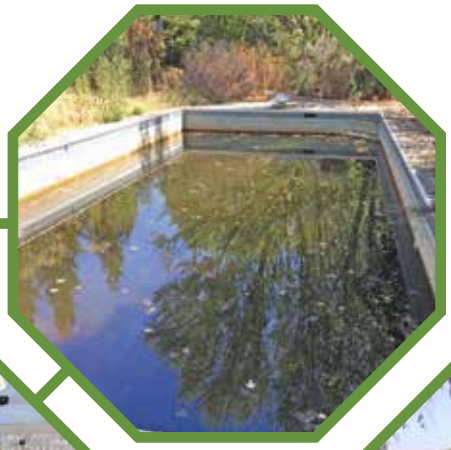
2016 ANNUAL REPORT

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL

CELEBRATING 70 YEARS 1946 2016
fight the BITE
OF PROTECTING OUR COMMUNITY




SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

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Dear Residents, Colleagues & Friends

We are pleased to present the 2016 Annual Report for the Sacramento-Yolo Mosquito and Vector Control District. This year we are happy to be celebrating 70 years of service protecting our community and the residents we serve against mosquitoes, West Nile virus (WNV) and other threats to public health. This report describes the work performed by the District.

The 2016 season was a very intense WNV year as many mosquitoes and birds tested positive for the virus. Initially, most activity was concentrated in the Arden-Arcade area of Sacramento County and by the middle of the summer WNV was found throughout both Sacramento and Yolo counties. By the end of the season, we had tested more birds and mosquito samples than any other year. As a result of the increased and ongoing activity, our District responded by implementing our successful IPM plan developed in coordination with the California Department of Public Health.

Early in the year, to commemorate our 70th anniversary, the District's Public Information and Outreach campaign produced videos celebrating our history and commitment to protect residents. The annual Fight the Bite contest also focused on the 70th anniversary theme and utilized winning artwork to produce a television commercial that aired throughout the season. Our Laboratory worked diligently collecting dead birds and monitored mosquito activity by trapping, sorting and testing mosquito samples to see if they were infected with WNV. When the disease was found at levels that posed a threat, the District responded by conducting ground and aerial spraying as needed to quickly and effectively decrease the abundance of infected adult mosquitoes that could pose a threat to public health. Our field technicians spent much of their time inspecting various sources where mosquitoes breed and responding to service requests by the public. Our Catch Basin program continued monitoring and treating the thousands of basins that routinely produce mosquitoes in urban areas. Our successful Fisheries program reared and planted mosquitofish in various urban, rural and agricultural areas. Lastly, our Ecological Management department collaborated closely with various agencies to implement sound water management practices that reduce mosquito populations decreasing the need for pesticide applications.

Throughout the state, 2016 the invasive mosquito species *Aedes aegypti* and *Aedes albopictus* continued to spread creating new challenges for mosquito control as a whole. In addition, news of Zika virus dominated headlines as this "new disease" came to California, a virus that is carried by the invasive mosquitoes. Early in the year, Yolo County recorded the first Zika travel related case for the state. However, by summer, many other Zika travel related cases had also been confirmed. While the two invasive mosquito species were not detected in our two counties, they certainly are a public health concern that must be addressed which our District is preparing for.

For 70 years the Sacramento-Yolo Mosquito and Vector Control District has worked diligently to protect the residents that we serve! As we move forward, we are committed to continuing this tradition of service in offering the best mosquito control program to the people of Sacramento and Yolo counties.

If you have any questions about this report or District services, please visit our website at www.FIGHTtheBITE.net or call us at 1-800-429-1022.

Sincerely,

Gary Goodman
District Manager

Sincerely,

Bruce Eldridge
2016 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.

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Administrative Office, Public Information, Control Operations, Fisheries and Laboratory
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Personnel

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

Laboratory

Laboratory Director: Paula Macedo
Biologist: Sarah Wheeler
Vector Ecologist: Debbie Dritz
Microbiologist: Kara Kelley
Laboratory Technicians: Bret Barner, Dave Butler, Paula Matney, Stanley Roberts, Marilou Thomas, Derek Reis, Marti Towery
Laboratory Assistant: Joy Drake, George Santiago

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: Henry Estrada, Steven Ramos

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, John Fendick, Lisa FitzGerald, Robert Fowler, Ken Harris, Guy Kachadorian, Timothy Yuen

Mosquito Control Operations
South Sacramento County

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

Mosquito Control Operations
North Yolo County

Supervisor: Michael Fike
Field Technicians: Garrett Bell, Tim Gee, Jason Lloyd, 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
Field Technicians: Shan Badhan, Jay Geigle, Eric Guimont, David Smith, Ryan Wagner

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, Western Equine Encephalomyelitis (WEE), St. Louis encephalitis (SLE), canine heartworm, malaria, Babesiosis and Ehrlichiosis. 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, print ads in various languages, outdoor creative ads and online interactive web 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 Design a Calendar Page Contest for all students and schools within Sacramento and Yolo counties.

