

# 2018 ANNUAL REPORT



CONTRA COSTA  
**MOSQUITO  
& VECTOR  
CONTROL**  
DISTRICT

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## 1927-2018 91 Years of Service

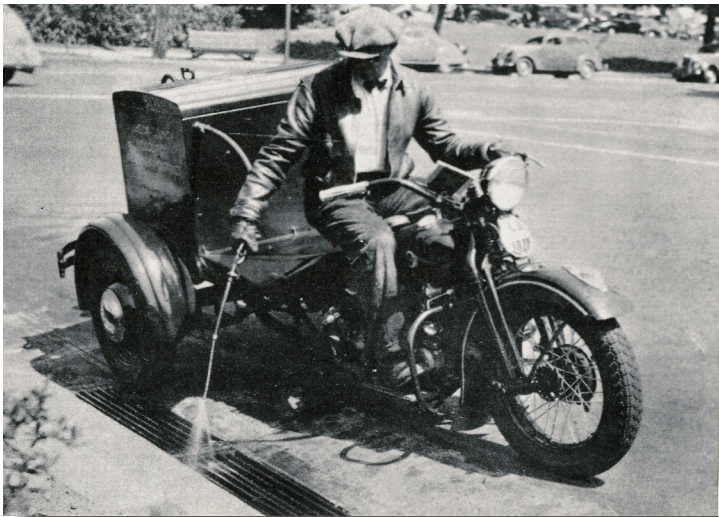
### History

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 for and controlling vectors of disease in Contra Costa County. For 91 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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# Principles

## Vision

Healthy people who can live, work, and play in a healthy environment

## Mission

To protect and promote public health and welfare through integrated vector management services and programs utilizing best management practices and least toxic components by:

### Community Value

Providing essential services to prevent, detect, and suppress public health pests, and to reduce the risk of vector-borne disease transmission to the people who live, work or play within the county

### Service Area

Serving all of Contra Costa County

### Public Confidence

Delivering accessible, accountable, efficient, transparent and cost-effective services

### Public Relations

Working closely with all constituents, private and public, to ensure prompt delivery of accurate information, to raise public awareness, and to develop relationships that promote healthy living

### Environmental Commitment

Meeting or exceeding federal, state, and local environmental standards, practicing responsible environmental stewardship, enhancing value of wetlands, and considering relevant environmental factors as an integral component of mosquito and vector control

### Research

Investigating environmental concerns and developing and/or testing new materials, methods and technologies to ensure quality control oversight on all services and programs, while anticipating resurgent and/or newly introduced vectors or vector-borne diseases

### Interagency Relations

Integrating and communicating District programs and services with other public agencies to ensure cooperative, cohesive, and innovative program delivery

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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; Richard Means, Pleasant Hill; Daniel Pellegrini, Martinez; Michael Krieg, Vice President, Oakley; Jim Fitzsimmons, Lafayette; and James Murray, Walnut Creek

**Kneeling/Seated:** Warren Clayton, President, Pinole; James Pinckney, Contra Costa County; H. Richard Mank, Secretary, El Cerrito; Lola Odunlami, Antioch; Chris Cowen, Contra Costa County; Peter Pay, San Ramon; and Perry Carlston, Concord

*Not pictured:* Randall Diamond, Danville; Richard Ainsley, Ph.D., Pittsburg; Peggie Howell, Clayton; Sohelia Bana, Ph.D., Richmond; and Darryl Young, Contra Costa County



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

*Not pictured: Jeremy Shannon, Vector Control Planner; Jonathan Rehana, Program Supervisor*



Christopher Doll, VCI; Heidi Budge, VCT; Danielle Wisniewski, VCI; Olivia Zaragoza, VCT; Josefa Cabada, VCI; Jeremy Tamargo, VCI; Brandon French, VCI; Dave Obrochta, VCI; Lawrence Brown, VCI; Tim Mann, VCI; Tom Fishe, Mechanic II; Felipe Carrillo, VCI; Steve Fisher, VCI; and Patrick Vicencio, VCI;

*Not Pictured: Jason Descans, VCI; Miaja McCauley, VCT; Joe Cleope, VCI; Shaun Redman, VCT; and Reed Black, 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 Assistant: Natalie Martini

### 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: Bradley Wright

#### Mosquito Control Operations

Program Supervisor: Sheila Currier

#### Inspectors:

Lawrence Brown

Josefa Cabada

Felipe Carrillo

Brandon French

Jeremy Tamargo

#### Technicians:

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

Shaun Redman

#### Vertebrate Vector Control Operations

Program Supervisor: Jonathan Rehana

#### Inspectors:

Joe Cleope

Jason Descans

Steve Fisher

Dave Obrochta

Danielle Wisniewski

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
- **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
- **Trapping**—Trapping and euthanizing skunks that pose a threat to public health and welfare

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 mosquitoes 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, 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

One of the primary reservoirs and vectors of rabies in California is skunks. 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 extermination 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. The District does not provide a service for other species of yellowjackets, nor those that make their nest on or in structures.

## Ticks & Lyme Disease

There are four species of common human-biting ticks 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 Lyme disease for a fee. Visit [Tick Testing Labs](#) for more information.

## Public Information & Education

The Public Affairs Department employees work closely with residents and the 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.

## Africanized Honey Bees

Africanized honey bees (AHBs) were first detected in California in 1994 and were detected and successfully intercepted in Contra Costa County in 1997 and 2008.

AHBs are not known to transmit disease and are no more venomous than European honey bees (EHBs); however, AHBs respond to threats more rapidly than EHBs and will defend their hive with greater numbers of bees which could result in an increased number of stings to an individual. Although people have died as a result of 100 - 300 stings, it is estimated that the average lethal dose of venom for an adult human is 1,100 bee stings; for a child—substantially less.

District services for bees are very limited. 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. The District does not determine if bees are Africanized or European.

## 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 County Department of Health Services, Contra Costa County Animal Control Department, Contra Costa County Agricultural Commissioner's Office and other state and local agencies.

## Mosquito & Vector Surveillance

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
- Tick and Lyme disease surveillance
- Identification of ticks and other biting arthropods
- Quality control 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 2018, laboratory staff counted and identified 34,623 mosquito larvae and pupae.

