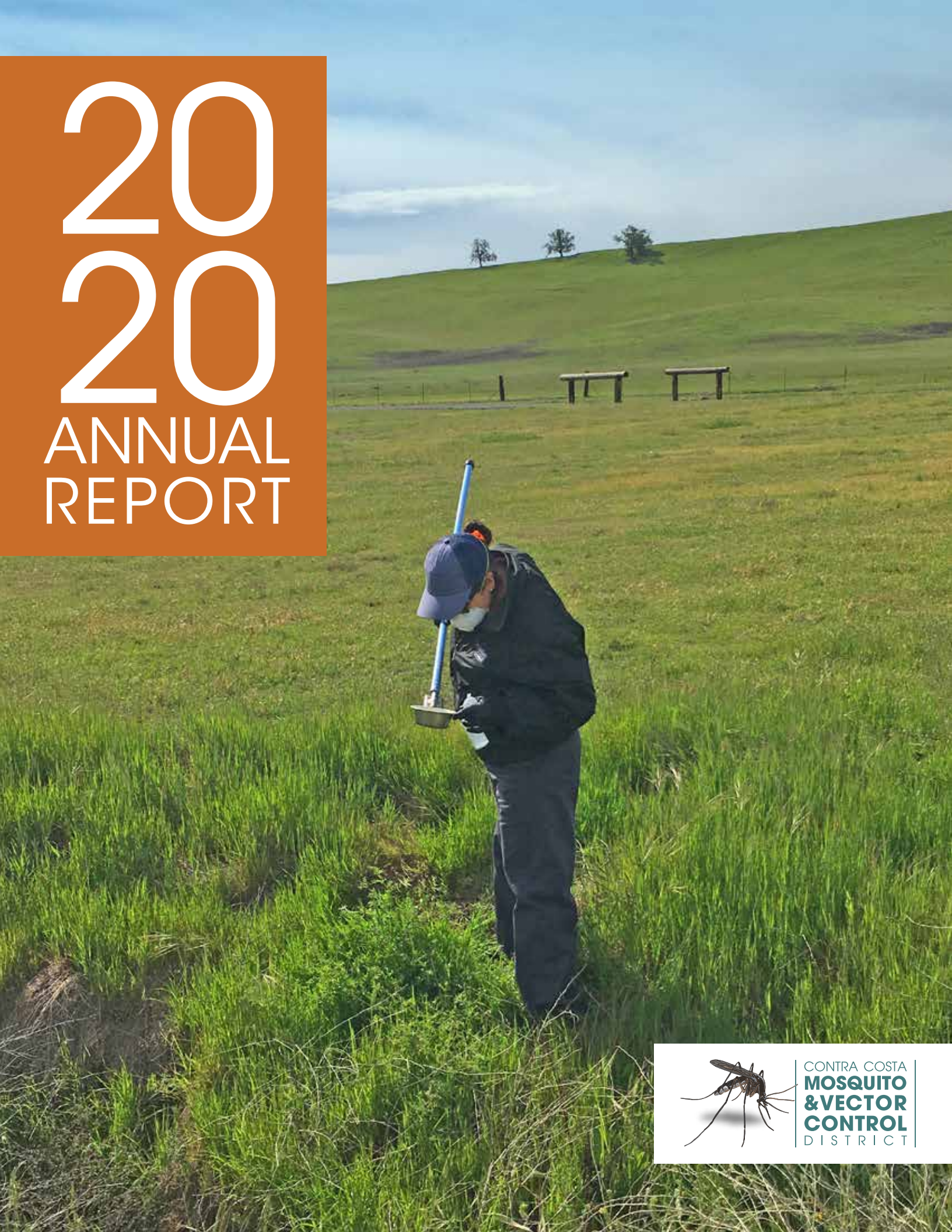


20 20 ANNUAL REPORT



CONTRA COSTA
**MOSQUITO
& VECTOR
CONTROL**
DISTRICT

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1927-2020 93 Years of Service

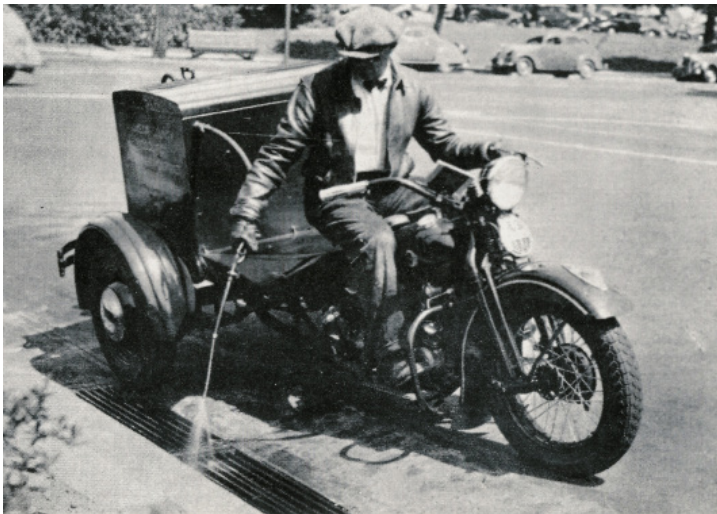
History

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

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

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

In 2020, the District faced once-in-a-century challenges brought on by the COVID-19 pandemic (pandemic). Scientific research quickly determined the novel coronavirus, SARS-CoV-2 which causes COVID-19 disease, is not spread by mosquitoes; however, due to the pandemic and subsequent shelter at home orders in Contra Costa County, the District's essential work to reduce the risk of vectors and vector-borne disease was more important than ever. The District adopted District-wide safety procedures and required increased health and safety precautions aimed at protecting District employees as they continued to serve and protect the public by monitoring and controlling vectors of disease in Contra Costa County. For 93 years, the District has remained steadfast in protecting public health from vector-borne diseases, even during a global pandemic.



Mosquito spraying; date unknown



Vector Control Technician Shaun Redman inspects 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.

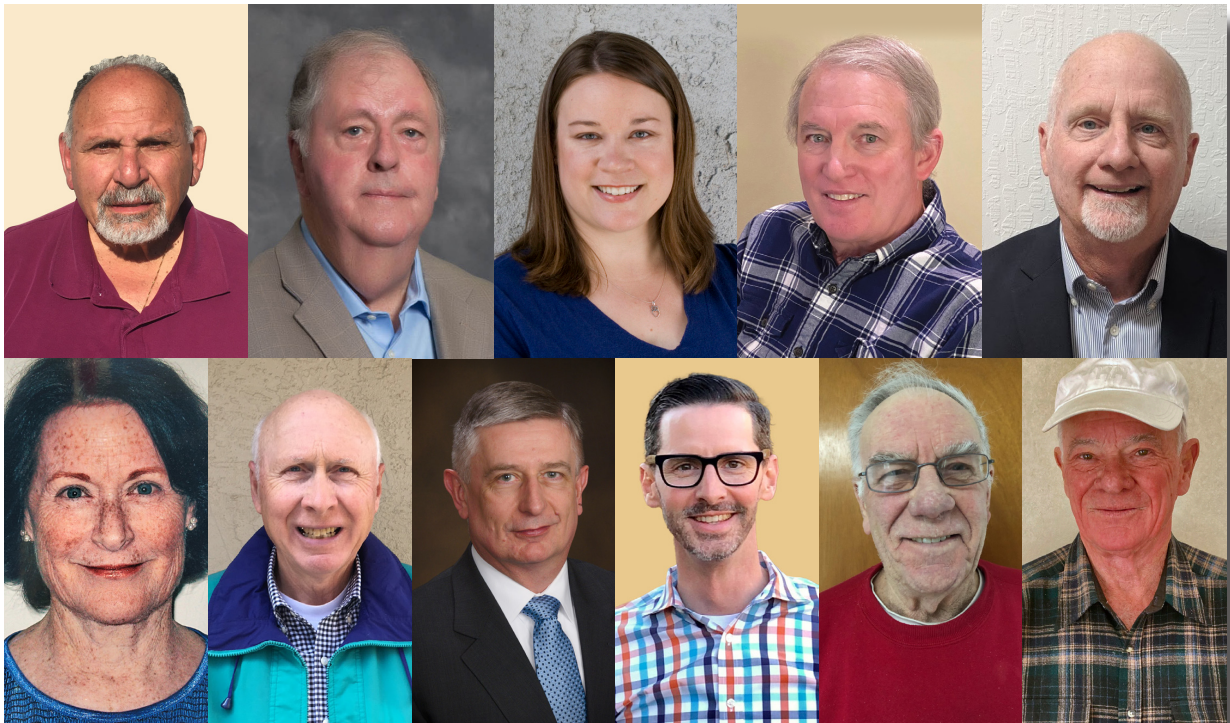


Independent Special District Classification

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

Board of Trustees



Top Row Left to Right: Daniel Pellegrini, Secretary, Martinez; James Murray, Walnut Creek; Jennifer Hogan, Pleasant Hill; Kevin Marker, Orinda; and Michael Krieg, Oakley