All community members are encouraged to reduce mosquitoes and West Nile virus by practicing the **DISTRICT D'S** of Mosquito Prevention. **DRAIN** any standing water that may produce mosquitoes. **DAWN** and **DUSK** are times to avoid being outside. These are the times when mosquitoes are most active. **DRESS** appropriately by wearing long sleeves and pants when outdoors. **DEFEND** yourself against mosquitoes by using an effective insect repellent, such as DEET, picaridin or oil of lemon eucalyptus. Make sure you follow label directions! **DOOR** and window screens should be in good working condition. This will prevent mosquitoes from entering your home. **DISTRICT** personnel are available to address any mosquito problem you may be experiencing by calling **1-800-429-1022** or visiting us online at **www.FIGHTtheBITE.net**.

Community Events Attended in 2016

- Binational Health Week
- Citrus Heights Sunday Funday
- California Department of Social Services
- Celebrate Davis
- City of Sacramento District Food Truck Event
- City of Sacramento Earth Day
- Costco Health & Safety Fair
- Courtland Pear Fair
- Creek Week
- Davis Picnic Day
- Davis Concerts in the Park
- Doggy Dash
- DMV Health Fair
- Earth Day at the Sacramento Zoo
- ECOS Earth Day
- Elk Grove Giant Pumpkin/Harvest Festival
- Galt Bird Festival
- Farm to Fork
- Folsom Family Expo
- iFest Rancho Cordova
- Independence Day Celebration at the State Capitol
- International Kids day
- MVCAC Fight the Bite at the Capitol
- Pacific Rim Festival
- Rivercats Fight the Bite Night
- Sacramento County Fair (5 days)
- Sacramento Earth Day
- SOAR Senior Health Fair
- Univision Dia de Donar Sangre
- Winters Youth Day
- Woodland Health Fair
- Yolo County Fair (5 days)

Additional Community Event Involvement and Partnerships

Adelante Media
California Department of Transportation, Caltrans
City of Sacramento Neighborhood Services
Clear Channel Communications
Creek Week Cleanup
Crossings KBTV
CDFA Health and Wellness Fair
Elk Grove Western Festival
Entercom Radio
Entravision Communications
Family Radio
Folsom Parks and Recreation
Galt 4th of July Festival
Galt Senior Day
Homeless Connect
KCRA 3
Loaves and Fishes
My Sisters House
Mercy Housing
Mexican Consulate Health Program
National Night Out
News 10
North Highlands Family Night
UCD Osher Life Long Learning Institute
Parks and Recreation Departments
Renaissance Society at Sacramento State University
Rotary Club (various chapters)
Russian American Media
SACA Community Center
Sacramento County Board of Supervisors
Sacramento Food Bank
Sacramento Neighborhood Services
Sacramento News and Review
Sacramento START
Sacramento Zoo
Sons in Retirement (various chapters)
Telemundo 33
Univision 19
Yolo County Board of Supervisors
Yolo County Public Health Week
Yolo County Department of Agriculture

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 2016 a total of **28 presentations** were made to local classrooms and community groups reaching almost 2,000 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 2016 we participated in **32 community events** reaching close to **25,000 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 Calendar Page Contest for Sacramento and Yolo county students in grades K-12. Students were asked to create a calendar page encouraging the audience to practice one or all of the District D's of Mosquito Prevention. Twelve winners were selected from 1668 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 17-23. 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 Design a Calendar Page 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 vector-borne 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 2016, our District collected over 228,000 mosquitoes during 26,605 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 currently uses three types of traps for collection of abundance data — American Light traps, Mosquito Magnet® traps, and Gravid traps. All three trap types are set in representative sites in both counties and are used to gather information on the distribution of all mosquito species and to monitor populations of mosquito species of concern. Data are interpreted in the context of historical records and mosquito abundance is 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 Mosquito Magnet® trap captures host-seeking mosquitoes that are attracted to the carbon dioxide emissions produced from burning liquid propane. 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 2016 the District used 25 American Light traps in fixed sites within Sacramento and Yolo Counties for a total of 9,058 trap nights. The total number of mosquitoes collected with those traps was 96,117. Of these, 61,912 (64.4%) were females. The most abundant mosquito species captured by the American Light traps were *Culex tarsalis*, followed by *Culex pipiens*, *Culiseta inornata*, *Aedes melanimon*, *Anopheles freeborni*, *Culiseta incidens*, *Culex stigmatosoma*, *Culex erythrothorax*, and *Aedes vexans*. Other mosquito species were collected in smaller numbers and accounted for less than 1% of the total collection.

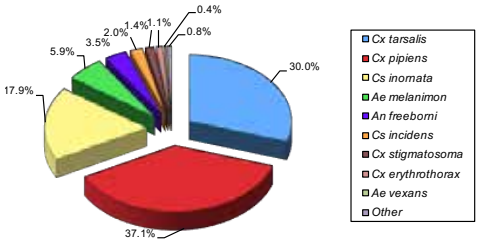
MAGNET TRAPS®

The District used a total of 25 Mosquito Magnet traps in 2016 in Sacramento and Yolo Counties during 8,515 trap nights. A total of 94,395 mosquitoes were collected by these traps, and most (94.6%) were females. The most abundant species collected were *Cx. tarsalis*, *Ae. melanimon*, *An. freeborni*, *Cx. pipiens*, *Cs. inornata*, *Cs. incidens*, *Ae. sierrensis*, *Ae. washinoi*, *Cx. erythrothorax*, *Cx. stigmatosoma*, and *Ae. vexans*. Other species collected accounted for less than 0.2% of the total collection.

