

2018 ANNUAL REPORT

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL



SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

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Dear Residents, Colleagues & Friends

We are pleased to present the 2018 Annual Report for the Sacramento-Yolo Mosquito and Vector Control District. We are happy that once again the District was able to successfully protect 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 2018 season was a very intense one for West Nile virus as many mosquitoes and birds tested positive for the virus. Initially, most activity was concentrated throughout different neighborhoods in Elk Grove and by the middle of July activity intensified in the Pocket and other areas within the City of Sacramento. 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.

Throughout the year, the District's public information and outreach campaign disseminated messages on the importance of preventing mosquitoes and public cooperation for preventing mosquito breeding sites at home. A significant project was the re-design of the website as well as responding in real time by attending a variety of community events in areas with high WNV activity. Our laboratory and surveillance program worked diligently collecting dead birds and monitoring mosquito activity by trapping, sorting and testing mosquito samples to see if they were infected with West Nile virus. 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 the public. 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/storm drain" program continued monitoring and treating the many thousands of basins that routinely produce mosquitoes in urban areas. Our successful mosquitofish program offered a non-pesticide solution to mosquito problems in various urban, rural and agricultural areas. Our Ecological Management department led the state in the use of Unmanned Aerial Systems. This new technology allows for a variety of drone trials, topographic modeling and imagery. The department also collaborated closely with various entities to implement sound water management practices that reduce mosquito populations decreasing the need for pesticide applications.

Throughout the state, 2018 posed ongoing challenges as the invasive mosquito species *Aedes aegypti* and *Aedes albopictus* continued spreading northward to many new areas where it has become permanently established. Our District has a comprehensive surveillance program in place for invasive mosquitoes and we are confident that we will rise to the challenge if these mosquitoes are detected in our area.

As we move forward, our dedication and commitment stands firm to continue offering the best mosquito control program to the people of Sacramento and Yolo counties.

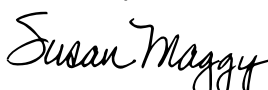
If you have any questions about this report or District services, please visit our website at www.FIGHTtheBITE.net or call us at 1-800-429-1022.

Sincerely,



Gary Goodman
District Manager

Sincerely,



Susan Maggy
2018 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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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: Bret Barner, Dave Butler, 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, 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
Sanouvang, George Santiago

Mosquito Control Operations Catch Basin Crew

Supervisor: Randy Burkhalter
Field Technicians: Shan Badhan,
Douglas Camero, Jay Geigle, Eric
Guimont, 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 Fight the Bite 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 2018

A Walk on the Wildside
Ag Day
Canoemobile (4 days)
Citrus Heights Sunday Funday
California Department of Social Services Health Day
California Lottery Health and Safety
CAL OES Emergency Preparedness Day
City of Sacramento District Food Truck Event
City of Sacramento Earth Day
City of Sacramento Community Resource Fair
Costco Health & Safety Fair
Courland Pear Fair
Creek Week
Davis Picnic Day
Doggy Dash
DMV Health Fair
Duck Days
Earth Day at the Sacramento Zoo
ECOS Earth Day
Elk Grove Giant Pumpkin/Harvest Festival
Elk Grove Safety Day
Elk Grove Food Truck event
Elk Grove Multicultural Festival
Emergency Preparedness Festival in Old Sacramento
Galt Bird Festival
Family Safety Day at Safetyville
Farm to Fork
Filipino Fiesta
Folsom Family Expo
Fish Fest
iFest Rancho Cordova
Healthy Kids Expo
Independence Day Celebration at the State Capitol
International Kids day
Kaiser Outreach Day
Keema Farms Pumpkin Fest
Kidtopia
National Night Out (2 events)
Rivercats Fight the Bite Night
Sacramento County Fair (5 days)
Sacramento Earth Day
Seymour Park Jazz Festival
SOAR Senior Health Fair
Trucks and Such Food Truck Event at Garcia Bend Park
Univision Dia de Donar Sangre
Winters Youth Day
Yolo County Fair (5 days)