Bottom Row Left to Right: Peggie Howell, Clayton; Perry Carlston, President, Concord; Peter Pay, San Ramon; Randall Diamond, Danville; Warren Clayton, Pinole; and James Pinckney, Contra Costa County

Not pictured: Richard Ainsley, Ph.D., Pittsburg; Soheila Bana, Ph.D., Richmond; Chris Cowen, Contra Costa County; Jim Fitzsimmons, Lafayette; Robert Lucacher, Moraga; Thomas Minter, El Cerrito; Duylinh Nguyen, Hercules; Lola Odunlami, Vice President, Antioch; Marshon Thomas, Brentwood; and Darryl Young, Contra Costa County

Contra Costa Mosquito & Vector Control District

Personnel

General Manager



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

Public Affairs



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

Administrative Staff



Areej Al Bahrani, Administrative Analyst I

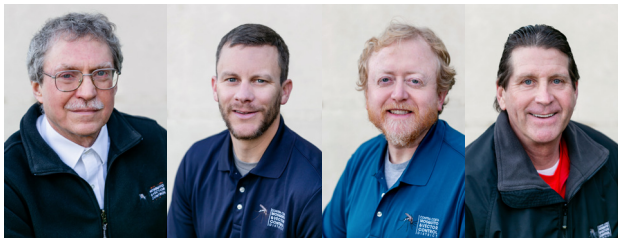
*Not pictured: Maria Bagley, Administrative Services Manager;
Tina Cox, Accounting/Benefits Specialist; and
Natalie Martini, Administrative Analyst II*

Information Technology



Wayne Shieh, IT Systems Administrator

Laboratory



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

Operations



Sheila Currier, Program Supervisor
Terry Davis, Program Supervisor

Not pictured: David Wexler, Program Supervisor



Felipe Carrillo, Vector Control Inspector
Joe Cleope, Vector Control Inspector
Patrick Vicencio, Vector Control Inspector
Reed Black, Vector Control Inspector



Brandon French, Vector Control Inspector
Miaja McCauley, Vector Control Technician
Shaun Redman, Vector Control Technician



David Obrochta, Vector Control Inspector
Steve Fisher, Vector Control Inspector
Lawrence Brown, Vector Control Inspector
Danielle Wisniewski, Vector Control Inspector



Heidi Budge, Vector Control Technician
Olivia Zaragoza, Vector Control Technician
Marc Dilbeck, Mechanic/Technician

*Not pictured: Jason Descans, Vector Control Inspector and
Jeremy Shannon, Vector Control Planner*



Tim Mann, Vector Control Inspector
Jeremy Tamargo, Vector Control Inspector
Josefa Cabada, Vector Control Inspector
Chris Doll, 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, other insects, ticks, mites, and rats, but not including any domesticated animal.”

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

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

Integrated Vector Management

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

- **Vector Surveillance** — Investigating vector populations, vector habitats, 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, stocking, and providing to the public the “mosquitofish” *Gambusia affinis*; and possibly using other predators or pathogens of vectors
- **Chemical Control** — Applying bacterial products and selective insecticides to reduce populations of larval or adult mosquitoes and other invertebrate threats to public health, and rodenticides to control rats and other rodent threats to public health

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

Mosquitoes

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

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

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

Rats & Mice

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

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

District services for Contra Costa County residents or business owners include rat and mouse identification and advice for prevention and control. District employees 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 a natural predator of rodents and they will 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 warrant live catch skunk traps if a skunk has created a den and is actively living on private property. Typically, an active skunk den may be found under a deck, shed, house or wood pile.

Yellowjackets

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

The District provides control of ground-nesting yellowjackets only. Ground-nesting yellowjackets typically build nests in areas such as abandoned rodent burrows, the hollow areas near the root systems of shrubs, under railroad ties or under wood piles. Residents must locate and mark the nest before contacting the District for service. The District does not provide service for other species of yellowjackets, nor those that make their nests in structures.

Ticks

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

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

Bees (European and Africanized Honey Bees)

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

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

Other Animals of Importance

Although certain animal species such as bats, ground squirrels, 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, Hantavirus, or Lyme disease and may be surveyed for diseases. The District may provide education and consultation services to the public about disease risk associated with these vectors and appropriate measures to protect human health.

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

Mosquito and Vector-Borne Disease Surveillance and Research

The District's laboratory staff conducts a comprehensive surveillance program for mosquitoes and the pathogens they can transmit, including West Nile virus (WNV), Western equine encephalomyelitis (WEE) and Saint Louis encephalitis (SLE) as part of California's statewide surveillance effort. The District also collaborates with the California Department of Public Health, the University of California and other state and federal agencies on studies intended to detect or predict new mosquito-borne diseases which might be introduced to Contra Costa County in the future. A virus native to Africa which first appeared in the US in 1999, WNV has been the most prominent mosquito-borne virus here in California since its arrival in 2003, with approximately 7,200 reported cases and 317 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. Four human cases of SLE were reported in California in 2020 in San Joaquin, Stanislaus, Madera, 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 also been reported in Contra Costa County, but so far the District has not found evidence of local transmission of these diseases or of the mosquito species known to be capable of transmitting them.

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

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

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

Mosquito Population Surveillance

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

Larval Mosquito Surveillance

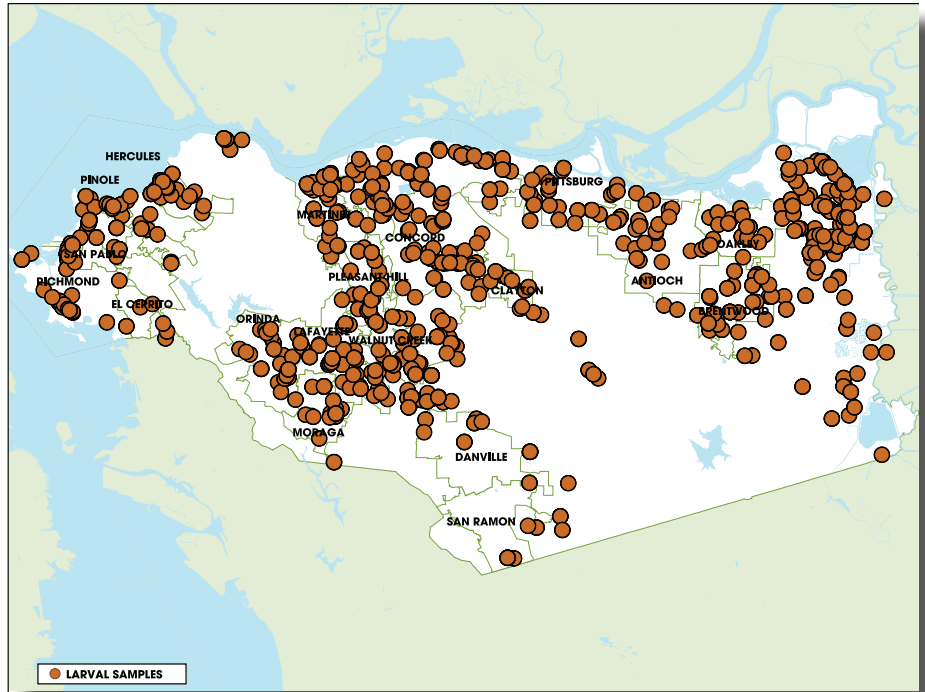
District personnel collect samples of mosquito larvae in the field daily and return them to the District's Laboratory for counting and identification. Treatment decisions can then be made, based upon species and density information in addition to other factors including habitat type, proximity to populated areas, and presence or absence of natural predators. The data are stored in a database which enables the District's laboratory staff to make comparisons with historical averages and to map larval populations by species. In 2020, laboratory staff counted and identified 38,551 mosquito larvae and pupae.



Scientific Program Manager Steve Schutz, Ph.D. identifies mosquitoes collected within Contra Costa County.