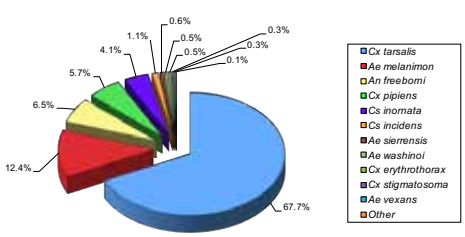
GRAVID TRAPS

A total of 25 Gravid traps were used in 2016 in Sacramento and Yolo Counties for adult mosquito abundance tracking during 9,032 trap nights. A total of 38,004 mosquitoes were collected by these traps, and most (85.7%) were females. The most abundant species, as expected, was *Cx. pipiens*, followed by *Cx. tarsalis*, *An. freeborni*, *Cs. incidens*, and *Cs. inornata*. Other mosquito species constituted less than 1% of the total collection.

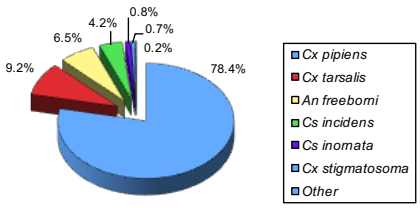
AMERICAN LIGHT TRAP COLLECTION



MOSQUITO MAGNET TRAP 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 2016 was much higher initially, from April through June, average until the end of October, and again much higher than the 5-year average in November and December.

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 2016 did not follow the pattern observed in the 5-year average, peaking earlier in the season in July and August, with abundance significantly higher than average. Populations of this species were back to the 5-year average abundance from September until the end of the year.

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* sp., *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 2016 followed the pattern observed in the 5-year average. *Culex stigmatosoma* abundance in 2016 was significantly 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 2016, *An. freeborni* populations followed the pattern observed in the 5-year average for that species. 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* sp. 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 currently has a surveillance program in place for these invasive species. At this time these species have not been detected in Sacramento or Yolo Counties.

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 used by some mosquito control agencies in their surveillance programs and may serve as an early indicator of local arbovirus activity in an area.

In 2016, the District maintained a total of 30 chickens distributed in 4 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 21 through October 19. 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 23, 2016. At the end of the sampling period, antibody conversions had been found in two of the four flocks with a total of 7 chickens positive for antibodies towards West Nile virus. No seroconversion for other viruses was detected.

2016 SENTINEL CHICKEN TESTS

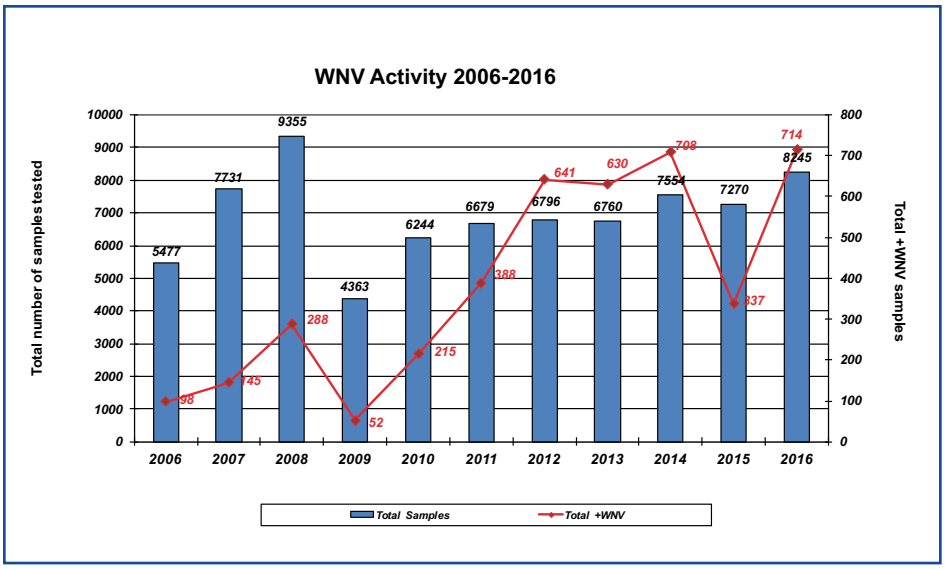
SACRAMENTO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Tyler Island	0	0	3
Rancho Murieta	0	0	0

YOLO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Esparto	0	0	4
Knights Landing	0	0	0

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 WN 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.

Over 285,000 mosquitoes were captured during 4,911 trap nights with the two trap types in 2016. Most of the mosquitoes captured were females (97%) and 90.7% of them were captured in the dry ice-baited traps. A total of 8,245 mosquito samples (of one to 50 female mosquitoes each) were tested by the District in 2016. The first West Nile virus-positive mosquito was detected on a sample of *Cx. pipiens* collected on June 1, 2016, and the last positive sample was collected on October 6, 2016. A total of 714 mosquito samples tested positive for West Nile virus in 2016 – 455 from Sacramento County and 259 from Yolo County. No other viruses were detected.



