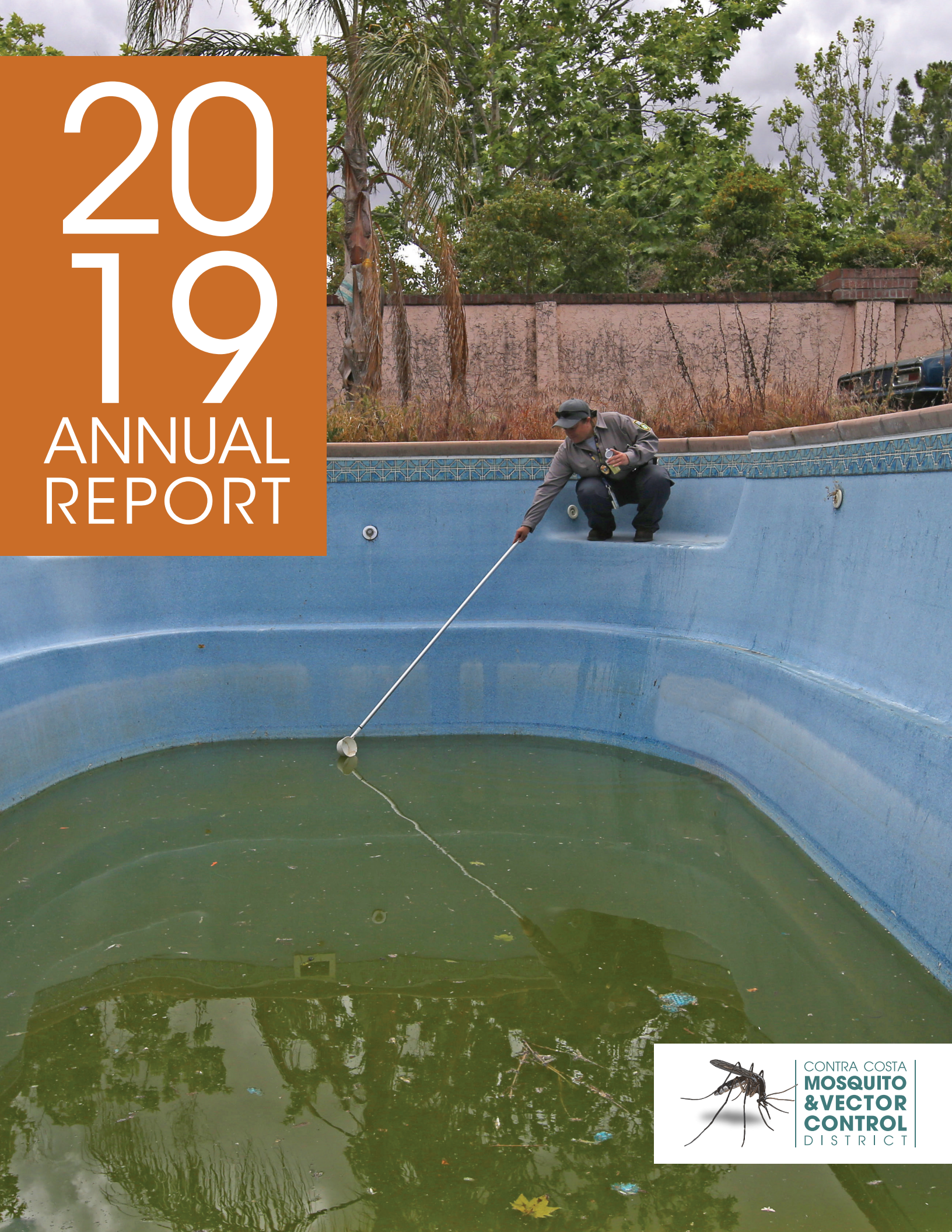


# 2019 ANNUAL REPORT



CONTRA COSTA  
**MOSQUITO  
& VECTOR  
CONTROL**  
DISTRICT

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## 1927-2019 92 Years of Service

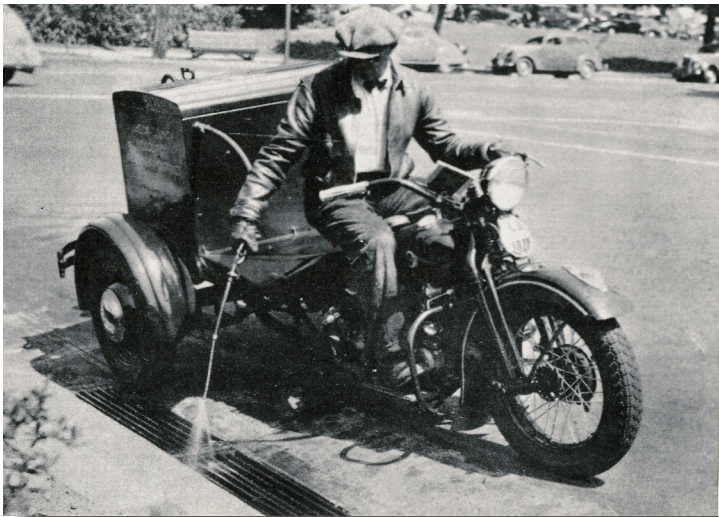
### History

Historical records show Contra Costa County suffered from large populations of mosquitoes as early as 1772, when hordes of mosquitoes welcomed the first Europeans as they explored the San Francisco Bay Area.

More than 140 years later, in 1915, the California State Legislature passed a bill to provide for the formation, organization, and financing of mosquito abatement districts. In 1926, Contra Costa County citizens partnered with several waterfront industries to form a committee to address the need for mosquito control.

In 1927, the Contra Costa Mosquito Abatement District (CCMAD) began operations to control marsh mosquitoes in north central Contra Costa County. During the next 60 years, individual cities petitioned CCMAD to be included within the District's jurisdiction. By 1986, CCMAD became a countywide agency. In 1993, Contra Costa County transferred its rat and rabies risk reduction programs to CCMAD. Subsequently, the District changed its name to Contra Costa Mosquito & Vector Control District (District).

Today, District employees continue to serve and protect the public by monitoring and controlling vectors of disease in Contra Costa County. For 92 years, the District has remained steadfast in protecting public health from vector-borne diseases.



Mosquito Spraying in Contra Costa County  
Date Unknown



Vector Control Technician Heidi Budge treats a catch basin to control mosquitoes.

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# Mission Statement

The Contra Costa Mosquito & Vector Control District is a public health agency dedicated to protecting the community from mosquitoes and other vectors of disease.

## PRINCIPLES

Established in 1927, the Contra Costa Mosquito & Vector Control District is committed to:

### PUBLIC HEALTH

We use Integrated Vector Management (IVM) as our core approach to reducing risk to the community.

### ENVIRONMENTAL STEWARDSHIP

We use materials and methods that meet or exceed all applicable regulatory requirements.

### SCIENCE & TECHNOLOGY

We work diligently with the scientific community to ensure that our methods are scientifically sound and to advance the state of the art of our discipline.

### PUBLIC EDUCATION

We educate and help our residents understand the role they play in assisting us in reducing the risk from vectors of disease.

### SAFETY

We are committed to the safety of employees and the public through ongoing attention to facilities, equipment and training.

### MANAGEMENT EFFECTIVENESS

We use management systems, protocols and methods that allow us to fulfill our mission in an efficient, transparent and fiscally responsible manner.

### TEAMWORK & COLLABORATION

We believe that a productive work environment requires teamwork, active collaboration and clear and open communication within and across all entities to develop the future.



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## *Independent Special District Classification*

The Contra Costa Mosquito & Vector Control District is classified as an independent special district and is *not* part of Contra Costa County's governmental system. Contra Costa County encompasses the District's physical jurisdiction for mosquito and vector control. Special districts are:

- Formed by local residents to provide local services
- Sanctioned by the State of California Government Codes
- Often the most economical means of providing public service
- Independent agencies governed by a board of trustees
- Operated as nonprofit organizations
- Responsible directly to the people
- Accountable - Accessible - Efficient

## *Board of Trustees*



**Standing Left to Right:** Robert Lucacher, Moraga; Warren Clayton, Pinole; Jim Fitzsimmons, Lafayette; Michael Krieg, President, Oakley; Daniel Pellegrini, Secretary, Martinez; James Murray, Walnut Creek; Perry Carlston, Vice President, Concord; Kevin Marker, Orinda; James Pinckney, Contra Costa County; Randall Diamond, Danville

**Kneeling/Seated:** Darryl Young, Contra Costa County; Richard Ainsley, Ph.D., Pittsburg; Chris Cowen, Contra Costa County; Soheila Bana, Ph.D., Richmond; Lola Odunlami, Antioch; Peggie Howell, Clayton; and Peter Pay, San Ramon

*Not pictured: Richard Means, Pleasant Hill; Marshon Thomas, Brentwood*



Steve Schutz, Ph.D., Scientific Program Manager; Terry Davis, Program Supervisor; Maria Bagley, Administrative Services Manager; Natalie Martini, Administrative Analyst II; Sheila Currier, Program Supervisor; Eric Ghilarducci, Vector Ecologist II; Nola Woods, Public Affairs Director; Paula Macedo, D.V.M., Ph.D., General Manager; Tina Cox, Accounting/Benefits Specialist; Jeremy Shannon, Vector Control Planner; Damien Clauson, Vector Ecologist; David Wexler, Program Supervisor; Wayne Shieh, IT Systems Administrator; Andrew Pierce, Public Information and Technology Officer; and Chris Miller, Biologist

*Not pictured: Areej Al Bahrani, Administrative Analyst I; and Brad Wright, Operations Manager*



Felipe Carrillo, VCI; Josefa Cabada, VCI; Jeremy Tamargo, VCI; Danielle Wisniewski, VCI; Steve Fisher, VCI; Lawrence Brown, VCI; Joe Cleope, VCI; Brandon French, VCI; Patrick Vicencio, VCI; Dave Obrochta, VCI; Tim Mann, VCI; Olivia Zaragoza, VCT; Christopher Doll, VCI; Shaun Redman, VCT; Reed Black, VCI; Heidi Budge, VCT; and Miaja McCauley, VCT

*Not Pictured: Tom Fische, Mechanic II; and Jason Descans, VCI*

District technicians and inspectors are certified through the Vector Control Certification Program of the California Department of Public Health.

