

# 2022

## ANNUAL REPORT



CONTRA COSTA  
**MOSQUITO  
& VECTOR  
CONTROL**  
DISTRICT

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## 1927-2022 95 Years of Service



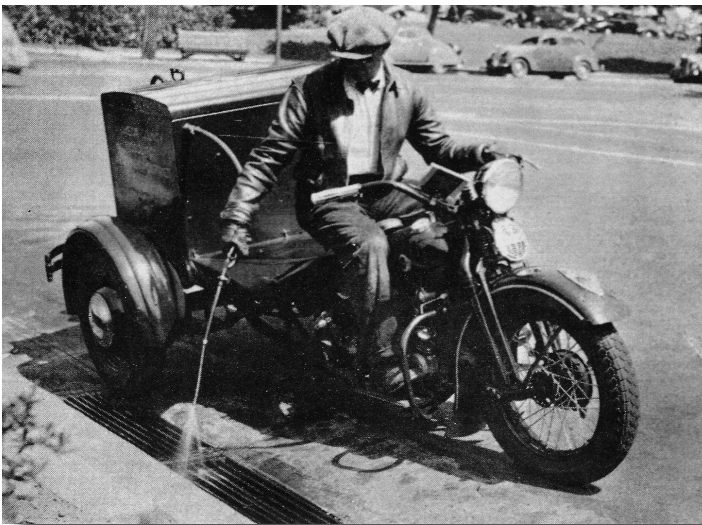
## History

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 and Vector Control District (District).

In 2022, the District marked 95 years of protecting public health. Due to the ongoing COVID-19 pandemic (pandemic), the District was unable to host an open house or other activities inviting the public to the District; however, the Public Affairs department created a video, a newsletter, social media posts, and an anniversary logo that was integrated into employee email signatures, the District website, advertising and publications. In late 2022, District employees detected the presence of an invasive mosquito species within Contra Costa County that can transmit the causative agents of Zika, dengue, chikungunya and yellow fever. This detection further illustrates that the District's critical role as a public health agency dedicated to protecting the community from mosquitoes and other vectors of disease is just as important today as it was 95 years ago.



*Joe Baker  
1934 - Used with Permission Alameda MAD*



*Vector Control Technician Charles Baek inspects a channel on Bethel Island for mosquitoes.*

# Mission Statement

The Contra Costa Mosquito and 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.



## *Independent Special District Classification*

The Contra Costa Mosquito and 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 services. Special districts are:

- Formed by local residents to provide local services
- Sanctioned by 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



**Top Row Left to Right:** Michael Krieg, 2022 Board President, Oakley; Perry Carlston, 2022 Board Vice President, Concord; Daniel Pellegrini, 2022 Board Secretary, Martinez; Peggy Howell, Clayton; and Peter Pay, San Ramon

**Middle Row Left to Right:** James Murray, Walnut Creek; Warren Clayton, Pinole; Randall Diamond, Danville; Chris Cowen, Contra Costa County; James Pinckney, Contra Costa County; and Richard Ainsley, Ph.D., Pittsburg

**Bottom Row Left to Right:** Jennifer Hogan, Pleasant Hill; Kevin Marker, Orinda; James Frankenfield, Moraga; Damian Wong, Hercules; Wade Finlinson, Antioch; and Chris Dupin, Richmond

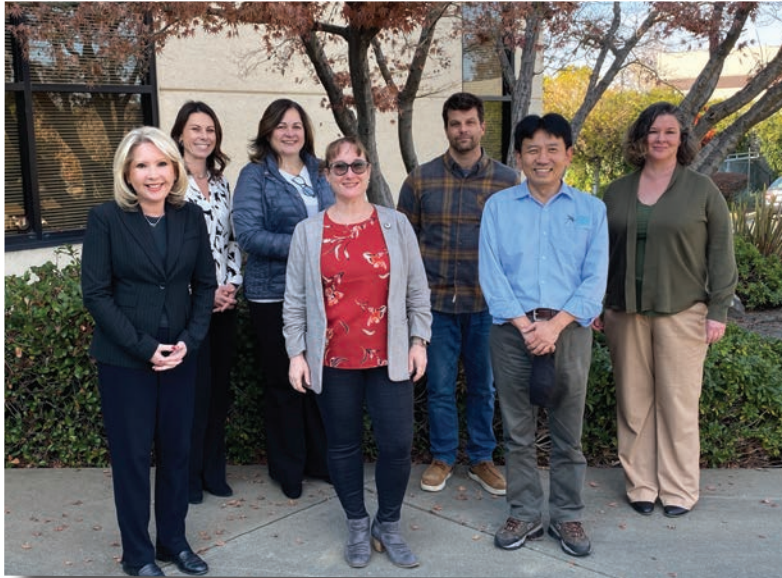
*Not pictured: Jim Fitzsimmons, Lafayette; Jon Elam, Brentwood; Darryl Young, Contra Costa County*

**Board Vacancies as of December 31, 2022:** Clayton, El Cerrito, San Pablo

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# *Contra Costa Mosquito & Vector Control District Personnel*

## Administration



**Back Row Left to Right:** Natalie Martini, Administrative Analyst II; Paula Macedo, D.V.M., Ph.D., General Manager; Andrew Pierce, Public Information and Technology Officer, and Christine Widger, Customer Service Specialist

**Front Row Left to Right:** Nola Woods, Public Affairs Director; Stacy Stark, Human Resources and Risk Manager; and Wayne Sheih, IT Systems Administrator

## Scientific Programs



**Back Row Left to Right:** Eric Ghilarducci, Vector Ecologist II; Steve Schutz, Ph.D., Scientific Programs Manager; and Chris Miller, Biologist/Fish Program

**Front Row Left to Right:** Marie Cerda, Laboratory Technician; and Damien Clauson, Vector Ecologist

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## Operations



**Back Row Left to Right:** Steve Fisher, Vector Control Inspector (VCI); David Obrochta, VCI; Tim Mann, VCI; Jeremy Shannon, Program Supervisor; Chris Doll, VCI; D.J. Regan, Vector Control Technician (VCT); David Wexler, Program Supervisor; and Lawrence Brown, VCI

**Front Row Left to Right:** Cameron Oliver, VCT; John Boyd, VCT; Charles Baek, VCT; Brandon French, VCI; Shaun Redman, VCT; Miaja McCauley, VCT; and Josefa Cabada, VCI

*Not pictured: Terry Davis, Program Supervisor; Joe Cleope, VCI; Patrick Vicencio, VCI; Heidi Budge, VCT; and Olivia Zaragoza, VCT*

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

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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 World Health Organization defines a vector as, "...living organisms that can transmit infectious pathogens between humans, or from animals to humans."

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, and disease pathogens 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 and other water sources; 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 reduction or prevention of vector habitats on private and public property through shared information
- **Biological Control** — Rearing and stocking 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 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 and utilize a range of water sources. In 2022, District employees found an additional species of mosquito in Contra Costa County, *Aedes aegypti*; however, the District has not confirmed that this species is permanently established and attempts are being made to eradicate it before it does so. Until it is confirmed to be established, the number of known mosquito species in Contra Costa County remains at 23.

Mosquitoes in Contra Costa County can transmit the pathogens that cause a variety of diseases including WNV, malaria, St. Louis encephalitis (SLE), Western equine encephalomyelitis (WEE), and potentially other encephalitis viruses as well as dog heartworm. The newly found *Aedes aegypti* mosquitoes can transmit the causative agents of Zika, Dengue fever, Chikungunya, and yellow fever.

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 an 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. If a mosquito issue is emanating from a closed water feature such as a pond or neglected swimming pool, a District employee may place mosquitofish in the water feature to provide long-term mosquito prevention. Mosquitofish eat young mosquitoes as they develop in water, preventing those young mosquitoes from developing into adult mosquitoes capable of biting and potentially spreading the causative agents of mosquito-borne illness.

### 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.



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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 an inspection to identify potential attractants or habitat locations for rats and mice and advice for prevention and control. District employees provide valuable, detailed information, guidance and recommendations.

## Skunks

Skunks can be beneficial to the environment because skunks are natural predators of rodents and may consume other garden pests including immature and adult beetles and crickets. 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 provide a property inspection as well as guidance and recommendations on how to reduce the risk that a skunk may create a den and actively live on private property. In Contra Costa County, skunks are known to create a den under areas such as a deck, shed, house or wood pile.

## Yellowjackets

Yellowjackets are beneficial insects that eat garden pests and provide incidental pollination of crops through their daily foraging activities; however, ground-nesting yellowjackets can bite, have a painful sting, can fly moderate distances, are sometimes attracted to sweets and meats, and can be 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 inspection and 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. The District does not provide service for other species of yellowjackets, nor those that make their nests in structures.