#### 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.

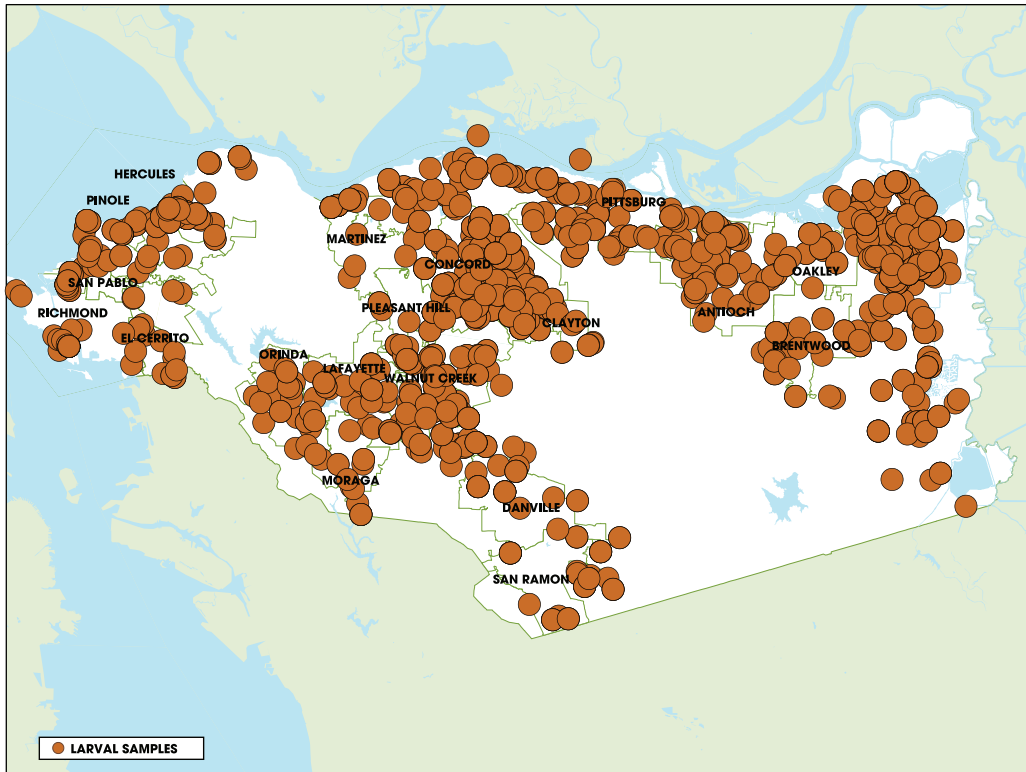
LARVAL SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culiseta incidens</i>	10,495
<i>Culex tarsalis</i>	8,564
<i>Culex pipiens</i>	6,391
<i>Aedes washinoi</i>	2,733
<i>Aedes dorsalis</i>	1,227
<i>Culiseta inornata</i>	993
<i>Aedes melanimon</i>	472
<i>Culex stigmatosoma</i>	471
<i>Aedes sierrensis</i>	421
<i>Aedes nigromaculis</i>	419
<i>Aedes squamiger</i>	373
<i>Culiseta particeps</i>	96
<i>Aedes vexans</i>	59
<i>Culex apicalis</i>	35
<i>Culex erythrothorax</i>	30
<i>Anopheles franciscanus</i>	19
<i>Anopheles punctipennis</i>	15
<i>Anopheles occidentalis</i>	6
Pupae*	1,804
<b>TOTAL</b>	<b>34,623</b>

\*pupae not identified to species

*Mosquito larvae identified in 2018 by species*



*Vector Ecologist Eric Ghilarducci counts and identifies mosquitoes collected in traps.*



*Locations of mosquito larval samples collected by the District in 2018*

New Jersey light traps use light from a 5-watt fluorescent 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 21 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.

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.



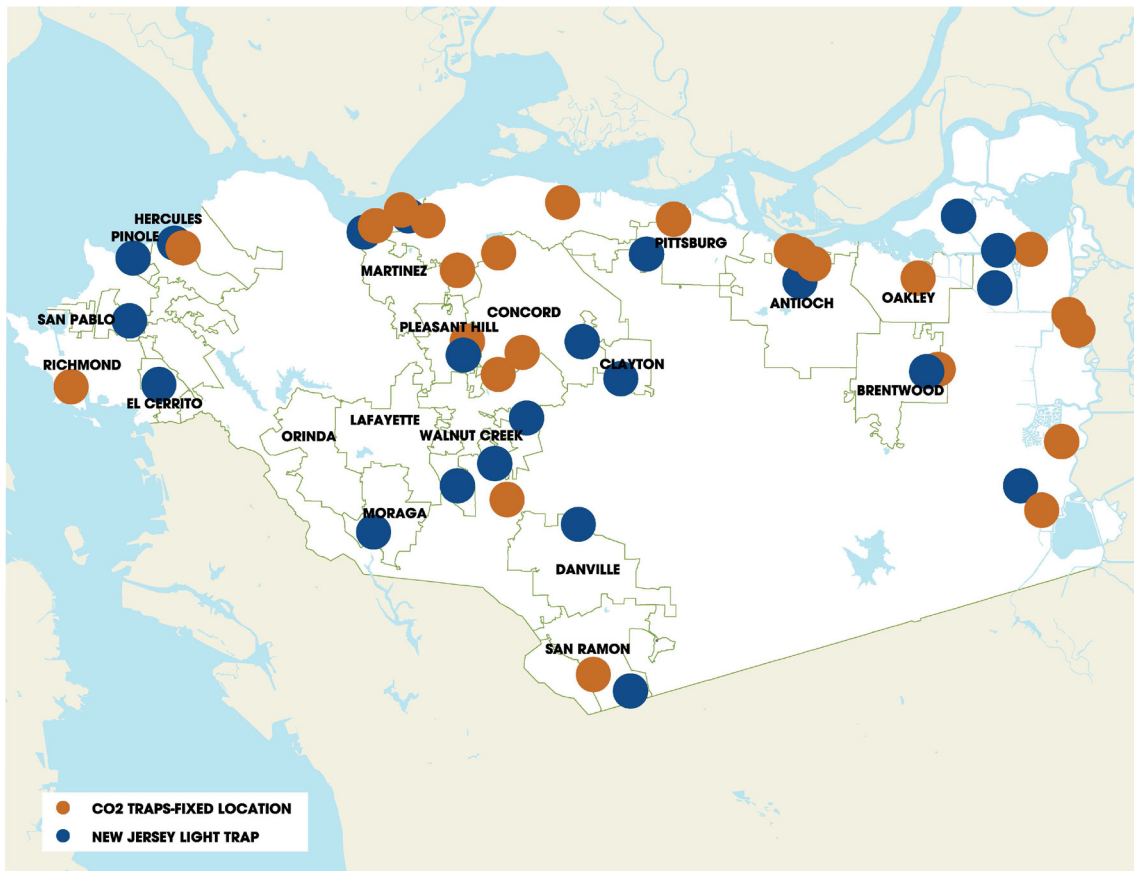
*A New Jersey light trap hangs ready to trap adult mosquitoes. A 5-watt fluorescent bulb attracts night-flying mosquitoes.*

## 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 over watering of lawns and other urban water runoff that keeps the storm drains constantly wet.

