

2021

ANNUAL REPORT



CONTRA COSTA
**MOSQUITO
& VECTOR
CONTROL**
DISTRICT

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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).

In 2021, as the COVID-19 pandemic (pandemic) continued, the District made necessary adjustments to continue to provide the essential services of protecting the people of Contra Costa County from vectors of disease or harm, while reducing the risk of COVID-19 transmission to District employees. District-wide safety procedures evolved as increasing scientific data regarding the pandemic helped to shape new local and statewide directives. And once safe and effective vaccines became available, the District's Board of Trustees approved a policy that all District employees be vaccinated against COVID-19. For 94 years, the District has remained steadfast in protecting public health from vector-borne diseases, and that commitment remains stronger than ever, even during a persistent and ever-changing pandemic.



Mosquitofish in a barrel

Date Unknown



Vector Control Technician Heidi Budge treats a catch basin to detect the presence of mosquitoes.

Mission Statement

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

PRINCIPLES

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

PUBLIC HEALTH

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

ENVIRONMENTAL STEWARDSHIP

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

SCIENCE & TECHNOLOGY

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

PUBLIC EDUCATION

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

SAFETY

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

MANAGEMENT EFFECTIVENESS

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

TEAMWORK & COLLABORATION

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



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



Top Row Left to Right: Peggie Howell, President, Clayton; Peter Pay, Vice President, San Ramon; Daniel Pellegrini, Secretary, Martinez

Middle Row Left to Right: James Pinckney, Contra Costa County; Richard Ainsley, Ph.D., Pittsburg; Randall Diamond, Danville; Warren Clayton, Pinole; Michael Krieg, Oakley

Bottom Row Left to Right: Perry Carlston, Concord; James Murray, Walnut Creek; Kevin Marker, Orinda; Shiva Mishek, Richmond; and Jennifer Hogan, Pleasant Hill

Not pictured: Chris Cowen, Contra Costa County; Jim Fitzsimmons, Lafayette; James Frankenfield, Moraga; Thomas Minter, El Cerrito; Duylinh Nguyen, Hercules; Jon Elam, Brentwood; Darryl Young, Contra Costa County; and Lola Odunlami, Antioch

Board Vacancies: San Pablo

Contra Costa Mosquito & Vector Control District Personnel

Administration



Paula Macedo, D.V.M.,
Ph.D., General Manager



Maria Bagley, Administrative
Services Manager



Stacy Stark, Human
Resources and Risk
Manager



Nola Woods, Public Affairs Director;
Andrew Pierce, Public Information and
Technology Officer



Natalie Martini, Administrative Analyst II; Areej Al
Bahrani, Administrative Analyst I; and Wayne Shieh, IT
Systems Administrator

Scientific Programs



Steve Schutz, Ph. D., Scientific
Programs Manager



Eric Ghilarducci, Vector Ecologist II; Damien Clauson, Vector
Ecologist; Chris Miller, Biologist/Fish Program; Marie Cerda,
Laboratory Technician

Operations



Program Supervisors: David Wexler, Terry Davis, and Jeremy Shannon



Vector Control Inspectors: Felipe Carrilo, Joe Cleope, Patrick Vicencio, and David Obrochta



Vector Control Inspectors: Steve Fisher, Lawrence Brown, and Danielle Wisniewski



Vector Control Inspectors: Tim Mann, Jeremy Tamargo, Josefa Cabada, and Chris Doll



Vector Control Inspector: Brandon French
Vector Control Technicians: Miaja McCauley and Shaun Redman



Vector Control Technicians: Heidi Budge, Olivia Zaragoza, and Melvin Mariano

Not pictured: Jason Descans, Vector Control Inspector

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

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, mites, ticks, other arthropods, and rodents and other vertebrates.”

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, tide gates, levees, and other water control facilities; the use of all-terrain vehicles, and maintenance of paths; and the use of trapping of vectors that pose a threat to public health and welfare
- **Public Education** — Encouraging 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. Mosquitoes can transmit the pathogens that cause a variety of diseases including West Nile virus (WNV). Certain species of mosquitoes found in Contra Costa County can transmit malaria, WNV, St. Louis encephalitis (SLE), Western equine encephalomyelitis (WEE), and potentially other encephalitis viruses. Another species of mosquito is also capable of transmitting dog heartworm.

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

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

Rats & Mice

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

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

District services for Contra Costa County residents or business owners include rat and mouse identification and advice for prevention and control. District employees provide valuable, detailed information, guidance and recommendations. They may also issue a formal, detailed report, upon request.

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 survey properties, provide guidance and recommendations and may loan 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 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 control of ground-nesting yellowjackets only. Ground-nesting yellowjackets typically build nests in areas such as abandoned rodent burrows, the hollow areas near the root systems of shrubs, under railroad ties or under wood piles. Residents must locate and mark the nest before contacting the District for service. 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 tick identification services to the public and medical personnel and educates the public on tick bite prevention and tick removal. People who are concerned

about possible Lyme disease infections should contact their physician. Information on Lyme disease testing of ticks may be found by visiting [Lyme disease Q & A](#). Several commercial laboratories will test ticks for the bacteria that causes Lyme disease for a fee. Visit [Tick Testing Labs](#) for more information.

Bees (European and Africanized Honey Bees)

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

District services for bees are very limited. The District provides an inspection and education about bees. The District does not respond to bee stinging incidents. District employees treat bee swarms or hives that are a threat to people in public areas such as 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.

Other Animals of Importance

Although certain animal species such as bats, ground squirrels, coyotes, raccoons, opossums, and fleas are not regularly controlled by the District, these animals play important roles in the transmission of rabies, plague, murine typhus, or Hantavirus, 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 collaboration with the California Department of Public Health, Contra Costa Health Services, Contra Costa County Animal Services, Contra Costa County Department of Agriculture and other local, state and federal agencies.

Mosquito and Vector-Borne Disease Surveillance and Research

The District's laboratory staff conducts a comprehensive surveillance program for mosquitoes and the pathogens they can transmit, including West Nile virus (WNV), Western equine encephalomyelitis (WEE) and Saint Louis encephalitis (SLE) as part of California's statewide surveillance effort. The District also collaborates with the California Department of Public Health, the University of California and other state and federal agencies on studies intended to detect or predict new mosquito-borne diseases which might be introduced to Contra Costa County in the future. A virus native to Africa which first appeared in the US in 1999, WNV has been the most prominent mosquito-borne virus here in California since its arrival in 2003, with approximately 7,400 reported symptomatic cases and 360 deaths (the actual number of cases is probably much higher since only patients with the most severe form of the illness tend to be tested and diagnosed). Serious outbreaks of WEE and SLE occurred in California as recently as the 1950s and 1960s. Three human cases of SLE were reported in California in 2021 in Marin, Stanislaus, and Fresno Counties. The District last detected WEE activity in 1997, when two chickens at the District's flock in the Martinez waterfront area tested positive for antibodies. Occasional travel-related human cases of Zika, dengue and chikungunya viruses have been reported in Contra Costa County, but so far the District has not found evidence of local transmission of these diseases or of the mosquito species known to be capable of transmitting them.

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

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

- Mosquito population surveillance
- Encephalitis virus surveillance
- Surveillance for other vector-borne diseases
- Identification of ticks and other biting arthropods
- Quality control and resistance monitoring for pesticide applications
- Research and special projects

Mosquito Population Surveillance

Mosquito surveillance is a key component of the District's IVM program. **23 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

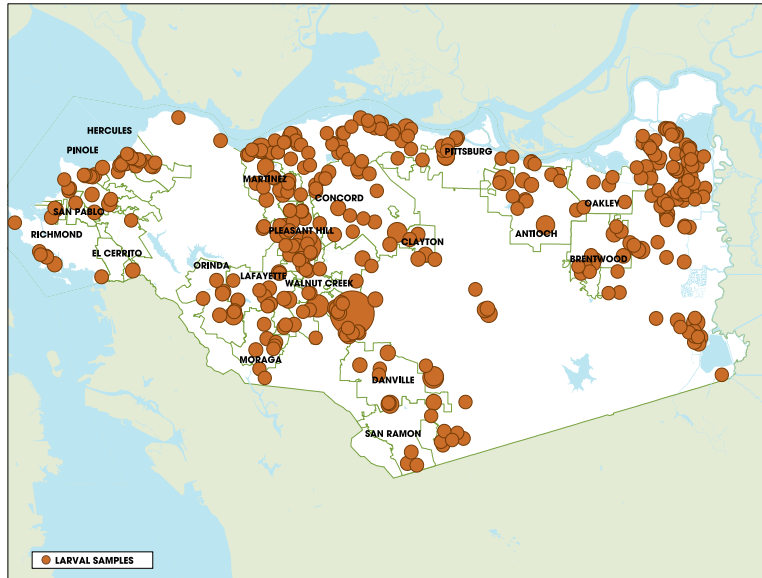
District personnel collect samples of mosquito larvae in the field daily and return them to the District's Laboratory for counting and identification. Treatment decisions can then be made, based upon species and density information in addition to other factors including habitat type, proximity to populated 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 2021, laboratory staff counted and identified 16,079 mosquito larvae.