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# Contra Costa Mosquito & Vector Control District

155 Mason Circle  
Concord, CA 94520  
925-685-9301  
www.ContraCostaMosquito.com

## Personnel

### Administration

General Manager: Paula Macedo, D.V.M., Ph.D.  
Administrative Services Manager: Maria Bagley  
Accounting & Benefits Specialist: Tina Cox  
Administrative Analyst II: Natalie Martini  
Administrative Analyst I: Areej Al Bahrani

### Laboratory

Scientific Program Manager: Steve Schutz, Ph.D.  
Vector Ecologist II: Eric Ghilarducci  
Vector Ecologist: Damien Clauson  
Biologist/Fish Program: Chris Miller

### Public Affairs

Public Affairs Director: Nola Woods  
Public Information & Technology Officer: Andrew Pierce

### Shop & Facility Maintenance

Mechanic II: Tom Fishe

### Information Technology

IT Systems Administrator: Wayne Shieh

### Operations

Operations Manager: Brad Wright

#### Mosquito Control Operations

Program Supervisor: Sheila Currier

#### Inspectors:

Lawrence Brown  
Josefa Cabada  
Felipe Carrillo  
Brandon French  
Jeremy Tamargo

#### Technician:

Olivia Zaragoza

#### Mosquito Control Operations

Program Supervisor: David Wexler

#### Inspectors:

Reed Black  
Christopher Doll  
Tim Mann  
Patrick Vicencio

#### Technicians:

Heidi Budge  
Shaun Redman  
Miaja McCauley

#### Vertebrate Vector Control Operations

Program Supervisor: Terry Davis

#### Inspectors:

Joe Cleope  
Jason Descans  
Steve Fisher  
Dave Obrochta  
Danielle Wisniewski

#### Vector Control Planner Operations

Vector Control Planner: Jeremy Shannon

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## Programs & Services

The District exists to reduce the risk of vector-borne disease or discomfort to the residents of Contra Costa County. The California Health and Safety Code defines a vector as, “any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rats, but not including any domesticated animal.”

Many vectors are extremely mobile and can cause the greatest harm and discomfort away from their breeding site. Each potential vector has a unique life cycle and occupies a specific habitat.

**Most District programs and services are funded by tax dollars and are therefore provided at no additional charge.**

### Integrated Vector Management

Mosquito and vector control is based on scientifically planned management tactics and control strategies that reduce the abundance of target pests in a timely manner. **Integrated vector management (IVM)** is a comprehensive program that incorporates several coordinated activities:

- **Vector Surveillance** — Investigating vector populations, vector habitats, disease pathogens, and public distress including trapping and laboratory analysis of vectors to evaluate populations and disease threats, and direct visual inspection of known or suspected vector habitats
- **Physical Control** — Managing vector habitat, especially through vegetation management, water control and maintenance or improvement of channels, tide gates, levees, and other water control facilities; the use of all-terrain vehicles, and maintenance of paths; and the use of trapping of vectors that pose a threat to public health and welfare
- **Public Education** — Encouraging and assisting reduction or prevention of vector habitats on private and public property through shared information
- **Biological Control** — Rearing, stocking, and providing to the public the “mosquitofish” *Gambusia affinis*; and possibly using other predators or pathogens of vectors
- **Chemical Control** — Applying bacterial products and selective insecticides to reduce populations of larval or adult mosquitoes and other invertebrate threats to public health, and rodenticides to control rats and other rodent threats to public health

Through the use of the District’s IVM program, District employees conduct surveillance and control of the following vectors of disease and discomfort:

### Mosquitoes

Contra Costa County is home to **23 different species of mosquitoes** that inhabit diverse ecological regions that create a range of mosquito sources. Mosquitoes can transmit the pathogens that cause a variety of diseases including West Nile virus (WNV). Certain species of mosquitoes found in Contra Costa County can transmit malaria, WNV, St. Louis encephalitis (SLE), Western equine encephalomyelitis (WEE), and potentially other encephalitis viruses. Another species of mosquito is also capable of transmitting dog heartworm.

In addition to the ability to transmit disease, mosquitoes can cause human discomfort when the female mosquito bites to obtain blood. Physical reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. An abundance of mosquitoes can also cause economic losses, and loss of use or enjoyment of recreational, agricultural or industrial areas.

The District regularly surveys more than 10,000 acres of marshland along the waterfront, 60,000 acres of irrigated farmland in the eastern portion of the county, and numerous ponds, creeks and residential sources countywide. District employees also inspect residential and commercial properties for mosquito problems and provide recommendations for controlling mosquito populations.

### Rats & Mice

Two introduced species of rats—the Norway rat and the roof rat—and the house mouse are present in Contra Costa County and are subjects of District action. In addition to being unsanitary, rats and mice can transmit a variety of organisms that can infect humans.

Rats are hosts to the worm that causes trichinosis in humans. Humans may become infected when they eat poorly cooked meat from a pig that has eaten an infected rat. Rat and mouse urine may contain the bacteria that cause leptospirosis, and their feces may contain salmonella bacteria. Bubonic plague and murine typhus may be transmitted by infected rat fleas. Rat bites may cause bacterial rat-bite fever or infection. Gnawing by rats and mice causes damage to woodwork and electrical wiring, resulting in damaged circuits and potential fires. Additionally, an abundance of rats and mice can cause economic losses, loss of use of public recreational areas and loss of the enjoyment of property.

District services for Contra Costa County residents or business owners include rat and mouse identification and advice for prevention and control. District employees do not bait nor set traps, but provide valuable, detailed information, guidance and recommendations. They may also issue a formal, detailed report, upon request.



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## Skunks

Skunks can be beneficial to the environment because skunks are a natural predator of rodents and they will consume other garden pests including beetles, crickets and grubs. Skunks are also one of the primary reservoirs and vectors of rabies in California. Because of extensive residential development near natural areas and their ability to live in close proximity to people, skunks pose a potential health risk.

In an effort to reduce risk of rabies transmission by reducing potential contact/conflicts between humans and skunks, the District works with homeowners to discourage skunks from visiting their property. District employees survey properties, provide guidance and recommendations and may warrant live catch skunk traps if a skunk has created a den and is actively living on private property. Typically, an active skunk den may be found under a deck, shed, house or wood pile.

## Yellowjackets

Yellowjackets are beneficial insects that eat garden pests and complete incidental pollination of crops through daily foraging; however, ground-nesting yellowjackets can bite, have a painful sting, can fly moderate distances, and are found throughout Contra Costa County. A single nest can lead to loss of use of public recreational areas, and loss of the enjoyment of property. More significantly, yellowjacket stings can result in anaphylactic shock and rapid death for the approximately 0.5 percent of the public with severe allergies.

The District provides control of ground-nesting yellowjackets only. Ground-nesting yellowjackets typically build nests in areas such as abandoned rodent burrows, the hollow areas near the root systems of shrubs, under railroad ties or under wood piles. Residents must locate and mark the nest before contacting the District for service.

## Ticks

There are four species of ticks that commonly bite people in Contra Costa County. Of these four, only the Western black-legged tick (*Ixodes pacificus*) is known to transmit Lyme disease in California.

The District provides tick identification services to the public and medical personnel. People who are concerned about possible Lyme disease infections should contact their physician. Information on Lyme disease testing of ticks may be found by visiting [Lyme disease Q & A](#). Several commercial laboratories will test ticks for the bacteria that causes Lyme disease for a fee. Visit [Tick Testing Labs](#) for more information.

## Bees (European and Africanized Honey Bees)

All honey bees are beneficial insects that are essential for pollination of many native California crops and plants. If a bee swarm does not present an immediate threat, it is best to leave it alone. Honey bee swarms in Contra Costa County are most likely ordinary European honey bees in pursuit of a permanent home and are docile unless provoked. Both European and Africanized honey bees are non-aggressive in this stage as they are not protecting their honey nor their hive. The swarms typically move away in a day or two.

District services for bees are very limited. The District provides inspection and education for bees. The District does not respond to bee stinging incidents. District employees treat bee swarms or hives that are a threat to people in public areas such as a school or shopping center. The District does not treat bee hives that are in or on a structure or on private property. Because Africanized and European honey bee populations can interbreed and are physically indistinct, the District cannot conclusively determine whether bees are Africanized or European by visual inspection. If there is reasonable evidence, the District may coordinate with other agencies for genetic testing and identification.

## Other Animals of Importance

Although certain animal species such as bats, ground squirrels, fleas, and opossums are not regularly controlled by the District, these animals play important roles in the transmission of rabies, plague, murine typhus, Hantavirus, or Lyme disease and may be surveyed for diseases. The District may provide education and consultation services to the public about disease risk associated with these vectors and appropriate measures to protect human health.

In extreme cases where the transmission of disease is likely, as with the other District integrated vector management activities, control efforts may be employed. Control of these animals is done in consultation with the California Department of Public Health, Contra Costa Health Services, Contra Costa County Animal Services, Contra Costa County Department of Agriculture and other local, state and federal agencies.

## Mosquito and Vector-Borne Disease Surveillance and Research

The District's laboratory staff conducts a comprehensive surveillance program for mosquitoes and the pathogens they can transmit, including West Nile virus (WNV), Western equine encephalomyelitis (WEE) and Saint Louis encephalitis (SLE) as part of California's statewide surveillance effort. The District also collaborates with the California Department of Public Health, the University of California and other state and federal agencies on studies intended to detect or predict new mosquito-borne diseases which might be introduced to Contra Costa County in the future.

A virus native to Africa which first appeared in the US in 1999, WNV has been the most prominent mosquito-borne virus here in California since its arrival in 2003, with approximately 6,800 reported cases and 303 deaths (the actual number of cases is probably much higher since only patients with the most severe form of the illness tend to be tested and diagnosed).

Serious outbreaks of WEE and SLE occurred in California as recently as the 1950s and 1960s. Six human cases of SLE were reported in California in 2019 in Fresno, Imperial, Kern and Stanislaus Counties. The District last detected WEE activity in 1997, when two chickens at the District's flock in the Martinez waterfront area tested positive for antibodies. Occasional travel-related human cases of Zika, dengue and chikungunya viruses have also been reported in Contra Costa County, but so far the District has not found evidence of local transmission of these diseases or of the mosquito species known to be capable of transmitting them.

The San Francisco Bay Area has also had a history of severe malaria outbreaks in the early part of the 20th century. Pioneering mosquito control efforts by Stanley Freeborn and others led to the eradication of malaria in California; however, international travel still occasionally brings people infected with malaria to our area, and *Anopheles* mosquitoes capable of transmitting the disease to others still occur here. The District works with the Contra Costa Department of Public Health to investigate and treat (if necessary) *Anopheles* mosquito breeding sites within the vicinity of reported human cases in order to prevent local disease transmission.

The District's Entomology Laboratory collects and analyzes the following types of information to help guide and plan effective and environmentally sound control of vectors and vector-borne diseases in Contra Costa County:

- Mosquito population surveillance
- Encephalitis virus surveillance
- Surveillance for other vector-borne diseases
- Identification of ticks and other biting arthropods

- Quality control and resistance monitoring for pesticide applications
- Research and special projects

### Mosquito Population Surveillance

Mosquito surveillance is a key component of the District's IVM program. **Twenty-three different species of mosquitoes** are found in Contra Costa County, and each one is different in terms of its habitat, biting habits, ability to transmit disease, flight range and appropriate control methods. The District's surveillance program monitors larval and adult mosquito populations countywide to track changes over time and identify potential risk areas for nuisance or disease issues. This information is used by the District's operations program employees to plan and carry out efficient, effective and environmentally sound mosquito control strategies.

### Larval Mosquito Surveillance

District personnel collect samples of mosquito larvae in the field daily and return them to the District's Laboratory for counting and identification. Treatment decisions can then be made, based upon species and density information in addition to other factors including habitat type, proximity to populated areas, and presence or absence of natural predators. The data are stored in a database which enables the District's laboratory staff to make comparisons with historical averages and to map larval populations by species. In 2019, laboratory staff counted and identified 34,623 mosquito larvae and pupae.