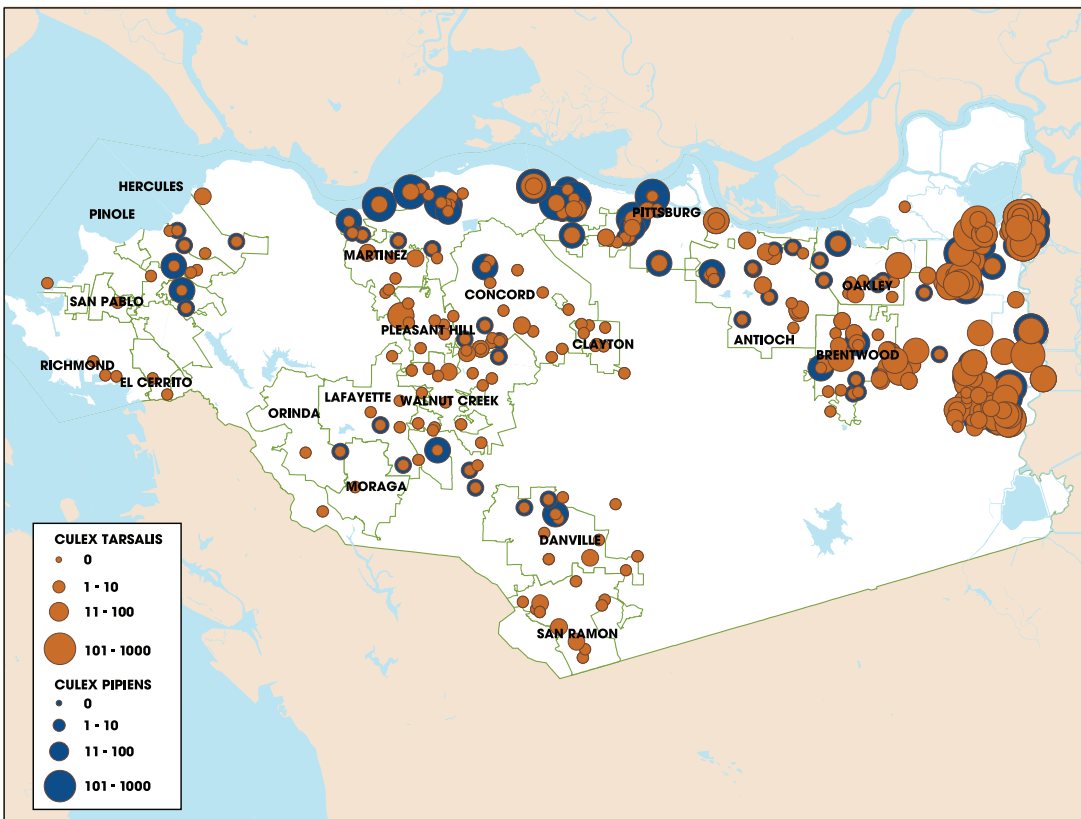


Scientific Program Manager Steve Schutz, Ph.D. examines adult mosquitoes that were trapped in the field and have been delivered to the District’s laboratory.



### FIXED ADULT MOSQUITO TRAP LOCATIONS IN 2018

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 2018.



**RANDOM ADULT MOSQUITO TRAP LOCATIONS IN 2018**

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 illustrate how many mosquitoes were collected.

Rainfall was close to the ten-year average during 2018, and daily temperatures were below average for most of the season except for June and July. Countywide populations of *Culex tarsalis* and *Culex pipiens* fluctuated, but were above the five-year average for much of the season. Most of that average is based on drought conditions, and the county's mosquito populations were still well below long-term averages. High *Culex tarsalis* counts and high West Nile virus infection rates in *Culex pipiens* prompted two adult mosquito control operations in the affected areas.

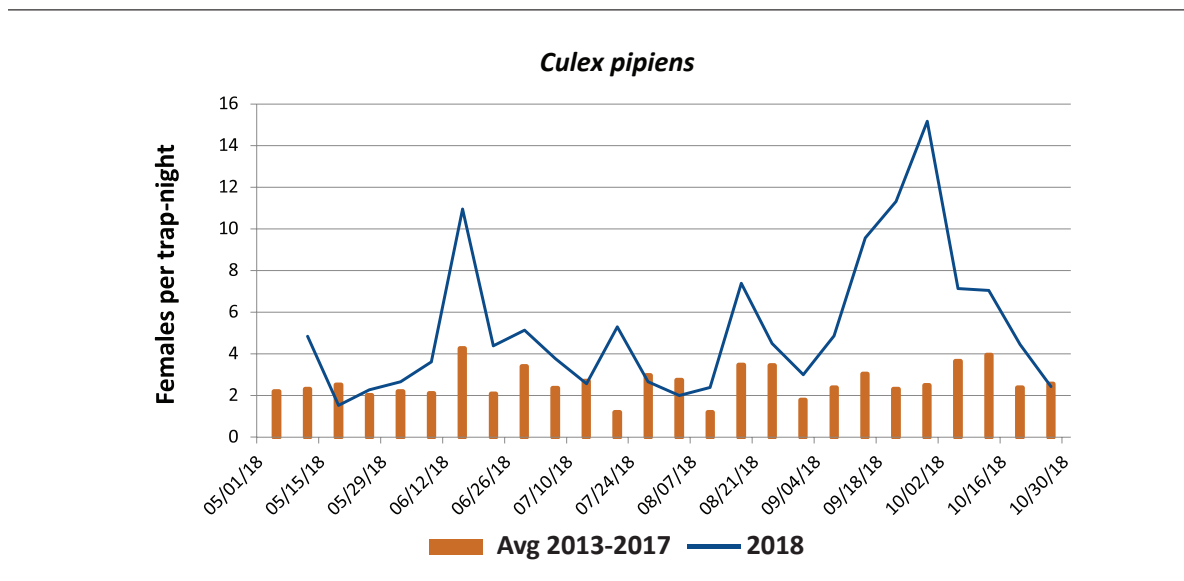
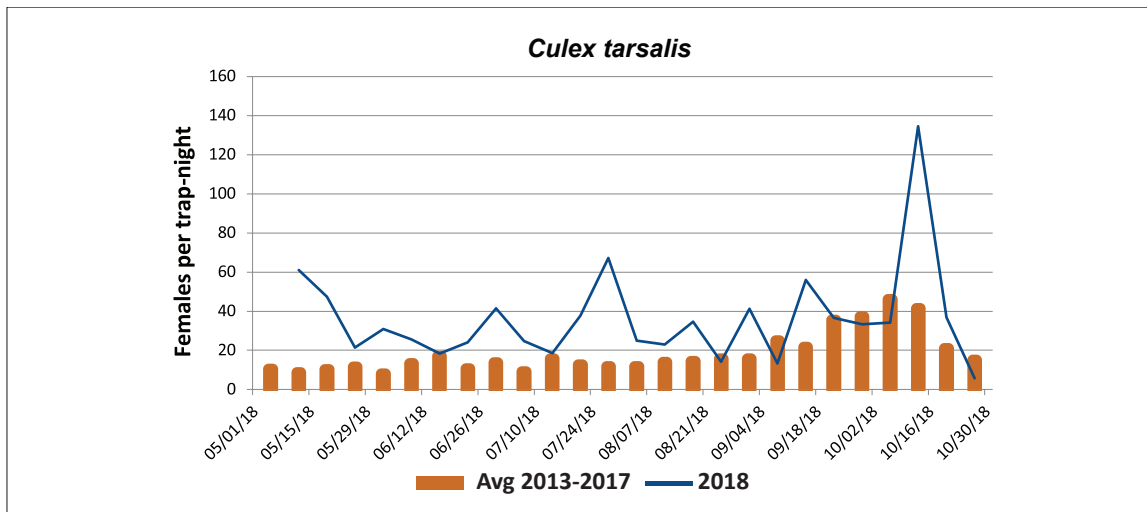
A total of more than 42,000 adult mosquitoes were collected and identified in the District's random and fixed-location traps in 2018.