## Ticks

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

The District provides a biting and stinging pest identification service that includes tick identification services and tips on tick bite prevention and tick removal for the public. 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 Laboratories](#) for more information.

## Bees (European & Africanized Honey Bees)

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 an inspection and education about bees. The District does not respond to bee stinging incidents. District employees may treat bee swarms or hives that are a threat to people in public areas such as schools or shopping centers. 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.

## Mosquito and Vector-Borne Disease Surveillance and Research

The District's laboratory staff conduct 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.

WNV was new to California in 2003 and continues to be the most prominent mosquito-borne virus in the state, with approximately 170 reported symptomatic cases and 12 reported 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) statewide in 2022. Contra Costa County recorded one symptomatic case in 2022. In addition to WNV, 11 human cases of SLE were reported in California in 2022. Occasional travel-related human cases of Zika, dengue and chikungunya viruses have been reported in Contra Costa County, but so far the District has not found evidence of local transmission of these diseases; however, in 2022 *Aedes aegypti*, a potential vector of these diseases, was found for the first time in a small area in Martinez and the District has been working to prevent it from spreading.

The District's Entomology Laboratory staff collect and analyze 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. 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.

Through the District's surveillance program, the District has identified **23 different species of mosquitoes** to be established in Contra Costa County, and each one is different in terms of habitat, biting habits, ability to transmit disease, flight range and appropriate control methods. As mentioned in this report, the District found an additional species of mosquito in Contra Costa County in late 2022, *Aedes aegypti* which is a non-native, invasive mosquito species. At this time, the District has not confirmed this species to be permanently established, therefore the official count of established species in Contra Costa County remains at 23.

### 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 2022, laboratory staff counted and identified 19,725 mosquito larvae.



*Scientific Program Manager Steve Schutz, Ph.D. examines larval mosquitoes from Contra Costa County.*

## LARVAL SAMPLES BY SPECIES

SPECIES	COUNT
<i>Culiseta incidens</i>	6,092
<i>Culex tarsalis</i>	4,485
<i>Culex pipiens</i>	3,569
<i>Culiseta inornata</i>	2,460
<i>Culex erythrothorax</i>	905
<i>Aedes dorsalis</i>	574
<i>Aedes melanimon</i>	375
<i>Culex stigmatosoma</i>	353
<i>Aedes washinoi</i>	244
<i>Culiseta particeps</i>	242
<i>Aedes nigromaculis</i>	184
<i>Aedes aegypti</i>	103
<i>Culex apicalis</i>	45
<i>Aedes vexans</i>	35
<i>Anopheles punctipennis</i>	17
<i>Anopheles occidentalis</i>	14
<i>Aedes squamiger</i>	12
<i>Anopheles franciscanus</i>	9
<i>Culex boharti</i>	3
<i>Aedes sierrensis</i>	3
<b>TOTAL</b>	<b>19,725</b>

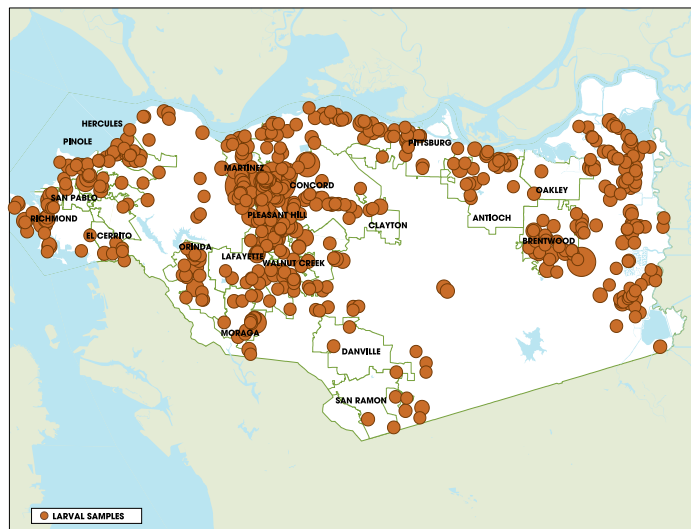
### Mosquito larvae identified in 2022 by species

### Adult Mosquito Surveillance

The District routinely 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. Two new specialized trap types (BG-Sentinel and GAT) were introduced in 2022 to detect and monitor invasive *Aedes* mosquitoes.

**New Jersey light traps** use light from a 2-watt LED light 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.

**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



Locations of mosquito larval samples collected by the District in 2022

them overnight at 23 '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 laboratory while the mosquitoes are still alive so that laboratory 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 BG-Sentinel trap is placed in Contra Costa County for use in *Aedes aegypti* surveillance.

**BG-Sentinel and GAT** traps are specialized traps that use either a chemical attractant or a stagnant water source to attract *Aedes aegypti* and other invasive mosquito species.

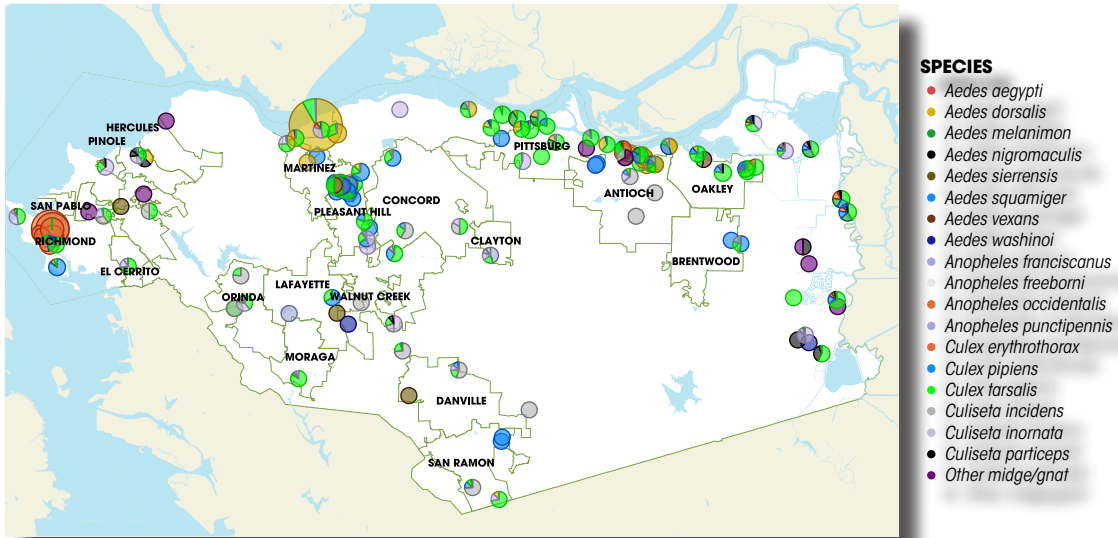
## Adult Mosquito Abundance Trends

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 ‘neglected’ pool can affect a large area. *Culex pipiens* prefers water containing high concentrations 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.

Rainfall was well below the ten-year average during the majority of 2022, and daily temperatures were above average during the summer months. Countywide populations of *Culex pipiens* were above average for most of the season, while *Culex tarsalis* counts trended below average early and mid-season but were well above average towards the end of the season due to limited access to some larval sources in waterfront industrial areas. In addition, several large emergences of *Aedes dorsalis* (a salt marsh mosquito) occurred in waterfront areas following high tides. A total of more than 100,000 adult mosquitoes were collected and identified in the District’s random and fixed-location traps in 2022.