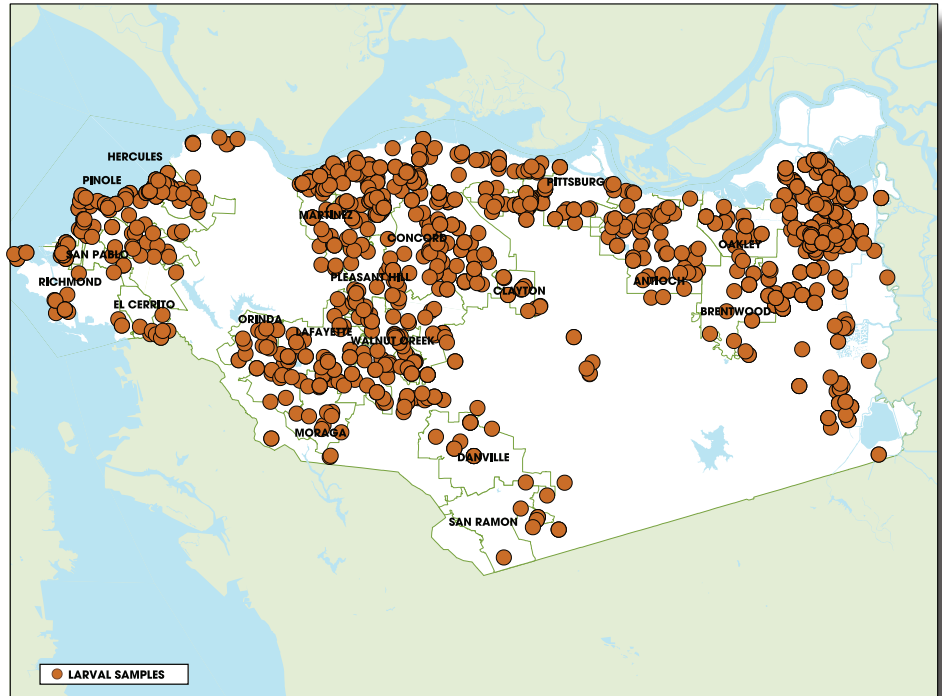


*District Vector Ecologist Eric Ghilarducci identifies mosquito larvae collected within Contra Costa County.*

LARVAL SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culiseta incidens</i>	12,538
<i>Culex tarsalis</i>	12,336
<i>Culex pipiens</i>	10,195
<i>Culiseta inornata</i>	1,884
<i>Aedes sierrensis</i>	1,069
<i>Aedes washinoi</i>	987
<i>Aedes dorsalis</i>	919
<i>Aedes nigromaculis</i>	898
<i>Aedes vexans</i>	624
<i>Aedes melanimon</i>	495
<i>Culex stigmatosoma</i>	439
<i>Aedes squamiger</i>	374
<i>Culiseta particeps</i>	278
<i>Culex apicalis</i>	239
<i>Anopheles franciscanus</i>	178
<i>Culex erythrothorax</i>	63
<i>Anopheles punctipennis</i>	63
<i>Anopheles occidentalis</i>	9
<i>Culex boharti</i>	9
Pupae*	2,519
<b>TOTAL</b>	<b>46,116</b>

\*pupae not identified to species

*Mosquito larvae identified in 2019 by species*



*Locations of mosquito larval samples collected by the District in 2019*

### Adult Mosquito Surveillance

The District utilizes two types of traps to monitor adult mosquito populations throughout the District’s service area—New Jersey light traps and Carbon dioxide (CO<sub>2</sub>) traps—at representative locations throughout Contra Costa County.

**New Jersey light traps** use light from a 2-watt LED bulb to attract night-flying mosquito species. The traps have light sensors which automatically turn them on at dusk and off at dawn and are operated year-round at 23 locations, some of which have been in use for 20 years or more. District employees pick up samples once a week and return them to the District laboratory for counting and species identification. Each week, current trap counts are compared to historical averages for different regions of the county to identify population trends that might require additional examination.



*A New Jersey light trap hangs ready to trap adult mosquitoes. A 2-watt LED bulb attracts night-flying mosquitoes.*

CO<sub>2</sub> traps are portable, battery-powered, and use dry ice to produce carbon dioxide, which is a powerful attractant for mosquitoes. In addition to the dry ice, there is also a small LED light. District employees set the traps once per week and leave them overnight at 24 'fixed' locations throughout the county and as many as 10-20 variable locations that are chosen based on other surveillance information (dead bird reports, mosquito complaints, field observations by District personnel, etc.). These traps collect both day and night-flying mosquitoes. District employees retrieve the traps and return them to the District lab while the mosquitoes are still alive so that lab employees can test them for WNV and other viruses. Counts can also be compared with regional averages to track population changes and target control activities.

### Adult Mosquito Abundance Trends

Although the District is able to monitor abundance of most of the mosquito species present in Contra Costa County, two species—the Western Encephalitis Mosquito, *Culex tarsalis*, and the Northern house Mosquito, *Culex pipiens*—are considered the most significant since they are the primary vectors of WNV and other encephalitis viruses such as SLE. Both species are widespread and abundant throughout the county. *Culex tarsalis* prefers clear water, and used to be more common in rural agricultural areas; however, in recent years it has become the most abundant species in abandoned or unmaintained swimming pools in residential neighborhoods. This mosquito may fly five miles or more from its larval habitat and so a single 'bad' pool can affect a large area. *Culex pipiens* prefers water containing a large percentage of organic material and is most common in sewer plants, dairy farm ponds and underground storm drains. This mosquito usually does not travel more than a few blocks from its larval 'source', but may be extremely widespread in residential neighborhoods during the summer due to overwatering of lawns and other urban water runoff that keeps the storm drains constantly wet.



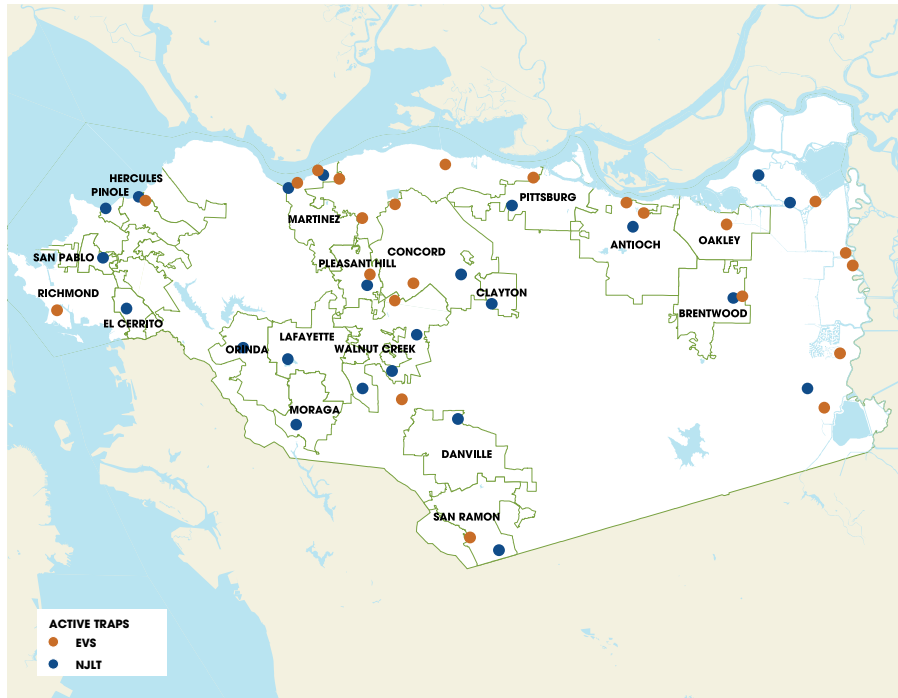
Scientific Program Manager Steve Schutz, Ph.D. examines adult mosquitoes that were trapped.

Rainfall was above the ten-year average during 2019, and daily temperatures were below average early and late in the season and above average during the summer months. Countywide populations of *Culex pipiens* fluctuated, but were below the five-year average for much of the season, while *Culex tarsalis* counts trended above average for much of the season. Part of that average is based on drought years, and the county's mosquito populations were still well below long-term averages. Some limited adult mosquito control operations were required in East County and Waterfront areas due to locally high mosquito populations.

A total of more than 58,000 adult mosquitoes were collected and identified in the District's random and fixed-location traps in 2019.

ADULT SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culex tarsalis</i>	22,784
<i>Culex erythrothorax</i>	19,444
<i>Aedes melanimon</i>	4,730
<i>Culex pipiens</i>	3,085
<i>Aedes vexans</i>	3,023
<i>Culiseta inornata</i>	2,663
<i>Culiseta incidens</i>	1,395
<i>Aedes dorsalis</i>	564
<i>Aedes sierrensis</i>	250
<i>Aedes washinoi</i>	241
<i>Culiseta particeps</i>	176
<i>Aedes nigromaculis</i>	169
<i>Anopheles franciscanus</i>	137
<i>Aedes squamiger</i>	16
<i>Anopheles freeborni</i>	6
<i>Anopheles occidentalis</i>	5
<i>Anopheles punctipennis</i>	5
<i>Culex stigmatosoma</i>	2
<b>TOTAL</b>	<b>58,695</b>