**ADULT SAMPLES BY SPECIES**

SPECIES	COUNT
<i>Cx tarsalis</i>	23,931
<i>Ae vexans</i>	9,256
<i>Cx pipiens</i>	3,073
<i>Ae melanimon</i>	1,754
<i>Cs inornata</i>	1,586
<i>Ae dorsalis</i>	1,471
<i>Cx erythrothorax</i>	886
<i>Cs incidens</i>	504
<i>Ae squamiger</i>	111
<i>Ae washinoi</i>	90
<i>Ae sierrensis</i>	67
<i>An franciscanus</i>	35
<i>Cs particeps</i>	29
<i>Ae nigromaculis</i>	24
<i>An punctipennis</i>	7
<i>An freeborni</i>	6
<i>Cx stigmatosoma</i>	3
<b>TOTAL</b>	<b>42,833</b>

Adult mosquitoes collected in all fixed and random traps by species, 2018

## Abundance of Vector Mosquito Species in Contra Costa County in 2018



Adult mosquito trap collections vs. 5 year average, 2018



## Mosquito Samples

Between 30 and 50 dry ice-baited mosquito traps are set every week, some at fixed locations and others at variable or 'random' locations, based on dead bird reports, mosquito complaints, or other indicators of possible virus or nuisance risk. Mosquitoes from these 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 University of California Davis Arbovirus Research and Training where they are tested for WNV, WEE, and SLE. Results of this testing enable the District to determine areas of the County at risk for disease transmission and target control resources efficiently.

In 2018, 709 samples comprising 23,776 mosquitoes were tested; 17 samples were positive for WNV (10 *Culex tarsalis*, 7 *Culex pipiens*). 16 samples came from eastern Contra Costa County, including Discovery Bay (5), Brentwood (3), Quimby Island (3), Oakley (2), Knightsen (1), Byron (1), and Bethel Island (1). One sample came from the Martinez waterfront. Adult mosquito control operations were conducted at the Martinez waterfront and Discovery Bay, to reduce the risk of West Nile virus cases and alleviate severe nuisance (biting) issues.



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

## 2007 – 2018 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

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

\*testing restricted to crows/jays only + includes five 'chronic positive' birds ^Includes 1 RAMP positive



## 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 (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 2018 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 2018, the WNV Hotline received 711 dead bird reports from Contra Costa County residents, which was slightly more than the smallest number of dead bird reports the District has ever received in a single year, which was in 2017. Of the birds reported in 2018, 45 birds were collected for testing and 17 (38%) tested positive. Positive birds were scattered throughout eastern Contra Costa County, with only two in central Contra Costa County.

## 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 2018, 16 of the District's chickens (all 10 on Holland Tract, two in Oakley, and four in Martinez) tested positive for WNV antibodies. Chickens tested positive for antibodies between July and late 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 use paper strips to collect a small drop of blood from chickens' combs. The strips are marked and saved for 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

Four human cases of WNV were reported by the Contra Costa County Department of Public Health in 2018. Due to patient confidentiality regulations, information on specific locations is not available. The vast majority of mild cases go untested and unreported since they may be asymptomatic (no symptoms) or mistaken for 'the flu'.

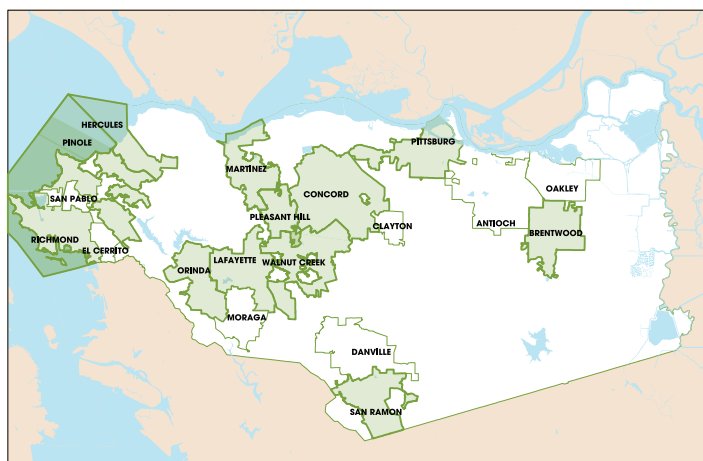
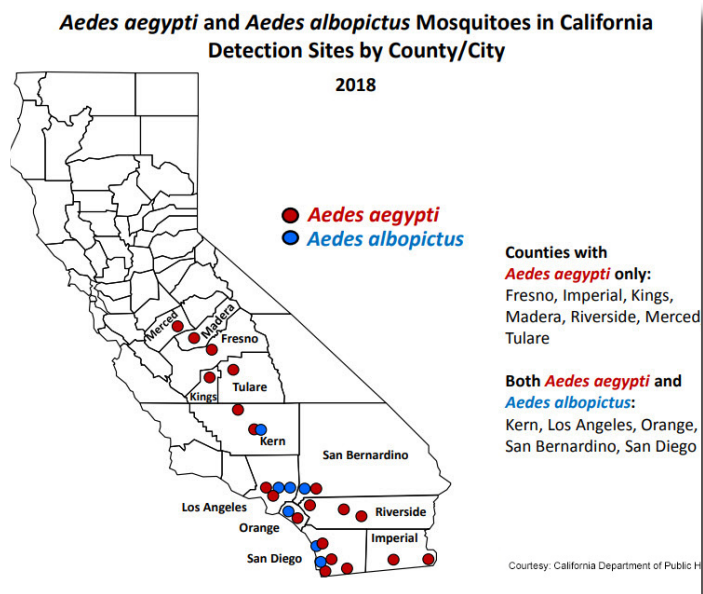
Statewide, 208 human cases and 10 fatalities were reported in 2018, down from 553 cases and 42 fatalities reported the previous year. 148 of them were neuroinvasive cases which are the most severe form of WNV. The California Department of Public Health reports that there are typically 30 to 70 non-neuroinvasive (West Nile fever) cases for every reported case of neurological disease, so more than 10,000 Californians may have had West Nile virus infections in 2018, 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; 11 positive horses in 8 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.

## 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*. Both 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.

In 2018 the District received a Federal grant to expand the District's invasive *Aedes* surveillance and education programs. Specially designed traps were set in 12 Contra Costa cities. The new traps did not detect the presence of any non-native mosquito species in Contra Costa County, nor have active populations been found in any other Bay Area counties since 2015. District technicians will continue to proactively search for them as part of the District's ongoing surveillance program; however, since these are very much 'backyard' mosquitoes, it is essential for the public to be vigilant in eliminating any potential mosquito breeding sites on their property, reporting mosquito problems (especially mosquitoes biting during the day) to the District, and saving mosquito samples for identification.



*Invasive Aedes trap locations in Contra Costa County in 2018*

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 locally in California.

## Mosquito Control Operations

The District provides year-round mosquito control services to the residents of all 19 cities in Contra Costa County and monitors marshlands, irrigated farmland, numerous ponds, creeks, residential sources, catch basins, and neglected swimming pools.

The District divides the 716 miles of the county into 10 mosquito control zones, and one vector control inspector or technician is assigned to oversee and perform inspection and control efforts in each zone. In some areas, individual cities may be divided between two or more zones. The 10 zones present significantly diverse challenges for mosquito surveillance and control.