Scientific Programs Manager Steve Schutz, Ph.D. examines mosquitoes recently collected in traps from locations in Contra Costa County.

LARVAL SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culiseta incidens</i>	6,328
<i>Culex pipiens</i>	3,351
<i>Culex tarsalis</i>	3,023
<i>Aedes dorsalis</i>	1,020
<i>Culiseta inornata</i>	575
<i>Aedes nigromaculis</i>	475
<i>Aedes washinoi</i>	412
<i>Aedes melanimon</i>	309
<i>Aedes squamiger</i>	132
<i>Aedes vexans</i>	130
<i>Aedes sierrensis</i>	80
<i>Culex erythrothorax</i>	80
<i>Culex stigmatosoma</i>	76
<i>Culiseta particeps</i>	67
<i>Culex apicalis</i>	16
<i>Anopheles punctipennis</i>	4
<i>Anopheles franciscanus</i>	1
TOTAL	16,079

Mosquito larvae identified in 2021 by species



Locations of mosquito larval samples collected by the District in 2021

throughout the County and as many as 10-20 variable locations that are chosen based on other surveillance information (dead bird reports, mosquito complaints, field observations by District personnel, etc.). These traps collect both day and night-flying mosquitoes. District employees retrieve the traps and return them to the District lab while the mosquitoes are still alive so that lab employees can test them for WNV and other viruses. Counts can also be compared with regional averages to track population changes and target control activities.

Adult Mosquito 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 (CO₂) traps—at representative locations throughout Contra Costa County.

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

CO₂ traps are portable, battery-powered, and use dry ice to produce carbon dioxide gas, which is a powerful attractant for mosquitoes. In addition to the dry ice, there is also a small LED light to attract mosquitoes. District employees set the traps once per week and leave them overnight at 23 'fixed' locations



A New Jersey light trap hangs ready to trap adult mosquitoes. A 2-watt LED 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 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.



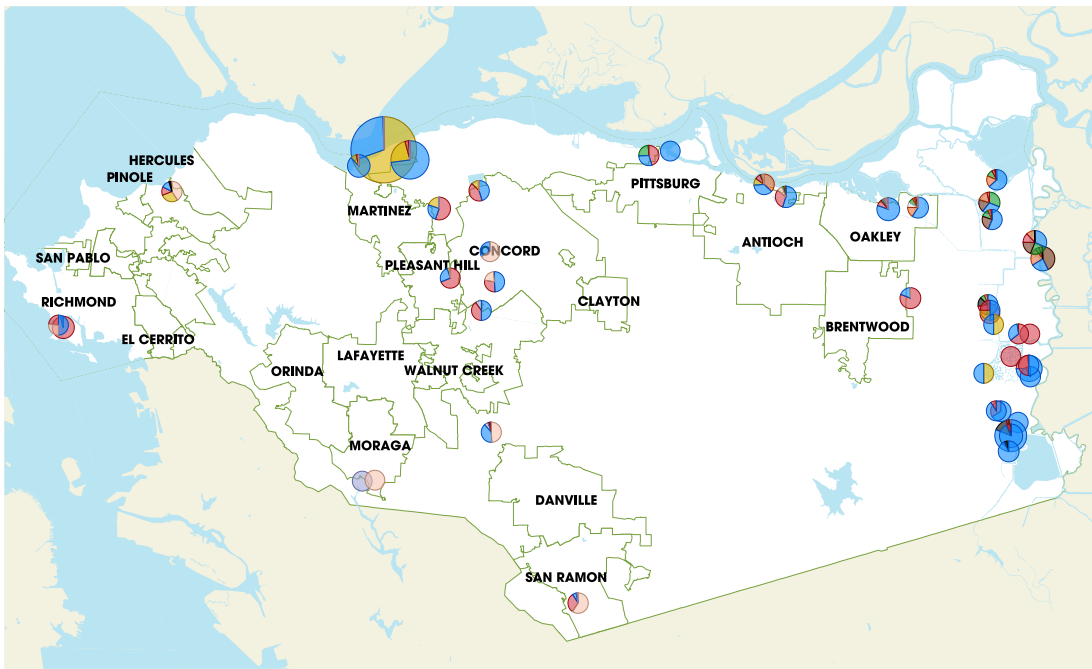
Vector Ecologist II Eric Ghilarducci examines mosquitoes collected from locations around Contra Costa County.

Rainfall was well below the ten-year average during 2021, and daily temperatures were mostly average or below 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 due to limited access to some larval sources in waterfront industrial areas.

A total of nearly 44,000 adult mosquitoes were collected and identified in the District’s random and fixed-location traps in 2021.

ADULT SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culex tarsalis</i>	22,549
<i>Aedes dorsalis</i>	12,465
<i>Culex pipiens</i>	3,583
<i>Aedes melanimon</i>	1,172
<i>Aedes vexans</i>	1,005
<i>Culex erythrothorax</i>	853
<i>Aedes nigromaculis</i>	835
<i>Culiseta incidens</i>	575
<i>Culiseta inornata</i>	556
<i>Anopheles franciscanus</i>	150
<i>Anopheles freeborni</i>	62
<i>Culiseta particeps</i>	17
<i>Anopheles punctipennis</i>	17
<i>Culex stigmatosoma</i>	15
<i>Aedes sierrensis</i>	12
<i>Aedes washinoi</i>	8
<i>Anopheles occidentalis</i>	3
<i>Aedes squamiger</i>	2
TOTAL	43,879

Adult mosquitoes collected in all fixed and random traps by species, 2021



SPECIES

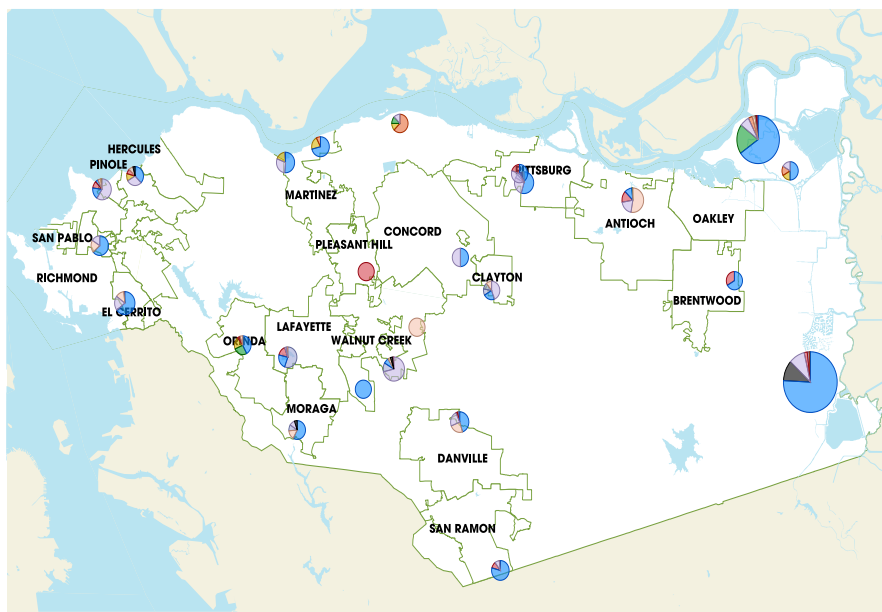
- *Aedes dorsalis*
- *Aedes melanimon*
- *Aedes nigromaculis*
- *Aedes sierrensis*
- *Aedes squamiger*
- *Aedes vexans*
- *Anopheles franciscanus*
- *Anopheles freeborni*
- *Anopheles occidentalis*
- *Anopheles punctipennis*
- *Culex erythrothorax*
- *Culex pipiens*
- *Culex stigmatosoma*
- *Culex tarsalis*
- *Culiseta incidens*
- *Culiseta inornata*
- *Culiseta particeps*