Adult mosquitoes collected in all fixed and random traps by species, 2019

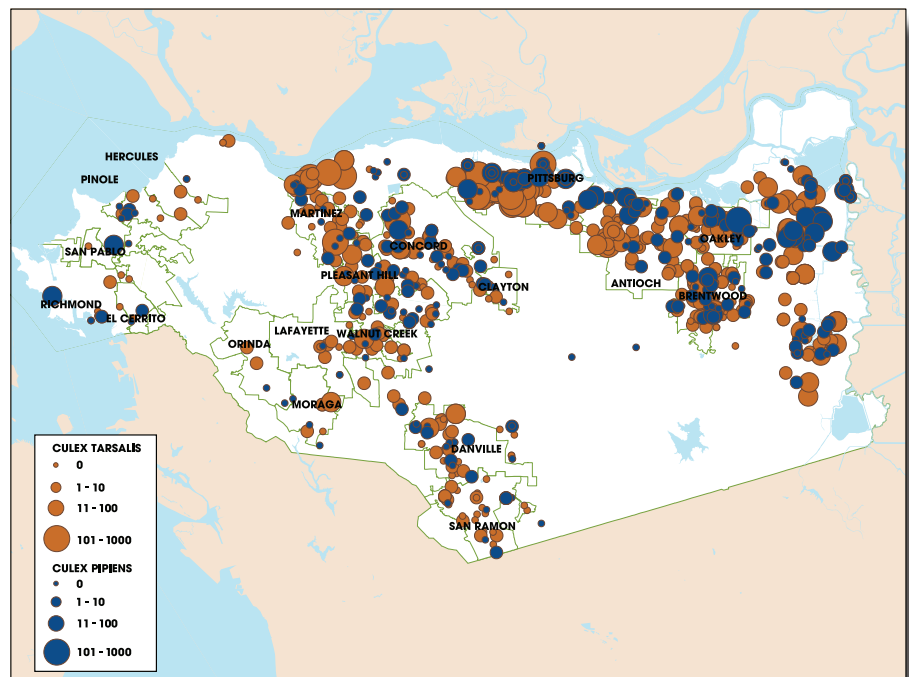


**FIXED ADULT MOSQUITO TRAP LOCATIONS IN 2019**

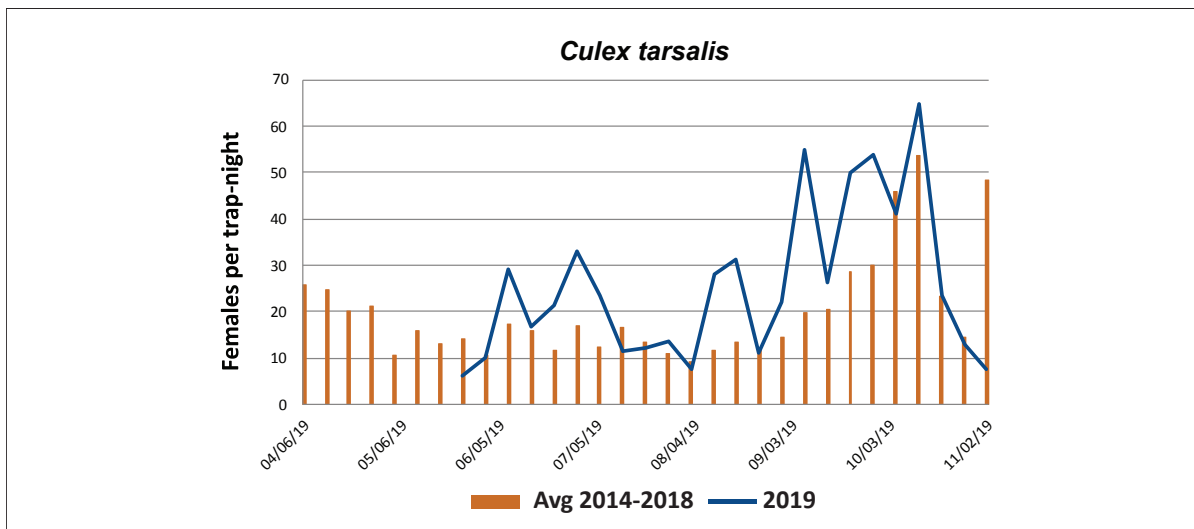
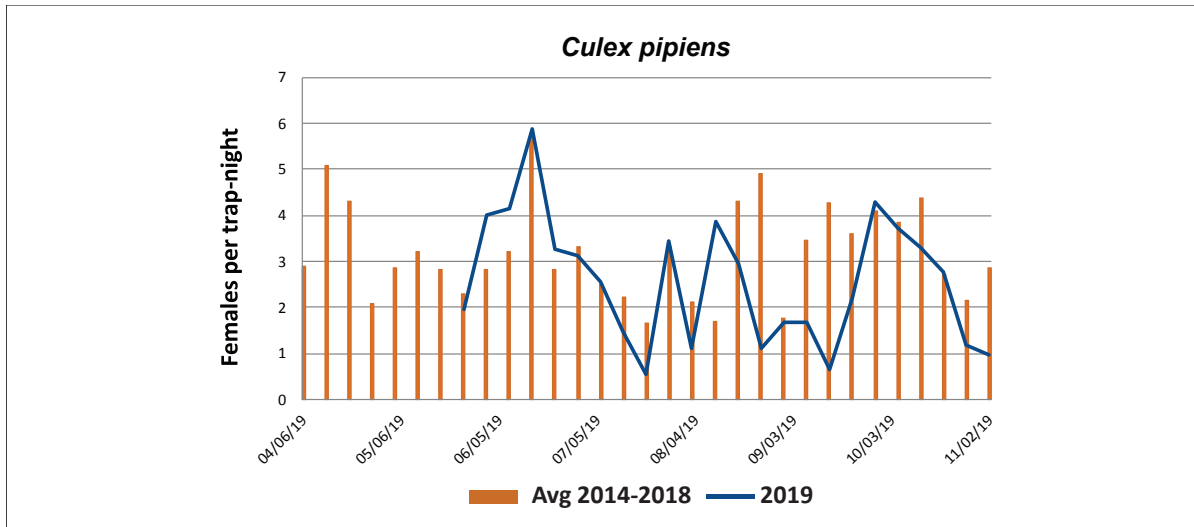
Both carbon dioxide, which simulates the breath of a person or animal, and light attract mosquitoes to the traps. Mosquitoes are then counted and identified to species to determine the risk of disease or nuisance to people. This graphic shows the locations of the District's CO<sub>2</sub> traps and New Jersey light traps in 2019.

**RANDOM ADULT MOSQUITO TRAP LOCATIONS IN 2019**

Random traps set throughout Contra Costa County capture mosquitoes for surveillance and control applications. *Culex tarsalis* and *Culex pipiens* are primary vectors of West Nile virus and other diseases. In this figure, the size of the circles illustrates how many mosquitoes were collected.



*Abundance of Vector Mosquito Species in Contra Costa County in 2019*



Adult mosquito trap collections vs. 5 year average, 2019

## Mosquitoborne Virus Surveillance

Mosquitoes collected in fixed location and random location CO<sub>2</sub> traps are tested for mosquito-borne viruses in batches, or 'pools' of between 10 and 50 individuals of a particular species. Samples are sent to the Davis Arbovirus Research Team (DART) laboratory at the University of California, Davis where they are tested for WNV, WEE, and SLE. This testing enables the District to determine areas of the County at risk for disease transmission and target our field employees and resources efficiently.

In 2019, 454 samples (15,451 mosquitoes) were tested; only one sample was positive for WNV, very late in the season (*Culex tarsalis*, Benicia Bridge/Martinez, October 28th). Very low West Nile virus activity was observed throughout the entire Coastal Region, and much of California, in 2019.



*District Vector Ecologist Eric Ghilarducci prepares a trap to capture adult mosquitoes by using dry ice to simulate human breath to attract the mosquitoes.*

## Dead Birds

The dead bird surveillance program represents a very successful collaboration between the California Department of Public Health, the District and the residents of Contra Costa County. Members of the public report dead birds to the statewide WNV Hotline by phone (1-877-WNV-BIRD) or online at <http://westnile.ca.gov>. Hotline operators screen the calls to determine whether the birds are suitable candidates for testing; if so, they are referred to the District to be collected. Although not all birds are candidates for testing, all reports are important since they are mapped and used to identify potential risk areas and to target additional surveillance (mosquito trapping and larval source inspections, for example).

Testing in 2019 was restricted to corvid (crow family) birds only (crows, ravens, jays, magpies). Although the District has occasionally found WNV positive birds of other species, corvids are the most highly susceptible and therefore represent the most sensitive indicators. During 2019, the WNV Hotline received 321 dead bird reports from Contra Costa County residents, which was the lowest number of dead bird reports the District has ever received in a single year. Of the birds reported in 2019, 23 birds were collected for testing and only one, a crow collected in Danville on September 3rd tested positive for WNV. Dead bird reports have been declining steadily since the beginning of the program in 2005, apparently due to a decline in public interest (birds still appear to be susceptible to the virus, since infection rates have fluctuated but have not shown a similar steady decline).



*Scientific Program Manager Steve Schutz, Ph.D. prepares a sample for WNV testing.*

## Sentinel Chickens

Chickens are naturally resistant to some mosquito-borne viruses and do not become ill, nor can they pass the virus back to mosquitoes, but they do develop antibodies that can be detected in lab tests. This makes them ideal 'sentinels' for detection of virus transmission. The District maintains a total of 50 chickens (ten at each of five flock sites) within Contra Costa County. The District obtains new young chickens from a commercial chicken farm each spring to ensure that they have not been previously infected. District lab personnel collect blood samples twice a month from April through October and submit the samples to the California Department of Public Health's Viral and Rickettsial Disease Lab in Richmond to be tested for antibodies towards WNV, WEE and SLE viruses.

In 2019, two of the District's chickens (both at Holland Tract, near Knightsen) tested positive for WNV antibodies. Chickens tested positive for antibodies between late August and September. Since chickens cannot pass the virus on to others, they are donated to charitable organizations for egg production or adopted by owners of the host properties at the end of each season.



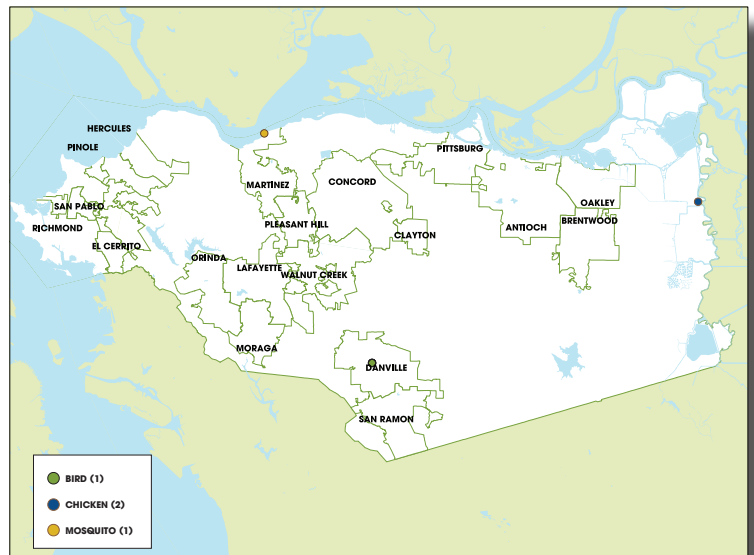
*Vector Ecologists Damien Clauson and Eric Ghilarducci prepare to collect a small drop of blood from each chicken's comb for antibody testing. Chickens do not get sick from West Nile virus, but they develop antibodies to the virus. If antibodies are detected, then it's evidence of West Nile virus transmission in the area.*

## Human and Equine Disease Cases

One human case of WNV was reported by the Contra Costa County Department of Public Health in 2019. Due to patient confidentiality regulations, specific information about the patient is not available. The vast majority of mild cases go unreported, for every reported case of neurological disease, so more than 10,000 Californians may have had West Nile virus infections in 2019, the vast majority of which were never diagnosed or reported.

Statewide, 214 human cases and six fatalities were reported in 34 counties 2019, down from 217 cases and 11 fatalities reported the previous year. The California Department of Public Health reports that there are typically 30 to 70 non-neuroinvasive (West Nile fever) cases, most of which go unreported, for every reported case of neurological disease, so more than 10,000 Californians may have had West Nile virus infections in 2019, the vast majority of which were never diagnosed or reported.

No equine cases were reported in Contra Costa County by the California Department of Food and Agriculture; 15 positive horses from 12 counties were reported statewide. An effective vaccine for horses has been available for several years and the vast majority of cases involve unvaccinated horses. A human vaccine is not available.