ADULT SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culex erythrothorax</i>	47,902
<i>Aedes dorsalis</i>	33,429
<i>Culex tarsalis</i>	12,201
<i>Culex pipiens</i>	4,085
<i>Culiseta incidens</i>	1,110
<i>Culiseta inornata</i>	1,067
<i>Aedes melanimon</i>	1,059
<i>Aedes vexans</i>	287
<i>Culiseta particeps</i>	181
<i>Aedes aegypti</i>	149
<i>Aedes nigromaculis</i>	128
<i>Anopheles franciscanus</i>	58
<i>Aedes sierrensis</i>	23
<i>Anopheles freeborni</i>	9
<i>Aedes washinoi</i>	8
<i>Anopheles punctipennis</i>	7
<i>Aedes squamiger</i>	1
<i>Anopheles occidentalis</i>	1
<b>TOTAL</b>	<b>101,705</b>

*Adult mosquitoes collected in all fixed and random traps by species, 2022*

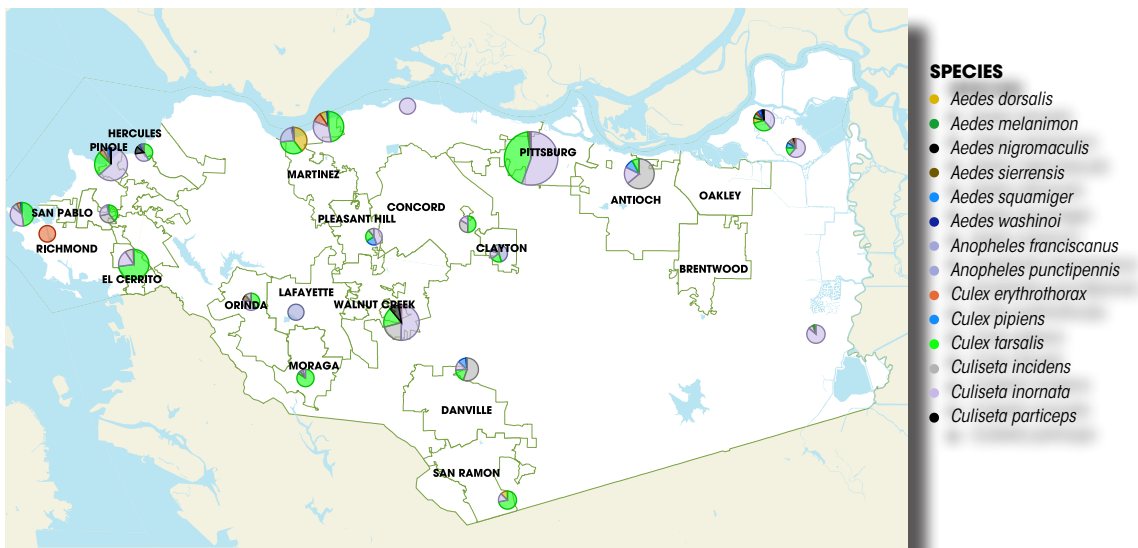


**ADULT MOSQUITO SPECIES COLLECTED IN CO<sub>2</sub> TRAPS IN 2022**

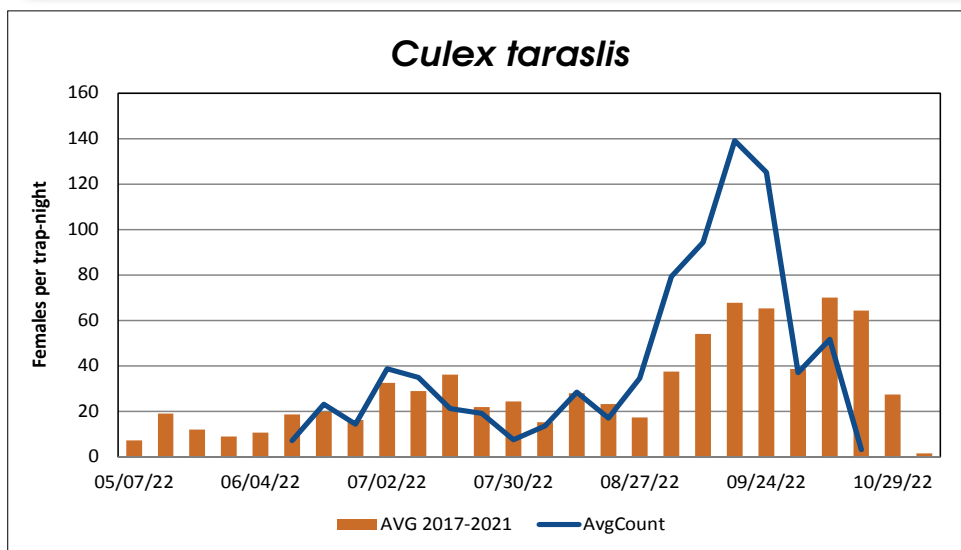
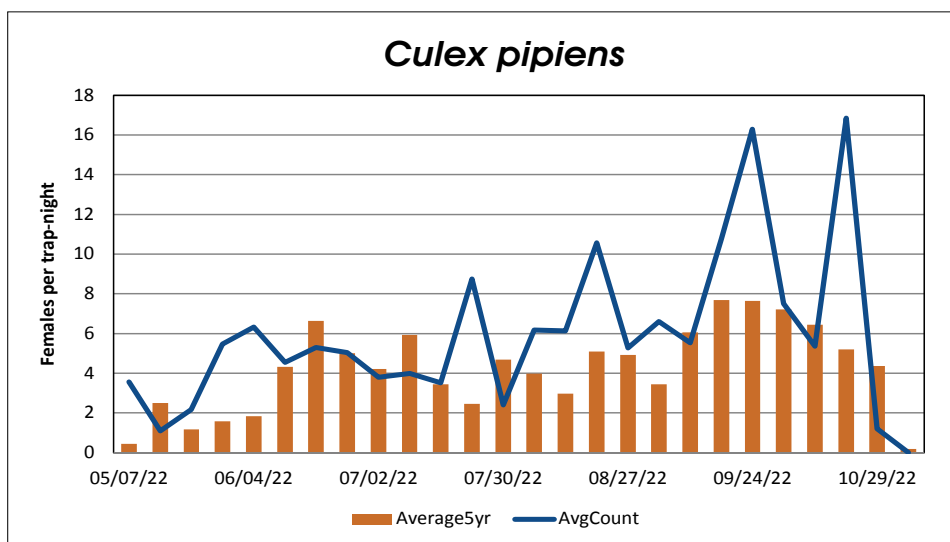
Fixed and random traps set throughout Contra Costa County capture mosquitoes for surveillance and control applications. *Culex tarsalis* and *Culex pipiens* are primary vectors of West Nile virus and other diseases. In this figure, the size of the circles is proportional to how many mosquitoes were collected.

**ADULT MOSQUITOES SPECIES COLLECTED IN LIGHT TRAPS IN 2022**

A 2-watt LED light attracts mosquitoes to the traps. Mosquitoes are then counted and identified to species to determine relative abundance and the risk of disease or nuisance to people. In this figure, the size of the circles is proportional to how many mosquitoes were collected.



## Abundance of Vector Mosquito Species in Contra Costa County in 2022



Adult mosquito CO<sub>2</sub> trap collections vs. 5 year average, 2022

## Mosquito-borne 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 2022, 307 samples (9,791 mosquitoes) were tested and two samples were positive for WNV (1 *Culex tarsalis* and 1 *Culex pipiens*), between July 25<sup>th</sup> and August 8<sup>th</sup> in eastern Contra Costa County, one in Oakley and one in an agricultural area east of Brentwood. WNV detections in mosquitoes were above the 5-year average statewide but below average locally.

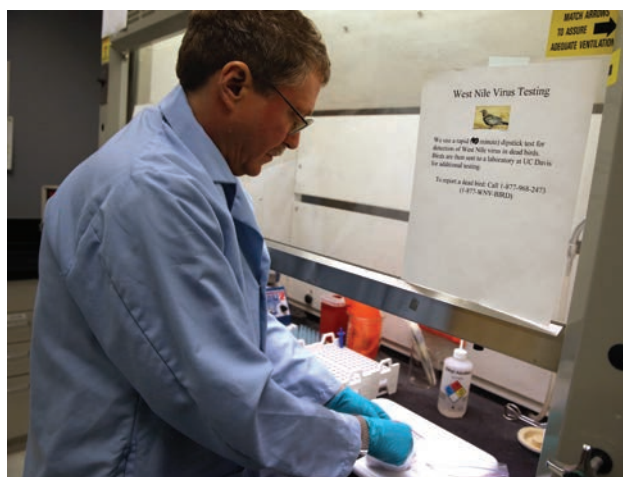


District employees set up a trap in an agricultural area known to produce mosquitoes.

## 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 Call Center by phone (1-877-WNV-BIRD) or online at <http://west-nile.ca.gov>. Call Center 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).

The District only tests corvid (crow family) birds (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. In 2022, the WNV Call Center received 373 dead bird reports from Contra Costa County residents, which was a decrease from the 392 received in 2021. Of the birds reported in 2022, 38 were collected for testing and one collected in early May near Discovery Bay tested positive for WNV. Dead bird reports have been declining steadily since the beginning of the program in 2005, possibly due to a decline in public interest. Birds, however, 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. performs a preliminary assessment on a dead bird for West Nile virus.