ADULT MOSQUITO SPECIES COLLECTED IN CO₂ TRAPS IN 2021

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 2021

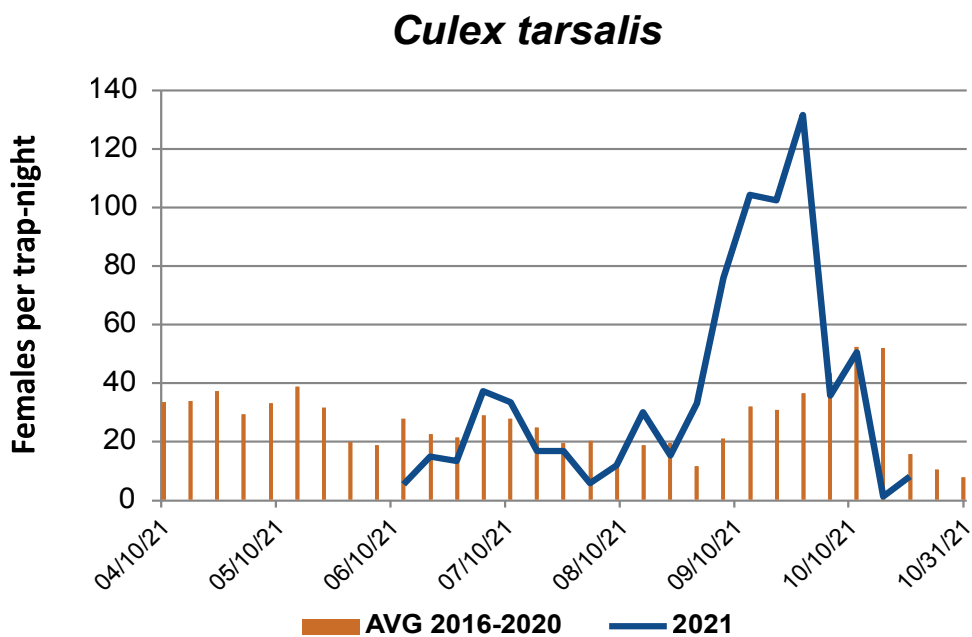
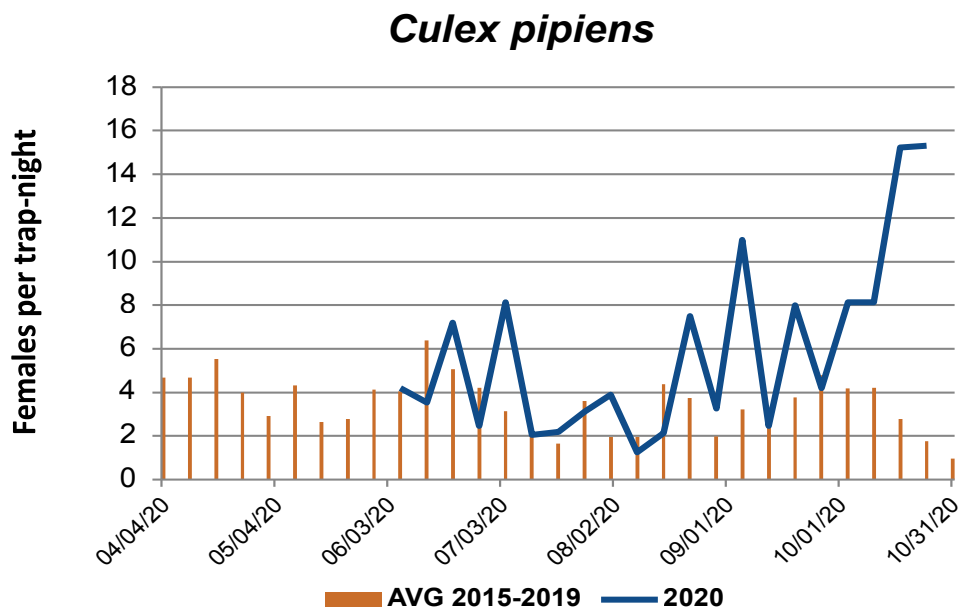
A 2-watt LED light attracts mosquitoes to the traps. Mosquitoes are then counted and identified to species to determine relative abundance and the risk of disease or nuisance to people. In this figure, the size of the circles is proportional to how many mosquitoes were collected.



SPECIES

- *Aedes dorsalis*
- *Aedes melanimon*
- *Aedes nigromaculis*
- *Aedes sierrensis*
- *Aedes washinoi*
- *Anopheles franciscanus*
- *Anopheles punctipennis*
- *Culex erythrothorax*
- *Culex pipiens*
- *Culex tarsalis*
- *Culiseta incidens*
- *Culiseta inornata*
- *Culiseta particeps*

Abundance of Vector Mosquito Species in Contra Costa County in 2021



Adult mosquito trap collections vs. 5 year average, 2021

Mosquito-borne Virus Surveillance

Mosquitoes collected in fixed location and random location CO₂ 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 2021, 396 samples (14,415 mosquitoes) were tested and 8 samples were positive for WNV (7 *Culex tarsalis* and 1 *Culex pipiens*), between June 29th and September 20th. Virus detections were concentrated in East County, with four in Brentwood, 2 in Discovery Bay, and one each in Byron and Oakley. West Nile detections were below the 5-year average both regionally and statewide.



District Vector Ecologist II Eric Ghilarducci prepares a trap to capture adult 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).

Testing in 2021 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 2021, the WNV Call Center received 392 dead bird reports from Contra Costa County residents, which was a decrease from the 488 received in 2020. Of the birds reported in 2021, 37 were collected for testing and 4 tested positive for WNV, two of which were from Brentwood, one was from Martinez and one from San Pablo. Dead bird reports have been declining steadily since the beginning of the program in 2005, apparently due to a decline in public interest (birds still appear to be susceptible to the virus, since infection rates have fluctuated but have not shown a similar steady decline).



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

Sentinel Chickens

Chickens are naturally resistant to some mosquito-borne viruses and do not become ill, nor can they pass the virus back to mosquitoes, but they do develop antibodies that can be detected in lab tests. This makes them ideal 'sentinels' for detection of virus transmission. In 2021 the District started with a total of 24 chickens (six at each of four flock sites) within Contra Costa County. One flock was destroyed by predators early in the season. 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.



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

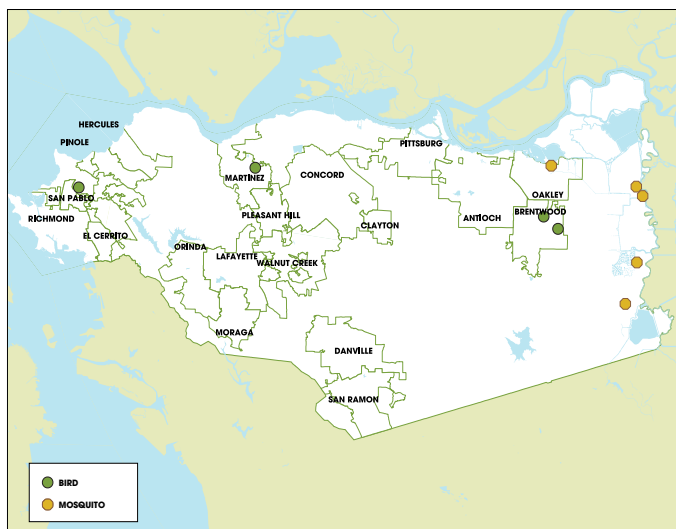
In 2021, none of the District's chickens tested positive for antibodies to WNV. Since chickens cannot pass the virus on to others, they are donated to charitable organizations for egg production or adopted by owners of the host properties at the end of each season.

Human and Equine Disease Cases

One locally acquired and two non-locally acquired human cases of WNV were reported in Contra Costa County for 2021. 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 or mistaken for 'the flu'.