*Positive West Nile Virus Activity in Contra Costa County in 2019—two sentinel chickens, one dead bird and one mosquito sample tested positive.*



## 2005 – 2019 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mosquito Samples	Samples Tested	425	523	721	729	814	536	484	468	454	652	622	495	550	709	454
	Total No. Mosquitoes	20,309	24,358	28,290	23,502	27,436	16,820	14,321	11,571	12,730	17,999	21,533	15,612	16,546	23,776	15,451
	West Nile Virus Positive	4	20	28	31	17	4	7	19	13	25	8	11	6	17	1
Chickens	Blood Samples Tested	800	904	669	851	717	773	600	590	631	598	609	571	624	554	527
	Total No. Chickens	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
	Seropositive	18	24	5	15	13	4	0	7	8	15	18	5	7	16	2
Dead Birds	Total Reported	5,589	3,472	2,042	2,227	1,221	923	1,057	1,816	1,377	1,355	912	861	692	711	321
	Total Tested	518	388	158	115	80	32*	74*	106*	123*	115*	49*	76*	58*	45*	23*
	West Nile Virus Positive	94	92	29	88	45	8	43	66	68	44	11	33	19	17	1

\*testing restricted to crows/jays only

### Invasive Mosquito Species

In addition to the non-native Asian tiger mosquito (*Aedes albopictus*), which has been established in parts of the Los Angeles basin since at least 2011, vector control districts in the Central Valley and Southern California have continued to report finding populations of the yellow fever mosquito, *Aedes aegypti*. During 2019, this species expanded its range northward into nearby San Joaquin and Sacramento Counties. *Aedes notoscriptus*, the Australian backyard mosquito, has also been found in southern California although its range does not appear to be expanding as quickly.

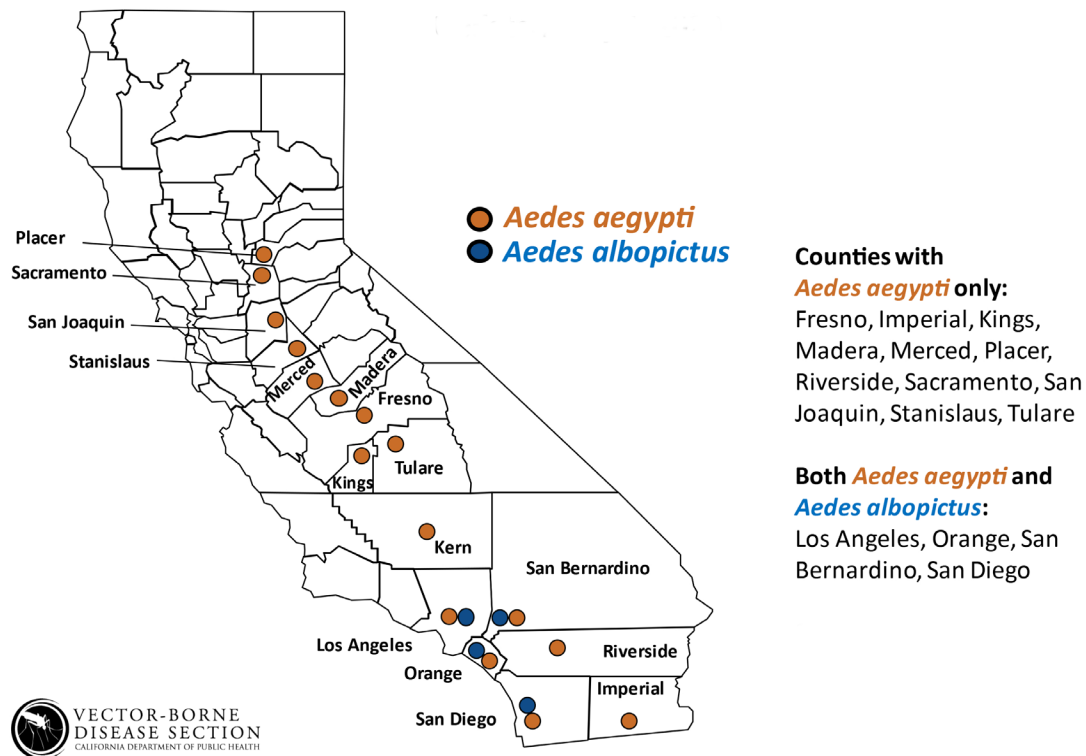
All of these species are similar in behavior, in that they are adapted to living around humans and lay their eggs in a wide variety of natural and artificial water containers. They are potential vectors of viruses that transmit human disease, including dengue virus, which has been on the increase worldwide, chikungunya virus, which spread explosively throughout the Caribbean, Central and South America in 2014, and Zika virus, which spread rapidly in South and Central

America in 2015. Travel-related cases of these viruses continue to be reported throughout the United States.

These mosquitoes are known for being difficult to control and for causing significant nuisance issues. So far, attempts to eradicate the new mosquito populations have met limited success. Cases of chikungunya, dengue and Zika diagnosed in California residents returning from the affected areas raise the concern that the invasive mosquitoes may spread these viruses.

In 2018, the District obtained a Federal grant to purchase specialized traps (BG Sentinel) to assist with detection of invasive mosquitoes. In 2019, District employees continued to set the traps at suspect locations. So far, our surveillance program has not detected the presence of these species in Contra Costa County, although they are now at our eastern border.

## ***Aedes aegypti* and *Aedes albopictus* Mosquitoes in California Detection Sites by County/City**



### **Pesticide Resistance Monitoring**

Mosquitoes and other insects always have the potential to develop resistance against the materials we use to control them. Since all of the products we have used to control adult mosquitoes in recent years come from a single related class of chemical compounds (natural pyrethrins and synthetic pyrethroids), which are also widely used by homeowners and private pest control operators as well as on agricultural operations, it is important to determine whether our local mosquito populations are still susceptible or whether we need to consider alternative control agents. In 2019 we tested *Culex tarsalis* collected from our Waterfront area and determined that they are still fully susceptible to etofenprox, the active ingredient we are currently using most frequently. In addition, we were able to re-establish a colony of known susceptible *Culex tarsalis* which can be used as a baseline to compare against 'wild' mosquitoes, and obtained and successfully used a new commercially available membrane blood-feeding device (and built another) to feed our colony warmed chicken blood. Our previous colony had gone extinct several years earlier due to inbreeding.



*Apex blood feeder in use*

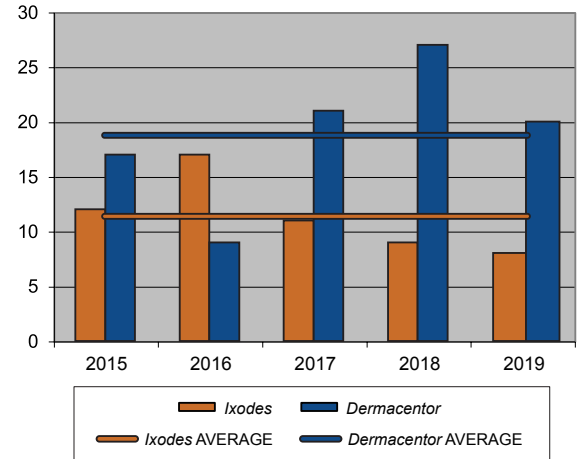
## Tick and Pest Identification and Information

Lyme disease is a bacterial infection transmitted by the western black-legged tick (also known as the deer tick). On average, there are two to four human cases reported per year, and it can cause serious complications if not treated promptly.

District staff continue to identify ticks brought in by members of the public. Identification is important as only one of the three species of ticks that commonly bite people (western black-legged tick) transmits the causative agent for Lyme disease. After careful consideration, the District entomologist and vector ecologist, along with biologists from the California Department of Public Health concluded that individual tick testing does not significantly reduce the risk of Lyme disease for patients since the data cannot confirm human disease. People who are concerned about the possibility of being infected with Lyme disease should contact their physician.

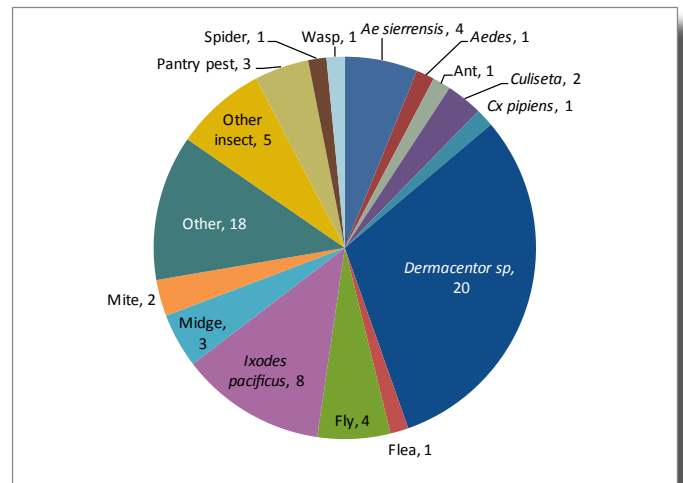
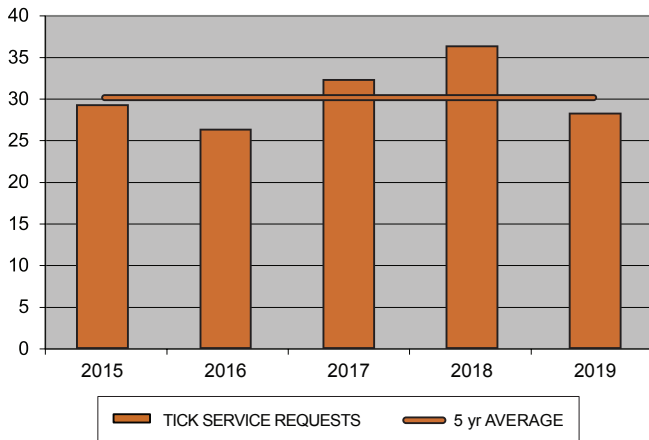
In 2019, there was a slight decrease in the total numbers of tick related service requests compared to the 5 year average. Of the 28 ticks identified by our staff, 8 were western black-legged ticks, the vector of Lyme disease.

Tick Service Requests by Type



As a courtesy to the public, our Laboratory staff also identifies samples of biting and stinging pests submitted by the public. In 2019 we responded to 75 such requests which do not include inquiries received via phone or email.

Tick Service Requests



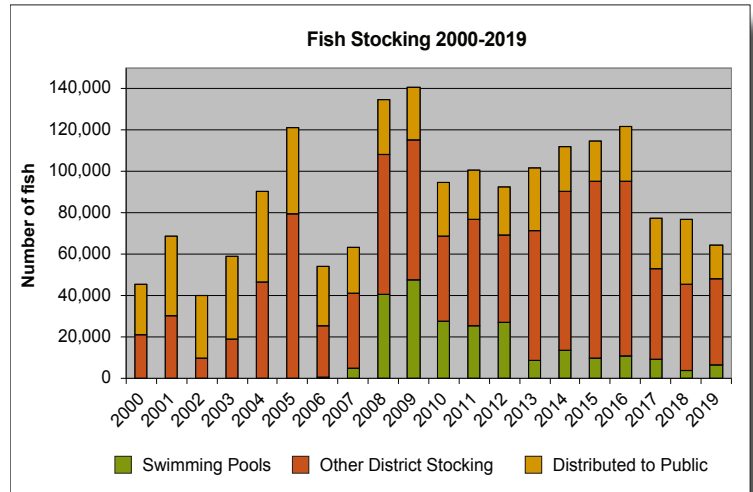
Pest identifications by Lab staff in 2019. "Other" refers to samples not containing biting insects or other arthropods.