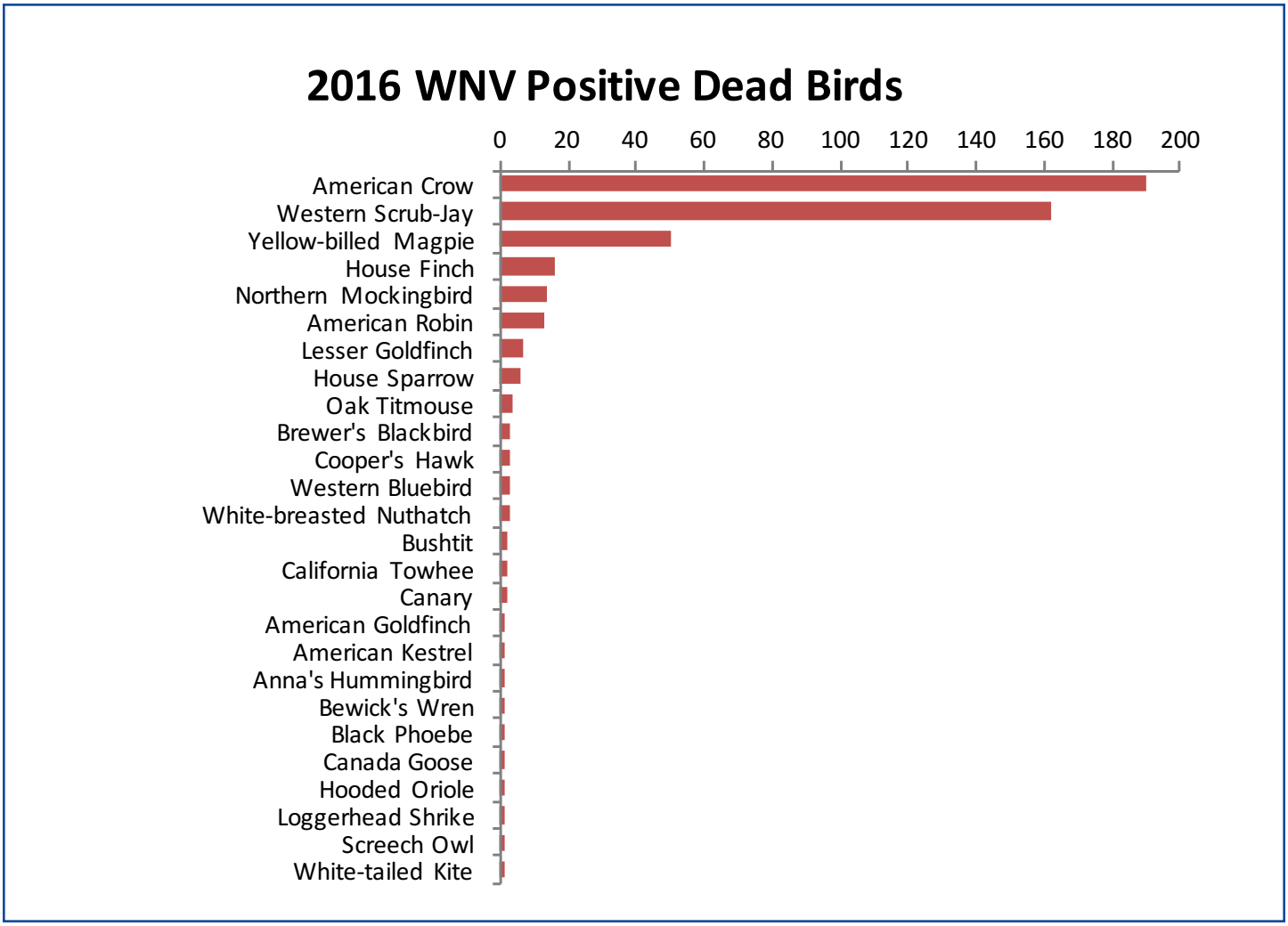
2010-2016 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2010	2011	2012	2013	2014	2015	2016
Mosquito pools	Total tested	6244	6679	6796	6760	7554	7270	8245
	WNV-positive	215	388	641	630	708	337	714
Chicken samples	Total tested (Total no. chickens)	2909 (91)	2514 (91)	1100 (104)	518 (50)	516 (50)	420 (30)	278 (30)
	Seropositive	11	7	40	18	19	8	7

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 http://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 2016, over 2,000 dead birds from Sacramento and Yolo Counties were reported to the WNV hotline. A total of 840 dead birds were tested for WN, WEE and SLE viruses and 490 were found positive for WNV (415 from Sacramento County and 75 from Yolo County). Most of the positive dead birds were American Crows (38.8%) and Western Scrub Jays (33.1%), followed by Yellow-billed Magpies (10.2%), House Finches (3.3%), Northern Mockingbirds (2.9%), and American Robins (2.7 %). Other bird species constituted 10% of the total WNV-positive birds tested.