Additional Partnering Agencies and Event Involvement

Bonneyville Radio
 California Department of Transportation, Caltrans
 City of Sacramento Neighborhood Services
 Clear Channel Communications
 Clear Channel Outdoor
 Comcast Cable
 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
 iHeart Media
 KCRA 3
 Lazer Media
 Loaves and Fishes
 My Sisters House
 Mercy Housing
 Mexican Consulate Health Program
 News 10
 North Highlands Family Night
 UCD Osher Life Long Learning Institute
 Parks and Recreation Departments
 Rotary Club (various chapters)
 Russian American Media
 Sacramento County Board of Supervisors
 Sacramento Food Bank
 Sacramento Neighborhood Services
 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 **2018** a total of **42 presentations** were made to local classrooms and community groups reaching almost **5,000** 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 **2018** we participated in **47 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 **1,320 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 **2018**, 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.

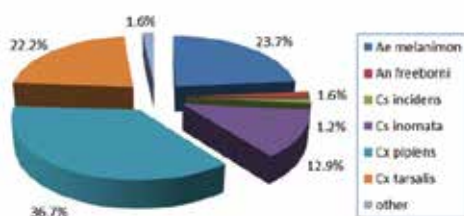




AMERICAN LIGHT TRAPS

In 2018 the District used 24 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 inciden*. Other mosquito species were collected in smaller numbers and accounted for less than 1% of the total collection.

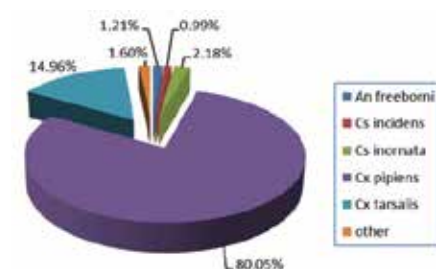
AMERICAN LIGHT TRAP COLLECTION



LOCKER TRAPS

The District used a total of 13 Mosquito Locker traps in 2018 in Sacramento and Yolo Counties during 2,255 trap nights. A total of 7,753 mosquitoes were collected by these traps, and most (95.2%) were females. The most abundant species collected were *Cx. pipiens*, *Cx. tarsalis*, *Cs. inornata*, *Cs. inciden*, and *An. freeborni*. Other species collected accounted for less than 1% of the total collection.

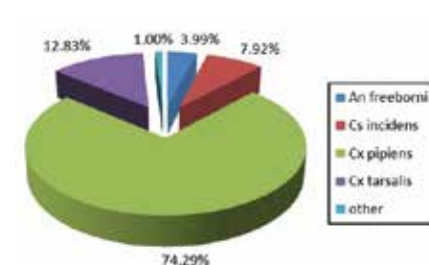
LOCKER TRAP COLLECTION



GRAVID TRAPS

A total of 24 Gravid traps were used in 2018 in Sacramento and Yolo Counties for adult mosquito abundance tracking during 8,384 trap nights. A total of 64,415 mosquitoes were collected by these traps, and most (84.5%) were females. The most abundant species, as expected, was *Cx. pipiens*, followed by *Cx. tarsalis*, *Cs. inciden*, and *An. freeborni*. 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 2018 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 2018 were slightly below the 5-year average.

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 2018 were similar as to the 5-year average. *Culex stigmatosoma* abundance in 2018 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 2018, *An. freeborni* populations did not exhibit the late winter/early spring peak and activity was 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 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 2018, 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 5 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 20, 2018. At the end of the sampling period, antibody conversions had been found in four of the five flocks with a total of 10 chickens positive for antibodies towards West Nile virus. No seroconversion for other viruses was detected.