Statewide, 142 human cases and 13 fatalities were reported in 40 counties in 2021, down from 240 cases and 15 fatalities reported the previous year. The California Department of Public Health reports that there are typically 30 to 70 non-neuroinvasive (West Nile fever) cases, most of which go unreported, for every reported case of neurological disease, so more than 6,000 Californians may have had West Nile virus infections in 2021, 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; 13 positive horses from 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.



Positive West Nile Virus Activity in Contra Costa County in 2021

2007 – 2021 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Mosquito Samples	Samples Tested	721	729	814	536	484	468	454	652	622	495	550	709	454	471	396
	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	15,451	14,288	14,415
	West Nile Virus Positive	28	31	17	4	7	19	13	25	8	11	6	17	1	13	8
Chickens	Blood Samples Tested	669	851	717	773	600	590	631	598	609	571	624	554	527	270	232
	Total No. Chickens	50	50	50	50	50	50	50	50	50	50	50	50	50	24	18
	Seropositive	5	15	13	4	0	7	8	15	18	5	7	16	2	7	0
Dead Birds	Total Reported	2,042	2,227	1,221	923	1,057	1,816	1,377	1,355	912	861	692	711	321	488	392
	Total Tested	158	115	80	32*	74*	106*	123*	115*	49*	76*	58*	45*	23*	60*	37
	West Nile Virus Positive	29	88	45	8	43	66	68	44	11	33	19	17	1	22	4

*testing restricted to crows/foys only

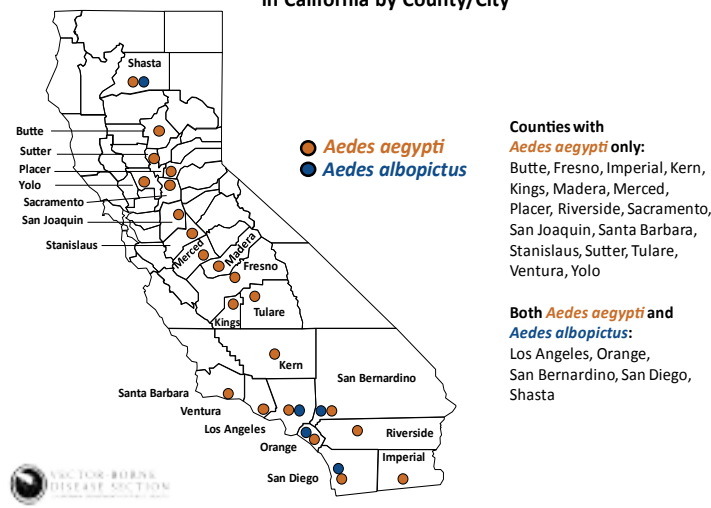
Invasive Mosquito Species

In addition to the non-native Asian tiger mosquito (*Aedes albopictus*), which has been established in parts of the Los Angeles basin since at least 2011, vector control districts in the Central Valley and Southern California have continued to report finding populations of the yellow fever mosquito, *Aedes aegypti*. During 2021, this species continued to expand its range northward, as far as Butte and Shasta counties. *Aedes notoscriptus*, the Australian backyard mosquito, has also been found in southern California although its range does not appear to be expanding as quickly. All of these species are similar in behavior, in that they are adapted to living around humans and lay their eggs in a wide variety of natural and artificial water containers. They are potential vectors of viruses that transmit human disease, including dengue virus, which has been on the increase worldwide, chikungunya virus, which spread

explosively throughout the Caribbean, Central and South America in 2014, and Zika virus, which spread rapidly in South and Central America in 2015. Travel-related cases of these viruses continue to be reported throughout the United States.

These mosquitoes are known for being difficult to control and for causing significant nuisance issues. So far, attempts to eradicate the new mosquito populations have met with 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. So far, our surveillance program has not detected the presence of these species in Contra Costa County, although they are now at our eastern border.

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



Pesticide Resistance Monitoring

Mosquitoes and other insects always have the potential to develop resistance against the materials we use to control them (similar to antibiotic resistance in bacteria). Since all of the adulticide materials we have 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 our local mosquito populations are still susceptible or whether we need to consider alternative control agents. In 2019, we tested *Culex tarsalis* collected from our waterfront area and determined that they are still fully susceptible to etofenprox, the active ingredient we are currently using most frequently. We 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

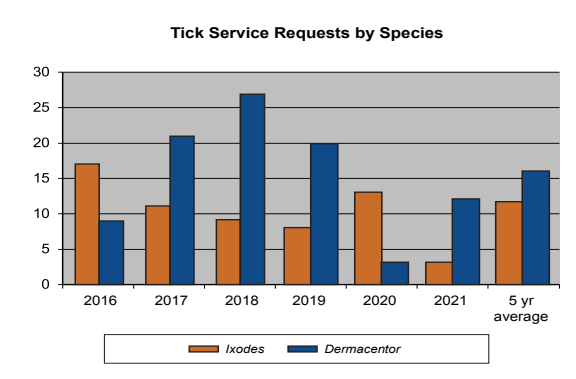
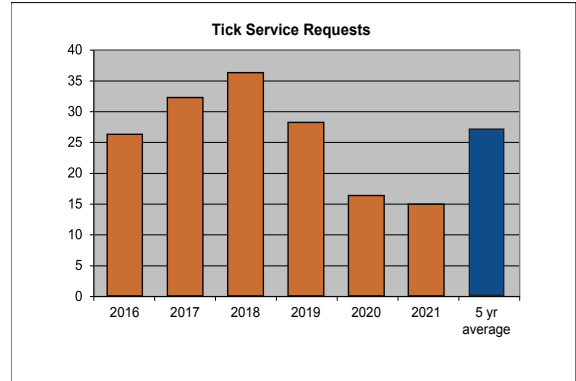
There are four species of common human-biting ticks in Contra Costa County:

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

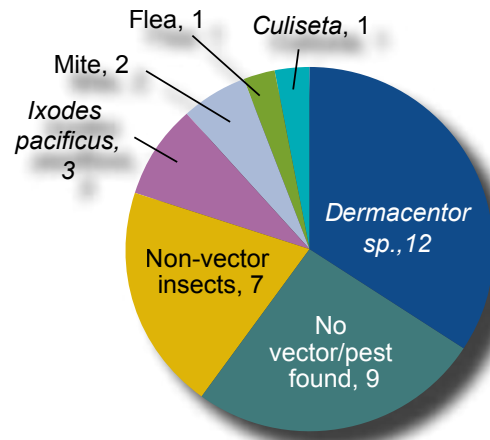
Lyme disease is a bacterial infection transmitted by the western black-legged tick (also known as the deer tick) and it can cause serious complications if not treated promptly.

District staff continues to identify ticks brought in by members of the public. 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 2021, we continued to receive samples by mail and accepted limited walk-in samples when Covid-19 restrictions permitted. Of the 15 ticks identified by our staff, 3 were western black-legged ticks (*Ixodes pacificus*), the potential vector of Lyme disease and the remainder were dog ticks (*Dermacentor variabilis* and *D. occidentalis*).



As a courtesy to the public, the District's Laboratory staff also identifies samples of biting and stinging pests submitted by the public. In 2021, Laboratory staff responded to more than 35 such requests. Inquiries received via phone or email only (no samples received) are not currently being recorded in the District database.



Identifications by Laboratory staff in 2021.

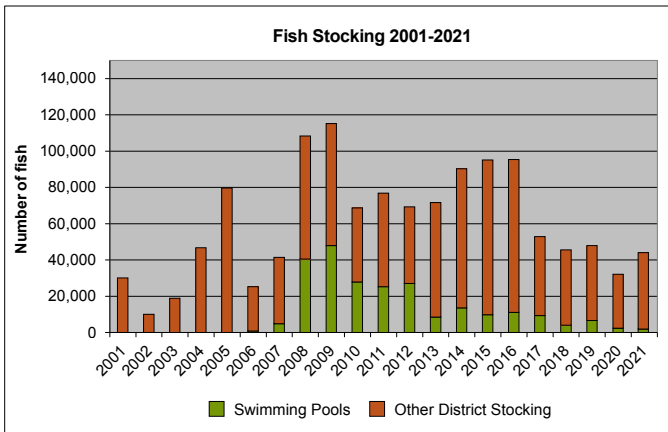
Biological Control and Fisheries Research

Known around the world as mosquitofish, *Gambusia affinis* are an effective biological control tool, as each surface feeding fish has the ability to eat multiple mosquito larvae, thus preventing them from developing into adult mosquitoes capable of biting and potentially spreading mosquito-borne illness. District employees place mosquitofish in water sources, in accordance with California Department of Fish and Wildlife regulations, to reduce the risk of mosquitoes.