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. In addition, the District maintains a Canine Heartworm Surveillance program, which consists of contacting veterinary clinics and hospitals in Sacramento and Yolo Counties and collecting data on heartworm tests performed and number of positive cases detected. Positive cases are then matched with sources of the western treehole mosquito to determine the areas of greatest risk of transmission of canine heartworm. The report generated is also sent to all veterinary clinics to reinforce the vector component of the heartworm transmission cycle and help create awareness about the disease and the District's participation.

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 2016, the District received four 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 additional transmission.

Dengue, Chikungunya, and Zika are also diseases caused by viruses transmitted to people by mosquitoes. The mosquito species that transmit them (*Ae. aegypti* and *Ae. albopictus*) are not currently found or established in Sacramento and Yolo Counties. Whenever the District receives a report of a case, the laboratory initiates trapping for any *Aedes* species around the reported location. Eleven dengue cases and 13 Zika cases were reported to the District by the Sacramento and Yolo County Health and Human Services Departments in 2016 and all were related to travel outside of the United States. Traveler cases of Chikungunya virus were reported in California in 2016, but none of the cases were from Sacramento or Yolo Counties.

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 eleven 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 and test them if they are found to be western blacklegged ticks. 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.

2016 LYME DISEASE SURVEILLANCE DATA

YOLO COUNTY	Total Ticks	Pools Tested	Positive Pools	Infection Rate*
Cache Creek – site 1	22	8	1	45.13
Cache Creek – site 2	157	34	0	0
SACRAMENTO COUNTY	**Total Ticks**	**Pools Tested**	**Positive Pools**	**Infection Rate***
Ancil Hoffman	4	4	0	0
East Lake Natoma	469	97	2	4.28
Folsom trail	7	15	0	0
Gold Lake	23	8	0	0
Mississippi Bar	151	35	1	6.63
Negro Bar	198	41	5	26.35
Nimbus Dam	90	21	1	11.13
Snipes Park	123	28	0	0
Willow Creek	171	38	3	17.99
TOTALS	**1415**	**329**	**13**	

*Infection rate MLE = Maximum Likelihood Estimate (in 1,000)

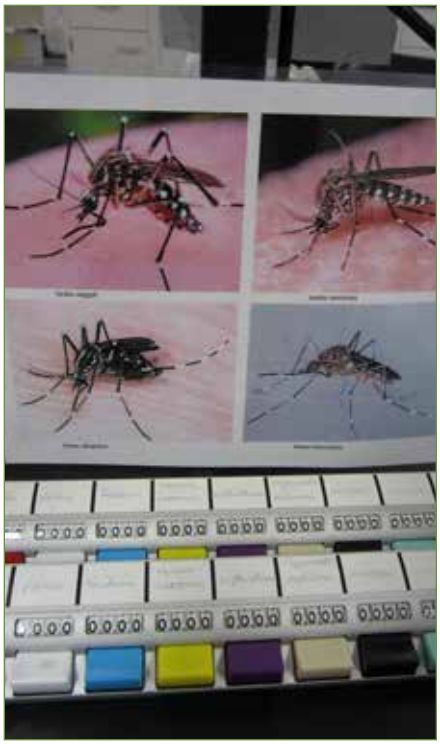
Surveillance of Bees and Wasps

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 three locations in Yolo County and six in Sacramento County.

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 23 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 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 23 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 2016

RICE FIELDS STOCKED WITH MOSQUITOFISH

Number of Fields	195
Pounds of Fish*	2,507
Acres Stocked	13,181

WILDLIFE REFUGES AND DUCK CLUBS STOCKED WITH MOSQUITOFISH

Number of Fields	169
Pounds of Fish	718
Acres Stocked	2,680

SOURCES STOCKED WITH GUPPIES

Number of Sources	22
Pounds of Guppies	1.79
Acres Stocked	1.91

MOSQUITOFISH SUPPLIED TO TECHNICIANS

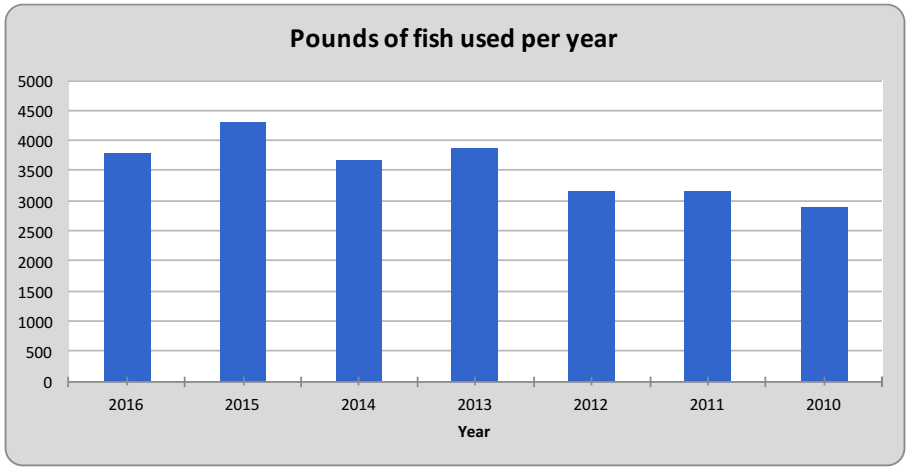
Woodland Facility	130.0
Elk Grove Facility	500.0

SUMMARY OF ALL MOSQUITOFISH PLANTS IN 2016

Number of Sources	4,283
Pounds of Fish	3,802.86
Acres Stocked	21,287.64

* 1 pound of fish equals approximately 450 fish.

