Fortna Avenue
Elk Grove, CA 95624	Woodland, CA 95776
Phone: 1-800-429-1022	Phone: 1-800-429-1022
Fax: 916-685-5464	Fax: 530-668-3403
Web site: www.FIGHTtheBITE.net	Web site: www.FIGHTtheBITE.net
Hours: 7:00 am to 3:30 pm	Hours: 7:00 am to 3:30 pm

The Sacramento-Yolo Mosquito & Vector Control District is concerned about protecting and preserving the environment. We strive to cut down on waste and use eco-friendly materials wherever possible.

If you must print this electronic version, please help by using recycled paper made from post-consumer waste.