The District's biologist facilitates the fish program. In 2021, District employees distributed 43,735 mosquitofish on residential properties and other closed sources of water compared to the 34,970 mosquitofish District employees distributed in 2020.



Mosquitofish (*Gambusia affinis*)



Fish Stocking 2000-2021

Mosquitofish Service Request

The District's mosquitofish service provides Contra Costa County residents with the opportunity to receive an inspection of any water features on the property. If a District employee determines mosquitofish are an appropriate solution to address mosquito issues on the property, the District employee will place the fish. In 2021, the District received 269 requests for mosquitofish service, compared to 332 requests the District received in 2020.

The service remains beneficial in that it enables District employees to confirm that the fish are being appropriately placed. It also provides an additional opportunity to educate residents on other ways to reduce the risk of mosquitoes.

Fisheries Research

While *Gambusia affinis* is the District's first choice for biological control, the District also conducts research on the potential use of California native fish species in mosquito control and environmental education. In 2021, the District continued several native fish projects, including spawning hardhead, and Sacramento perch.

District Operations

In 2021, the District implemented significant changes to its operations. Previously, District employees provided service based upon geographic zones based on distinct service programs. Over the years, this resulted in the District service area broken into roughly a dozen mosquito zones handling mosquito and yellowjacket program services, three rodent zones handling rat and mouse program services, and two skunk zones handling skunk program services. In 2021, the District's operational zones for mosquitoes, yellowjackets, and rats and mice were consolidated into 13 zones with slightly smaller geographic boundaries, and the previous skunk zones carried forward as before. This means a single District employee assigned within a geographic area now responds to resident requests for mosquito, yellowjacket, rats and mice service.

Additionally, the District's Operations program began testing and learning how to use a web-based data management system at the start of the year. The system was adopted and officially deployed midway through the year. This new system now allows operations personnel to visualize real-time information in geographic formats, create service requests, record data, and more while in the field utilizing mobile devices. This reduces the need for data entry and processing at the main District facilities, allowing field staff more time to address vector concerns throughout Contra Costa County.

Mosquito Control Operations

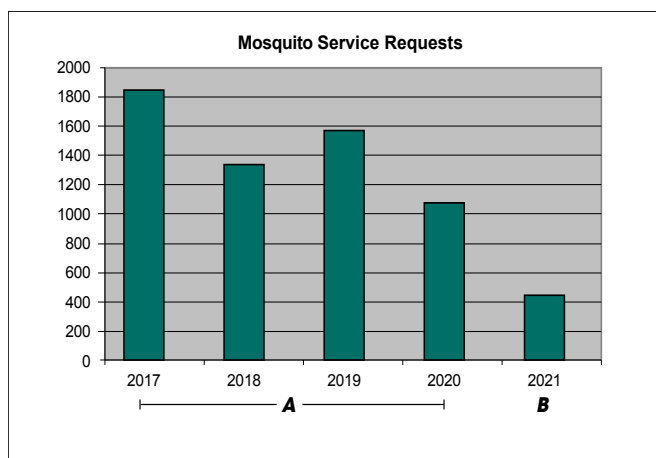
District employees work year-round to reduce the risk of mosquito-borne illness across the 716 square miles of Contra Costa County by preventing mosquitoes when possible and controlling mosquitoes when necessary to protect public health for 1.15 million county residents.

While responding to requests for mosquito services in 2021, District employees found many residents at home after making their requests, creating more opportunities to educate residents about how to prevent mosquito issues.

The District employees responded to 423 requests for mosquito service from Contra Costa County residents and performed 6,508 inspections and site visits across all programs. During 1,106 of those inspections and site visits, District employees confirmed mosquito production at the location.

Under the District's previous data management system, mosquito-related services (mosquito service, neglected

swimming pools, mosquitofish) were all initially categorized as "mosquito service requests." With the implementation of the District's new data management software, the way in which the public requests District services are more precisely categorized and represented. The perceived reduction in service requests in 2021 is actually a more accurate representation of instances when members of the public are experiencing mosquitoes on their property and seeking assistance from the District for that specific issue, rather than another mosquito-related service.



A: 2017-2020 Previous data collection system combined data from mosquito-related services within mosquito service requests.
B: 2021 New data management software separates mosquito program data for more efficient reporting.

Reducing the Risk of Mosquitoes Before Mosquitoes are Present

Mosquitoes can lay eggs on or near sources of standing water. Overgrown vegetation in creeks and other areas can stop water from flowing, creating potential mosquito sources. These areas of abundant plant life can present challenges to District employees while trying to gain access for mosquito control. The District regularly works with landowners and other responsible agencies to address overgrown vegetation and other conditions that are conducive to mosquito production or inhibit access by District personnel to mosquito sources.

Several species of mosquitoes present in Contra Costa County lay their eggs on the soil of pastures. These eggs hatch once these pastures are irrigated and, when irrigation water remains for an excessive amount of time allowing mosquito larvae and pupae to complete their lifecycle, they emerge as adults. The irrigated pasture mosquitoes (*Aedes*

nigromaculis) and (*Aedes melanimon*) are commonly found in these irrigated areas, bite aggressively during daylight hours, and can become major pests.

In 2021, excessive irrigation of pastures and agricultural areas in eastern Contra Costa County created significant sources of these mosquitoes, wreaking havoc on local residents. Significant efforts were made by the District to provide control, combined with consistent communication to landowners and tenants to modify their operations to reduce mosquito production on their properties through adjustments to the extent and timing of irrigation practices.

Early each year following the rainy season, temporary rainwater ponds and puddles can produce mosquitoes in many areas of the county. The freshwater mosquito (*Aedes washinoi*), the California salt marsh mosquito (*Aedes squamiger*), the inland floodwater mosquito (*Aedes vexans*), and the summer salt marsh mosquito (*Aedes dorsalis*) are common and can be abundant at certain times of the year and they will bite people and become a significant problem in certain locations. These mosquitoes are aggressive daytime-biting mosquitoes that are strong fliers and may bite people far away from their larval habitat; the California salt marsh mosquito, in particular, is known to fly up to 20 miles from its source. District employees performed inspections and treatment of these early-year sources known for past mosquito production as well as newly identified sources.

Creeks Channels and Pastures

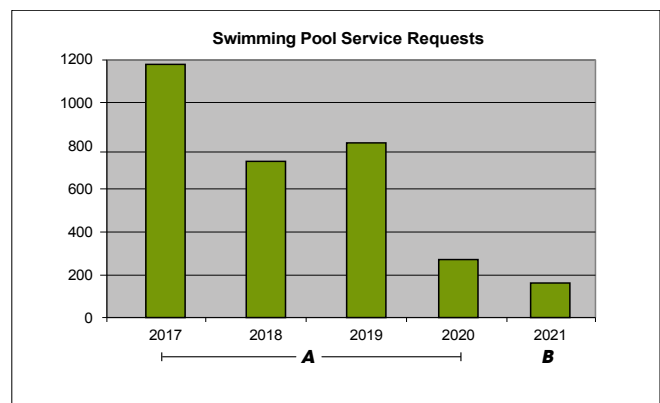
Below-average rainfall caused once-flowing water in areas including creeks and channels to slow and eventually leave pools of standing water, creating potential sources of mosquitoes. District employees worked to manage both nuisance and disease-carrying mosquitoes in these areas, finding them more accessible for inspection and treatment due to the efforts District employees made to clear vegetation from the area earlier in the year. District employees also inspect pastures, fields, and channels for mosquitoes that emerge after rainwater followed by continued irrigation. District employees work with landowners and recommend irrigation schedules and changes to work practices to reduce the likelihood of mosquito production.