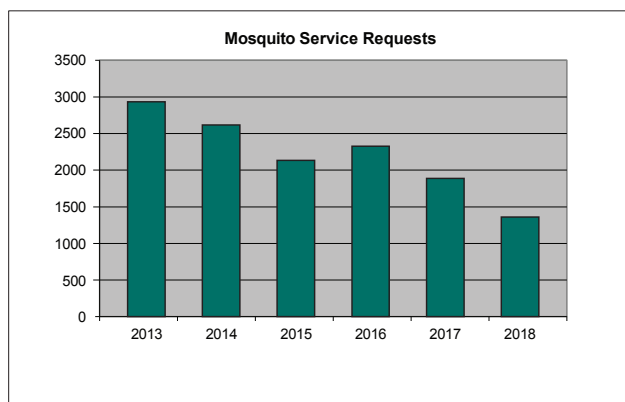
District employees work to manage both nuisance and disease carrying mosquitoes so that they do not pose significant health threats to the public or local businesses. Technicians and inspectors respond to service requests from local residents and property owners to manage both immature and adult mosquito populations. Those who work in mosquito control operations collaborate with other departments and utilize informational pamphlets and door hangers to educate and inform the public about the potential for disease threats and prevention measures. They also work closely with the District's lab staff to assist with adult mosquito surveillance, pick up dead birds for WNV testing, or assist with research projects.

In 2018, the District received 1,361 requests for mosquito-related residential service with peak service requests occurring in the months of April, May, and July. Compared to the previous five years, 2018 continued the trend of decreasing numbers of service requests. As mosquitoes need water to develop from egg to adult, low rainwater totals in the winter and spring may have impacted mosquito populations in 2018. According to the California Department of Water Resources, the Sierra snowpack was 52% of "normal" in 2018, potentially reducing the amount of standing water used by mosquitoes.

While overall water amounts were down; in 2018, water was abundant along Contra Costa County's shorelines and coastal communities. In two of these areas, District employees trapped elevated numbers of adult mosquitoes prompting the District to conduct adult mosquito control operations along the Martinez Waterfront and in Discovery Bay. In eastern Contra Costa County, where WNV has historically been prevalent, the District used an aircraft to apply granular larvicide to target large numbers of mosquito larvae found on Quimby Island, which had been flooded due to a fire.



*Vector Control Inspector Josefa Cabada provides a residential inspection for mosquitoes.*



*Mosquito Service Requests 2013-2018*

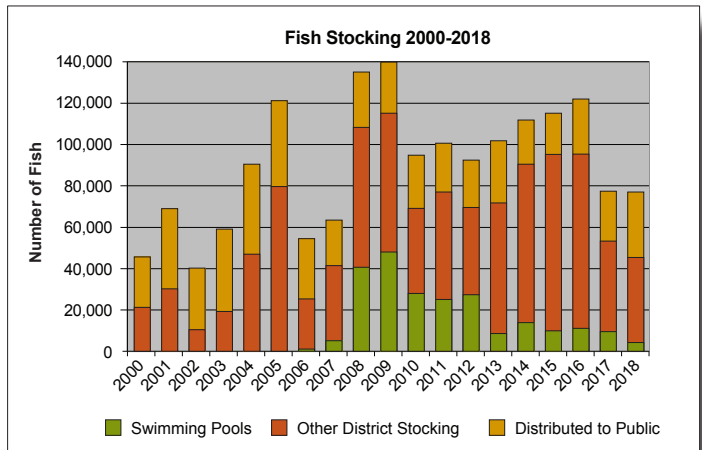
## Fisheries

Mosquitofish (*Gambusia affinis*) are an effective biological control tool for use in integrated vector management, as each surface feeding fish has the ability to eat mosquito larvae, thus preventing them from developing into adult mosquitoes with the ability of biting and potentially spreading mosquito-borne illness. The District places mosquitofish in water sources to reduce the risk of mosquitoes. The District also provides 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 produced approximately 960,000 mosquitofish and distributed 77,139 mosquitofish in Contra Costa County in 2018.



Mosquitofish (*Gambusia affinis*)

Spawning trials were conducted on splittail and hardhead in 2018 with only a few splittail having been produced. Due to the small numbers, these California native fish have not been used in mosquito control. Once adequate numbers of juveniles are produced mosquito control trials will begin.



Fish Stocking 2000-2018

In addition to rearing standard color mosquitofish the District's fish biologist, who oversees the District's mosquitofish program, continues to work with California native fish species for use in mosquito control and environmental education. Current native fish studies involve California roach (*Lavinia symmetricus*), Sacramento splittail (*Pogonichthys macrolepidotus*), and Hardhead (*Mylopharodon conocephalus*).

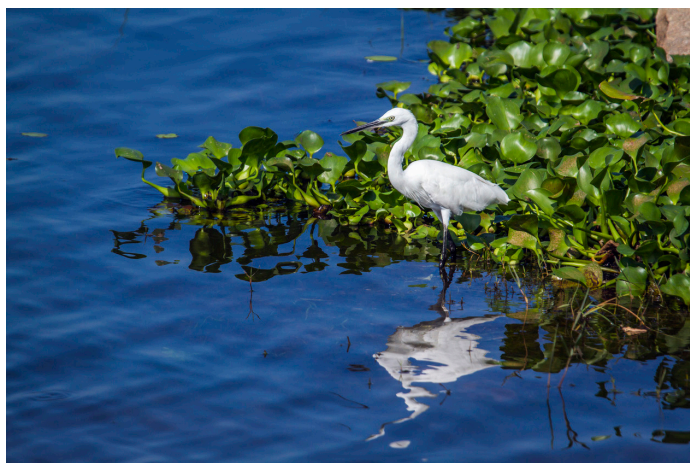
The District produced 3,000 California roach in 2018. District employees have only stocked this species in non maintained swimming pools and private ponds, where the fish eat larvae, effectively controlling adult mosquito populations. The fish have not yet been placed in public waters of Contra Costa County due to restrictions of California Department of Fish & Wildlife. The District's fish biologist has been working with the Department to get permits to stock this species as well as other California native fish that could be used in mosquito control where appropriate.

## Research, Special Projects and Presentations

### Water Hyacinth Research

The District's scientific and operations programs continued to work together with the US Department of Agriculture, Agricultural Research Service in 2018 on a project to determine the impact of invasive aquatic weed control on mosquito populations in the San Joaquin Delta. As part of the Delta Regional Area-wide Aquatic Weed Program (DRAAWP), the District studied potential methods of mosquito surveillance and possible control of larval mosquitoes found in areas of Contra Costa County affected by invasive water hyacinth. The purpose of DRAAWP is to understand the potential relationship between decaying water hyacinth in the Delta and the creation of mosquito breeding habitat.

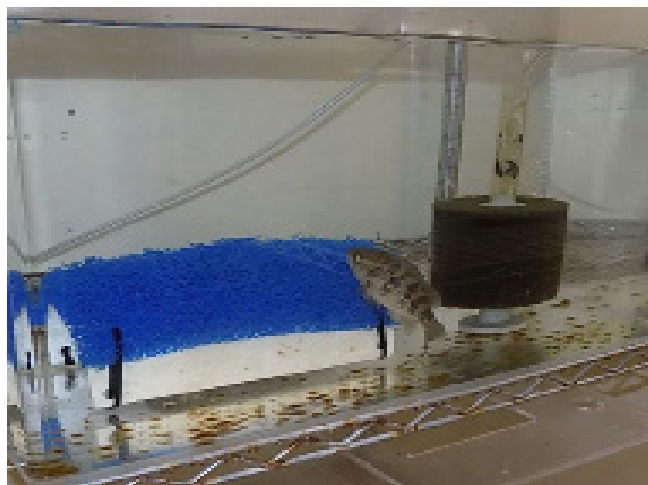
In 2018, the District's employees monitored for the presence of mosquito larva in the residual organic material remaining after herbicidal treatment of water hyacinth. The District's scientific programs staff also continued to rear and evaluate potential biological control agents for the control of introduced water hyacinth, which has been choking Delta waterways. The District's preliminary data continue to suggest that navigable channels, where the majority of aquatic weed control activities are occurring, are not contributing significantly to mosquito populations due to tidal action and higher water flow rates.