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## 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 laboratory tests. This makes them ideal 'sentinels' for detection of virus transmission. In 2022 the District started with a total of 24 chickens (six at each of four 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 laboratory 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 Laboratory in Richmond to be tested for antibodies towards WNV, WEE and SLE viruses.

In 2022, five of the District's chickens at one flock near Knightsen tested positive for antibodies to WNV. 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.



*The District uses chickens as part of the surveillance program for West Nile virus.*

## Human and Equine Disease Cases

In 2022, one locally acquired and fatal human case of WNV was reported. Due to patient confidentiality regulations, information on the specific location is not available. Statewide, 188 symptomatic human cases and 13 fatalities were reported in 27 counties in 2022, up from 129 cases and 12 fatalities reported the previous year.

The California Department of Public Health (CDPH) reports that the vast majority of mild human WNV cases go untested and unreported since they may be asymptomatic (no symptoms) or mistaken for 'the flu.' For the more serious cases, CDPH reports there are typically 30 to 70 unreported non-neuroinvasive (West Nile fever) cases for every reported case of neurological disease, so more than 5,000 Californians may have had WNV infections in 2022, 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; however, 16 positive horses from 10 counties were reported statewide (including two in Sacramento County and one in San Joaquin). An effective vaccine is available for horses and the vast majority of equine cases involve unvaccinated horses. A human vaccine is not available.



## 2008–2022 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Mosquito Samples	Samples Tested	729	814	536	484	468	454	652	622	495	550	709	454	471	396	307
	Total No. Mosquitoes	23,502	27,436	16,820	14,321	11,571	12,730	17,999	21,533	15,612	16,546	23,776	15,451	14,288	14,415	9,791
	West Nile Virus Positive	31	17	4	7	19	13	25	8	11	6	17	1	13	8	2
Chickens	Blood Samples Tested	851	717	773	600	590	631	598	609	571	624	554	527	270	232	251
	Total No. Chickens	50	50	50	50	50	50	50	50	50	50	50	50	24	18	24
	Seropositive	15	13	4	0	7	8	15	18	5	7	16	2	7	0	5
Dead Birds	Total Reported	2,227	1,221	923	1,057	1,816	1,377	1,355	912	861	692	711	321	488	392	373
	Total Tested	115	80	32	74	106	123	115	49	76	58	45	23	60	37	38
	West Nile Virus Positive	88	45	8	43	66	68	44	11	33	19	17	1	22	4	1

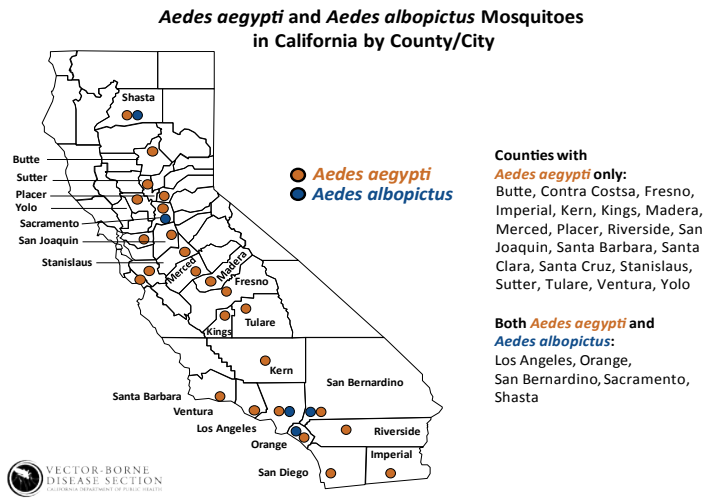
### Invasive Mosquito Species

Non-native mosquitoes have been spreading through California for more than a decade. There are currently two invasive species that have become established in or recently introduced to 28 counties across California, the invasive Asian tiger mosquito (*Aedes albopictus*) and the yellow fever mosquito (*Aedes aegypti*). 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 Zika, dengue fever, chikungunya, and yellow fever. 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 in addition to the risk of disease transmission. So far, attempts to eradicate the new

mosquito populations have been met with limited success. Cases of chikungunya, dengue and Zika diagnosed in California residents returning from countries where these viruses are endemic raise the concern that the invasive mosquitoes may spread these viruses locally.

In August 2022, a District employee detected *Aedes aegypti* for the first time while conducting a routine inspection of a residential area in Martinez. Subsequently, the District conducted more than 1,600 backyard inspections in the neighborhood, and a total of 155 adult and 101 larval *Aedes aegypti* were collected. Sources were treated or drained when they were found, but there is no way to be certain that the population has been completely eradicated and District employees will continue to monitor the area in 2023. Following the District's detection, populations of *Aedes aegypti* were also found in two other Bay Area counties, Santa Clara and Santa Cruz.



## Pesticide Resistance Monitoring

Mosquitoes and other insects always have the potential to develop resistance against the materials District employees use to control them (similar to antibiotic resistance in bacteria). Since all of the adulticide materials the District has used in recent years come from a single related class of chemical compounds (natural pyrethrins and synthetic pyrethroids), which are widely used by homeowners and private pest control operators as well as by mosquito control programs, it is important to determine whether the local mosquito populations are still susceptible or whether the District needs to consider alternative control agents. The District's laboratory staff maintain a colony of known susceptible *Culex tarsalis* which can be used as a baseline to compare against 'wild' mosquitoes.

## Tick and Pest Identification and Information

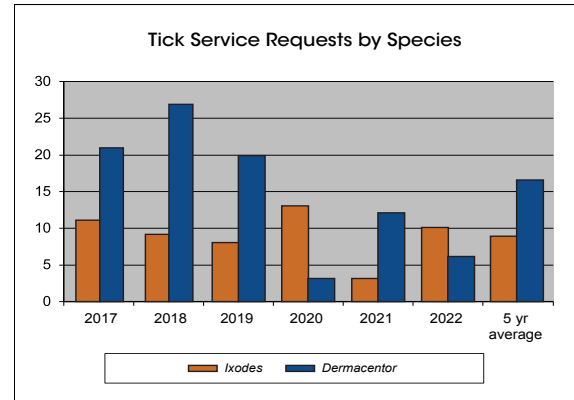
There are four species of common human-biting ticks in Contra Costa County:

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

Lyme disease is a bacterial infection transmitted by the western black-legged tick (also known as the deer tick) and it can cause serious complications if not treated promptly.

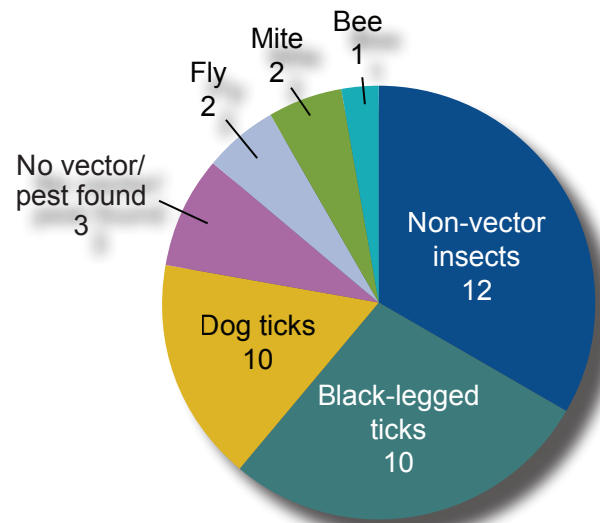
District laboratory staff identify ticks brought in or mailed to the District by Contra Costa County residents. Identification is important as only one of the four species of ticks that commonly bite people (western black-legged tick) transmits Lyme disease. People who are concerned about the possibility of being infected with Lyme disease should contact their physician.

In 2022, of the 16 ticks identified by laboratory staff, 10 were western black-legged ticks, the potential vector of Lyme disease.

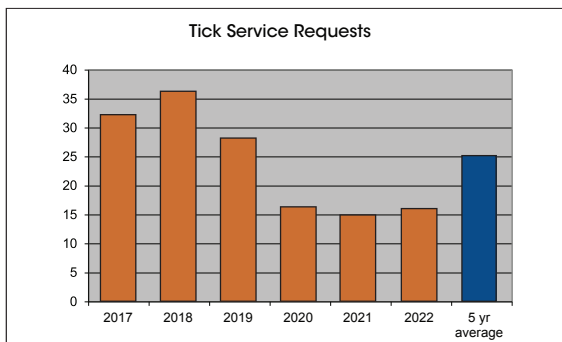


Tick Service Requests by Species 2017 - 2022

As a courtesy to the public, the District's laboratory staff also identify samples of biting and stinging pests submitted by Contra Costa county residents. In 2022, staff members responded to 36 such requests. Inquiries that are received via phone or email only, without a physical sample, are not currently being recorded in the District's database.