LARVAL SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culiseta incidens</i>	14,515
<i>Culex pipiens</i>	9,214
<i>Culex tarsalis</i>	6,619
<i>Culiseta inornata</i>	1,471
<i>Aedes dorsalis</i>	1,294
<i>Aedes nigromaculis</i>	1,154
<i>Aedes melanimon</i>	685
<i>Aedes washinoi</i>	561
<i>Aedes squamiger</i>	544
<i>Aedes sierrensis</i>	285
<i>Culex stigmatosoma</i>	134
<i>Culex erythrothorax</i>	124
<i>Culiseta particeps</i>	112
<i>Aedes vexans</i>	71
<i>Anopheles punctipennis</i>	14
<i>Culex apicalis</i>	7
<i>Anopheles franciscanus</i>	6
<i>Culex boharti</i>	5
TOTAL	36,815

Mosquito larvae identified in 2020 by species



Locations of mosquito larval samples collected by the District in 2020

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, 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



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

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 lab while the mosquitoes are still alive so that lab employees can identify them and submit them for testing for WNV and other viruses. Counts can also be compared with regional averages to track population changes and target control activities. During 2020, laboratory staff were able to maintain a full fixed trapping schedule in spite of staffing reductions due to the pandemic (no seasonal assistants hired), and although the laboratory staff were not able to set 'random' traps, staff coordinated with the District's Operations personnel to set traps in areas where other surveillance indicated a high risk of virus transmission.



Scientific Program Manager Steve Schutz, Ph.D. examines adult mosquitoes in traps.

Culex pipiens prefer 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 overwatering of lawns and other urban water runoff that keeps the storm drains constantly wet.

ADULT SAMPLES BY SPECIES	
SPECIES	COUNT
<i>Culex tarsalis</i>	26,329
<i>Aedes vexans</i>	9,769
<i>Aedes melanimon</i>	7,154
<i>Culex erythrothorax</i>	4,813
<i>Culex pipiens</i>	3,812
<i>Aedes dorsalis</i>	2,847
<i>Culiseta inornata</i>	1,167
<i>Aedes nigromaculis</i>	845
<i>Culiseta incidens</i>	833
<i>Aedes washinoi</i>	434
<i>Culiseta particeps</i>	287
<i>Anopheles franciscanus</i>	224
<i>Anopheles punctipennis</i>	35
<i>Anopheles occidentalis</i>	13
<i>Aedes sierrensis</i>	9
<i>Anopheles freeborni</i>	6
<i>Aedes squamiger</i>	4
TOTAL	58,581

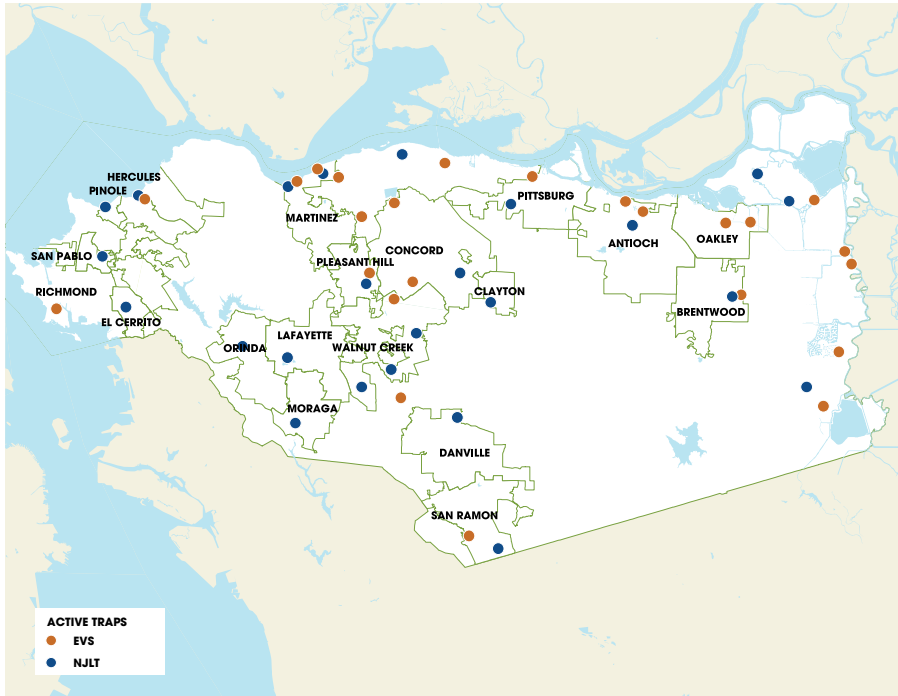
Adult mosquitoes collected in all fixed and random traps by species, 2020

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.

Rainfall was well below the ten-year average during 2020, and daily temperatures were below average early in the season and above average during the summer months. Countywide populations of *Culex pipiens* fluctuated close to the five-year average early in the season and were well above average toward the end, while *Culex tarsalis* counts trended below average early and mid season, but were also above average toward the end. Some limited adult mosquito control operations were required in East County due to locally high mosquito populations and detections of WNV.

A total of more than 58,000 adult mosquitoes were collected and identified in the District's random and fixed-location traps in 2020.



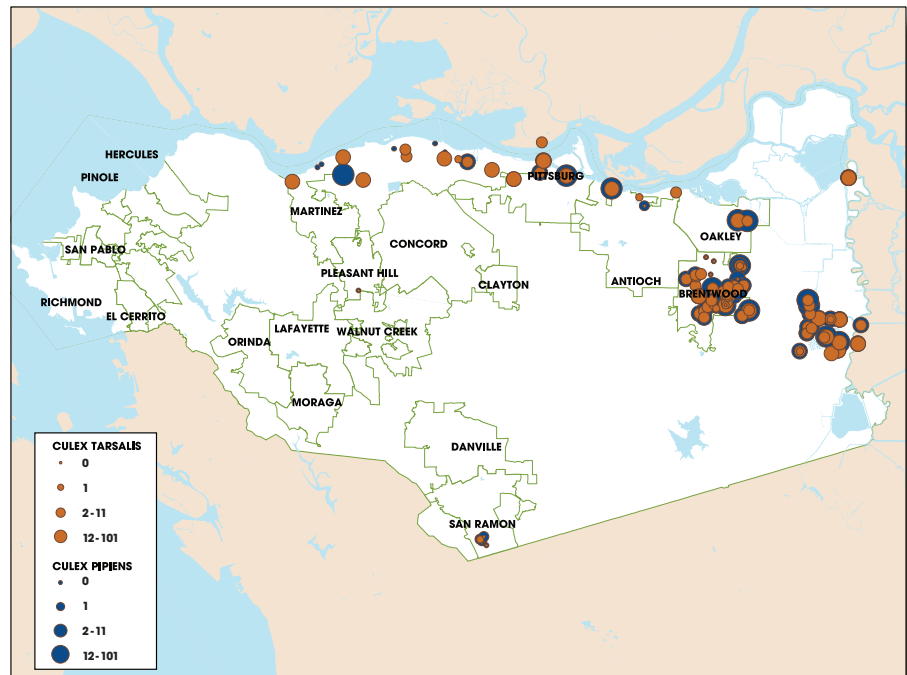
FIXED ADULT MOSQUITO TRAP LOCATIONS IN 2020

Both carbon dioxide, which simulates the breath of a person or animal, and light attract mosquitoes to the traps. Mosquitoes are then counted and identified to species to determine the risk of disease or nuisance to people. This graphic shows the locations of the District's CO₂ traps and New Jersey light traps in 2020.