## Biological Control and Fisheries Research

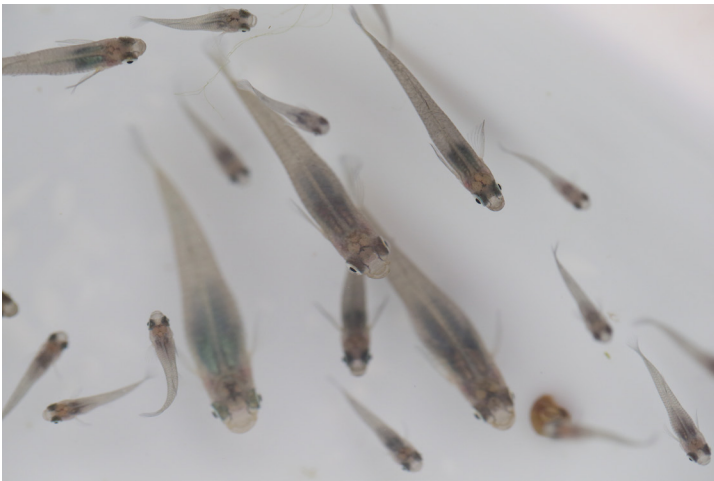
Known around the world as mosquitofish, *Gambusia affinis* are an effective biological control tool, as each surface feeding fish has the ability to eat mosquito larvae, thus preventing them from developing into adult mosquitoes capable of biting and potentially spreading mosquito-borne illness. District employees place mosquitofish in water sources to reduce the risk of mosquitoes. We also provide the fish to Contra Costa County residents for placement in water sources on private property including decorative ponds, neglected swimming pools, hot tubs, and horse troughs.

The District's biologist facilitates the fish program, which in 2019 produced approximately 920,000 mosquitofish and distributed 64,198 mosquitofish to properties and other locations in Contra Costa County.

While *Gambusia affinis* is the District's mosquitofish, the District also conducts research on potential California native fish species for use in mosquito control and environmental education. In late 2019 the District worked with the Department of Water Resources regarding breeding and stocking native fish species as part of an effort to restore the Delta to tidal wetlands, and provided Lab-reared native fish for classroom projects.



Fish Stocking 2000 - 2019

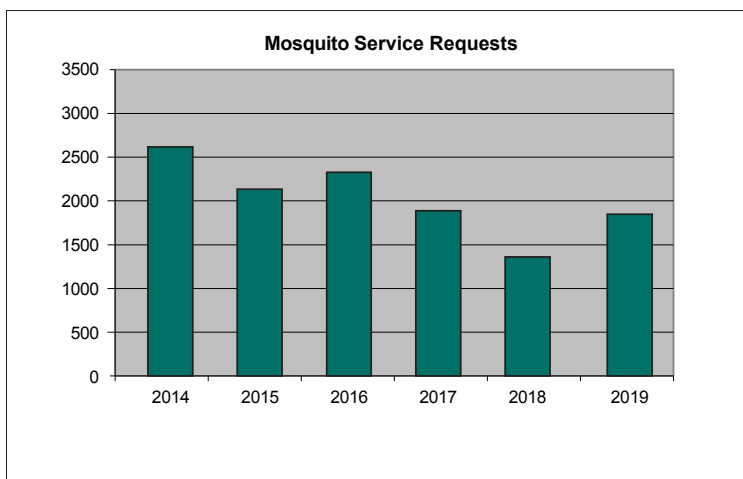


Mosquitofish (*Gambusia affinis*)

## Mosquito Control Operations

District employees work year-round to reduce the risk of mosquito-borne illness across the 716 square miles of Contra Costa County by preventing mosquitoes when possible and controlling mosquitoes when necessary to protect public health for 1.15 million county residents.

In 2019, District employees responded to 1,576 requests for mosquito service from Contra Costa County residents and performed 6,607 inspections of potential sources of mosquitoes county-wide. During 2,350 of those inspections, the District employee confirmed mosquito production at the location.



## Training and Certification

### Annual Training

Annual training for District employees is designed to ensure that we comply and exceed all requirements of the regulatory agencies with jurisdiction over the use of public health pesticides to reduce the risk of vectorborne disease. Training sessions are scheduled throughout the year and include review of the 23 known species of mosquitoes currently in Contra Costa County, instruction on current labels for the products used by the District, and equipment training and review. Proper training allows District employees to carry out their tasks with confidence and expertise.

### State Certification

District technicians and inspectors are certified through the Vector Control Certification Program of the California

Department of Public Health. District employees obtain and maintain state certification for public health work in vector control to ensure that best practices are followed through continuing education and state-proctored testing. Areas of focus during state certification include safe and effective use of pesticides, biology and control of mosquitoes, other invertebrates and vertebrates of public health significance. Certification is renewed every two years.

### Early Prevention Reduces Risk of Mosquitoes

Overgrown vegetation in creeks and other areas can become potential sources of mosquitoes. These areas can present challenges to control the mosquitoes when the vegetation prevents access for District employees. To increase access, early each year, District employees conduct brushing, which is cutting back vegetation to prevent over-growth and allow for access later in the year.

Potential mosquito sources can also be found in tree holes which are the voids that can form, often in older trees, including oak trees. The western tree hole mosquito (*Aedes sierrensis*) is a day biting vector of dog heartworm. The District works to reduce the risk of dog heartworm by doing proactive treatments to tree holes. In 2019, District employees focused on areas where previous mosquito activity was reported and used an expandable product to fill in the tree holes and prevent water from accumulating, thus preventing mosquitoes. During the course of the year, they subsequently responded to 40 requests for service related to tree hole mosquitoes.

Rainwater can produce sources of mosquitoes in many areas of the county, including along coastal areas where the freshwater mosquito (*Aedes washinoi*), the California salt marsh mosquito (*Aedes squamiger*) and the inland floodwater mosquito (*Aedes vexans*) can be found. District employees provide inspections and treatments as necessary for these mosquitoes after periods of rainwater because they are aggressive day-biting mosquitoes, and the California salt marsh mosquito in particular can fly up to 20 miles from their source.

## Creeks, Channels and Pastures

As the rainy season ends, warm temperatures usher in the heart of mosquito season when once flowing water in areas including creeks and channels can pool, creating sources of mosquitoes. District employees work to manage both nuisance and disease carrying mosquitoes in these areas, finding them more accessible for inspection and treatment due to the brushing District employees conducted earlier in the year.

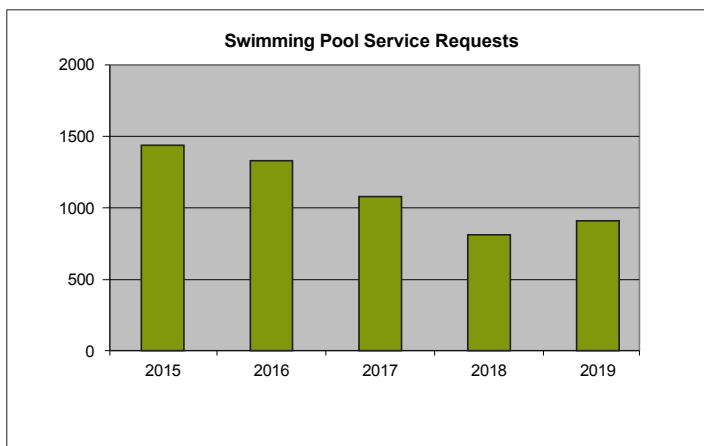
District employees inspect pastures, fields and channels for mosquitoes that can be the result of rainwater followed by continued irrigation. District employees work with land owners and often recommend irrigation schedules and changes to work practices to reduce the likelihood of mosquito production.

## Neglected Swimming Pools and the Risk of Mosquito-borne Disease

The two species of mosquitoes that are known to transmit West Nile virus (WNV) in Contra Costa County are the western encephalitis mosquito (*Culex tarsalis*) and the northern house mosquito (*Culex pipiens*). The two species will lay eggs in a number of sources including neglected swimming pools. One neglected swimming pool has the potential to produce 1 million mosquitoes and can put an entire neighborhood at risk of WNV, making neglected swimming pool inspections a priority for mosquito prevention and control.

### Neglected Swimming Pool Program

In 2019, the District revised our neglected swimming pool program to increase owner responsibility. The District's Vector Control Planner (VCP) now serves as the point of contact to communicate and meet with homeowners. The change in the program is to encourage and empower homeowners to maintain their swimming pools. When needed, the VCP can refer the property to a District employee for a mosquito inspection. In 2019, District employees received 832 requests for service at neglected swimming pools. In the first year of the updated program, the number of requests for service increased from the previous year, but was less than the five year average.



### Zone Reassignments

As the 2019 mosquito season moved toward the mid-summer peak of mosquito activity, District supervisors reconfigured the District's 10 mosquito program coverage zones to provide more effective distribution of services. There are now 11 mosquito zones, each represented by a District employee who responds to requests for mosquito service from county residents as well as other mosquito sources throughout each zone. Moving forward, the District plans to take a closer look at the mosquito zones and make future adjustments as needed to ensure efficient mosquito control coverage.

## Special Projects and Equipment

### Water Hyacinth Research

2019 marked the end of a five-year joint project involving the District and the U.S. Department of Agriculture, Agriculture Research Service to determine the impact of invasive aquatic weed control on mosquito populations along the Delta. During the five year project, the District investigated whether efforts to control water hyacinth, an invasive aquatic weed that has become overgrown in areas of the Delta, have a positive or negative impact on our mosquito control efforts.

Our Laboratory and Operations staff continued to inspect the hyacinth mats, and the areas treated with aquatic herbicides, by boat. We also used CO<sub>2</sub> traps to study the presence of adult mosquitoes in the area. We are grateful to the Department of Boating and Waterways, Parks and Recreation; and the USDA for the opportunity to work together on this project.



CO<sub>2</sub> trap used during water hyacinth research along the Delta

## District Boats

The District has three boats for use in the mosquito program. The boats allow District employees to reach areas along the Contra Costa County shoreline, including the islands within Contra Costa County, along the Delta and among the hyacinth mats that were previously out of reach. District employees also use the boats to conduct coastal trapping which allows them to determine the influence of wind and precipitation and monitor adult mosquito populations.



*District vector control technician Olivia Zaragoza inspects vegetation for mosquito larvae from a District boat.*

## UAS Program

In 2018, the District purchased an Unmanned Aircraft System (UAS), also known as a drone. In 2019, the drone was put into use for mosquito surveillance. The UAS allows for more efficient inspection of large agricultural and wetland areas that would take someone on foot many hours or more to completely inspect. The information gathered by the UAS helps the District plan appropriate treatment of specific areas of the county. The District is currently investigating other uses of the UAS in surveillance and control of mosquitoes.

## Vector Control Planning

As mentioned earlier in this report, the District's Vector Control Planner (VCP) now serves as the point of contact to communicate and meet with homeowners as a result of changes in the District's neglected swimming pool program. In addition, the VCP reviewed approximately 254 project proposals from local, county, state, and federal agencies for potential vector control concerns in 2019.

In 2019, the VCP coordinated better vector control access to several sites throughout Contra Costa County and relayed maintenance concerns and guidance to other agencies regarding possible sources of mosquitoes.

Areas of concern for mosquito production include ponds with overgrown vegetation that restricts proper drainage and subsequently leads to consistent mosquito production. The problem may be magnified when a water feature is adjacent to a residential community. When working with a Home Owners Association (HOA), the VCP can help resolve mosquito-related problems and improve quality of life for local residents.