Pest Identifications by laboratory staff in 2022



Tick Service Requests 2017 - 2022

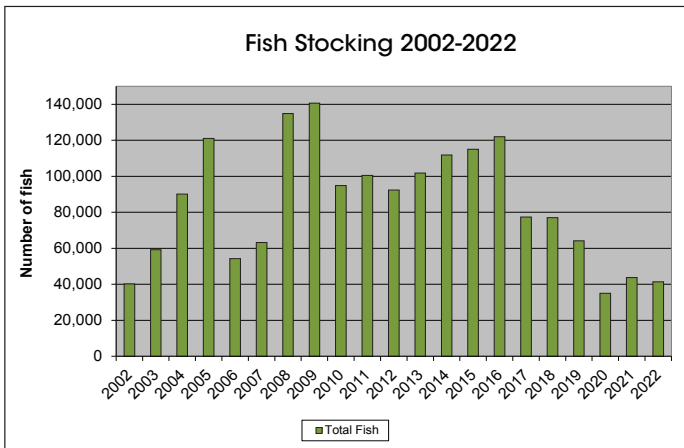
## Biological Control

*Gambusia affinis* are known around the world as mosquitofish that have become an effective biological mosquito control tool. These surface feeding fish have the ability to eat multiple mosquito larvae, thus preventing the larvae 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 in accordance with California Department of Fish and Wildlife regulations.



Mosquitofish (*Gambusia affinis*)

In 2022, District employees distributed 41,426 mosquitofish on residential properties and other closed sources of water compared to the 43,735 mosquitofish District employees distributed in 2021.



Fish Stocking 2002 -2022

## Mosquitofish Service Request

Contra Costa County residents may request the District's mosquitofish service or mosquitofish may be provided during a mosquito inspection when a District employee observes a water feature for which mosquitofish would be an appropriate control method. In that scenario, the District employee can place fish in the water feature. In 2022, the District received 110 service requests for mosquitofish service, compared to 269 requests in 2021. While placing mosquitofish in a water feature where the fish can serve as an effective mosquito control method, District employees have an additional opportunity to educate residents on other ways to reduce the risk of mosquitoes.

## Fisheries Program

*Gambusia affinis* is the District's first choice for biological control; however there may be potential use of California native fish species in mosquito control and environmental education in the future. In 2022, the District's biologist maintained populations of Sacramento perch (*Archoplites interruptus*), Hitch (*Lavinia exilicauda*), and Hardhead (*Mylopharodon conocephalus*) for potential use in biological control in the future.

## District Operations

The District's operations employees work year-round to reduce the risk of vector-borne illness across the 716 square miles of Contra Costa County by preventing vectors when possible and controlling them when necessary to protect public health of 1.16 million County residents.

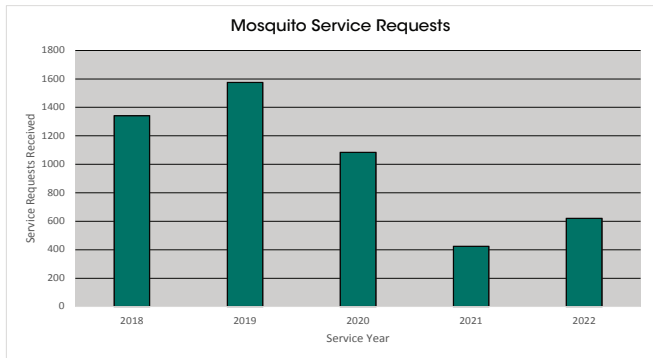
2022 marked the first complete calendar year that the District's Operations department operated under the combined zoning structure implemented in late 2021. Under the zoning structure, Contra Costa County is divided into 14 geographic areas with one District vector control technician or inspector assigned to each zone. That District employee is responsible for providing District services for mosquitoes, rats and mice, and ground-nesting yellowjackets in the employee's specific zone. The District's skunk program operated separately from the zone structure. In 2022, several new hires were made to fill vacant positions, allowing the District's Operations department to address vector-related concerns more effectively.

This was also the first complete calendar year that the Operations department utilized the District's new web-based, geo-referenced data management system, which has continued to be updated and refined. It became instrumental regarding the District's response to the detection of invasive *Aedes aegypti* mosquitoes in the city of Martinez. The data management system allowed operations employees to record work performed while still in the field, which informed colleagues in real-time and increased efficiency by reducing the need for data entry and paperwork management in-office at the end of each workday.

## Mosquito Control Operations

In 2022, operations employees responded to approximately 620 requests for mosquito service from Contra Costa County residents and recorded 13,110 mosquito-related inspections. Operations staff recorded 7,093 site treatments to address mosquito production throughout the county.

There were two events of prominent significance in 2022. First, was the detection of invasive *Aedes* mosquitoes in Martinez at the beginning of August, and the District's ensuing response. This particular mosquito, *Aedes aegypti*, is commonly known as the yellow fever mosquito and can transmit the viruses associated



*Mosquito Service Requests 2018 -2022*

with dengue fever, chikungunya, yellow fever, and Zika, among others. It is well-suited to lay eggs in containers and artificial water sources (plant saucers, spas, buckets, bird baths, etc.) within residential yards, requiring thorough inspections of front and back yards to identify potential mosquito sites.

The District responded to the detection with an all-hands-on-deck approach. District employees from all departments went door-to-door in the affected area performing residential inspections of all homes within a quarter-mile of the initial detection (approximately 460 locations) and hundreds more beyond the quarter-mile perimeter for a total of more than 1,600 inspections.



*District technician Olivia Zaragoza inspects a Martinez backyard for signs of *Aedes aegypti*.*

The response required inspections multiple days per week, including weekends. *Aedes aegypti* larvae were found and treated at seven locations between the initial detection and mid-October.

BG-Sentinel mosquito traps designed to attract host-seeking adults were deployed beginning the first week of August to ascertain the extent of their range in the area. Over a total of 183 trapping events, 151 *Aedes aegypti* were collected, at a total of 24 locations, all within a 1/4 mile radius of the initial detection. Another type of trap designed to capture egg-laying adult females was deployed beginning in early October in the affected area. These traps are set and remain in place for about a week before being collected. A total of 20 trapping events resulted in 5 collections of females.

Three residual Adult Mosquito Control (AMC) applications were conducted to control *Aedes aegypti* in areas where trapping confirmed their presence. Additionally, staff mailed more than 1,000 pieces of correspondence to neighborhood residents about the need for inspections, created thousands of service requests to track work performed, posted door notices requesting access at more than 50 locations, and ultimately obtained inspection warrants for seven locations to ensure the District investigated and thoroughly addressed this detection.

The second event related to mosquito control operations of prominent significance in 2022 happened when Contra Costa County experienced a surge (or resurgence) of adult *Aedes dorsalis* mosquitoes emerging from coastal marshes primarily along the Martinez and Bay Point waterfront. District staff speculate that this was caused by California's continued drought, when rain and snowmelt levels were low and the coastal waters' salinity could have been higher. These aggressive day-biting mosquitoes are considered potential secondary vectors of California Encephalitis and Western Equine Encephalitis viruses, and are also a significant localized pest problem when present in elevated numbers, because of their extended flight range and aggressive biting.

Sampling and trapping data led to five AMC events along the Martinez waterfront. Two similar events were conducted near Bay Point. These waves of emerging mosquitoes correlated with an increase in mosquito service requests in 2022.

## Creeks Channels and Pastures

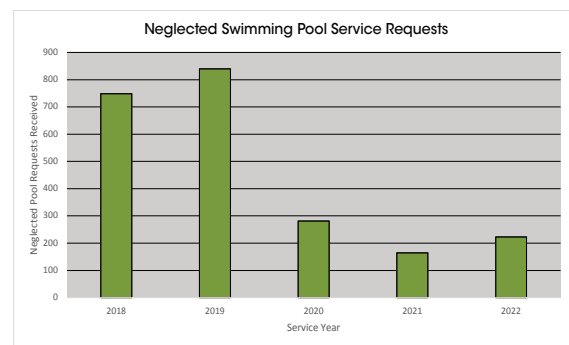
Below-average rainfall for nearly all of 2022 led once-flowing water in creeks and channels to slow and eventually leave pools of standing water, creating potential sources of mosquitoes. In some creeks, this issue was compounded by a significant amount of yard debris and garbage that had been dumped into some of these areas, further restricting water flow and creating mosquito sites that were increasingly difficult to navigate and address.