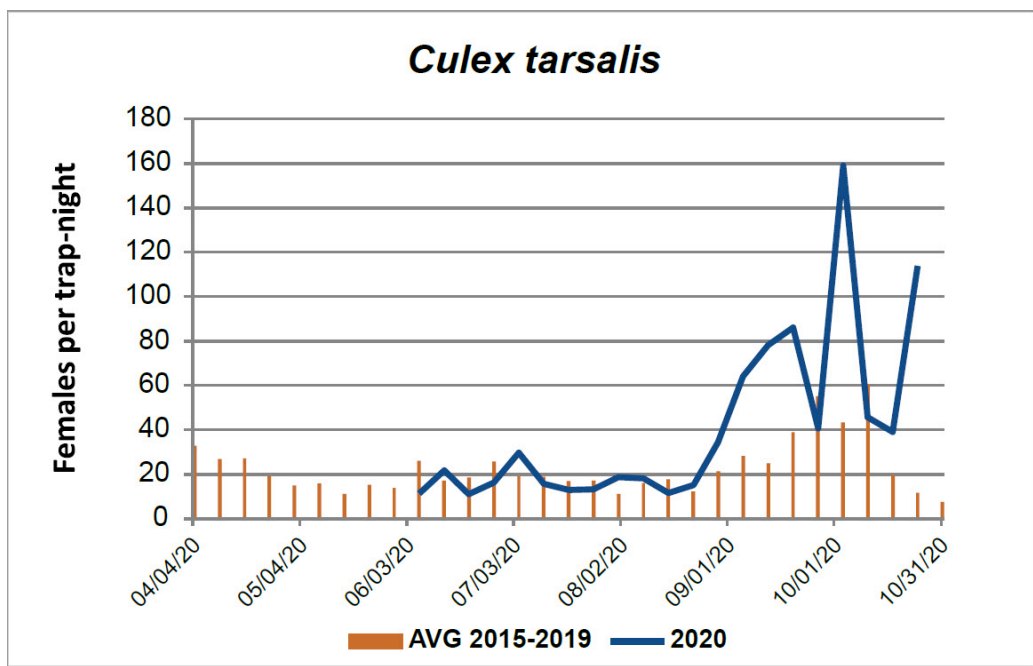
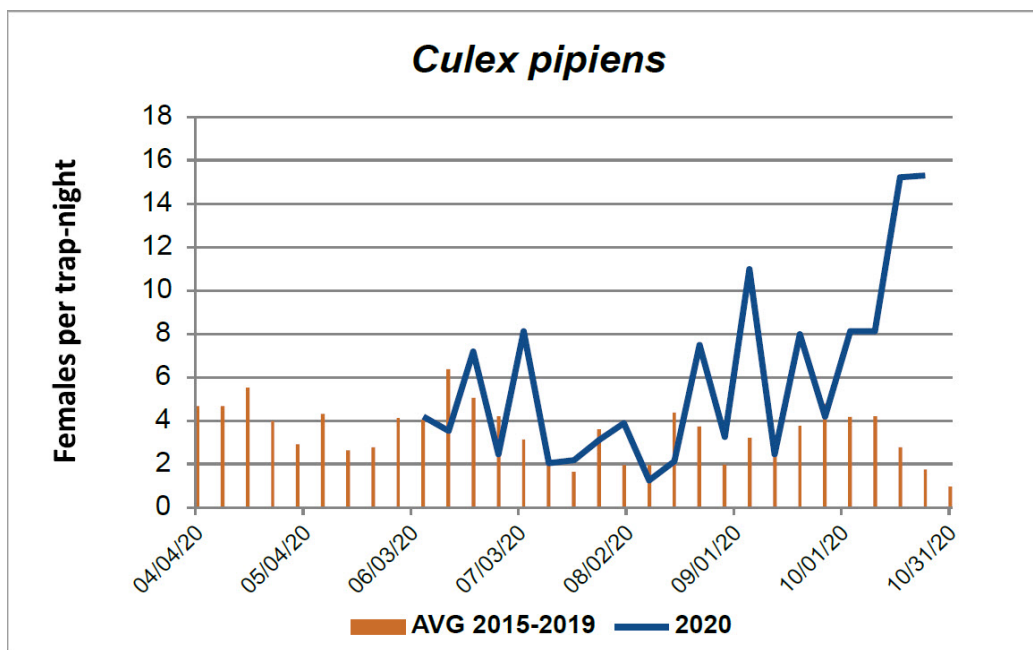
RANDOM ADULT MOSQUITO TRAP LOCATIONS IN 2020

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.



Abundance of Vector Mosquito Species in Contra Costa County in 2020



Adult mosquito trap collections vs. 5 year average, 2020

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 of disease transmission and target our field employees and resources efficiently.

In 2020, 471 samples (14,288 mosquitoes) were tested and 13 samples were positive for WNV (6 *Culex tarsalis* and 7 *Culex pipiens*), between August 10th and September 21st. Virus detections were concentrated in East County, with eight in Brentwood, two in Discovery Bay, and one each in Knightsen, Byron, and Martinez. Although WNV detections were higher than in 2019, they were still below the 5-year average both regionally and statewide.

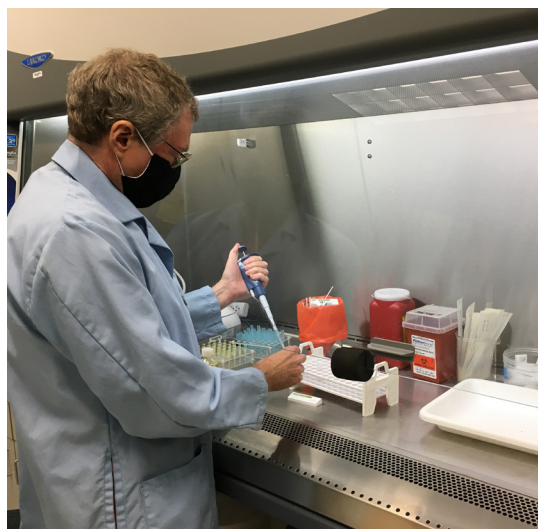


District Vector Ecologist Eric Ghilarducci prepares a trap to capture adult mosquitoes by using dry ice to simulate human breath to attract the mosquitoes.

Dead Birds

The dead bird surveillance program represents a very successful collaboration between the California Department of Public Health, the District and the residents of Contra Costa County. Members of the public report dead birds to the statewide WNV Call Center by phone (1-877-WNV-BIRD) or online at <https://westnile.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 because 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 2020 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 2020, the WNV Call Center received 488 dead bird reports from Contra Costa County residents, which was an increase from the 321 received in 2019. Of the . birds reported in 2020, 60 birds were collected for testing and 22 tested positive for WNV, 16 of which were from Brentwood. Dead bird reports have been declining steadily since the beginning of the program in 2005, apparently due to a decline in public interest (birds still appear to be susceptible to the virus, since infection rates have fluctuated but have not shown a similar steady decline).



Scientific Program Manager Steve Schutz, Ph.D. prepares a sample to be submitted 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 2020, the District maintained a total of 24 chickens (six at each of four flock sites) within Contra Costa County. One previous flock site in Hercules was discontinued due to a change in ownership of the property (the District never had any virus detection over the history of that location.) 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 Lab in Richmond to be tested for antibodies towards WNV, WEE and SLE viruses. Due to a reduction in the number of chickens per flock from 10 to six, and the reduction of flock sites from five to four, the District's laboratory staff were able to maintain a full chicken sampling schedule simultaneously with mosquito trapping (which was previously done by seasonal laboratory assistants).



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

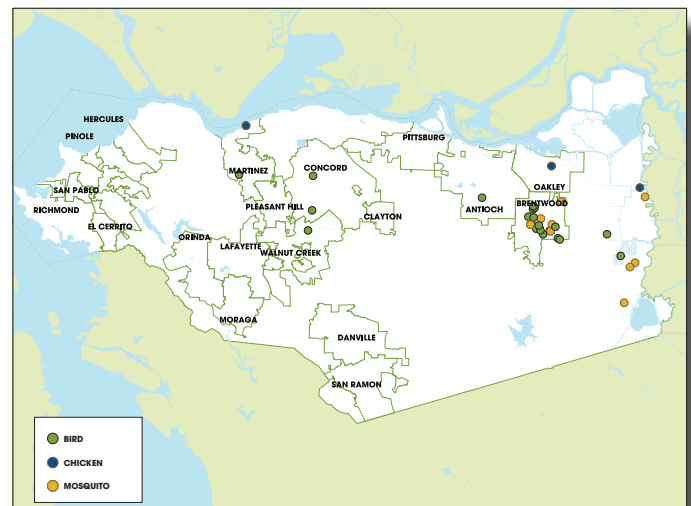
In 2020, seven of the District's chickens (two at Holland Tract, near Knightsen, three in Oakley and two in Martinez) tested positive for WNV antibodies. Chickens tested positive for antibodies toward the end of the season, between September and mid October. Since chickens cannot pass the virus on to 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

Four human cases of WNV were reported by the Contra Costa County Department of Public Health in 2020, three of which were described as 'possibly or probably locally acquired.' Due to patient confidentiality regulations, specific location information is not available. The vast majority of mild cases go untested and unreported since they may be asymptomatic (no symptoms) or mistaken for 'the flu.'

Statewide, 223 human cases and eight fatalities were reported in 34 counties 2020. The number of cases were down from 243 cases the previous year; however the number of fatalities increased from six 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 9,000 Californians may have had West Nile virus infections in 2020, 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; 20 positive horses from 13 counties were reported statewide (including one in Solano County and four in San Joaquin County). 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 2020

2006 – 2020 SUMMARY OF ENCEPHALITIS VIRUS SURVEILLANCE

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mosquito Samples	Samples Tested	523	721	729	814	536	484	468	454	652	622	495	550	709	454	471
	Total No. Mosquitoes	24,358	28,290	23,502	27,436	16,820	14,321	11,571	12,730	17,999	21,533	15,612	16,546	23,776	15,451	14,288
	West Nile Virus Positive	20	28	31	17	4	7	19	13	25	8	11	6	17	1	13
Chickens	Blood Samples Tested	904	669	851	717	773	600	590	631	598	609	571	624	554	527	270
	Total No. Chickens	50	50	50	50	50	50	50	50	50	50	50	50	50	50	24
	Seropositive	24	5	15	13	4	0	7	8	15	18	5	7	16	2	7
Dead Birds	Total Reported	3,472	2,042	2,227	1,221	923	1,057	1,816	1,377	1,355	912	861	692	711	321	488
	Total Tested	388	158	115	80	32*	74*	106*	123*	115*	49*	76*	58*	45*	23*	60*
	West Nile Virus Positive	92	29	88	45	8	43	66	68	44	11	33	19	17	1	22