A COMPARISON OF MOSQUITOFISH USED



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 other District departments on an as needed basis, including additional field and evening ULV applications.

MOSQUITO REDUCTION BEST MANAGEMENT PRACTICES (BMP) MANUAL

In 2016, 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: http://www.fightthebite.net/physical-control/.

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 2016

The Ecological Management Department handled seventeen individual work requests in addition to eleven 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 2016, the Ecological Management Department reviewed twenty two 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 Prgram continues to grow as regulatory controls require stormwater runoff to be treated or contained on site. In addition to new development issues, The Department continued to address numerous drainage blockages, access issues associated with dense riparian or vegetated streambanks, and upland mosquito breeding within drainage corridors.

Department staff responded to multiple West Nile virus hot spots near stormwater conveyance or stream cooridors in 2016.

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. Due to drought conditions, the District worked on only a handful of agency owned lands to remove and monitor eight dams on a routine basis. 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 the California Department of Water Resources (DWR) particularly within, Robla Creek in and around Hansen Ranch.

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 2016 ten wetland properties, including the California Department of Fish and Wildlife's Yolo Bypass Wildlife Area flooded prior to October 1st and 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.

URBAN / INDUSTRIAL PROGRAM

Staff inspected all cemeteries within the District on a routine basis. No major violations were noted with minor issues being resolved with brief site meetings with cemetery management. A new inspection method was utilized using clear siphon tubes to look for any invasive *Aedes* species. A higher amount of general mosquito breeding was noted using this inspection method however; no invasive mosquito species were found. Staff assisted three cemeteries by treating vases with standing water with Watersorb material to eliminate standing water in the vases.

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 one pool access and enforcement requests from zone supervisors. While most pool entry requests were resolved by contacting the property owners, ten 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 2016, one warrant was executed to gain access and treat the backyard swimming pool.

UAS (DRONE) PROGRAM

The District's Unmanned Aerial Systems program was started early in 2016 culminating with the licensing of one staff member with the FAA and the purchase of a DJI Phantom quadcopter. The District participated in multiple drone trials ranging from aerial multispectral imagery to underwater larval detection, to re-flooded rice field treatments in the fall. The District has adopted a drone management plan as well as updates to the District safety manual to include the drone safety and operating procedures. It is anticipated that this program will continue to grow as hardware and pesticide carrying capabilities evolve and improve, thus adding to the District's available options for precision surveillance and pesticide application techniques.

FIELD TRIALS

Staff assisted control operations operations with the duties associated with a variety of field efficacy and manufacturer new product trials conducted on private landowner properties.

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 26 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 immature and adult 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 outlines the District's response 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).

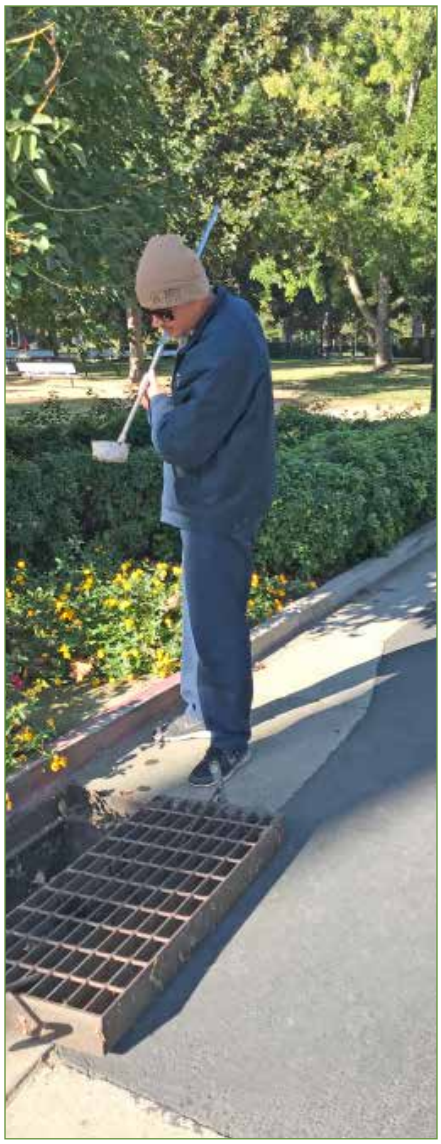
CATCH BASIN PROGRAM

The Catch Basin Program was enhanced in 2005 to sample and survey the high number and types of catch basins that produce mosquitoes within Sacramento and Yolo counties. A catch basin is defined as a chamber, well or inlet designed to collect rain water which includes systems to collect debris and sediment and prevent the clogging of sewers. Catch Basin technicians focus their primary efforts on inspecting, monitoring and treating approximately 160,000 catch basins, many of which are found to be problematic in urban and suburban neighborhoods throughout both of our counties.