2018 SENTINEL CHICKEN TESTS

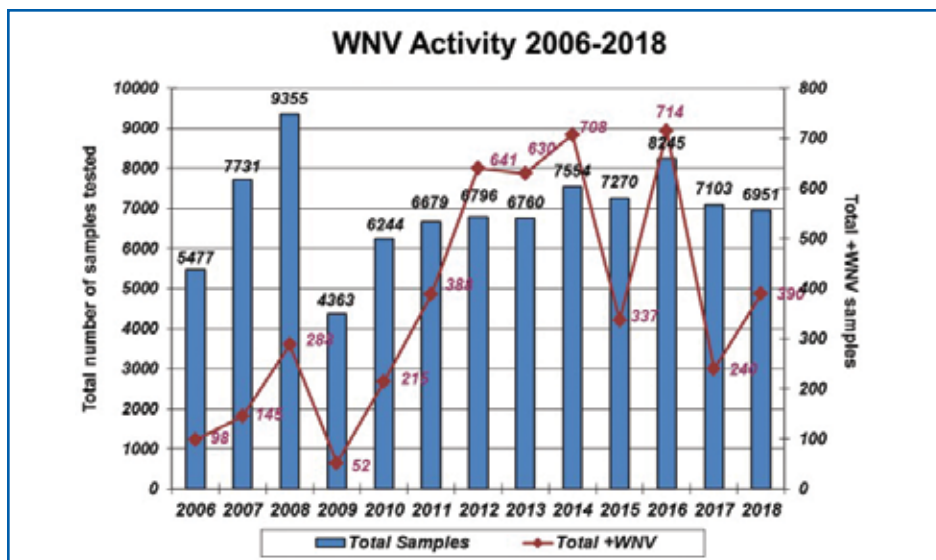
SACRAMENTO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Tyler Island	0	0	2
Gibson Ranch	0	0	4
Rancho Murieta	0	0	0

YOLO COUNTY			
Flock Location	WEE positive	SLE positive	WNV positive
Dunnigan	0	0	3
Knights Landing	0	0	2

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 223,450 mosquitoes were captured during 4,523 trap nights with the two trap types in 2018. Most of the mosquitoes captured were females (96%) and 73% of them were captured in the dry ice-baited traps. A total of 6,951 mosquito samples (of one to 50 female mosquitoes each) were tested by the District in 2018. The first West Nile virus-positive mosquito sample was a sample of *Cx. tarsalis* mosquitoes collected on May 30, 2018 from Sacramento County. The last positive sample was collected on October 5, 2018 also from Sacramento County. A total of 390 mosquito samples tested positive for West Nile virus in 2018 – 300 from Sacramento County and 90 from Yolo County. No seroconversion for other viruses was detected.



2012-2018 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2012	2013	2014	2015	2016	2017	2018
Mosquito pools	Total tested	6796	6760	7554	7270	8245	7103	6951
	WNV-positive	641	630	708	337	714	240	390
Chicken samples	Total tested (Total no. chickens)	1100 (104)	518 (50)	516 (50)	420 (30)	278 (30)	230 (30)	375 (25)
	Seropositive	40	18	19	8	7	4	10



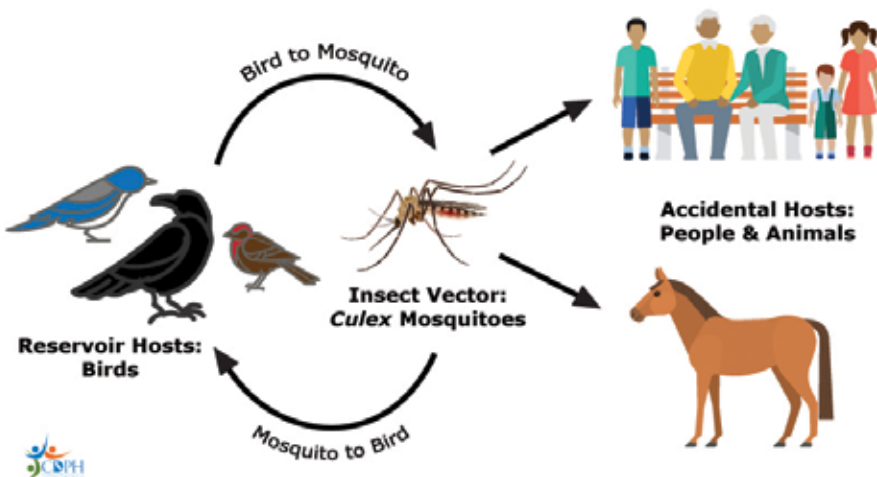
DEAD BIRDS

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.