*testing restricted to crows/gays only

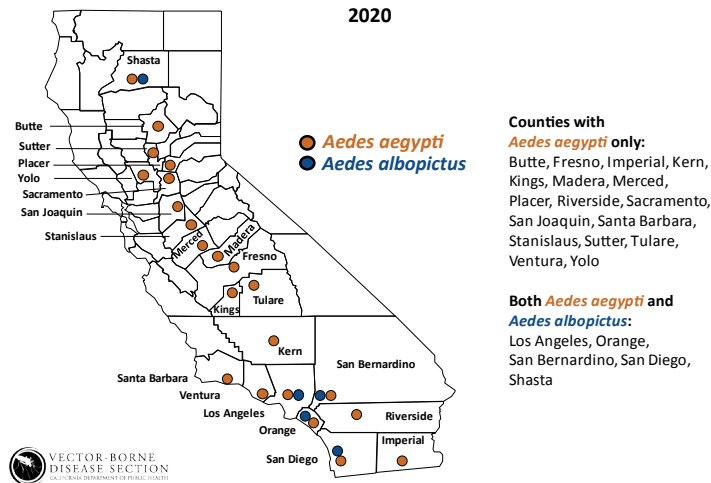
Invasive Mosquito Species

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 2020, this species continued to expand its range northward, with the closest detection in Isleton (Sacramento County). *Aedes notoscriptus*, the Australian backyard mosquito, has also been found in Southern California, although its range does not appear to be expanding as quickly. All of these species are similar in behavior, in that they are adapted to living around humans and lay their eggs in a wide variety of natural and artificial water containers. They are potential vectors of viruses that transmit human disease, including dengue virus, which has been on the increase worldwide, chikungunya virus, which spread explosively

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

These mosquitoes are known for being difficult to control and for causing significant nuisance issues. So far, attempts to eradicate the new mosquito populations have met limited success. Cases of chikungunya, dengue and Zika diagnosed in California residents returning from the affected areas raise the concern that the invasive mosquitoes may spread these viruses. So far, the District's surveillance program has not detected the presence of these species within Contra Costa County, although they are now at the District's eastern border.

***Aedes aegypti* and *Aedes albopictus* Mosquitoes in California Detection Sites by County/City 2020**



Pesticide Resistance Monitoring

Mosquitoes and other insects always have the potential to develop resistance against the materials the District uses to control them (similar to antibiotic resistance in bacteria). Since all of the products District employees have used to control adult mosquitoes in recent years come from a single related class of chemical compounds (natural pyrethrins and synthetic pyrethroids), which are also widely used by homeowners and private pest control operators as well as by other mosquito control programs, it is important to determine whether our local mosquito populations are still susceptible or whether the District needs to consider alternative control agents. In 2019, the District tested mosquitoes collected from the county's Waterfront area and determined that they are still fully susceptible to the pyrethroid etofenprox, the active ingredient the District currently uses most frequently. 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

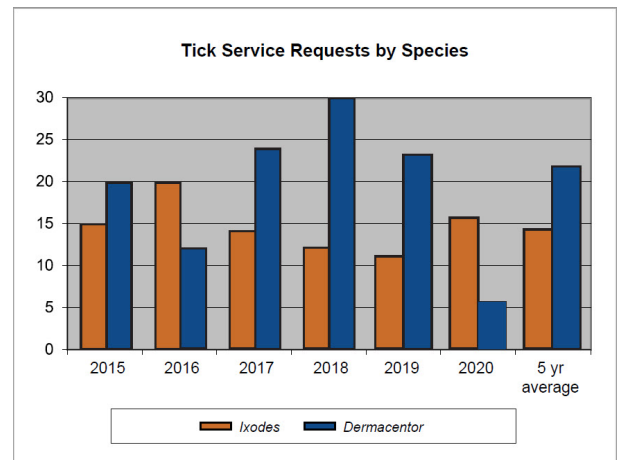
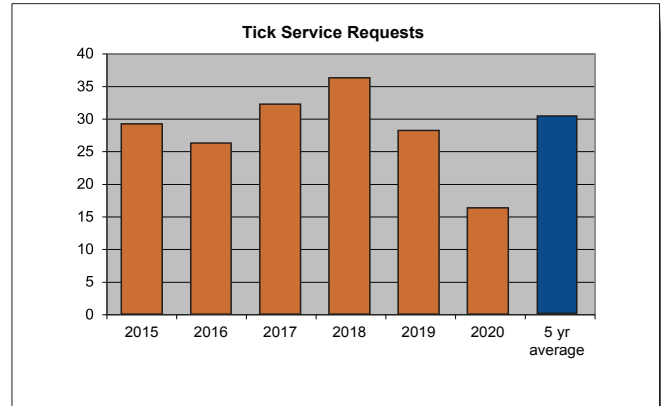
There are four species of common human-biting ticks in Contra Costa County:

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

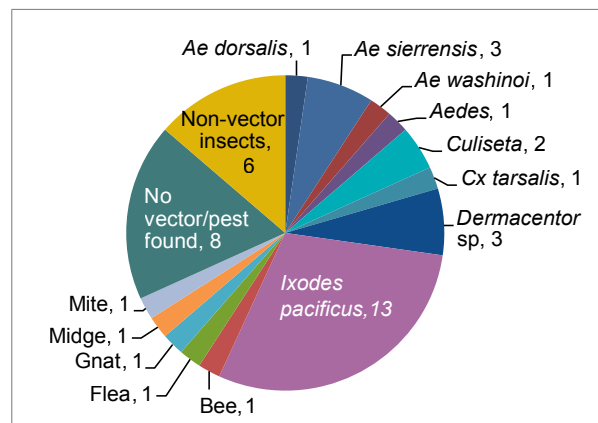
Lyme disease is a bacterial infection transmitted by the western black-legged tick (also known as the deer tick). Lyme disease can cause serious complications if not treated promptly.

District laboratory staff continue 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 the bacteria that causes Lyme disease. People who are concerned about the possibility of being infected with Lyme disease should contact their physician.

In 2020, due to the pandemic, the District building remained closed to the public for most of the year, and so the District could not accept walk-in tick samples. Members of the public could, however, mail samples for identification. Consequently, there was a decrease in the number of tick-related service requests compared to the 5-year average. Of the 16 ticks identified by laboratory staff, 13 were western black-legged ticks, the vector of Lyme disease.



As a courtesy to the public, the District's laboratory staff also identifies samples of biting and stinging pests brought in or sent in by members of the public. In 2020, members of the public mailed 44 samples for pest identification.



Identifications by laboratory staff in 2020.

Biological Control and Fisheries Research

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

The District's biologist facilitates the fish program, which in 2020 produced approximately 900,000 mosquitofish. Due to the pandemic, the District distributed just 34,970 mosquitofish to properties and other locations in Contra Costa County, slightly more than half of the number of fish the District distributed in 2019.

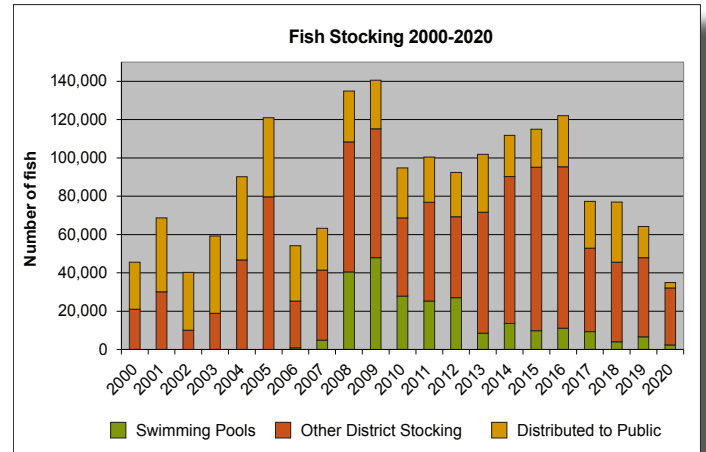


Young mosquitofish (*Gambusia affinis*)

Mosquitofish Service Request

The District distributed fewer fish in 2020 due to the pandemic. The District building was closed to the public, making Contra Costa County residents unable to pick up mosquitofish in person. Instead, upon request, a District employee performed an inspection to determine if the mosquitofish were the appropriate solution to address the mosquito issues and placed the fish. The District received 332 requests for mosquitofish in 2020.