In 2016, staff also spent time converting all old paper maps into a digital format. Mapping is a very complex yet very important part of the Catch Basin Program as it helps crews find and identify basins with landmarks for each confirmed basin. The electronic formatting of the catch basin maps decreased the time necessary to make map alterations thus increasing the time available for other treatments and tasks.

The Catch Basin Program staff was also involved in field efficacy testing of District products used to treat the basins. Evaluating the effectiveness of such products ensures that they are used at appropriate levels and intervals. Four bikes continued to be an important part of the program because under proper conditions they are more efficient than vehicles. Another bonus with using the bikes is the decrease in carbon emissions which helps the environment.

This year, the Catch Basin Program continued collaborations with the City of Sacramento and other cities to enhance and promote a green waste container program which encourages residents to utilize green waste containers for all yard clippings instead of leaving it loose on the street. Grass clippings and other lawn debris can flow into street basins and gutters increasing the production of mosquitoes. Placing all waste into containers helps to limit the growth of mosquito populations and reduces favorable areas where they can develop.



SWIMMING POOL PROGRAM

In 2016, the swimming pool program continued to be a large focus of the Districts 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. This year, the District's request for service program generated 926 pool-related requests.

The best way to prevent mosquitoes in a pool is to keep it clean or drain it. However if a pool is neglected, District technicians will add mosquitofish to the pool. While it will still be dirty, it will no longer produce mosquitoes or pose a public health threat.

2016 MATERIALS USAGE

LARVICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Agnique MMF	5	5 gal	274
Agnique MMFG, Pak35	<1	20 lbs	296
Altosid Briquets	<1	2 lbs	159
Altosid Liquid & Liquid Concentrate	1,804	23 gal	764
Altosid Pellets	536	2,565 lbs	2,696
Altosid SBG	6	73 lbs	5
Altosid XR Briquets	100	3,264 lbs	3,135
Altosid XR-G	4,460	22,669 lbs	150
Fourstar SBG	140	427 lbs	3
Mosq Oil GB/BVA2	95	417 gal	569
Natular 2EC	4,766	52 gal	962
Natular G	1,658	7,347 lbs	52
Natular G30	1,073	5,975 lbs	3,326
Natular XRT	110	2,509 lbs	3,125
Vectobac 12AS	18,657	1,563 gal	2,545
Vectobac GS	121,183	607,142 lbs	1,631
Vectobac GR	18,470	89,952 lbs	210
Vectobac WDG	1,084	205 lbs	113
Vectolex FG	98	897 lbs	90
VectoMax CG/FG	345	4,299 lbs	23,497
VectoMax WSP	1,724	468 lbs	13,639

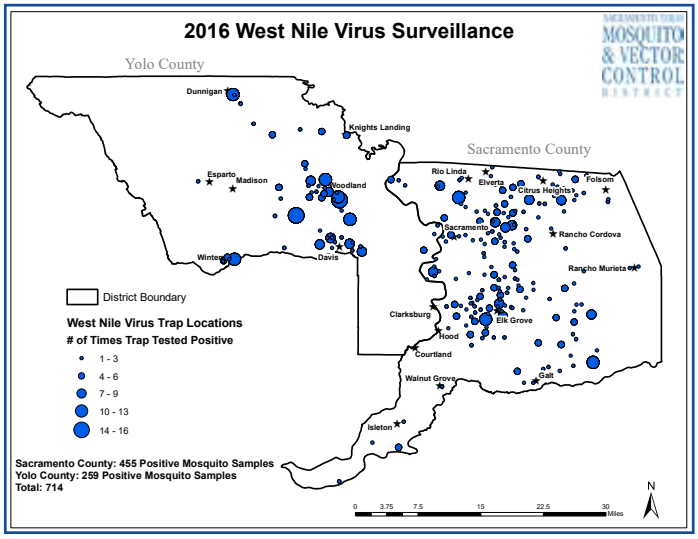
ADULTICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Organophosphate (Naled)	334,391	1,959 gal	52
Pyrethrins	587,115	2,904 gal	948
Pyrethroids	24	4 gal	458

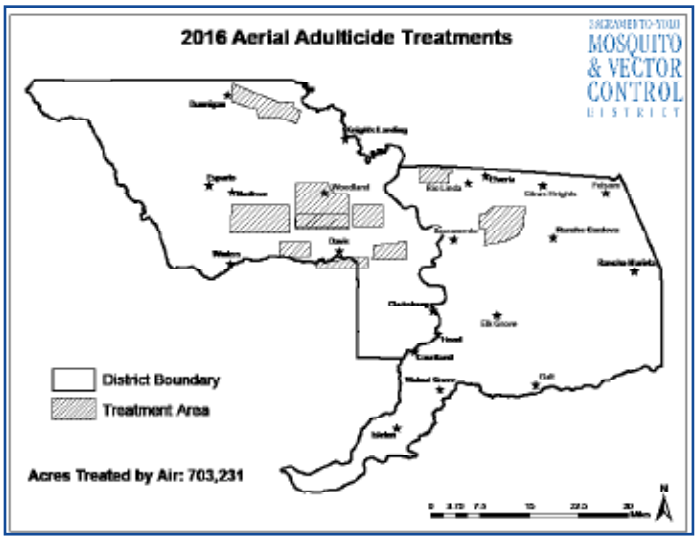
YELLOWJACKET CONTROL MATERIAL	AREA TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Drione	400 sq ft	10 lbs	107
PT 565 Plus XLO	740 sq ft	0.4 gal	11
Delta Dust	87 sq ft	3 lbs	4