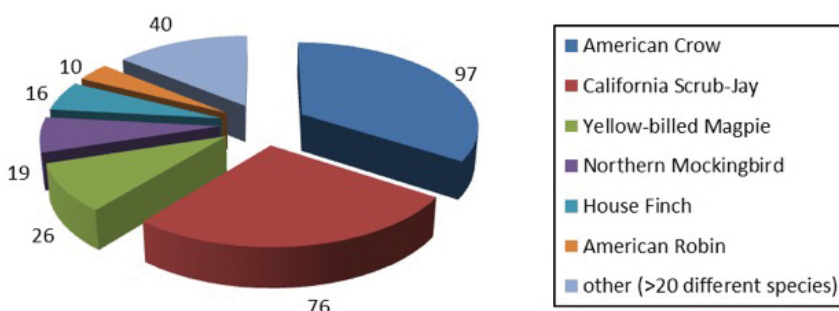
In 2018, 1,795 dead birds from Sacramento and Yolo Counties were reported to the WNV hotline. A total of 668 dead birds were tested for WN, WEE and SLE viruses and 284 were found positive for WNV (243 from Sacramento County and 92 from Yolo County). Most of the positive dead birds were American Crows (34%) and Western Scrub Jays (27%), followed by Yellow-billed Magpies (9%), Northern Mockingbirds (7%) and House Finches (6%). Various other bird species constituted the remaining 17% of the total WNV-positive birds tested.



West Nile Virus Transmission Cycle



2018 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 *Anopheles* 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 *Anopheles* mosquitoes are tested for malaria parasites. In 2018, the District received thirteen 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 *Anopheles* 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. Nine dengue cases and one chikungunya case were reported to the District by the Sacramento and Yolo County Health and Human Services Departments in 2018 and all were related to travel outside of the United States. Traveler cases of Zika virus were reported in California in 2018, 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 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.

2018 LYME DISEASE SURVEILLANCE DATA

YOLO COUNTY	Total Ticks	Pools Tested	Positive Pools	Infection Rate*
Cache Creek – site 1	13	5	0	0
Cache Creek – site 2	172	35	0	0
Camp Haswell	17	5	0	0
Putah Creek – site 1	7	4	0	0
Putah Creek – site 2	55	12	0	0
SACRAMENTO COUNTY	Total Ticks	Pools Tested	Positive Pools	Infection Rate*
Ancil Hoffman Park	6	3	0	0
Bannister Park	14	6	0	0
East Lake Natoma	113	25	2	18
Folsom Zoo Trail	15	6	0	0
Gold Lake Drive	3	2	0	0
Hinkle Creek	2	1	0	0
Humbug Trail	8	3	0	0
Lower Sunrise	7	3	0	0
Mississippi Bar	54	13	0	0
Negro Bar	171	38	1	6
Nimbus Dam	103	24	2	19
Sailor Bar	20	6	0	0
Snipes Park	79	46	2	25
Upper Sunrise	4	2	0	0
Willow Creek	79	17	2	25
TOTALS	942	256	9	

*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 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 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 2018