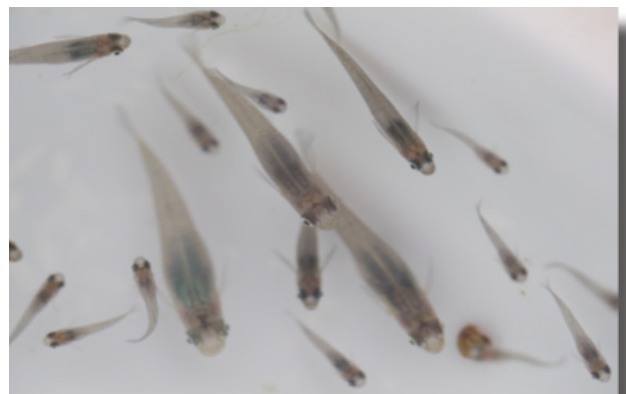
The service proved beneficial in that it enabled District employees to confirm whether the fish were being appropriately placed. It also provided an additional opportunity to educate residents on other ways to reduce the risk of mosquitoes.



Fish Stocking 2000-2020

Mosquitofish 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 2020, the District continued several native fish projects, including spawning Sacramento splittail, hardhead, and Sacramento perch. Various planned projects involving Contra Costa County schools had to be postponed due to the pandemic. The California Fish and Wildlife's permitting process for field stocking native fish also continued to suffer from delays.

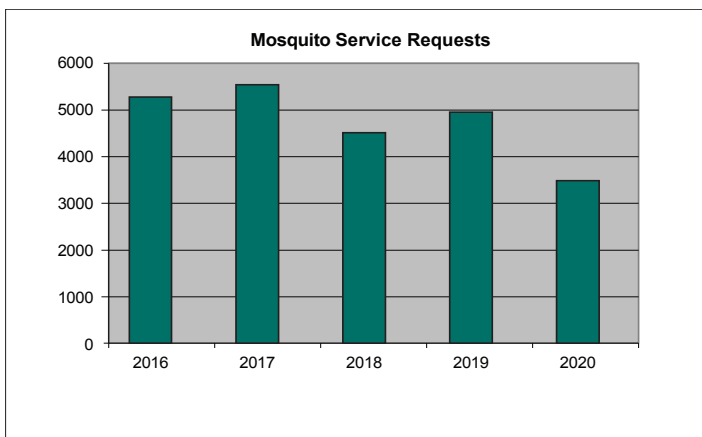


Mosquitofish (*Gambusia affinis*)

Mosquito Control Operations

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

In 2020, District employees continued to provide the District's essential mosquito service while adopting safety precautions to reduce the risk of COVID-19. District employees wore masks and maintained at least six feet of physical distance while responding to requests for mosquito service. Due to pandemic-related shelter at home orders in Contra Costa County, District employees found many residents at home after requesting mosquito service, making the safety precautions even more important. With more residents present as District employees performed residential mosquito service, District employees found opportunities to educate residents about how to prevent mosquito issues. Those opportunities to educate residents were particularly valuable when providing service to residents who were new to Contra Costa County. Some residents who moved to the county from other parts of the San Francisco Bay Area were surprised to find different insects and other animals in Contra Costa County than they had previously experienced in other, nearby counties.



In 2020, District employees responded to 3,414 requests for mosquito service from Contra Costa County residents and performed 9,438 inspections of potential sources of mosquitoes countywide. During 1,873 of those inspections, the District employees confirmed mosquito production at the location.

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. To improve access, early each year, District employees conduct brushing, which is cutting back vegetation to prevent over-growth and improve access later in the year. In 2020, District employees conducted brushing operations at several problem locations.

Tree holes, which are water-filled voids that can form in older trees, particularly oak trees, can also become significant sources of the Western tree hole mosquito (*Aedes sierrensis*). Besides being a significant nuisance, this day-biting mosquito can be a vector of dog heartworm. The District works to reduce the nuisance and the risk by conducting proactive treatment of tree holes. In 2020, the District used a combination of options to fill the tree holes to prevent water from accumulating and becoming a source of mosquitoes. In areas where the District historically needed to revisit on an annual basis, District employees used an expandable absorbent gel to fill tree holes and prevent water from collecting. In other locations, where the District anticipated the need for a longer term option, District employees used soil with the goal that plant life would grow and provide stability to keep the hole filled to prevent mosquitoes. In 2020, District employees inspected 43 known locations and conducted surveillance to locate others in an effort to reduce the number of potential mosquito sources.

In addition to filling tree holes and preventing potential standing water sources for mosquitoes, rainwater ponds and puddles can produce temporary sources of mosquitoes in many areas of the county. The freshwater mosquito (*Aedes washinoi*), the California salt marsh mosquito (*Aedes squamiger*) and the inland floodwater mosquito (*Aedes vexans*) are common and abundant at certain times of the year and although they are not known as disease vectors, 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.

In 2020, District employees performed inspections and treatment of coastal sources known for past mosquito production as well as newly identified sources.

Creeks, Channels and Pastures

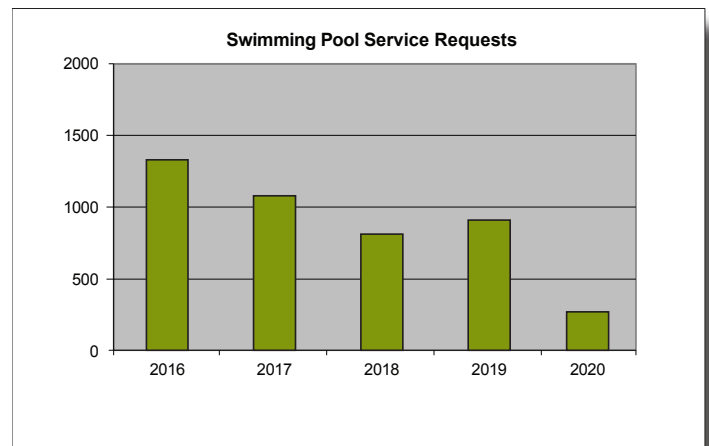
In 2020, below average rainfall caused once flowing water in areas including creeks and channels to slow and eventually leave pools of standing water, creating potential sources of mosquitoes. District employees worked to manage both nuisance and disease carrying mosquitoes in these areas, finding them more accessible for inspection and treatment due to the brushing District employees conducted 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 land owners and often recommend irrigation schedules and changes to work practices to reduce the likelihood of mosquito production. In 2020, the District received a high number of requests for service from central coastal areas previously known as seasonal mosquito sources. Upon inspection, District employees found a large number of salt marsh mosquitoes emerging from standing water that was apparently associated with a nearby construction project. The District worked to establish communication with the responsible parties and was able to access the area for treatment.



District technicians Olivia Zaragoza and Heidi Budge inspect a pasture for evidence 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. In 2020, the District refined and continued to implement our neglected swimming pool program. The District's Vector Control Planner (VCP) remains the primary point of contact to communicate and meet with residents and homeowners. When appropriate, the VCP will refer properties to District field personnel for mosquito inspection or control efforts. In 2020, the District received 275 requests for service of neglected swimming pools. The VCP sent letters explaining the District's pool program and expectations for compliance to 151 property owners.



Vector Control Planning

In addition to serving as the point of contact in the District's neglected swimming pool program, the VCP reviewed approximately 140 project proposals from local, county, state, and federal agencies for potential vector control concerns in 2020.

Also in 2020, the VCP relayed maintenance concerns and guidance to private landowners and other agencies regarding mosquito production sources. Areas of concern for mosquito production included over irrigated agriculture land, ponds with overgrown vegetation restricting proper drainage, and man-made container systems needing to be emptied. Guidelines provided by the District brought some areas into compliance, benefiting property owners and neighbors concerned about mosquitoes.



District Vector Control Planner Jeremy Shannon looks for signs of mosquito production in a neglected swimming pool.

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. In 2020, the District conducted trapping for adult mosquitoes along the county shoreline.

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 or more to completely inspect. The information gathered by the UAS helps the District plan appropriate treatment of specific areas of the county. In 2020, the UAS improved the District's ability to resolve and map sources that needed to be cleaned up or maintained.



The District drone flies above a flooded agricultural area of Contra Costa County.

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.

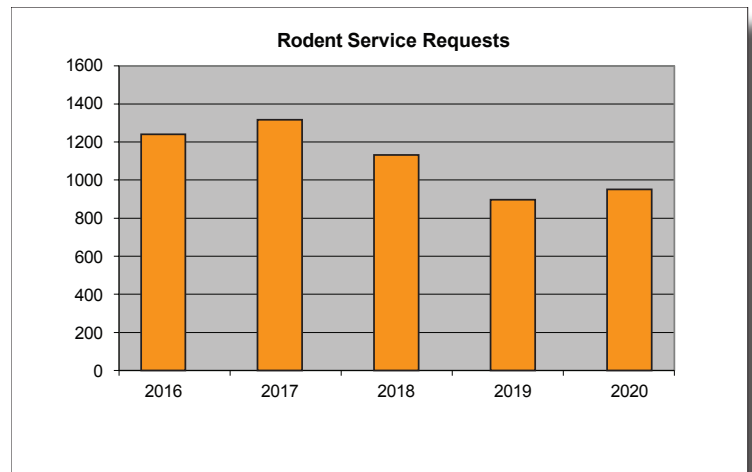
During an inspection of a residential or commercial property, a District employee looks for evidence of potential sources of food and shelter, and how the rats or mice are gaining access to a home or business. In 2020, due to the pandemic, the District temporarily limited inspections for rats and mice to exterior locations.