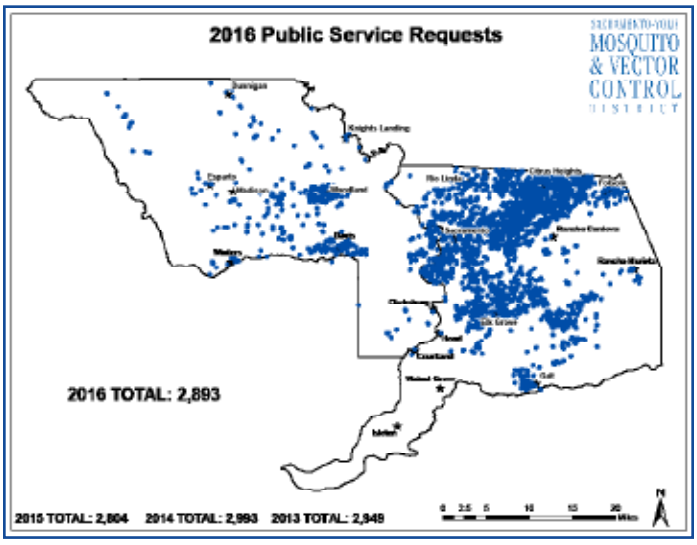
Geographic Information Systems & Information Technology

In 2016 the GIS Department recorded 63,339 applications of California Environmental Protection Agency-registered products to 1.1 million acres, which included 17,854 known mosquito breeding sources, 145,641 catch basins, 2,853 requests for service from the public, and 46,331 acres of rice. Besides the EPA registered products, mosquito eating fish were used in over 19,105 acres of mosquito breeding habitat. The GIS Department continues to provide spatial data analytics to evaluate 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, 2 Argo all terrain vehicles, 10 quad-runners, 4 John Deere Gator utility vehicles, 10 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, 2016

		Governmental Activities
ASSETS		
Cash and investments	$	11,095,819
Cash with fiscal agent		1,128,537
Accounts receivable		420,534
Interest receivable		8,991
Inventory		689,812
Net OPEB asset		37,059
Capital assets, net of accumulated depreciation		3,995,035
Total Assets		**17,375,787**
Deferred outflows of resources		1,590,518
LIABILITIES		
Accounts payable and other accrued liabilities	$	357,502
Compensated absences		362,805
Net pension liability		9,423,831
Total Liabilities	**$**	**10,144,138**
Deferred inflows of resources		1,082,288
NET POSITION		
Net investment in capital assets	$	3,995,035
Unrestricted		3,744,844
Total Net Position	**$**	**7,739,879**

Sacramento–Yolo Mosquito & Vector Control District

Statement of Revenues, Expenditures and Changes in Fund Balance

FOR THE YEAR ENDED JUNE 30, 2016

		GENERAL FUND
REVENUES		
Property taxes		$ 11,620,051
Interest		69,765
Other tax revenue		518,827
Other revenues		152,771
Total Revenue	**$**	**12,361,414**
EXPENDITURES		
Aircraft services		553,358
Auditing/Fiscal		11,500
Capital outlay		318,219
Communications		85,064
Control operations		22,047
District office expenses		12,253
Ecological management		6,406
Fisheries		19,599
Gas and petroleum		117,421
Geographic information systems		5,362
Information technology		26,447
Insecticides		439,922
Insect growth regulator		479,704
Laboratory services		97,040
Liability insurance		121,007
Materials and supplies		7,285
Member/Training		79,983
Microbial		1,124,948
Professional services		79,983
Public information		347,497
Research		60,000
Rents and leases		8,113
Safety program		4,651
Salaries and benefits		6,644,217
Structure and grounds		47,663
Utilities		76,756
Vehicle parts and labor		146,438
Total Expenditures	**$**	**10,942,883**
Change in Fund Balance		**1,418,531**
Fund Balance - July 1, 2015		**11,567,660**
Fund Balance – June 30, 2016	**$**	**12,986,191**

SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

FIGHT THE
BITE

Sacramento County
8631 Bond Road
Elk Grove, CA 95624
Phone: 1-800-429-1022
Fax: 916-685-5464
Web site: www.FIGHTtheBITE.net
Hours: 7:00 am to 3:30 pm

Yolo County
1234 Fortna Avenue
Woodland, CA 95776
Phone: 1-800-429-1022
Fax: 530-668-3403
Web site: www.FIGHTtheBITE.net
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.