District employees worked directly with homeowners adjacent to such creeks, informing them of the mosquito issues that arise from dumping items into creeks and other channels. These conversations paired with correspondence mailed to homeowners abutting these locations resulted in the voluntary removal of some of the blockages. This increased the District's access and ability to effectively control mosquitoes within these areas.

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

One neglected swimming pool has the potential to produce as many as 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. The District refined and continued to implement its neglected swimming pool program, which is overseen by one of the District's operations program supervisors. When appropriate, the program supervisor will refer properties to District employees for mosquito inspection or control efforts.

In 2022, the District received 223 requests for service regarding neglected swimming pools. The program supervisor sent letters explaining the District's pool program and expectations for compliance to 152 property owners. Approximately 68% of these requests were resolved within one visit or without needing a site visit by a District employee. Utilizing aerial photography services further enabled the District to resolve neglected swimming pool reports when tenants or owners were unresponsive.



Swimming Pool Services Requests 2018 - 2022

## District Boats

The District's mosquito program utilizes three boats to access remote islands and marshes within Contra Costa County that are inaccessible on foot or by truck. In 2022, District employees used the boats to inspect tidally-influenced islands after high tide events to detect salt marsh mosquitoes as well as islands that have levees to make sure rainwater drained effectively, reducing the risk of mosquito production.



*District boats vary in size from one able to navigate narrow channels to a larger landing craft that is able to carry multiple District technicians and equipment to areas for mosquito inspection and treatment.*



*When vector control planning activities are successful, the risk of mosquitoes is reduced for nearby residents.*

## UAS Program

The District's Unmanned Aircraft System (UAS), also known as a drone, allows for more efficient inspection of large agricultural and wetland areas that would take someone on foot many hours to completely inspect. The information gathered by the UAS helps the District plan appropriate treatment of specific areas of the County.

Among other uses, in 2022, the UAS was utilized to monitor vast stretches of marshland near Pittsburg that had been artificially flooded to extinguish an ongoing fire in the area. Monitoring this area on foot or via amphibious vehicles was not an option for a significant period of time due to hazards caused by the peat fires and subsequent flooding.



*The District drone was used in 2022 to assess the extent of potential mosquito habitat created by flooding used to put out a peat fire in Pittsburg.*

## Vector Control Planning

Vector control planning activities were handled by an operations program supervisor in 2022. The supervisor reviewed approximately 188 project applications from across Contra Costa County and provided appropriate feedback relating to vector concerns.

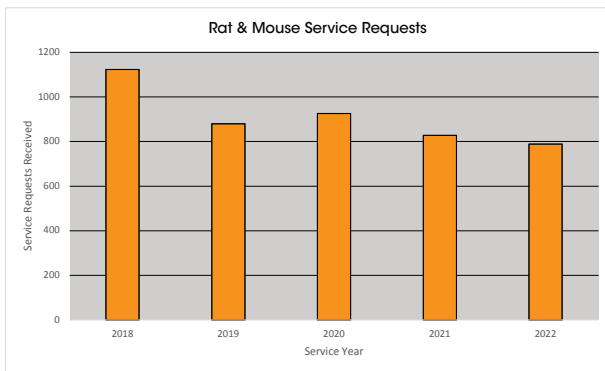
The supervisor sent correspondence related to mosquito production sites in need of maintenance to multiple landowners around the county. Areas of concern for mosquito production included ponds with overgrown vegetation restricting proper drainage and access, as well as stormwater treatment facilities. Multiple parties were eager to meet on-site at these locations to establish maintenance needs and to receive guidance from District personnel. Providing this guidance and maintaining relationships can help reduce the need for pesticide applications at these sites.

## Rats & Mice

Three specific rodent species of concern call Contra Costa County home: the Norway rat (*Rattus norvegicus*), the black or roof rat (*Rattus rattus*), and the house mouse (*Mus musculus*). These non-native, commensal (meaning they live in close proximity to humans) rodents are capable of spreading the causative agents of disease by contaminating food that has come into contact with their excrement or saliva. Ectoparasites associated with these rodents can spread plague, murine typhus, *Bartonella* bacteria, and various viruses. Rats and mice are also capable of causing significant damage to structures and other property, even causing increased fire risk by gnawing electrical wires.

The District provides an inspection and advice service to reduce the risk of rats and mice on residential and commercial properties within Contra Costa County. During inspections, District employees look for evidence of potential sources of food and shelter, and how the rats or mice may be gaining access to a home or business, and then relay steps residents can take to make their property less attractive to rodents and how to discourage their entry into structures. In 2022, the District continued to limit inspections for rats and mice to exterior locations.

The District received 789 requests for rat and mouse service in 2022. The majority of the requests for rat and mouse service came from areas in central and west Contra Costa County, with 91 requests for service coming from Walnut Creek, 80 from Concord, 66 from San Ramon, 64 from Lafayette, and 61 from Danville.



*Rat and Mouse Service Requests 2018 - 2022*

## Monitoring for Rats and Mice

The District monitors rat and mouse activity in public spaces throughout Contra Costa County through the use of non-toxic monitoring blocks and snap traps, and suppresses these populations through the use of traps and EPA-registered rodenticides. All products used for monitoring and control are deployed within secure stations that prevent access by humans and non-target animal populations.

In 2022, the District began upgrading its old plastic bait stations to a more secure and tamper-resistant steel model. These new stations give District employees the ability to place a non-toxic monitoring block inside, as well as non-toxic rat snap traps if needed. In the event they are required for control, these new stations will be used to reduce exposure to non-target animals and residents from accessing rodenticides or traps. In addition, the increased durability of the steel station is expected to outlast the old plastic stations.



*Metal bait stations provide more protection from non-target animals and vandalism.*

## Skunks and Rabies Risk Reduction

Striped skunks (*Mephitis mephitis*) are a natural part of our environment in Contra Costa County. These mammals can be beneficial as they consume many pest insects, such as beetle grubs and crickets, and are also predators of small mammals including rats and mice. Skunks, however, are one of the primary reservoirs and vectors of rabies in California. Skunks transmit the rabies virus through their saliva while biting other animals or humans. Rabies can infect the central nervous system and may lead to death if left untreated.

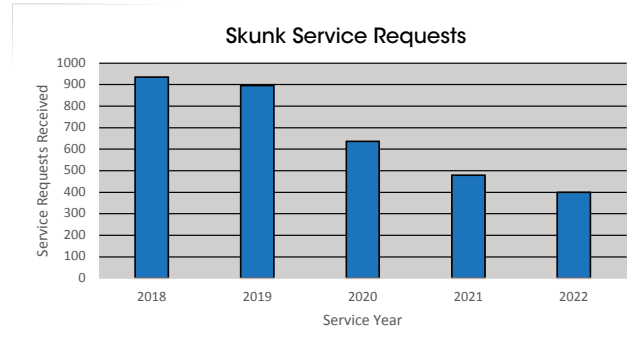
The District provides inspections and assistance to county residents when skunks are believed to be inhabiting dens on private property as these dens may lead to a higher probability of human-skunk interactions. While providing the District's skunk service, District employees educate residents on appropriate measures to reduce contact with skunks and eliminate attractants on the property. If it is determined that a skunk is denning on a property, the District may lend the resident a trap in order to catch the skunk for removal, but the District's primary goal is to educate residents on the permanent steps they can take to keep skunks from living on their property.

### Skunk Service Requests

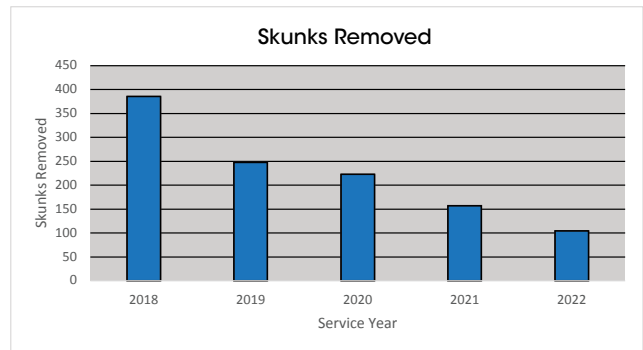
The District received 399 requests for skunk service in 2022 and District employees removed 105 skunks from Contra Costa County properties.