Water hyacinth is a floating aquatic plant that was introduced into the Delta from South America more than 100 years ago. The invasive plant can double in size every 10 days in hot weather and can quickly become a dense floating mat of vegetation up to six feet thick. Mats can travel with river currents and with tidal movement and can also attach to structures.

### Sacramento Perch Research

In 2018, the District's fish biologist continued a project to spawn Sacramento perch (*Archoplites interruptus*) in an aquarium. These fish, which are a strain that has been deemed genetically important, come from Jewel Lake in Tilden Park. The District conducted the project in cooperation with East Bay Regional Parks and the California Department of Fish & Wildlife.



*Sacramento perch (Archoplites interruptus) guarding eggs in an aquarium*

## UAS Program

In 2018, the District's Board of Trustees approved a policy to establish an Unmanned Aircraft System (UAS) program, also known as a drone program. The purpose of the UAS program is to provide the District with tools for research, operations, and public safety. The UAS will also be used for training, visual mapping and detection of mosquito habitat, larva detection, operational planning, and public information videos. In 2018, District employees used the UAS to search for mosquito habitat in areas that were otherwise inaccessible.

The program is expected to grow in value and significance in the years ahead. Future plans for the District's UAS program include purchasing additional UAS equipment with the ability to incorporate treatment and application technologies with our existing observational abilities. The long-term goal for the UAS program is to aid in surveillance and control of mosquitoes in a safer and more efficient manner.



*The District's new Unmanned Aircraft System (UAS) program, also known as a drone program, will help Vector Control Inspector Chris Doll find mosquito habitat locations previously inaccessible.*



*In 2018, the District's Board of Trustees approved the policy to establish a new Unmanned Aircraft System (UAS) program, also known as a drone program.*

## Vector Control Planning

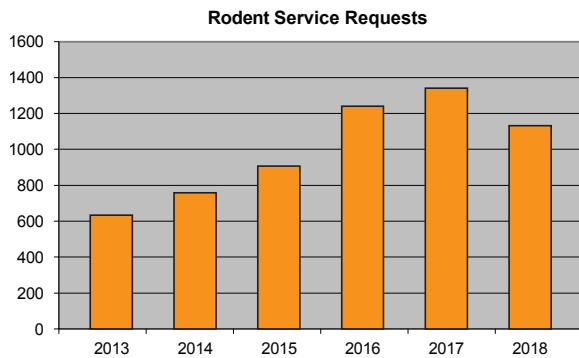
In 2018, the District's vector control planner reviewed approximately 180 project proposals from local, county, state, and federal agencies for potential vector control concerns. Due to the planner's efforts, access to previously restricted sites for the purpose of conducting mosquito surveillance and control work was improved through coordination between the District, private landowners, and public agencies. The District's vector control planner also facilitated coordination between county agencies for the purposes of physical control, maintenance, and environmental management of areas throughout the county. Results of these interagency collaborations included improved water drainage from reclamation ponds, better flood control procedures, and the creation of a dredge pond with assistance from the East Bay Regional Park District.

## Rats & Mice

The District provides year-round rat and mouse inspection services to homeowners, business owners, and individuals. While providing on-site inspection services, District employees provide identification of rats and mice and advice for prevention and control including detailed reports, guidance, and recommendations.

For the purposes of providing efficient rat and mouse services, Contra Costa County is divided into three zones and one vector control technician or inspector is assigned to oversee and perform inspection and control efforts in each zone. In some areas, individual cities may be divided between two or more zones.

In Contra Costa County, there are primarily two species of rats — the Norway rat and the roof rat. In 2018, the District received 1,123 requests for residential rat and mouse services; a decreased number of requests for service compared to the previous five years. Service requests for commercial properties increased in some cities; however, mainly due to lack of rat and mouse control services in the past.



Rodent Service Requests 2013-2018

## Sewer Baiting

The District inspects sewers semi-annually and baits in accordance to the rat activity taking place. The District has worked closely with city sanitary departments/districts as they



Vertebrate Inspector Danielle Wisniewki conducts sewer baiting to prevent rats.

# Skunks and Rabies

## Risk Reduction

The District provides inspections and advice to county residents who believe a skunk may be living on their property. Skunks can transmit the rabies virus by biting an animal or human. The virus infects the central nervous system and can lead to death if left untreated. Taking the appropriate measures to keep skunks from setting up dens on private and public properties may reduce the risk of rabies.

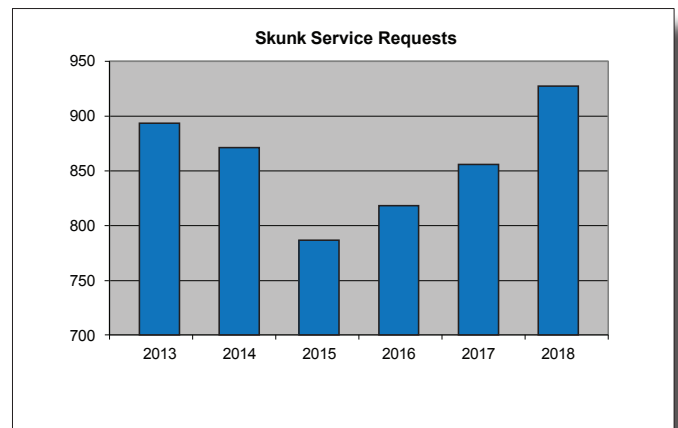
The primary goal of the District's skunk program is to educate residents, landowners, agencies, school officials, and business owners on the steps they can take to prevent having skunks living close by. Skunks will often start a den under decks, homes, sheds, and other structures. District employees provide property inspections and advice, such as instructions on installing wire mesh to block potential areas where skunks might build a den.

Skunks are attracted to fallen bird seed, fallen fruit; particularly figs from trees, and, in many cases, skunks cause lawn damage while searching for grubs. One of the most important messages the District provides is that any time food is left out for wildlife, that food is an attractant for skunks. When wildlife finds food that has been placed by humans, the wildlife begin to lose the ability to hunt for food on their own, and so the practice harms wildlife more than it helps. These messages fall in line with the California Fish and Wildlife program [Keep Me Wild](#).

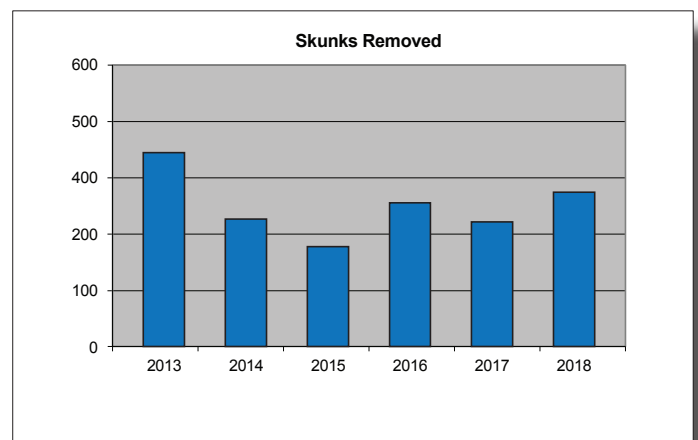
## When to Trap Skunks

District inspectors work to educate the public and provide property inspections and advice on what to do to discourage skunks from taking up residence on private property. When a skunk resides in a den on the property, the District employee may determine the property warrants a live catch trap.