RICE FIELDS STOCKED WITH MOSQUITOFISH

Number of Fields.....	158
Pounds of Fish*	1,465.2
Acres Stocked	10,481

WILDLIFE REFUGES AND DUCK CLUBS STOCKED WITH MOSQUITOFISH

Number of Fields.....	21
Pounds of Fish.....	182.5
Acres Stocked	2,002

SOURCES STOCKED WITH GUPPIES

Number of Sources	26
Pounds of Guppies	0.91
Acres Stocked	0.11

MOSQUITOFISH SUPPLIED TO TECHNICIANS

Woodland Facility	150.0
Elk Grove Facility	480.0

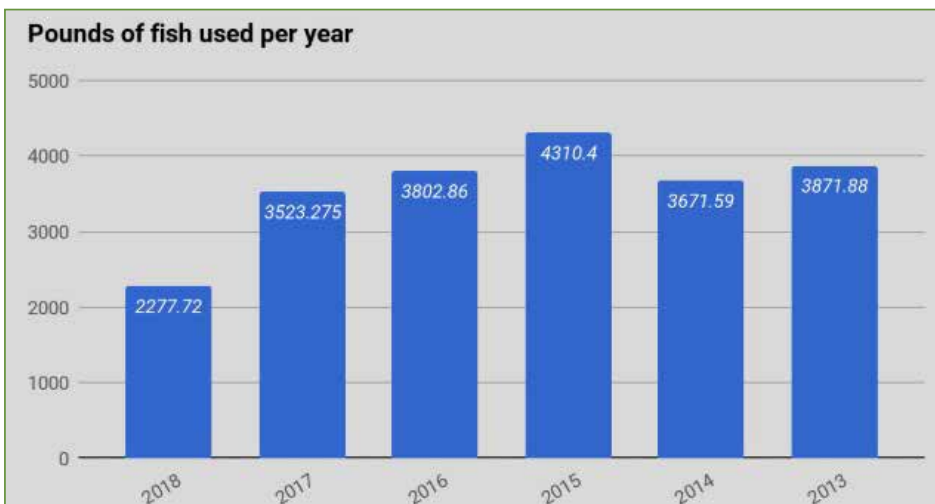
SUMMARY OF ALL MOSQUITOFISH PLANTS IN 2018

Number of Sources	4,029
Pounds of Fish.....	2,277.72
Acres Stocked	16,568

* 1 pound of fish equals approximately 450 fish.



A COMPARISON OF MOSQUITOFISH USED 2013-2018



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 2018 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 2018

The Ecological Management Department handled twenty-three 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 2018, the Ecological Management Department reviewed seven 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 hot spots near stormwater conveyance or stream corridors in 2018.

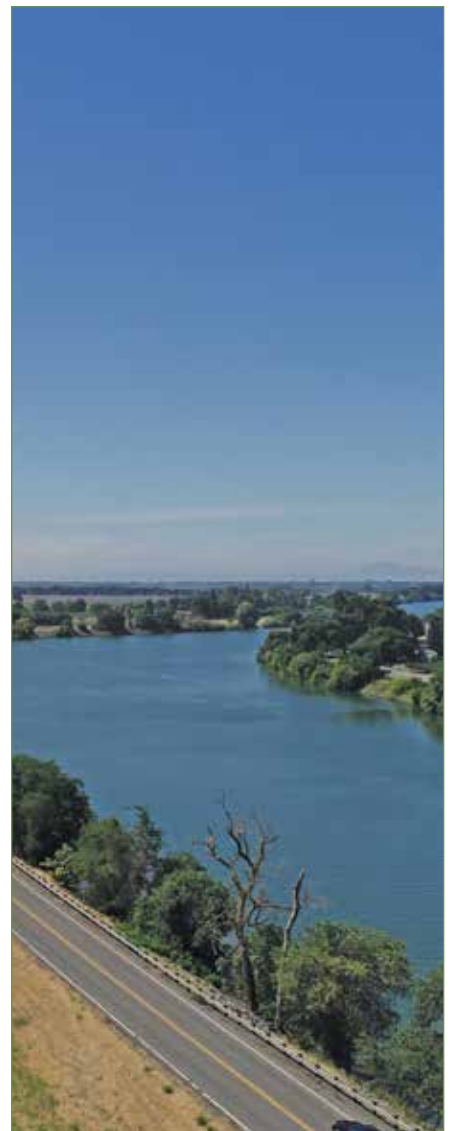
Flooding due to beaver dams has been an on-going problem for several years and causes significant mosquito breeding development sites to form in flooded pastures or other nearby dry grassy land. While direct population reduction methods (e.g. depredation) are the standard for beaver control, the Ecological 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 2018 thirteen 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 five 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. New to the program this year was the mapping and topographic modeling of entire fields and drainage issues provided by the Department's UAS program.

URBAN / INDUSTRIAL PROGRAM

Staff inspected all cemeteries within the District on a routine basis using clear siphons as the preferred inspection method. No major violations were noted with minor issues being resolved with brief site meetings with cemetery management. Most Managers were able to treat their vases with Watersorb with the Department helping with the applications on only a few small areas where necessary.