Neglected Swimming Pools and the Risk of Mosquito-borne Disease

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 our neglected swimming pool program. A District Program Supervisor became the primary point of contact to communicate and meet with residents and homeowners. When appropriate, the Program Supervisor will refer properties to District field personnel for mosquito inspection or control efforts. In 2021, the District received 150 requests for service regarding neglected swimming pools. The Program Supervisor sent letters explaining the District's pool program and expectations for compliance to 134 property owners. More than 60% of these requests were resolved without the need for a site visit by a District employee.

The District's previous data management system produced one request for neglected swimming pool service upon each request from the public, subsequently generating multiple service requests for one location if follow-up action or inspections were deemed necessary by District inspectors. The District's new data management software retains all relevant information and actions under a single identification number per location until the initial mosquito production situation is considered resolved. This provides insight into the apparent reduction in numbers of swimming pool service requests for 2021 compared to previous years. The District's Operations supervisors also hypothesize that many residents spending time at home during the ongoing pandemic could more readily address issues with swimming pools on their property over the last two years, further contributing to fewer neglected swimming pool service requests.



A: 2017-2020 Previous data collection system counted each visit to the same location as a new service request. B: 2021 New data management software assigns one service request number per location until the issue is resolved.

Vector Control Planning

Until a Program Supervisor took over these duties halfway through 2021, the Vector Control Planner (VCP) was the primary point of contact in the District's neglected swimming pool program. The VCP reviewed approximately 145 project proposals from local, county, state, and federal agencies for potential vector control concerns in 2021 and provided feedback as needed. The VCP also relayed maintenance concerns and guidance to private landowners and other agencies regarding mosquito production sources. Areas of concern for mosquito production included over irrigated agricultural land, ponds with overgrown vegetation restricting proper drainage, and devices designed to capture trash in stormwater drainage systems. Guidelines provided by the District brought some areas into compliance, benefiting property owners and neighbors concerned about mosquitoes. Other properties were ultimately referred to the District's Board of Trustees for abatement in order to bring them into compliance.

District Boats

The District has three boats for use in the mosquito program. The boats allow District employees to reach areas along the Contra Costa County shoreline that are not accessible from land, including the islands within Contra Costa County, and along the Delta. District employees also use the boats to conduct adult mosquito trapping which allows them to monitor adult mosquito populations in otherwise inaccessible areas.



One of the District's three boats for use in the mosquito program

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. In 2021, the UAS improved the District's ability to resolve and map sources that needed to be cleaned up or maintained.



The District drone helps District employees find a bioswale which can be a source of underground mosquito production.

Rats & Mice

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. County residents can request service by phone or on the [District's website](#). The county is home to three rodent pest species that are considered common household pests: the black rat, which is also known as the roof rat (*Rattus rattus*), the Norway rat (*Rattus norvegicus*), and the house mouse (*Mus musculus*). These three species are commensal, which means they prefer to live in close proximity to humans. These species in particular are well established throughout Contra Costa County and all of California.

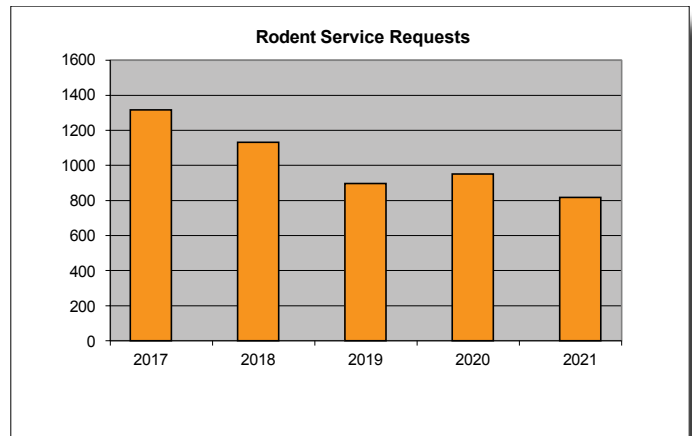
Preventing rats and mice is important because they can be vectors of disease. Worldwide, rats and mice have been associated with the spread of at least 35 diseases. They commonly spread disease through contamination of food that has come into contact with their urine, feces, or saliva. They are prolific breeders and may form large populations which can increase the likelihood of contamination. These commensal rodents can carry ectoparasites (fleas, mites, ticks, lice) capable of spreading murine typhus, plague, and bacteria in the *Bartonella* genus. Beyond potentially spreading diseases, they can also cause significant physical damage to a structure due to their gnawing behavior, possibly leading to economic loss. They also create a risk of structural fires because they have been known to gnaw on electrical wires.



A damaged vent screen can be an entry point into a home for mice.

During an inspection of a residential or commercial property, a District employee looks for evidence of potential sources of food and shelter, and how the rats or mice are gaining access to a home or business. Due to the ongoing pandemic, the District continued to limit inspections for rats and mice to exterior locations.

In 2021, there were 828 requests for rodent service, a 10.6 percent decrease compared to the number of requests the District received in 2020. The majority of the requests for rat and mouse service came from areas in central and west Contra Costa County, with 88 requests for service coming from Walnut Creek, followed by 87 from Richmond, 76 from Concord, 63 from Orinda, and 61 from El Cerrito.



Skunks and Rabies Risk Reduction

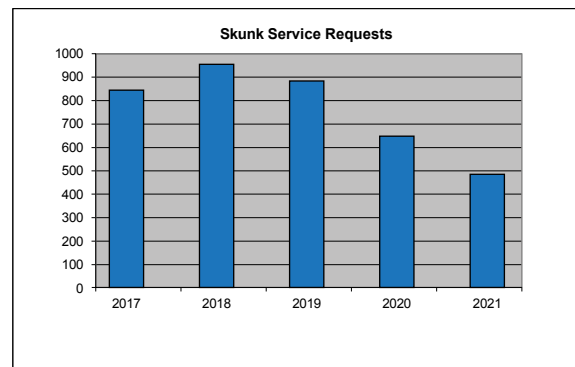
Skunks (*Mephitis mephitis*) are a natural part of our environment and can be beneficial as they consume many pest insects, such as beetle grubs and crickets. They are also predators of small mammals including rats and mice. Skunks, however, are one of the primary reservoirs and vectors of rabies in California. Skunks transmit the rabies virus through their saliva while biting other animals or humans. The rabies virus infects the central nervous system and can lead to death if left untreated. To reduce the risk of rabies, the District provides inspections and advice to county residents when skunks are believed to be on private property.

While providing the District's skunk service, District employees inform residents of appropriate measures to reduce contact with skunks and eliminate attractants on the property. Skunks are attracted to fallen fruit, birdseed, grubs in turf, and pet food left outdoors. Skunk populations thrive when they can find a consistent food source and suitable harborage located nearby. Skunks can establish dens in voids that exist under decks, porches, homes, sheds, and other ground-level locations. When skunks become established in close proximity to people it increases the possibility of human interaction and the potential for the spread of rabies.

The District's primary goal is to educate residents, landowners, agencies, school officials, and business owners on the permanent steps they can take to keep skunks from living nearby. District employees provide advice on how to prevent skunks from denning on the property including instructions on how to install wire mesh to block skunks from areas where they could potentially build a den.

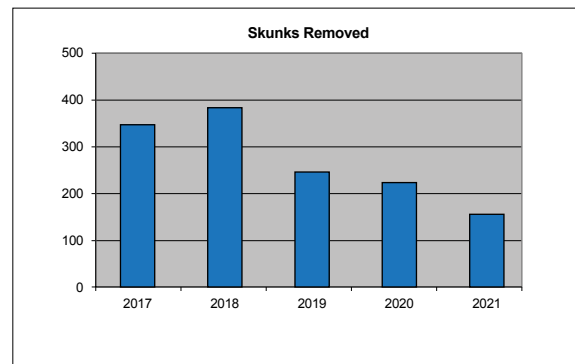
Skunk Service Requests

The District divides the county into two zones for skunk service with one vector control inspector assigned to each zone. District personnel continued providing skunk inspections in 2021 while following protocols in light of the continuing pandemic. In 2021, the District received 479 requests for skunk service, a 24.69% decrease compared to the number of requests received in 2020. District employees also removed 157 skunks from Contra Costa County properties, a 29.60% decrease over the number of skunks removed in 2020. This drop in service requests is believed to be, in part, the result of improvements many residents made to their residences while spending more time at home in 2020. Those repairs to their property reduced potential residential denning sites and potentially led to fewer interactions with skunks.