The county is divided into two vertebrate zones for skunk services and one vector control inspector is assigned to each zone to oversee efforts. In 2018 the District received 932 requests for skunk services, more than any of the previous five years. District employees removed 386 skunks from Contra Costa County properties in 2018, a 10 percent increase over the average number of skunks removed over the previous five years. When the District loans a live catch trap to a property owner, but a non-target animal is caught, that animal is released on the property. In 2018, 106 animals were released compared to 78 animals in 2017.



Skunk Service Requests 2013-2018



Skunks removed from Contra Costa County properties 2013-2018.



# Ticks & Lyme Disease

## Ticks of Contra Costa County

There are four species of common human-biting ticks in Contra Costa County.

- Western black-legged tick (*Ixodes pacificus*)
- Pacific Coast tick (*Dermacentor occidentalis*)
- American dog tick (*Dermacentor variabilis*)
- Brown dog tick (*Rhipicephalus sanguineus*)

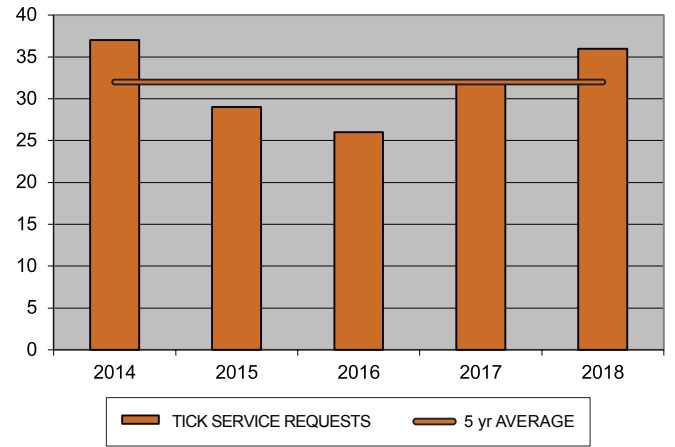
Of these four, only the Western black-legged tick, also referred to as the deer tick, is known to transmit *Borrelia burgdorferi*, the bacteria that causes Lyme disease in California. Adult females of the species are about 1/8" long and reddish-brown in color. Males are slightly smaller and brownish-black.

While Lyme disease is rare in Contra Costa County (on average there are two to four human cases reported per year), it can cause serious complications if not treated promptly.

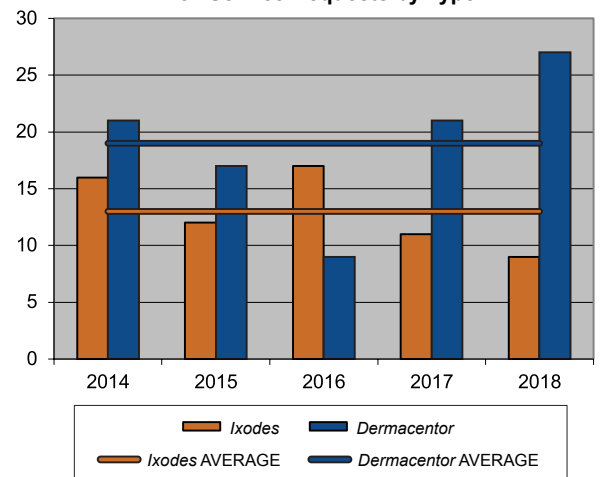
District laboratory staff continue to identify ticks brought in by members of the public. People who are concerned about the possibility of being infected with Lyme disease should contact their physician.

In 2018, there was a slight increase in the total numbers of tick-related service requests compared to the 5 year average. Of the 36 ticks identified by our staff, 9 were western black-legged ticks, the vector of Lyme disease.

Tick Service Requests



Tick Service Requests by Type

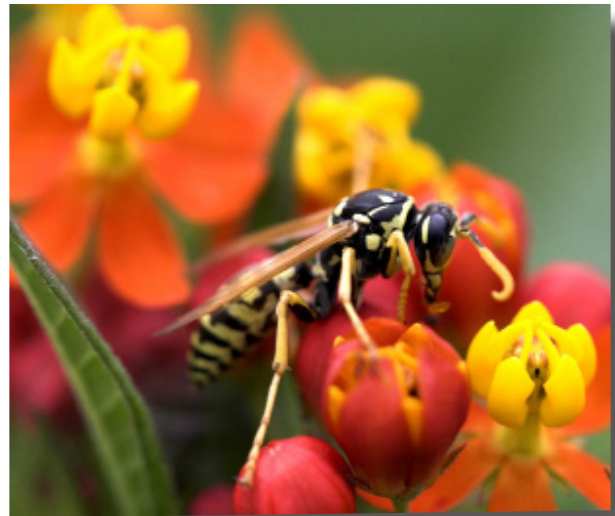


## Yellowjackets

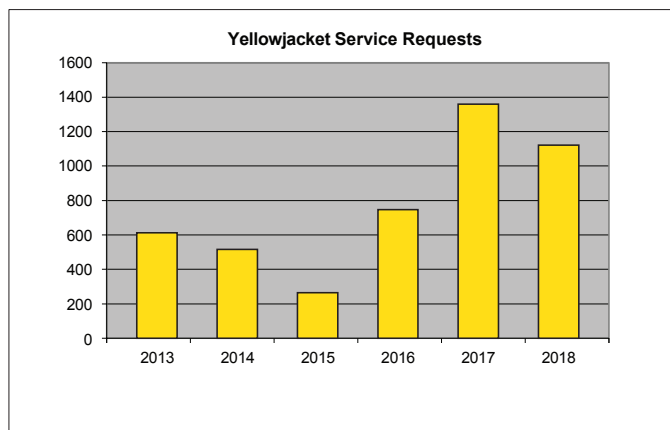
Yellowjackets pose a risk to public health because they have the ability to bite and sting multiple times, putting people, particularly those who suffer allergic reaction to stings and bites, at increased risk of injury.

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 1,115 requests for yellowjacket service in 2018 with peak months occurring in July, August, and September. While the number of requests in 2018 decreased from the record-number of 1,352 requests in 2017, both years far exceeded the number of yellowjacket service requests the District received during the four previous years.



*Yellowjackets do not have pollen sacks, like a bee and so they do not pollinate as efficiently as bees, but they can pollinate incidentally while moving from flower to flower.*



*Yellowjacket Service Requests 2013-2018*

## Africanized Honey Bees

The Africanized honey bee (AHB), also known as the "killer bee", is a hybrid of the European honey bee (EHB) and the African honey bee. AHB do not look noticeably different from the typical EHB and they can only be positively identified through molecular analysis.

Differences between the two varieties of bees are more noticeable in their behavior. Primarily, the AHB's hyper-defensive behavior differentiates them from EHBs.

Contra Costa County's first detection of AHBs was in July of 1997. The second was in December of 2008. Both incidents involved imported bees that hitched a ride on cargo ships. The bees were intercepted before they could escape and establish new colonies. The Contra Costa Mosquito & Vector Control District responds to public complaints of honey bee swarms and new hives in potentially hazardous locations.