### When a Non-Target Animal is Trapped

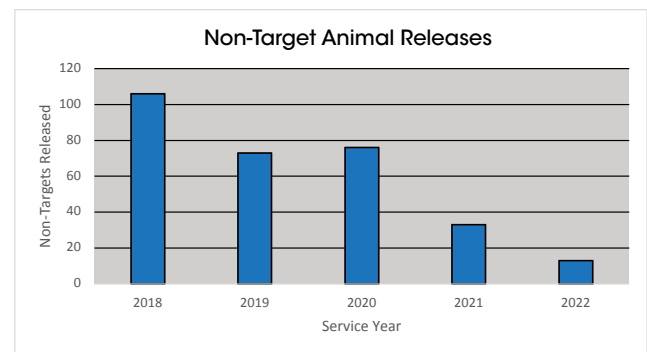
When the District loans a live catch trap to a property owner, but an animal other than a skunk is caught, the animal is released by a District employee on the property in accordance with the California Fish and Wildlife codes prohibiting the relocation of animals. In 2022, 13 non-target animals were released.



Skunk Service Requests 2018 - 2022



Skunks Removed 2018 - 2022



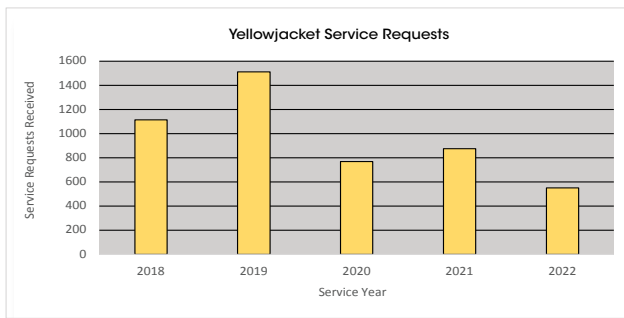
Non-Target Animal Releases 2018 - 2022



## Yellowjackets

There are four yellowjacket species commonly found in Contra Costa County, but the western yellowjacket (*Vespula pennsylvanica*), in particular, is of concern. These yellowjackets typically exploit abandoned rodent burrows and other subterranean voids to build their underground nests. While they can be beneficial as they feed on other insects, when disturbed, they can bite and sting multiple times, putting people at risk of injury or worse if they suffer allergic reactions to stings. The chances of interactions with people are high as ground-nesting yellowjackets aggressively go after proteins and sweets at barbecues, picnics, and outdoor dining areas, putting humans at increased risk of getting bitten and stung. To protect the public from these biting and stinging wasps, the District provides inspections and treatment of yellowjacket ground nests only.

The District received 550 requests for yellowjacket service in 2022. District employees determined that 411 of these yellowjacket requests were nests that warranted treatment. The majority of the requests for yellowjacket service came from cities near the Highway 24 corridor: 123 requests from Orinda, 85 from Walnut Creek, 54 from Lafayette, 50 from Danville, and 40 from Moraga.



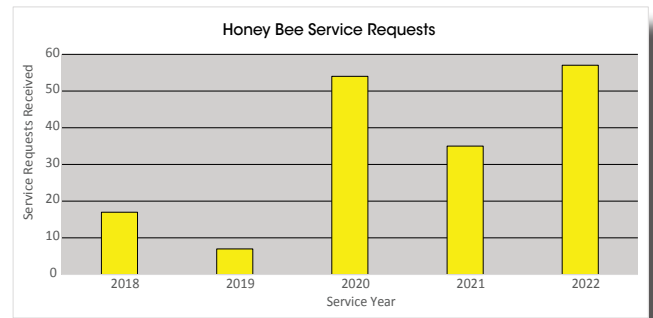
Yellowjacket Service Requests 2018 - 2022

## Honey Bees

There are dozens of species of bees native to the San Francisco Bay area, but the most common bee with which Contra Costa residents may be familiar is actually an introduced species known as the western or European honey bee (*Apis mellifera*). These bees are crucial pollinators for many flowers and crops, along with other plant varieties.

The District's bee service primarily consists of inspection for bees and education for residents. The District does not treat bee hives established in structures or that are located on private property. The District may treat bee swarms or hives that are an immediate threat to the people in public areas, such as shopping centers or schools; however, these swarms generally will relocate within a few days without provocation. The District generally refers residents to local beekeepers for the collection and removal of swarms or hives without killing them.

The District received 57 requests for honey bee service in 2022. Walnut Creek led with 10 requests for service, followed by Concord, Lafayette, Orinda, and Richmond each with 6 requests for service.



Bee Service Requests 2018 - 2022

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## *Environmental Health*

Integrated Vector Management (IVM) is a decision-making process for the optimal use of tools for efficient, cost-effective, and sustainable control of vectors. The District implements IVM practices to guide decisions using an evidence-based approach that is respectful to our environment. Interventions for a particular vector are based on the strengths, weaknesses, potential risks, and costs of each action, or a combination thereof, to determine what tactic is most appropriate for a given place, time, and risk to public health. Additionally, the District follows a **Programmatic Environmental Impact Report** (PEIR) that considers the effects of District control actions while also being held accountable to a National Pollutant Discharge Elimination System (NPDES) permit issued by the State Water Resources Control Board. NPDES permits are required by the U.S. Environmental Protection Agency and intended to address water pollution by regulating point sources that discharge pollutants into waters of the United States.

The District strives to be respectful of the environment, supporting a collaborative role in the protection of endangered species, conservation and restoration of Bay Area wetlands, and promotion of biorational (low environmental impact) control methods to protect the environment while also safeguarding public health. The District also complies with all state and local regulations regarding hazardous material storage and disposal, wastewater discharge, waste tire disposal, and stormwater discharge, helping to secure the District's lowest possible environmental impact.

## *Training and Certification*

### **Annual Training**

District employees attend annual training sessions designed to ensure they meet or exceed the requirements set forth by all regulatory agencies with jurisdiction over the use of public health pesticides. The District continued to employ online video training options in 2022, but was also able to begin the incorporation of in-person events, as well. Training sessions review vector biology, control products, equipment, updates to District procedures, instruction on the use of new software and technologies, and new laws and regulations relevant to vector control. Training enabled staff to continue to perform their work with confidence and skill while adhering to safe work practices.

### **State Certification**

District technicians and inspectors are certified through the Vector Control Certification Program of the California Department of Public Health. District employees maintain state certification for public health work in vector control to ensure that best practices are followed via continuing education and state-proctored testing. Areas of focus include the safe and effective use of pesticides, the biology and control of mosquitoes, and other invertebrates and vertebrates of public health significance. Certification is renewed every two years through continuing education units provided through approved workshops, presentations and conferences.



*The Vector-borne Disease Section of the California Department of Public Health oversees the Vector Control Technician Certification and Continuing Education programs.*

## Public Affairs

The Public Affairs department employees work closely with residents and news media to inform and educate Contra Costa County residents about important vector-related health topics. In a typical year, 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.

The District's public affairs program is designed to educate the more than 1.16 million residents who live and work within Contra Costa County's 716 square miles 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.

### Community Outreach

Community outreach is the mainstay of the District's public affairs program, with the goal of encouraging Contra Costa County residents to change behavior to reduce the risk of vector-borne disease. In 2022, this goal became even more important with the detection of the invasive mosquito species *Aedes aegypti* within Contra Costa County. That detection prompted an update in messaging and an increase in outreach efforts by Public Affairs department staff.

### Presentations and Events

Following two pandemic-limited years, in 2022, community events and presentation opportunities were once again plentiful. Public affairs staff provided 19 presentations and participated in seven community events and festivals where employees provided information.



*Public Affairs Director Nola Woods provided a presentation to the Martinez City Council regarding the discovery of invasive *Aedes aegypti* mosquitoes in Martinez.*

Among the presentations public affairs staff provided in 2022 were three presentations to city council members in areas where the District has vacancies on the Board of Trustees. The presentations were designed to educate council members and residents about the responsibilities associated with the Board of Trustees and increase interest from residents in Clayton, San Pablo, and El Cerrito.

### External Electronic Communication

The Public Affairs department publishes [News Releases](#), [Adult Mosquito Control Notifications](#), the [Mosquito Bytes Newsletter](#), and this [annual report](#) using internet distribution of District publications. Internet distribution, or electronic communication 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. The District ended 2022 with 2,919 total subscribers, a 2.31 percent increase over the total number of subscribers in 2021. Of the subscribers to the District's online publications, 39 percent opened the District's online publications on mobile devices and 61 percent accessed them through desktop computers.

### Internal Electronic Communication

The Public Affairs department staff worked with administration staff and the District's IT Systems Administrator in 2022 to create a District Intranet site. The Intranet provides District employees with easy access to forms, policies, benefits and training videos.



*The District's Intranet makes finding important forms and documents as easy as the click of a computer mouse.*

## Traditional Outreach

2022 marked the District's 95th anniversary of protecting public health. Subsequently, a specially created anniversary emblem appeared on the District's advertising. In 2022, the public affairs staff purchased advertising space in print and digital options.