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 one hundred and fourteen pool access and enforcement requests from zone supervisors. While most pool entry requests were resolved by contacting the property owners, thirty five 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 2018, nine warrants were executed to gain access and treat the backyard swimming pools.

UAS (DRONE) PROGRAM

The District's Unmanned Aerial Systems(UAS) program consists of five FAA Licensed UAS pilots, five smaller imaging UAS units, and one liquid larvicide spraying unit. The program provides aerial imagery, precision mapping, surveying, wind speed monitoring, BMP project design, UAS based mosquito control application support, and data collection for the District's GIS department. The Department works closely with FAA to conduct safe and legal flights throughout the District.

Departmental staff conducted thirty one 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 with numerous on-site demonstrations for various agency officials and educational groups.

In addition to aerial imagery, staff assisted a private contractor to complete fourteen separate aerial application orders for a total of seven hundred and eighty three acres treated by UAS'. The applications included liquid larvicide applications over edges of fallow rice fields, active rice, and flooded pastures. Halfway through the season a granular applicator option was employed. Granular larvicide applications included autonomous flights over flooded pastures, fall flooded wetland areas, re-flooded wild rice, and re-flooded rice checks and perimeters. All applications were very successful and provided the District the opportunity to learn about and implement this new application technology.

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' with the United States Fish and Wildlife Service, The California Department of Fish and Wildlife, the San Francisco Drone School, sUAS news, Propeller Aerial, Drone Deploy, Pix4D, Airbus aerial, Compass Drone, and Leading Edge Associates. Staff worked with these entities to test precision surveying, mapping software, A.I technology, precision modeling for BMP projects as well as automated mosquito control applications. 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 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 2018, 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.



SWIMMING POOL PROGRAM

In 2018, 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.



2018 MATERIALS USAGE

LARVICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Agnique MMF G	<1	<1 lbs	6.4
Agnique MMF G Pak35	<1	8.5 lbs	113
Altosid Briquete	23	119 lbs	86,394
Altosid Liquid and Liquid Concentrate	2204	27 gal	616
Altosid P35	579	2,890 lbs	58
Altosid Pellets	1,646	8,284 lbs	997
Altosid SBG II	8	160 lbs	3
Altosid XR Briquets	44	1,524 lbs	13,294
Altosid XR-G	8,178	4,107 lbs	143
Duplex-G	10	80 lbs	1
Fourstar BTI CRG/CRG/MBG	22	433 lbs	32
IC3	1.2	2.5 gal	1
Mosq oil BVA2/Cocobear/Kontrol	216	986 gal	809
Natular G30	5,935	12,370 lbs	896
Natular XRT	13,157	3,348 lbs	3,298
Natular2EC	5,147	60 gal	952
Suspend Polyzone/SC	49	13 gal	547
Sustain MBG	4	40 lbs	2
Vectobac 12AS	19,381	1,480 gal	2,066
Vectobac G	2	37 lbs	1
VectoBac GR	17,673	91,939 lbs	190
VectoBac GS	109,105	54,6871 lbs	1,557
Vectobac WDG	1,654	461 lbs	129
VectoLex FG	110	1,114 lbs	135
VectoLex WDG	1	1 lbs	2
VectoLex WSP	<1	<1 lbs	3
VectoMax FG	563	4,499 lbs	330
Vectomax WSP	35	674 lbs	1,463