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

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, including some types of coronaviruses; however, there is currently no evidence that rats and mice are capable of carrying or transmitting the Sars-CoV-2 virus which causes COVID-19. 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. They can also cause significant physical damage to a structure due to their gnawing behavior which can lead to economic loss. They also create a risk of structural fires because they have been known to gnaw on electrical wires.

In 2020, as many county residents sheltered at home during the pandemic and modified their usual behavior, District employees observed rats and mice adapting and modifying their behavior as well. When rodent populations become stressed due to a shortage of food, they slow down their biological reproduction. Competition for food ensues, and the strongest survive. With many restaurants closed or providing limited service due to the pandemic, District employees observed less rodent activity near potential commercial food sources. In residential areas, where due to the pandemic, residents had more opportunities to observe their property at various times of the day, there were 926 requests for rodent service, a five percent increase over the number of requests the District received in 2019.



The majority of the requests for rat and mouse service came from areas in central and west Contra Costa County, with 119 requests for service coming from Walnut Creek, followed by 94 from Concord, and 88 from Richmond.

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 denning 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, bird seed, 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.

Keep Me Wild

One of the largest contributing factors to a skunk problem is food left outside for wildlife. Food left out for feral cats and other animals can attract skunks from great distances. According to the California Department of Fish and Wildlife, wild animals naturally fear humans and keep their distance; however, if wild animals have access to human food, they will want more and are likely to come closer to the source of human food. That desire can bring wildlife together, increasing potential spread of disease. More information can be found at the California Department of Fish and Wildlife's [Keep me Wild](#) program.

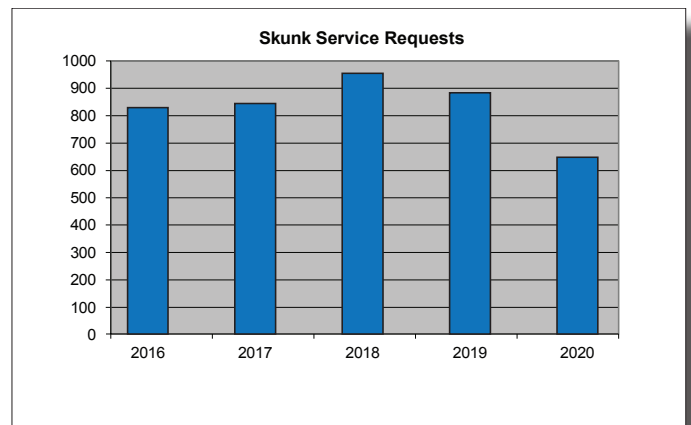
When to Trap

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.

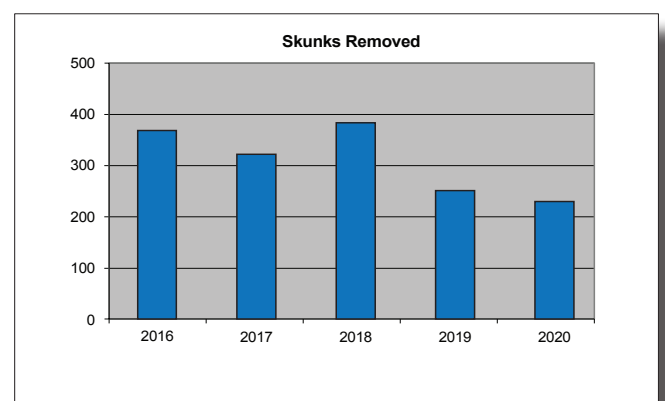
In certain instances, a District employee may determine the situation warrants the use of a live catch trap. If a trap is issued, the District employee provides very detailed directions on how to place and set it. The issuance of the trap provides a temporary solution to the problem and requires the property owner to make the necessary changes to the environment to deter skunks in the future.

Skunk Service Requests

The District divides the county into two zones for skunk service with one vector control inspector assigned to each zone. In 2020, the District received 643 requests for skunk service, a 27.75 percent decrease compared to the number of requests received in 2019. District employees also removed 222 skunks from Contra Costa County properties, a 10 percent decrease over the number of skunks removed in 2019.



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 relocation of animals. In 2020, 76 animals were released compared to 73 animals in 2019.

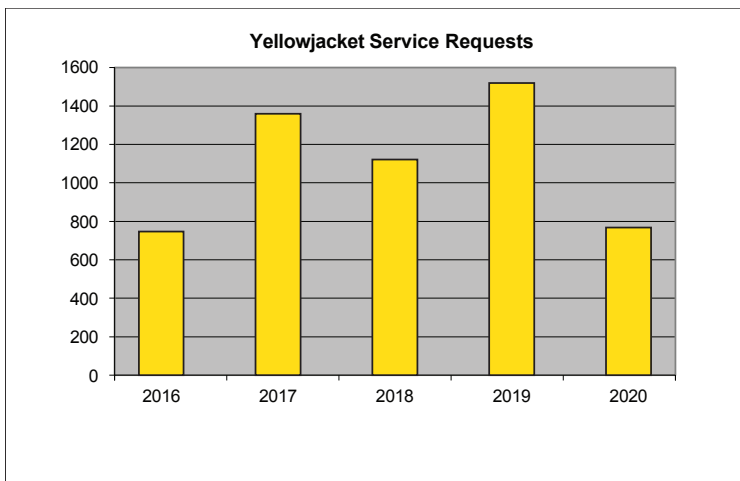


Yellowjackets

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 768 requests for yellowjacket service in 2020, a 49 percent decrease from the record number of requests the District received in 2019. District employees treated 657 yellowjacket nests in 2020. The majority of the requests for yellowjacket service in 2020 came from cities along the Highway 24 corridor. 164 requests for the District's yellowjacket service came from Orinda, 104 came from Lafayette and 78 came from Moraga.



Yellowjackets and the Fire Hydrant

Ground-nesting yellowjackets will build nests in many types of subterranean voids, including spaces created by erosion at the bases of fire hydrants. That is what District employees found in 2020 when the District received a request for yellowjacket service from a local fire department. Fire department employees had been stung while trying to access water at the hydrant, prompting the Fire Captain to contact the District. When District employees inspected the scene, they found and treated a large yellowjacket ground nest at the base of the hydrant.



Fire department employees encountered a yellowjacket nest at the base of this fire hydrant.



District vector control technician Heidi Budge treats a ground-nesting yellowjacket nest hidden by vegetation.

Honey Bees

Honey bees are beneficial insects that are essential for 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 bee hives nor do we respond to stinging incidents, but we do provide identification and information on honey bee biology and habitat. Residents who wish to have bees relocated are referred to local beekeepers, who can remove the bees safely without killing them.

Honey bee swarms are groups of worker bees that leave their hive along with a queen to seek a place to start a new hive. They look like a ball of bees clustered on a tree or a man-made structure. In 2020, a Concord resident went to her mailbox to retrieve her mail, only to find a swarm of bees had taken up residence. The resident contacted the District. District employees arrived and upon inspection, confirmed the honey bees were a seasonal swarm and informed the resident that bee swarms are temporary. The resident asked for the bees to be relocated. The District employees referred the homeowner to a local beekeeper who could remove the bees and relocate them to a suitable location.



In early 2020, a swarm of bees temporarily took over this mailbox in Concord.

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). The only time the District will provide treatment for bee swarms or hives is when they pose a potential threat to people in public areas such as schools or shopping center parking lots. The District does not treat bee swarms that are in or on structures or on private property.

In 2020, the District received 34 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

In addition to protecting public health, the District is dedicated to protecting the natural environment. The District plays an important and collaborative role in the conservation and restoration of Bay Area wetlands, protection of endangered and threatened species, and promotion of biorational (low environmental impact) control methods in order to protect both human and environmental health.

In 2020, the District's Vector Control Planner (VCP) consulted with regulatory agencies on behalf of property owners to support maintenance initiatives in multiple ecologically sensitive areas that would aid vector control efforts. The VCP attended stakeholder meetings and provided appropriate feedback for various environmental restoration projects throughout Contra Costa County. The VCP 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 procedures disease. In 2020, the District began the year with in person training sessions; however, as the pandemic took hold, the District shifted to online video training options. The virtual training sessions were designed to review the 23 known species of mosquitoes currently in Contra Costa County, and provide instruction and updates on the current requirements and procedures for use of vector control products and equipment. For hands-on training and review, COVID-19 safety precautions required the use of face masks and physical distancing, and the training sessions had to be held outdoors and with fewer numbers of employees at a time. Despite the need for special pandemic protocols, proper training allowed District employees to continue to carry out their tasks safely, with confidence and expertise.