*Area of concern*

## Rats & Mice

The District provides rat and mouse inspections of residential and business properties within Contra Costa County, upon request. The county is home to three primary rodents: Roof rats (*Rattus rattus*), Norway rats (*Rattus Norvegicus*) and the House mouse (*Mus musculus*). Of the close to 2,000 species of rodents worldwide, these three species are commensal, which means they prefer to live in close proximity to humans. These species are well established throughout our county and all of California.

Rats and mice are vectors of disease often through contamination of food that has come into contact with their urine, feces and saliva. For example, one mouse can deposit 50-75 droppings and 2,000 plus microdroplets of urine per day. This creates the potential for human exposure when coming in contact with contaminated surfaces or food.

Rats and mice are capable of spreading approximately 35 potential diseases and research indicates that exposure to specific proteins found in rodent urine known as Major Urinary Proteins (MUPs) is a potential cause of asthma. Rats and mice are also a risk to public health due to the damage they cause by gnawing and physically damaging structures. They pose the potential of starting structure fires by gnawing on electrical wiring.

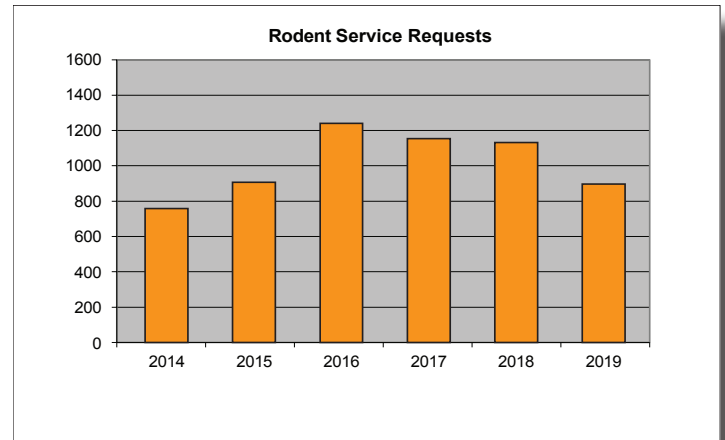
If county residents or property owners suspect rat or mouse activity in or around their home or business, they can contact the District to request service for rats and mice. In 2019, the District received 884 requests for rat and mouse service and District employees subsequently performed 871 inspections.



*District vector control inspector David Obrochta inspects a property for signs of rats and mice.*

The majority of the requests for rat and mouse service came from areas in central and west Contra Costa County, with 139

requests for service coming from Walnut Creek, followed by 74 from Lafayette, 73 from Concord, and 69 from Richmond.



During the inspections, District employees explain that rats and mice are opportunistic and even the cleanest homes may develop a rodent problem. The District service includes an inspection of the exterior of the structure as well as limited areas inside of a property such as kitchens and garages. District employees are state-certified and provide identification of the rodent species, information regarding how rats and mice may be gaining access to the structure and recommendations on what to do to reduce rodent harborage and access. Each inspection includes a detailed brochure outlining areas of concern, information on how to set traps, and a list of appropriate materials that can be used to seal up and repair rodent entry points. A written field inspection report may be provided at the request of the property owner or tenant.

The District does not provide control measures on private property; however, the District does provide rodent surveillance and control in coordination with other municipalities and entities that manage public space. Areas such as parks, trails, marinas, and open space are regularly monitored for rodent activity.

### Sewer Baiting

In 2019, District employees inspected and monitored sewer systems throughout Contra Costa County and treated 206 sewer locations for rodent activity.

### Bait Stations and Trapping

Throughout the county, we monitor rodent activity at creeks, parks, trails, marinas and other open spaces. Bait stations were placed and trapping was conducted at 70 locations in 2019.



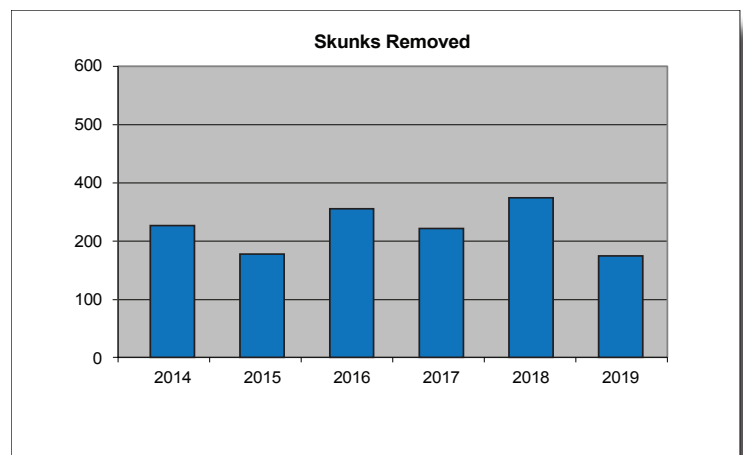
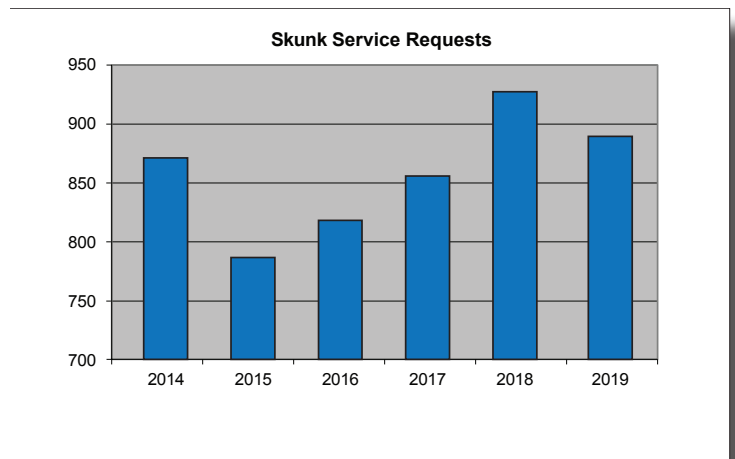
## Skunks and Rabies Risk Reduction

Skunks can be beneficial to the environment because skunks are a natural predator of rodents and they will consume other garden pests including beetles, crickets and grubs. Skunks are also one of the primary reservoirs and vectors of rabies in California. The District provides inspections and advice for county residents when skunks are believed to be denning on private property. Preventing skunks from living under homes and buildings and from raising their young in close proximity to people may help to reduce the risk of rabies. Skunks have the potential to transmit rabies by biting an animal or human. The virus infects the central nervous system and can lead to death if left untreated.

District inspectors inform residents on what appropriate measures are needed to reduce contact with skunks and eliminate denning on the property. Skunks are attracted to food. There are many food sources throughout any neighborhood that should be managed. Some favorite skunk food sources include bird seed, pet food and fallen fruit (especially figs). In many cases skunks cause damage to turf in search of lawn grubs. One of the largest contributing factors to a skunk problem is the feeding of animals outdoors. Food left out for feral cats and other wildlife can attract skunks from great distances. The routine feeding of wildlife is harmful as it conditions them to change their foraging behavior and brings animals together in higher density, increasing the potential for the spread of disease. More information can be found at the California Fish and Wildlife website: [Keep me Wild](#).

The District's primary goal is to educate residents, landowners, agencies, school officials and business owners on the permanent steps they can take to keep skunks from living nearby. Skunks will often create a den under decks, homes, sheds and other structures. District inspectors provide property inspections and advice on how to prevent skunks from denning on the property. The District employee also provides literature that includes instructions on how to install wire mesh to block skunks for areas where they could potentially build a den.

The District divides the county into two vertebrate zones for skunk services and one vector control inspector is assigned to each zone. In 2019 the District received 895 requests for skunk services, the second largest amount of the previous five years. District employees removed 247 skunks from Contra Costa County properties in 2019, a 36 percent decrease over the average number of skunks removed in 2018. When the District loans a live catch trap to a property owner, but a non-target animal is caught, the animal is released on the property. In 2019, 73 animals were released compared to 106 animals in 2018.

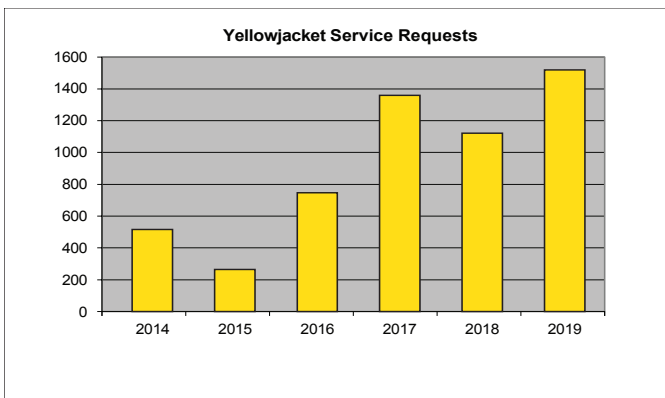


## Yellowjackets

Yellowjackets pose a risk to public health because they have the ability to bite and sting multiple times, putting people, particularly those who suffer allergic reactions to stings and bites, at increased risk of injury.

Contra Costa County is home to four common species of yellowjackets including the western yellowjacket (*Vespula pensylvanica*) which builds nests underground—usually taking over abandoned rodent holes and subterranean voids. To protect the public from these biting and stinging wasps, the District provides inspections and treatment of these specific nests.

The District received 1,511 requests, a record number of requests for yellowjacket service in 2019. District employees performed 289 inspections for groundnesting yellowjackets and treated 1,337 yellowjacket nests in 2019.



### An Early Start

Mild winter temperatures enabled many yellowjacket nests to survive the winter and increase their numbers more quickly than usual. Abundant rainfall also enhanced their food supply by allowing vegetation and populations of the plant-feeding insects that yellowjackets feed on to thrive. Rodent burrows abandoned due to rainwater flooding were empty and available by spring for ground-nesting yellowjackets to start building new nests.

Contra Costa County residents began requesting yellowjacket service in early spring, as activity began to increase. Many of the calls came as a result of social media posts, as neighbors shared information about the District's yellowjacket service. In some areas of the county, new construction displaced yellowjackets, prompting more requests for service. The majority of the requests for yellowjacket service came from areas in central and west

Contra Costa County, with 279 requests for yellowjacket service coming from Lafayette, followed by 250 from Orinda, 210 from Walnut Creek, 144 from Moraga and 97 from Martinez. A common feature among these locations is that they all have areas with hills and old growth trees which are more likely to have rodent burrows that attract ground-nesting yellowjackets.



*Entrance to a groundnesting yellowjacket nest obscured by vegetation*

### A Mild Winter Leads to Larger Nests

Most yellowjacket ground nests do not survive very cold winters, thus reducing the population at the beginning of the next season when the surviving queens emerge from their hiding places to start new nests. However, due to mild winter conditions in 2019, it appears that many nests not only survived, they thrived. District employees found evidence to support this theory when they found larger nests than usual in 2019.



*District vector control technician Heidi Budge inspects a large groundnesting yellowjacket nest.*

## Honey Bees

Honey bees are beneficial insects that are essential for pollination of many crops, flowers and other plants. Frequently, Contra Costa County residents request ground-nesting yellowjacket service, but when District employees arrive, they find honey bees instead. In 2019, the District modified our service to provide inspection and education about honey bees. The District does not provide treatment of bee hives nor do we respond to stinging incidents, but we do provide identification and information on honey bee biology and habitat. Residents who wish to have bees relocated are referred to local beekeepers, who can remove the bees safely without killing them.