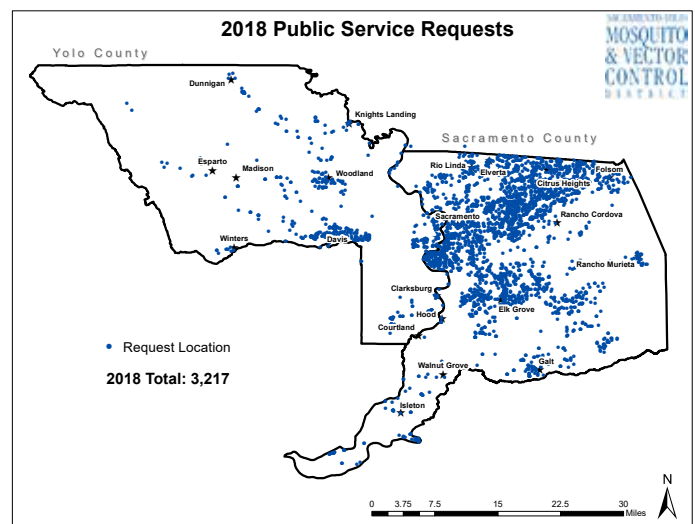
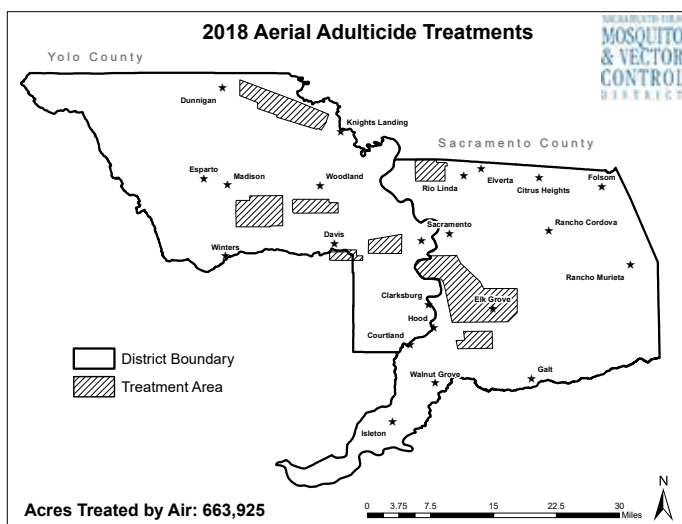
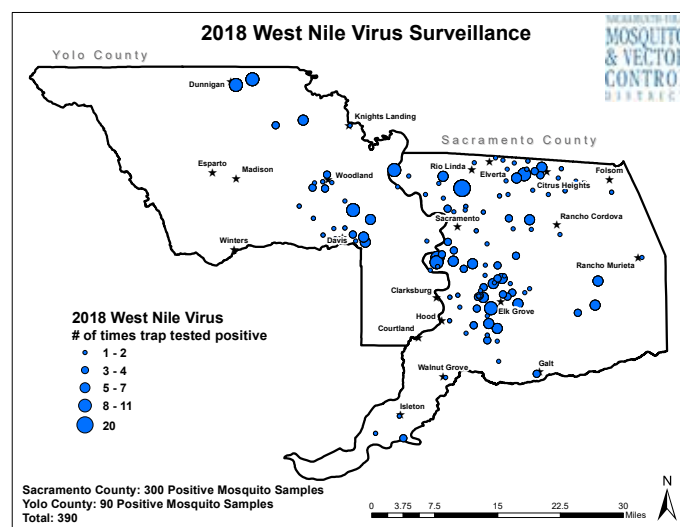
ADULTICIDE MATERIALS	ACRES TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
Organophosphates (Naled)	298,055	1,748 gal	41
Pyrethrins	1,765	3,586 gal	807
Deltamethrin (Adult Mosquito)	2,789	15 gal	6

YELLOWJACKET CONTROL MATERIAL	AREA TREATED	AMOUNT OF MATERIAL	NUMBER OF APPLICATIONS
DeltaDust	<1	<1	2
PT 565+ XLO	0.02	0.848 gal	47
DRIONE	0.037	30.097 lbs	174

Geographic Information Systems & Information Technology

In 2018 the GIS Department recorded mosquito control treatments to 1,065,879 acres, which included 18,703 known mosquito breeding sources, 186,533 catch basins, 3,217 requests for service from the public, and 46,707 acres of rice. Besides the EPA registered products, mosquito eating fish were used in over 16,500 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