In 2018, the District received 17 calls about honey bees. Most of the calls received were due to the presence of a honey bee swarm passing through the area or resting in a neighborhood. These swarms are generally not a threat as the bees are simply in search of a new hive location.

## Public Affairs

### 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

The public affairs department publishes [News Releases](#), [Adult Mosquito Control Notifications](#), the [Mosquito Bytes Newsletter](#), and this annual report online. Internet distribution of District publications is swift, succinct, and provides a sharable format making it a more efficient communication vehicle than traditional mail.

Members of the public may subscribe to the District's publications. In 2018, the District had 2,763 total subscribers. Of the subscribers to the District's online publications, 40 percent accessed the publications through mobile devices and 60 percent accessed them through desktop computers.

Electronic communication offers immediate and timely information about District activities and important messages. Adult mosquito control maps are interactive and describe where and when District crews are conducting adult mosquito control. News releases provide breaking news about current WNV activity and use interactive maps indicating where and when WNV is confirmed. [Contra Costa Health Services \(CCHS\)](#) provides information regarding human cases of the virus. While the District works with the health department to understand possible virus transmission locations, the District only provides information related to vectors. The CCHS provides any information allowed by law regarding humans.

### 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.

**Fight the NEW Bite:** In 2018, the public affairs department received part of a Federal grant to expand the District's invasive *Aedes* surveillance and education programs. The portion of the funding allotted for education programs allowed the public affairs department to create a new outreach campaign to raise awareness among Contra Costa County residents about invasive mosquito species that have established populations across California and are as close as just two counties away from Contra Costa County.

The campaign included [an article](#) in the District's Mosquito Bytes Newsletter, Internet advertising, [a button](#) on the District's website with a [direct link](#) to more information about the specific mosquitoes and their characteristics, [posts on Twitter](#), and [a survey](#) to gauge residents' knowledge about invasive mosquito species before and after the campaign that ran from June through July.

The District considers this campaign to have been a success as survey results reflected a 22 percent increase in invasive mosquito species awareness by the close of the campaign.



*The District's Fight The NEW Bite campaign focused on raising awareness about new invasive mosquito species that are two counties away from Contra Costa County in 2018.*

**Mosquito Control is in (Y)our Hands:** The public affairs department also continued with the advertising campaign entitled, “Mosquito Control is in (Y)our Hands” 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 displaying the “In (Y)our Hands” campaign on the back 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, 2018.

**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 that portion of the county with the District’s messages.

**Internet Advertising:** 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, “swimming pools” or, “mosquitoes.” The public affairs department purchased online advertising to appear on websites as part of the Invasive Mosquito Species campaign. When visitors clicked on these online ads, visitors viewed a web page specially created to detail more information about these two invasive species of mosquitoes.

## Presentations and Events

The public affairs staff also conducted 11 presentations to community groups and organizations, hosted three field trips at the District which include a presentation and tour, and provided an informational display at 18 events in 2018.



*Public Affairs Director Nola Woods and Public Information and Technology Officer Andrew Pierce increase awareness of District services.*

## 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 2018, 51 percent of website visitors viewed the pages on a desktop computer, 41 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 4,302 pageviews, information about all of the District’s services and programs earned 1,559 pageviews, and the employment opportunities page received 1,534 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 2018, 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, including KRON 4, ABC 7, KCBS, and the East Bay Times.

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## *Environmental*

In addition to protecting public health, the Contra Costa Mosquito & Vector Control District is dedicated to protecting the natural environment. Healthy wetlands support populations of natural predators which produce fewer mosquitoes than poorly modified habitats or those damaged by human activity. 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 bio-rational (low environmental impact) control methods in order to protect both human and environmental health.

## *Continuing Education*

The District employs vector control technicians and inspectors certified by the California Department of Public Health. In order to become certified, they are required to pass exams in pesticide use and safety, mosquito biology and control, terrestrial invertebrate biology and control, and vertebrate biology and control. Certificates are renewed every two years provided continuing education requirements have been met during that period. In addition, the District conducts annual in-house training and frequent reviews and updates of policies and procedures at weekly and monthly staff meetings.

## *Shop & Facility Maintenance*

In 2018, the District employed one mechanic responsible for all automotive and facility repair and maintenance. He maintained field and staff vehicles, vehicle sprayers, boats and their trailers, 8-wheel ARGOs, 4-wheel All Terrain Vehicles, trailers, Ultra Low Volume sprayers, and a forklift. The mechanic designed and fabricated specialized equipment and provided repairs and maintenance of grounds and equipment as needed.

## *Information Technology*

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

In 2018, the systems administrator started a project to work with a leading provider of spatial technology. The goal is to upgrade our current data collection workflow to the real-time and improve data integrity by using new advanced technologies.

## *Administration*

Administrative staff serve the residents of Contra Costa County by responding to telephone inquiries for District services, compiling mandated reports and maintaining public records. Staff responsibilities also include processing service requests, contract billing, payroll and accounts payable, as well as providing administrative support. Working closely with city and county personnel, staff also correspond and work extensively regarding compliance and enforcement on vector control issues.



*The District is located in Concord, California.*

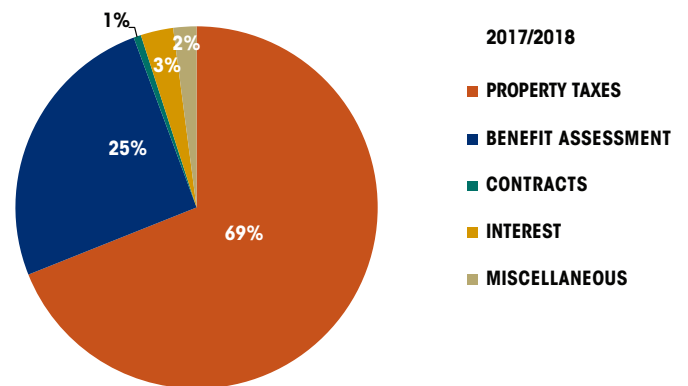
## Financial Statement

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 the annual revenue from property taxes. This revenue stream rose approximately 3.5 percent in the fiscal year 2017/2018 as compared to fiscal year 2016/2017.

Additionally, local property taxes earmarked for the District are diverted annually 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 the benefit of District services. The benefit assessment generates revenue that is used to provide mosquito and vector surveillance and control on public and private properties across the county.

As mandated by government code, the District is annually audited 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. The firm also confirms that the District's financial statements conform to generally accepted accounting principles (GAAP), they review 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	2016/2017*	2017/2018*
Property Taxes	\$5,401,903	\$5,524,853
Benefit Assessment	2,019,712	2,035,215
Contracts	75,372	53,318
Interest	42,710	233,173
Miscellaneous	201,794	165,832
<b>TOTAL REVENUES</b>	<b>\$7,741,491</b>	<b>\$8,012,391</b>
EXPENDITURES	2016/2017	2017/2018*
Salaries & Wages	\$5,154,599	\$5,492,325
Operations	1,357,585	1,394,571
Capital	228,950	127,912
<b>TOTAL EXPENDITURES</b>	<b>\$6,741,134</b>	<b>\$7,014,808</b>
<b>TRANSFER TO RESERVE</b>	<b>\$1,000,357</b>	<b>\$997,583</b>

\*Audited