Honey bee swarms are groups of worker bees that leave their hive along with a new queen to seek a place to start a new hive. They look like a ball of bees clustered on a tree or a man-made structure. Swarms are not aggressive, as they are in search of a permanent home and are not protecting their honey nor their hive. Swarms typically move away in a day or two when they find a good location to build a hive (usually inside a hollow tree or other cavity). The only time the District will provide treatment for bee swarms or hives is when they pose a potential threat to people in public areas such as schools or shopping center parking lots. The District does not treat bee hives that are in or on structures or on private property.

In 2019, the District received two requests for bee service. The District previously referred to our program as an Africanized honey bee (AHB) program, however, because Africanized and European honey bee populations can interbreed and are physically indistinct, the District cannot conclusively determine whether bees are Africanized or European by visual inspection. If there is reasonable evidence, the District may coordinate with other agencies for genetic testing and identification.



*A closer look at the bees in a tree*



*A District employee inspects bees in a tree.*

## Environmental

In addition to protecting public health, the Contra Costa Mosquito & Vector Control District is dedicated to protecting the natural environment. The District plays an important and collaborative role in the conservation and restoration of Bay Area wetlands, protection of endangered and threatened species, and promotion of biorational (low environmental impact) control methods in order to protect both human and environmental health. In 2019, we updated the District's spill prevention, control, and countermeasures plan; as well as the District's emergency response plan with environmental stewardship in mind. We also worked with the East Contra Costa County Habitat Conservancy and East Bay Regional Parks to mitigate concerns about the District's work at a habitat restoration project.

## Public Affairs

The public affairs department employees work closely with residents and news media to inform and educate about important health topics. Staff members provide general and tailored presentations to various groups of 12 or more adults or school children. Public Affairs personnel also write articles, create videos, participate in social media interaction, and provide information at events, workshops, and community discussions.

### Community Outreach

The goal of public affairs is to encourage Contra Costa County residents to change behavior to reduce the risk of vector-borne disease. Community outreach is the mainstay of the District's public affairs department. With more than 1.1 million residents who live and work within Contra Costa County's more than 716 square miles, public cooperation is imperative when it comes to preventing vector-borne disease.

The District's public affairs program is designed to educate residents about their important role in integrated vector management. The approach is diverse and uses specific tactics that are consistently evaluated for maximum and cost-effective impact.

### Electronic Communication

Internet distribution of District publications is swift, succinct, and provides a sharable format making it a more efficient communication vehicle than traditional mail. The public affairs department publishes [News Releases](#), [Adult Mosquito Control Notifications](#), the [Mosquito Bytes Newsletter](#), and this [annual report online](#). Members of the public may subscribe to the District's publications. The District ended 2019 with 3,490 total subscribers, a 26 percent increase over the total number of subscribers in 2018. Of the subscribers to the District's online publications, 47 percent accessed the publications through mobile devices and 53 percent accessed them through desktop computers.

### Traditional Outreach

The public affairs department conducts paid advertising, provides presentations and participates in events by providing informational displays, all in an effort to spread the District's messages and information through traditional outreach.

In 2019, the public affairs department focused on the advertising campaign entitled, "Mosquito Control is in (Y)our Hands," primarily during mosquito season, to symbolize the important partnership between the District and its residents. The theme was featured in digital advertising, signage, print advertising, and Internet advertising.

**Digital Billboard:** The public affairs department purchased digital advertising on a digital billboard located on the eastbound side of Highway 4 in Pittsburg to feature the "In (Y)our Hands" campaign from July through September. Caltrans estimated 155,000 vehicles passed by the sign per month, providing ample viewing opportunities for commuters. The District's message appeared as part of a slideshow that gave commuters eight seconds to view the message at a time while the sign was illuminated from 6 a.m. until midnight, seven days a week.

**Signage:** The public affairs department purchased bus advertising to display the "In (Y)our Hands" campaign on the back and side of 15 buses representing all three transit agencies in Contra Costa County: WestCat, TriDelta, and the County Connection. The campaign ran from early June until the end of August, 2019.



*"In (Y)our Hands" campaign sign on side of County Connections Bus*

**Internet Advertising:** In 2019, the public affairs department purchased Internet banner advertising to place additional focus on the District's service to reduce the risk of rats and mice. Internet banner ads can be designed to appear on webpages visited by Contra Costa residents who enter specific keywords into an online search engine, such as, "rats" or "mice." When visitors clicked on these online ads, they viewed a web page specially created to

detail more information about the District's service. The "Got Rats?" ads led to 878 pageviews when they appeared November 2019 through January 2020.



"Got Rats?" Internet banner campaign

**Print Advertising:** The East Bay Times newspaper reaches approximately half of the county's 1.1 million residents. The public affairs department purchased eight front page ads in the East Bay Times that were placed across the bottom of the page for high visibility and easy readability, June through September. The Brentwood Press is a publication that specifically provides news stories from Antioch, Brentwood, Discovery Bay, and Oakley. The public affairs department purchased 10 advertisements in this newspaper because these cities traditionally experience West Nile virus activity and the public affairs department recognized the importance of reaching these areas of increased mosquito activity with the District's messages.

## Presentations and Events

The public affairs staff conducted 15 presentations to community groups and organizations, and provided an informational display at 10 events in 2019.

## Website

The District's award-winning website remains the No. 1 communication tool for constituents and media alike. The 300-page site also serves as an important reference tool for a worldwide audience. Public affairs staff manage the website to ensure timely and up-to-date information. In 2019, 50 percent of website visitors viewed the pages on a desktop computer, 43 percent viewed the website on a mobile device, and 7 percent viewed website content on a tablet device. Among the most visited pages of the District website, the service request page received 4,080 pageviews, information about all of the District's services and programs earned 1,714 pageviews, and information about the virus risk of rodents earned 1,853 pageviews.

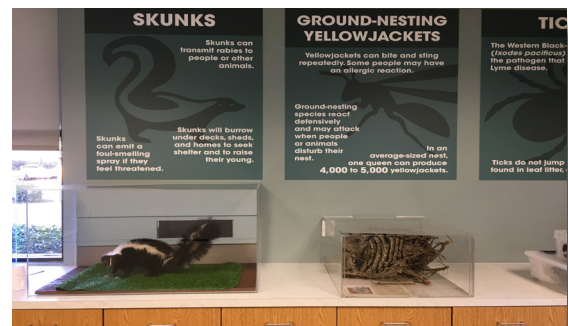
## Social Media

The District uses social media as a communication vehicle with the specific purpose of providing District messages and information to the public. In 2019, the public affairs department used Twitter to disseminate news releases and the Mosquito

Bytes Newsletter to members of the public and the local news media. As a result, several media outlets produced stories on behalf of the District throughout the year.

## Education Center

In 2019, the public affairs department embarked upon repurposing a portion of the District building to enhance the educational experience residents could receive at the District. The area is dedicated to specimen displays and interactive presentations.



District Education Center

An outdoor "vector house" was also constructed to further educate residents about what to look for in regard to evidence of insect or animal habitat or invasion. Both the education center and vector house are part of the public affairs department's effort to offer the public a more intuitive opportunity to learn about the service and programs that the District provides. Also, each entity can be utilized as an additional classroom and training opportunity for current and newly hired District employees.



District Vector House

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## *Administration*

The administrative staff serve both the residents of Contra Costa County and our District staff. Staff provide a wide range of supporting services including answering questions and entering service requests from residents; processing compliance reports for state and federal agencies; payroll, accounts payable and receivable; and providing information to the District's governing body. The Administration staff work closely with the General Manager and Board to help guide decision-making in order to promote legal, consistent and fair business practices and the appropriate use of resources throughout the District.

## *Information Technology*

The information technology systems administrator is responsible for all communication technology at the District including maintaining all aspects of the District's phone system, cell phones, computers, and Internet services. The systems administrator maintains multiple virtual servers and approximately 40 workstations with associated software. The systems administrator also programs and maintains two specialized systems for employee timekeeping and a vector control database which is used to record data for vector control surveillance, monitor pesticide usage, workload management, and more.

In 2019, the administration department and the systems administrator started to change paperwork processes to digital. The goal of the digitalization is to facilitate collaboration, improve timeliness, and lower document management costs.



*District Building*

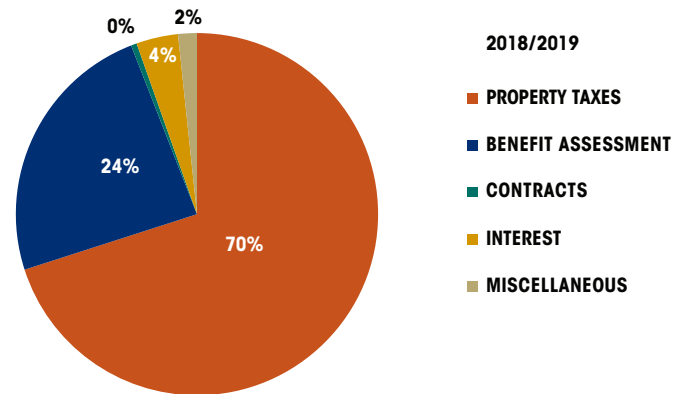
## Financial Statement

The Contra Costa Mosquito & Vector Control District depends on property tax revenues and benefit assessment charges in Contra Costa County to fund operations.

The District receives approximately 70 percent of its annual revenue from property taxes. This revenue stream rose approximately 1 percent in the fiscal year 2018/2019 as compared to fiscal year 2017/2018. The assessed values of Contra Costa County property taxes have stabilized over the past year, supported by a strong and stable regional housing market.

Additionally, the District receives approximately 25 percent of its revenue from a benefit assessment which was implemented after local property taxes, earmarked for the District, were diverted to the State of California's Educational Revenue Augmentation Fund (ERAF). In 1996, the District implemented a countywide benefit assessment to replace these lost funds. This nominal annual charge varies among four zones in Contra Costa County according to benefit of our services and generates revenue that is used to provide mosquito and vector surveillance and control to the properties in Contra Costa County.

As mandated by government code, the District is **audited** annually by an outside firm. The firm audits the District's financial statements to obtain reasonable assurance that the financial statements are free of material misstatement, and that our financial statements conform to the generally accepted accounting principles (GAAP). The auditors review the accounting principles used, all financial disclosures, and the overall financial statement presentation. The District annually receives an Unqualified Opinion, which is the best opinion bestowed.



FINANCIAL STATEMENT		
REVENUES	2017/2018*	2018/2019*
Property Taxes	\$5,524,853	\$5,958,946
Benefit Assessment	2,035,215	2,044,430
Contracts	53,318	43,782
Interest	233,173	317,870
Miscellaneous	165,832	132,686
<b>TOTAL REVENUES</b>	<b>\$8,012,391</b>	<b>\$8,497,714</b>
EXPENDITURES	2017/2018*	2018/2019*
Salaries, Wages, Benefits	\$5,492,325	\$5,752,382
Operations	1,394,571	1,451,966
Capital	127,912	121,423
<b>TOTAL EXPENDITURES</b>	<b>\$7,014,808</b>	<b>\$7,325,771</b>
<b>TRANSFER TO RESERVE</b>	<b>\$997,583</b>	<b>\$1,171,943</b>

\*Audited