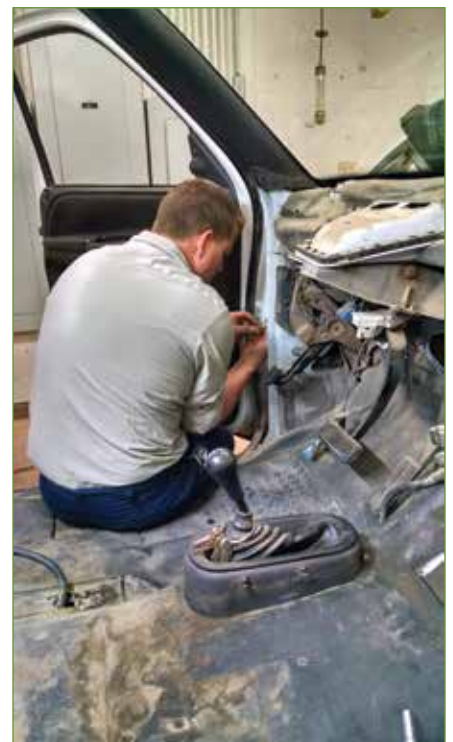
The District employs vector control technicians certified by the California Department of Public Health. Certificates are renewed every two years after established continuing education requirements are met. The Administrative Department tracks employees' continuing education units and helps organize 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, 2018

	GOVERNMENTAL ACTIVITIES
ASSETS	
Cash and investments	\$ 12,510,659
Cash with fiscal agent	1,357,564
Accounts receivable	538,124
Interest receivable	39,284
Inventory	876,116
Capital assets, net of accumulated depreciation	4,872,904
Total Assets	\$ 20,194,651
Deferred outflows of resources	
Related to net other post employment benefits (OPEB) liability	322,091
Related to net pension liability	3,815,564
Total Deferred Outflows of Resources	\$ 4,137,655
Total Assets and Deferred Outflows of Resources	\$ 24,332,306
LIABILITIES	
Accounts payable and other accrued liabilities	\$ 261,124
Compensated absences	
Due within one year	229,835
Due in more than one year	186,129
Net other post employment benefits (OPEB) liability	
Due in more than one year	980,162
Net pension liability	
Due in more than one year	13,633,290
Total Liabilities	\$ 15,290,540
Deferred inflows of resources	
Related to net other post employment benefits (OPEB) liability	113,280
Related to net pension liability	859,369
Total Deferred Inflows of Resources	\$ 972,649
Total Liabilities and Deferred Inflows of Resources	\$ 16,263,189
NET POSITION	
Net investment in capital assets	\$ 4,872,904
Unrestricted	3,196,213
Total Net Position	\$ 8,069,117
Total Liabilities, Deferred Inflows of Resources and Net Position	\$ 24,332,306

Sacramento–Yolo Mosquito & Vector Control District
Statement of Revenues, Expenditures and Changes in Fund Balance
FOR THE YEAR ENDED JUNE 30, 2018

	GENERAL FUND	
REVENUES		
Property taxes	\$	13,080,480
Interest		125,322
Other tax revenue		768,929
Other revenues		333,112
Total Revenues	\$	14,307,843
EXPENDITURES		
Aircraft services		577,685
Auditing/Fiscal		14,800
Capital outlay		133,031
Communications		68,633
Control operations		25,341
District office expenses		16,329
Ecological management		7,419
Fisheries		23,577
Gas and petroleum		119,726
Geographic information systems		4,467
Information technology		31,311
Insecticides		806,767
Insect growth regulator		796,709
Laboratory services		154,086
Liability insurance		121,643
Materials and supplies		9,200
Member/Training		89,526
Microbial		994,583
Professional services		92,835
Public information		360,140
Research		50,000
Rents and leases		8,182
Safety program		3,727
Salaries and benefits		7,370,779
Structure and grounds		56,610
Utilities		92,471
Vehicle parts and labor		92,846
Total Expenditures	\$	12,122,423
Change in Fund Balance		2,185,420
Fund Balance - July 1, 2017		12,875,203
Fund Balance – June 30, 2018	\$	15,060,623

SACRAMENTO-YOLO
**MOSQUITO
& VECTOR
CONTROL**
D I S T R I C T

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.