When a Non-Target 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 on the property in accordance with the California Fish and Wildlife codes prohibiting the relocation of animals. In 2021, 33 animals were released compared to 76 in 2020.



Yellowjackets

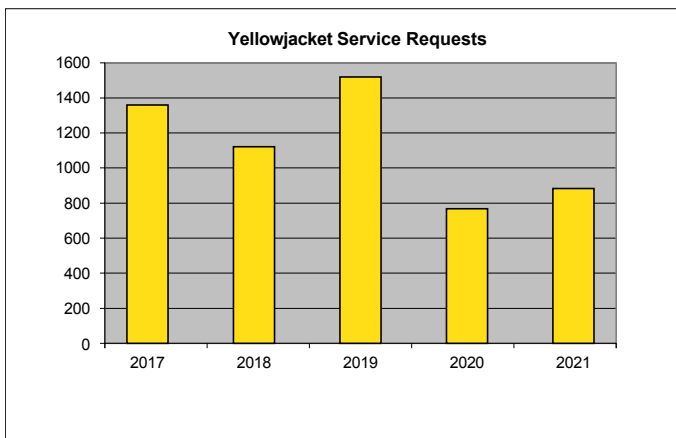
Yellowjackets pose a risk to public health because they have the ability to bite and sting multiple times, putting people, particularly those who suffer allergic reactions to stings and bites, at increased risk of injury.

Contra Costa County is home to four common species of yellowjackets including the western yellowjacket (*Vespula pensylvanica*) which builds nests underground—usually taking over abandoned rodent holes and subterranean voids. Other species build the familiar paper 'hornet's nests' in trees or on structures. All yellowjackets can be beneficial because they feed on other insects, but the ground-nesting species can become a threat to humans because the nests are harder to see, and they will also aggressively go after meats and sweets at barbecues and picnics. To protect the public from these biting and stinging wasps, the District provides inspections and treatment of yellowjacket ground nests.

The District received 876 requests for yellowjacket service in 2021, a 14 percent increase from the number of requests the District received in 2020. District employees treated 668 yellowjacket nests in 2021. The majority of the requests for yellowjacket service in 2021 came from cities near the Highway 24 corridor. 156 requests for the District's yellowjacket service were from Orinda, 142 from Walnut Creek, 122 from Lafayette, and 74 from Moraga.



District vector control technician Heidi Budge treats a ground-nesting yellowjacket nest in Contra Costa County.



Honey Bees

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

Honey bee swarms are groups of worker bees that leave their hive along with a queen to seek a place to start a new hive. Swarms look like a ball of bees clustered on a tree or a man-made structure. The bees in a swarm are not aggressive, as they are in search of a permanent home and are not protecting their honey nor their hive. Swarms typically move away in a day or two when they find a good location to build a hive (usually inside a hollow tree or other cavity). While the District does on occasion receive requests to relocate a bee swarm, District employees generally refer homeowners to a local beekeeper who can safely relocate the bees to a suitable location. The District will provide treatment for bee swarms or hives when they pose a potential threat to people in public areas such as schools or shopping centers. The District does not treat bee swarms that are in or on structures or private property.

In 2021, the District received 35 requests for bee service. The District previously referred to our program as an Africanized honey bee (AHB) program; however, because Africanized and European honey bee populations can interbreed and are physically indistinct, the District cannot conclusively determine whether bees are Africanized or European by visual inspection. If there is reasonable evidence, the District may coordinate with other agencies for genetic testing and identification.

Environmental Health

As has been described in this report, the District uses an Integrated Vector Management program (IVM) to guide the District's vector control decisions in an evidence-based manner that is environmentally respectful. When implementing a control program, the District continually evaluates the strengths, weaknesses, risks, and resource cost of each type of intervention to determine what combination in a given area is most appropriate for the current risk posed to public health from mosquitoes and the pathogens they transmit. To that end, the District follows a Programmatic Environmental Impact Report (PEIR) in conjunction with the District's IVM program. The District also receives oversight and is held accountable by filing for and receiving a National Pollutant Discharge Elimination System (NPDES) permit from US EPA. The NPDES permit is designed to address water pollution by regulating point sources that discharge pollutants to waters of the United States.

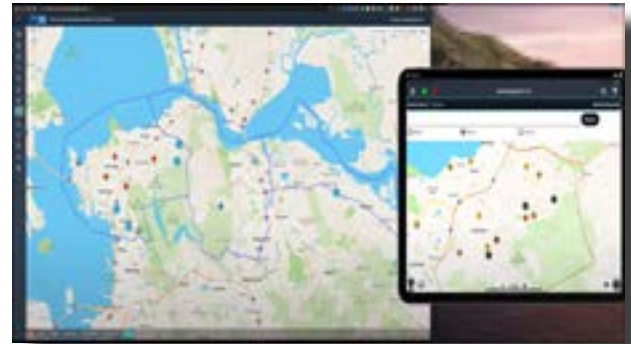
As part of the District's effort to be environmentally respectful, the District plays a collaborative role in the conservation and restoration of Bay Area wetlands, protection of endangered and threatened species, and promotion of biorational (low environmental impact) control methods in order to protect both human and environmental health.

In 2021, the District's VCP attended stakeholder meetings and provided appropriate feedback for various environmental restoration projects throughout Contra Costa County. The District also worked to ensure District compliance with state and local regulations regarding wastewater discharge, hazardous material storage, and waste tire disposal, helping to ensure the District reduces our environmental impact.

Training and Certification

Annual Training

Annual training for District employees is designed to ensure that District employees meet or exceed the requirements of all regulatory agencies with jurisdiction over the use of public health pesticides to reduce the risk of disease. In 2021, due to the ongoing pandemic, the District continued to employ online video training options. The virtual training sessions were designed to review the 23 known species of mosquitoes currently in Contra Costa County, provide instruction and updates on the current requirements and procedures for use of vector control products and equipment, as well as familiarize District personnel with new software and technologies. Proper training allowed District employees to continue to carry out their tasks safely, with confidence and expertise.



As the pandemic continued into 2021, the District conducted Annual Training using online presentations.

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 during state certification include safe and effective use of pesticides, biology and control of mosquitoes, and other invertebrates and vertebrates of public health significance. Certification is renewed every two years.



The California Department of Public Health oversees the California Vector Control Certification and Training Program.

Public Affairs

The public affairs department employees work closely with residents and news media to inform and educate about important 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.

Community Outreach

Community outreach is the mainstay of the District's public affairs department, with the goal of encouraging Contra Costa County residents to change behavior to reduce the risk of vector-borne disease. 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.

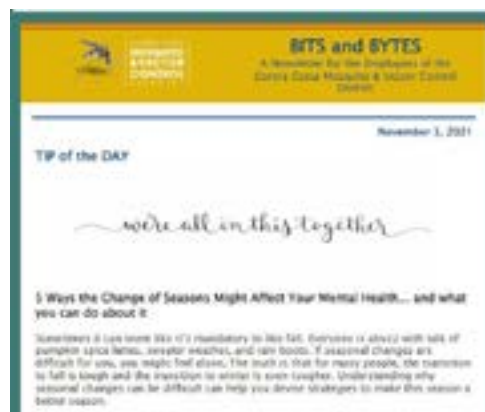
External Electronic Communication

Internet distribution of District publications is swift, succinct, and provides a sharable format making it a more efficient communication vehicle than traditional mail. As the pandemic continued into a second year, electronic communication remained a critically important communication tool.

The public affairs department publishes **News Releases**, **Adult Mosquito Control Notifications**, the **Mosquito Bytes Newsletter**, the **Bits and Bytes Employee Newsletter**, and this **annual report online**. Members of the public may subscribe to the District's publications. The District ended 2021 with 2853 total subscribers, a 5.78 percent increase over the total number of subscribers in 2020. Of the subscribers to the District's online publications, 25 percent opened the District's online publications through mobile devices and 75 percent accessed them through desktop computers.

Internal Electronic Communication

In 2021, the public affairs department continued to publish an electronic employee newsletter to disseminate important information to District employees and delivered directly into employees' email. The employee e-newsletter continues to serve as an important way to share timely information to District employees including changes in COVID-19 protocols, seasonal safety tips, and information on mindfulness which proved to be particularly useful during the stress of the second year of the pandemic.