State Certification

District technicians and inspectors are certified through the Vector Control Certification Program of the California Department of Public Health. District employees obtain and maintain state certification for public health work in vector control to ensure that best practices are followed, through continuing education and state-proctored testing. Areas of focus during state certification include safe and effective use of pesticides, biology and control of mosquitoes, and other invertebrates and vertebrates of public health significance. Certification is renewed every two years. Normally, many of these training sessions are held during in person conferences or workshops; however, in 2020, statewide in person training sessions were halted due to the pandemic and were held online instead.



During the pandemic, the District conducted Annual Training through online meetings.



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

The goal of the District's public affairs department is to encourage Contra Costa County residents to change behavior to reduce the risk of vector-borne disease. Community outreach is the mainstay of the District's public affairs department. With more than 1.15 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.

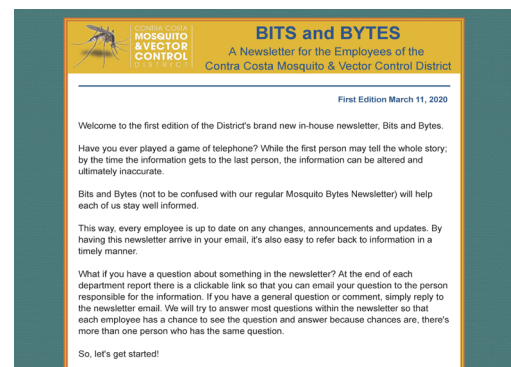
External Electronic Communication

Internet distribution of District publications is swift, succinct, and provides a sharable format making it a more efficient communication vehicle than traditional mail. In 2020, due to the pandemic, electronic communication became a critically important communication tool. The public affairs department publishes [News Releases](#), [Adult Mosquito Control Notifications](#), the [Mosquito Bytes Newsletter](#), and this [annual report online](#). Members of the public may subscribe to the District's publications. The District ended 2020 with 2,838 total subscribers, an 18 percent decrease over the total number of subscribers in 2019. Of the subscribers to the District's online publications, 32 percent accessed the publications through mobile devices and 68 percent accessed them through desktop computers.

Internal Electronic Communication

Following a survey of District employees that revealed an increased desire for more timely communication of

District information, in 2020, the public affairs department created and distributed an employee e-newsletter to disseminate important information to District employees in an easily accessible format—delivered directly into employees' email. As 2020 progressed, the employee newsletter proved to be especially important to keep District employees informed about the many changes enacted in response to the pandemic that impacted District procedures and practices.



The District's inaugural Employee Newsletter, "Bits and Bytes"

Traditional Outreach

In 2020, the public affairs department found an opportunity to introduce a "Back to Basics" advertising campaign in response to numerous questions and comments posed by county residents about District services. The artwork and accompanying messages for the advertising series were tailored specifically to provide the District information about, "Who We Are," and "What We Do." The first ad in the series provided information on all of the District services by depicting images of the vectors for which the District provides service, accompanied by the text, "Protecting Public Health Since 1927."



The District's 2020 "Back to Basics" advertising campaign featured specific information on District Services.

The initial "general services" ad was followed by individual ads containing an image of each vector for which the District provides service, along with verbiage on each specific District service. The theme was featured in digital advertising, print advertising, and Internet advertising.

Digital Billboard

The public affairs department purchased digital advertising on a digital billboard located on Highway 4 in Pittsburg to feature the "Back to Basics" general ad to eastbound and west bound traffic from July through September. The District's message appeared as part of a slideshow that gave commuters eight seconds to view the message every time it appeared while the sign was illuminated from 6 a.m. until midnight, seven days a week.

Internet Advertising

In 2020, the public affairs department purchased Internet banner advertising that featured the series of ads in the "Back to Basics" campaign in a strategic rotation to showcase each individual vector during its peak activity from June to January. The general ad ran in June, followed by the mosquitoes ad in July and August, the yellowjacket ad in September and October, the rats and mice ad in November and December, and the skunks ad in January 2021. The goal with directing attention to the individual vectors during the specific months of peak activity was to encourage awareness.



"Back to Basics - Skunks" Internet banner campaign

Print Advertising

In 2020, the public affairs department emphasized reaching all areas of Contra Costa County with the advertising campaign. That led the department to purchase advertising in four publications. The Brentwood Press (East County), Community Focus (northern Central County), Your Town Monthly (southern Central County), and the Contra Costa Marketplace (West County). The District's print ads appeared in the same vector-specific rotation as the Internet advertising with the same goal of directing attention to the individual vectors during the specific months of peak activity to raise awareness.

Presentations and Events

Due to the pandemic, all scheduled events were cancelled or post-postponed in 2020. The public affairs staff were able to conduct one in-person presentation before the pandemic restrictions began, and 2 virtual presentations during the rest of 2020.

Website

The District's award-winning website remains the No. 1 communication tool for constituents and media alike. The 300-page site also serves as an important reference tool for a worldwide audience. Public affairs staff manage the website to ensure timely and up-to-date information. In 2020, 62 percent of website visitors viewed the pages on a mobile device, 34 percent viewed the website on a desktop, 4 percent visited the website on a tablet. According to the District's website analytics, there was a 137 percent increase in overall website viewership via a mobile device in 2020 versus 2019.

The most visited pages in 2020 were the *Rodents Pose Virus Risk* article with a record-breaking 21,676 pageviews, the District's service request page with 3,693 views, an article on mites with 2,742 views, and an article *14 Surefire Ways to Attract Rats to your Property* with 1,807 views.

Social Media

The District uses social media as a communication vehicle with the specific purpose of providing District messages and information to the public. In 2020, the public affairs department used Twitter to promote both the California's Mosquito Awareness Week and the National Mosquito Awareness Week, to disseminate news releases and the Mosquito Bytes Newsletter to members of the public and the local news media. After many years of trying to establish a presence on the social media platform Nextdoor, in July 2020, the District was finally able to create a business account that allows the public affairs staff to post articles and messages that reach a growing number of Contra Costa County residents. As more county residents search for the District on Nextdoor, the wider the District's reach becomes.



The District's Nextdoor page

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.

Information Technology

The information technology systems administrator is responsible for all communication technology at the District including maintaining all aspects of the administration phone system, cell phones, computers, and internet services. The systems administrator maintains multiple virtual servers and approximately 40 workstations with associated software. The systems administrator also programs and maintains two specialized software programs, which are the District's timesheet and vector control information system.



The District Building in Concord, California

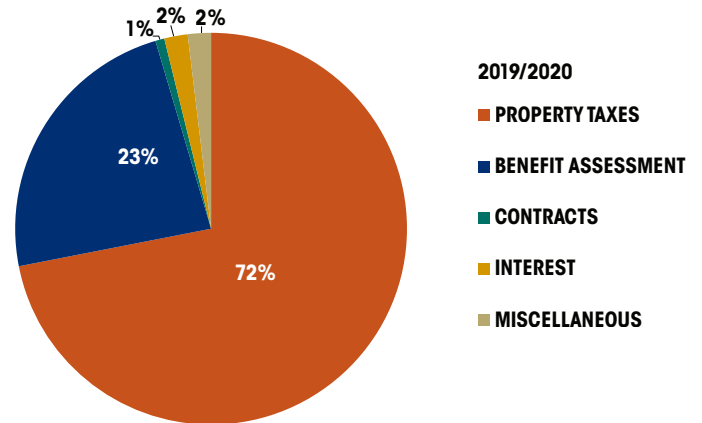
Financial Statement

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

The District receives approximately 94 percent of its annual revenue from property taxes. The breakdown is 72 percent of funding comes from the ad valorem assessments to county parcels and 23 percent comes from a benefit assessment. This revenue stream rose approximately 1.5 percent in fiscal year 2019/2020 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 regionally 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 that 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	2018/2019	2019/2020
Property Taxes	\$5,958,946	\$6,293,493
Benefit Assessment	2,044,430	2,054,797
Contracts	43,782	65,128
Interest	317,870	169,116
Miscellaneous	132,686	167,198
TOTAL REVENUES	\$8,497,714	\$8,749,732
EXPENDITURES	2018/2019	2019/2020
Salaries, Wages, Benefits	\$5,752,382	\$5,684,203
Operations	1,451,966	1,548,735
Capital	121,423	96,363
TOTAL EXPENDITURES	\$7,325,771	\$7,329,301
TRANSFER TO RESERVE	\$1,171,943	\$1,420,431