### Digital Billboard

The Public Affairs department conducts advertising in an effort to place the District's important public health messages where Contra Costa County residents are. In 2022, public affairs staff purchased advertising on a digital billboard along Highway 4 near Antioch, on websites, and in printed materials delivered to residents' homes.



*The District's 2022 advertising campaign included acknowledgement of the District's 95 years of protecting public health.*

### Internet Advertising

Public affairs staff used Internet banner advertising to increase the District's visibility on websites visited by Contra Costa County residents. Five versions of the District's "Back to Basics" campaign appeared on a seasonal rotation for vector activity. The ads focused on the District's skunks service in January, followed by all the District's services in June, mosquitoes in July and August, yellowjackets in September and October, rats and mice in November and December.



*The District uses a seasonal rotation to display internet advertising on websites and other Internet sites.*

### Print Advertising

In 2022, the public affairs employees chose to place print advertising in the hands of Contra Costa County residents all across Contra Costa County.



*Your Town Monthly is one of the community magazines the District uses to reach residents in Danville, Alamo, Black Hawk and San Ramon.*

Public affairs staff purchased print advertising in the Brentwood Press to reach communities in eastern Contra Costa County, the Contra Costa Marketplace to reach residents in western Contra Costa County, and on the backs of buses to share District messages with citizens in central Contra Costa County.

## Invasive *Aedes aegypti*

The 2022 detection of invasive *Aedes aegypti* in Contra Costa County meant the Public Affairs department joined the effort to raise awareness and promote action from Contra Costa County residents to dump out standing water and scrub containers to remove this mosquito's sticky eggs.

Public affairs staff joined other District employees participating in weekend work to inspect properties within the detection zone. Public affairs employees also created a door hanger and shared a brochure with detailed information on *Aedes aegypti* and what residents can do to mitigate the issue on their own property.



## Social Media

Just in time for the public affairs staff to use the District's social media channels to share important information about the detection of *Aedes aegypti*, the District learned it had been approved as a public agency on the social media platform Nextdoor. The designation as a public agency allows the public affairs staff to post messaging that appears in a specific area of Contra Costa County, or can appear countywide. When it came time to share information about the invasive mosquitoes in Martinez, public affairs employees posted messaging that appeared to subscribers located within the specific areas under investigation for the mosquito.



*Nextdoor post about the discovery of invasive Aedes aegypti in Martinez, August 2022.*

With the expanding opportunities to reach Contra Costa County residents on [Twitter](#), [Facebook](#), and [Nextdoor](#), in 2022, the Public Affairs department began creating content out of timely District messages to share with county residents on a weekly basis.

## Training and Certification

Public affairs staff are certified through the Vector Control Certification Program of the California Department of Public Health in order to provide accurate information when advising the public regarding vector issues in person or through written materials. In 2022, public affairs employees received continuing education to maintain this certification.

The Public Affairs department also receives annual Public Relations training through the Public Relations Society of America (PRSA). In 2022, the PRSA training was titled PR Boot Camp and it focused on developing behavior-based Public Relations through behavioral PR theories; qualitative and quantitative research techniques; best practices in internal and external communication; media relationship-building; crisis communication and issue anticipation; and evaluation.



*Public Affairs Department receive annual Public Relations training from PRSA in 2022.*

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## Administration

When a Contra Costa County resident contacts the District to ask a question or request a District service, a member of the District's Administration department is often the first to respond to the question or request because administration staff provide a wide range of supporting services for county residents and District employees, alike. Administration employees process payroll, accounts payable and receivable; provide information to the District's governing body; and compile compliance reports for state and federal agencies. The administration staff also work closely with the District's General Manager and Board of Trustees to help guide decision-making in order to promote legal, consistent and fair business practices and the appropriate use of resources throughout the District.

In 2022, all District Board meetings remained virtual, while in-house training sessions and meetings transitioned through hybrid meetings into in-person meetings. Interactions with members of the public who came to the District building were minimal, yet welcomed.

The District established a new position in 2021, a Human Resources and Risk Manager who joined the District in late 2021. The District Employee Handbook was updated to comply with legislative changes and the most recently signed Memorandum of Understanding (MOU). In 2022, a partnership between the Human Resources and Risk Manager, the IT Systems Administrator, and the Public Information and Technology Officer produced the first District Employee Intranet to simplify employee access to necessary policies and documents. In addition, the Administration Department worked to streamline the District's accounting practices and eliminate unnecessary overhead. Administration staff also began looking at updating the accounting platform, along with integrating a Human Resources Information Software (HRIS) System.

## Information Technology

The Information Technology (IT) Systems Administrator is responsible for all communication and connectivity technology at the District including maintaining all aspects of the administration phone system, mobile devices, computers, and internet services. The IT Systems Administrator maintains multiple virtual servers, all associated software at employee workstations, and maintains a specialized software programs.

In 2022, the IT Systems Administrator updated the District's internet access to faster fiber broadband in preparation for IT infrastructure changes and initiated the on-premises IT infrastructure decommissioning process by moving to cloud-based systems. In addition, the IT Systems Administrator migrated the legacy PBX phone system to a cloud-based VoIP phone system and conducted research and evaluation regarding hybrid meeting conference solutions, enhanced facilities safety and surveillance, and accounting and payroll cloud systems.

The IT Systems Administrator also worked with specific departments in 2022, including the operations department by subscribing to an imagery service designed to improve the District's swimming pool surveillance program, and continued to fine tune the District's data collection software. The IT Systems Administrator also conducts employee training to help employees adopt new technologies.



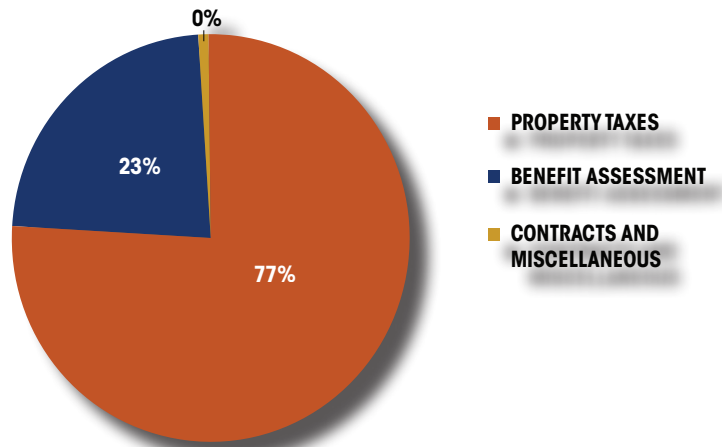
*The District Building in Concord, California*

## Financial Statement

The Contra Costa Mosquito and Vector Control District relies on property tax revenues and benefit assessment charges in Contra Costa County to fund all District operations. The countywide benefit assessment was implemented in 1996 and it varies among four zones in Contra Costa County according to benefit of District services and generates revenue that is used to provide mosquito and vector surveillance and control to the residents of Contra Costa County.

In 2022, the District received 99.5% of its annual revenue from property taxes and benefit assessment, with approximately 77% of funding coming from property taxes to county parcels and approximately 23% coming from the benefit assessment. This revenue stream rose 2.8% in fiscal year 2021/2022 compared to the prior fiscal year. Contra Costa County property tax assessed values have continued to see increases, although at a slower pace than previous years, and the County has maintained a relatively strong and stable housing market. Total operating expenditures for the fiscal year were \$7.8 million. Most expenditures were for employee salaries and benefits.

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, and that the District's financial statements conform to the generally accepted accounting principles (GAAP). They 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.



AUDITED FINANCIAL STATEMENTS		
REVENUES	2020/2021	2021/2022
Property Taxes	\$6,580,371	\$6,976,161
Benefit Assessment	2,062,943	2,074,580
Contracts	28,479	21,693
Interest	44,244	*
Miscellaneous	129,733	20,050
<b>TOTAL REVENUES</b>	<b>\$8,845,770</b>	<b>\$9,092,484</b>
EXPENDITURES	2020/2021	2021/2022
Salaries, Wages, Benefits	\$5,942,961	\$6,097,793
Operations	1,677,025	1,789,100
Capital	157,371	51,842
<b>TOTAL EXPENDITURES</b>	<b>\$7,777,357</b>	<b>\$7,938,735</b>
<b>TRANSFER TO RESERVE</b>	<b>\$1,068,413</b>	<b>\$1,153,749</b>



CONTRA COSTA  
**MOSQUITO  
& VECTOR  
CONTROL**  
DISTRICT