The District's Employee Newsletter, "Bits and Bytes" continued to be a valuable communication tool.

Traditional Outreach

The public affairs department continued to use the "Back to Basics" advertising campaign on print and digital advertising vehicles for a second year. By using the artwork that features the District's specific services with the main message of Protecting Public Health since 1927, department staff were able to reiterate to Contra Costa County residents the important job District employees do to protect public health.



The District's "Back to Basics" advertising campaign emphasized the District's essential role of protecting public health.

Digital Billboard

The public affairs department purchased advertising on a digital billboard located on the eastbound side of Highway 4 in Pittsburg to feature the "Back to Basics" 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.

Internet Advertising

The public affairs department 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 from skunks in January 2021 to mosquitoes and other vectors through the end of the year. The ads focused on the District's skunks service in January, followed by all of the District's services in June, mosquitoes in July and August, yellowjackets in September and October, rats and mice in November and skunks in December.



The District's Internet Advertising featured a seasonal rotation of vectors.

Print Advertising

The public affairs department continued to prioritize reaching all areas of Contra Costa County with the District's annual advertising campaign. While the use of Internet advertising allowed the District to reach residents all across Contra Costa County, print advertising allowed the District to focus on each region of the county.

To reach communities in western Contra Costa County, including Hercules; Rodeo; Pinole; El Sobrante; San Pablo, El Cerrito; and Richmond, the District purchased advertising in the Contra Costa Marketplace publication that sent physical copies to the residents in the specific cities listed. In eastern Contra Costa County, residents could see the District's print advertisements in the Brentwood Press which reached residents in Brentwood, Discovery Bay, Oakley, and Antioch. In central Contra Costa County, the cities of Martinez; Pacheco; Concord; Pleasant Hill; Walnut Creek; and Lafayette viewed the District's print advertising on the back of the County Connection buses. And in the southern section of I-680, the communities of Danville, Alamo, Blackhawk, and San Ramon

received the District's print advertising in the Your Town Monthly publication.



Presentations and Events

As the pandemic continued into a second year, public affairs department staff provided one virtual presentation to the California Special Districts Association as well as two in person presentations to community groups within Contra Costa County. The public affairs department also participated in the Heart of Oakley Festival, which was the first in person event for department staff since the pandemic began.



2021 Heart of Oakley Festival

Social Media

The District uses social media as a communication vehicle with the specific purpose of providing District messages and information to the public. The public affairs department uses Twitter and the District's Nextdoor business account to share current information including news releases, the District's e-newsletter, messaging about West Nile virus risk and seasonal specific vector information. In July 2021, the public affairs department opened a District Facebook account to continue the District's virtual outreach efforts. The additional characters allowed on each Facebook post provides the public affairs staff with the opportunity to share more information each time. Messaging included reminders to report dead birds, an explanation of changes to the District's mosquitofish program, helpful tips on reducing the risk of rats and mice, and updates on District hours due to holiday closings. During World Mosquito Day, social media posts encouraged residents to take precautions to reduce the risk of mosquito bites by dumping out standing water, using repellent at dawn and dusk when mosquitoes tend to be more active, and wearing long sleeves and long pants to reduce the risk of mosquito bites outdoors.

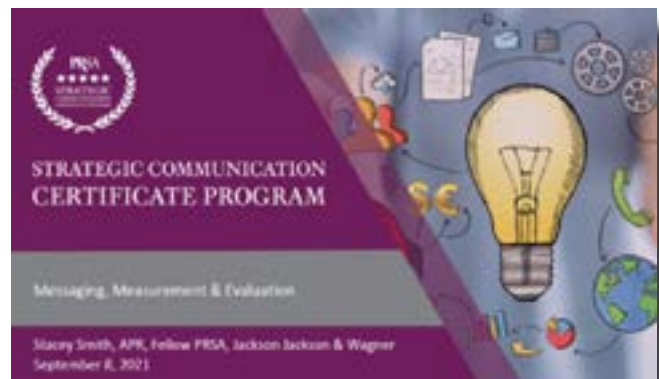


Facebook post for World Mosquito Day 2021

Training and Certification

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

Public affairs staff also received specific Public Relations training through the Public Relations Society of America (PRSA) in 2021. Public affairs staff completed and passed a certification exam to become certified in strategic communication. The subject matter included learning what constitutes the foundations of a strategic plan, the psychology behind creating strategic change, how to create goals and tactics that lead to measurable content, and how to communicate the results effectively. The skills learned are for the benefit of the District's internal and external communication.



Public Affairs Department staff became certified in Strategic Communication through PRSA in 2021.

Administration

The District's administration staff serve both the residents of Contra Costa County and District staff. Administration staff provide a wide range of supporting services including answering questions and entering service requests from residents; processing compliance reports for state and federal agencies; conducting payroll, accounts payable and receivable; and providing information to the District's governing body. The administration staff 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.

Due to the ongoing pandemic, all District meetings and training sessions remained virtual, while interactions with members of the public who came to the District building were minimal. With COVID precautions in place, administration staff were able to continue training on ways to improve efficiencies and increase productivity related to the department's responsibilities. With an emphasis on efficiency, the ongoing process of transferring documentation to digital formats continued in 2021.

As administration staff members are often the first District employees that members of the public encounter, whether in person or on the phone, the support and resources staff members provide to the public are important. So are the support and resources available to all District employees. To that end, the District established a new position in 2021, a Human Resources and Risk Manager who joined the District in late 2021.

Information Technology

The Information Technology division (IT) 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 IT staff maintains multiple virtual servers and all employees' workstations with associated software. The IT administrator also programs and maintains specialized software programs such as the District's timesheet system and operational software, which was implemented early in 2021, and has the ability to integrate the District's online service requests and fieldwork data collection—all in real-time.



The District Building in Concord, California

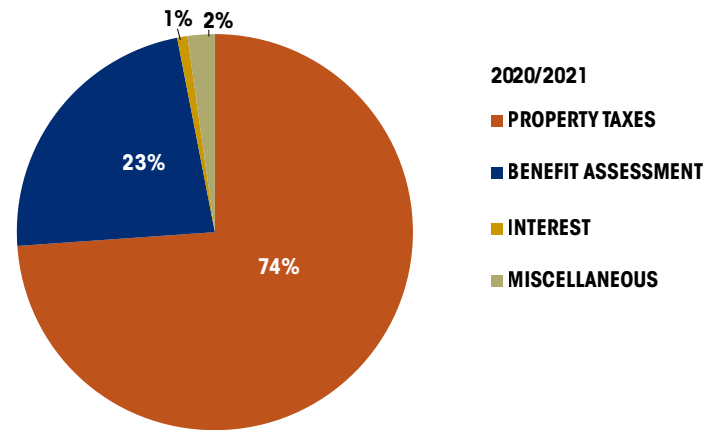
Financial Statement

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

The District receives approximately 97% of its annual revenue from property taxes and benefit assessment. The breakdown is 74% of funding comes from property taxes to county parcels and 23% comes from a benefit assessment. This revenue stream rose approximately 1.1% in fiscal year 2020/2021 compared to the prior fiscal year. Contra Costa County property tax assessed values have continued to see increases, although at a slower pace over the past year, and the County has a relatively strong and stable housing market.

It is important to note above that local property taxes earmarked for the District can be diverted annually to the State of California's Educational Revenue Augmentation Fund (ERAF). Therefore, in 1996, the District implemented a countywide benefit assessment to replace these lost funds. This nominal annual charge varies among four zones in Contra Costa County according to benefit of District services and generates revenue that is used to provide mosquito and vector surveillance and control projects on the properties in Contra Costa 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, 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	2019/2020	2020/2021
Property Taxes	\$6,293,493	\$6,580,371
Benefit Assessment	2,054,797	2,062,943
Contracts	65,128	28,479
Interest	169,116	44,244
Miscellaneous	167,198	129,733
TOTAL REVENUES	\$8,749,732	\$8,845,770
EXPENDITURES	2019/2020	2020/2021
Salaries, Wages, Benefits	\$5,684,203	\$5,942,961
Operations	1,548,735	1,677,025
Capital	96,363	157,371
TOTAL EXPENDITURES	\$7,329,301	\$7,777,357
TRANSFER TO RESERVE	\$1,420,431	\$1,068,413

