



SAN MATEO COUNTY MOSQUITO & VECTOR CONTROL DISTRICT

Protecting public health since 1916



ANNUAL REPORT FISCAL YEAR 2017-2018

Dear Residents,

I'm excited to share with you our 2018 annual report. This report contains updates on some key issues affecting the District and our work in San Mateo County.

During 2018, the District's Integrated Vector Management program was successful at controlling mosquitoes in their larval stages and keeping the number of biting adult mosquitoes at a very low level throughout the year. West Nile virus activity was relatively low; however, adult mosquitoes infected with the virus were detected in East Palo Alto on one occasion, prompting truck-mounted adult mosquito control in the Pulgas Gardens, Palo Mobile Estates, and Weeks Gateway neighborhoods. This treatment was successful, and no further sign of West Nile virus transmission was detected in the area.

The District's financial outlook is positive. In June of 2018, the Board approved a two-year balanced budget for fiscal year 2018-19 and 2019-20. This budget is tied in to a Financial Projection model and an updated, long-term Capital Improvement Plan, which guide the staff and Board of Trustees in financial decision-making.

The Financial Audit of FY 2017-18 has been completed. The independent auditor, Badawi & Associates, rendered an unmodified opinion, stating that the District's financial statements were fairly represented and in conformity with Generally Accepted Accounting Principles (GAAP). For the first time the District has also prepared a Comprehensive Annual Financial Report (CAFR) which is available on the District's website.

The Board of Trustees completed a new Strategic Plan in the Spring and Summer of 2018. The completed Plan is shorter, more succinct, and includes a brief description of the District, its funding and financial trends. The final Strategic Plan is available on the District's website.

In 2018, the Board updated its Integrated Mosquito and Vector Management Program and adopted a Programmatic Environmental Impact Report. These documents are also available on the District's website.

These and many other successes were made possible by the hard work and dedication of the District's staff and Board of Trustees. Thanks to their efforts, San Mateo County is a safer and healthier place to live, work, and visit.

Sincerely,

Chindi Peavey

District Manager

San Mateo County Mosquito and Vector Control District

ANNUAL REPORT FISCAL YEAR 2017–2018

Contents

ABOUT THE DISTRICT

Our Vision, Mission and Goals	2
The Board of Trustees and Officers	3
District Staff	3

SERVICE REQUESTS

Resident Services	4
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MOSQUITO PROGRAMS

Mosquito Population Surveillance	5
West Nile Virus Surveillance	6
Mosquito Trapping and Testing	7
Control of Mosquito Larvae	8
Control of Adult Mosquitoes	9
Surveillance for Invasive Aedes Mosquitoes	9

RODENT PROGRAMS

Rodent Service Requests	11
Rodent Control in Sewers and Creeks	11
Surveillance for Rodent-Borne Disease	11
Methods and Surveillance Techniques for Rodent Control	12

TICKS PROGRAMS

Surveillance for Ticks and Tick-Borne Disease	13
Surveillance for Tularemia	15

PUBLIC HEALTH EDUCATION AND OUTREACH.....16

Publications and Presentations	17
Events and Presentations	17

FINANCIAL REPORTS

Balance Sheet	18
Financial Highlights for Fiscal Year 2017/2018	18
Statement of Revenues, Expenditures and Changes in Fund Balance	19
Who Pays for Services	20
How Revenue is Used	20
Financial Reserves	20

Resident's Remarks

“Service was great. It was fast, I didn’t have to be home, and the follow-up phone call gave me a lot of info: some access points that needed closing, and the species of the rodents (roof rats). Excellent service, thanks.”

ABOUT THE DISTRICT

Our Vision

“We are an agency that protects public health through a science-based program of integrated vector management, which is responsive to the community, and prepared to adapt to new challenges.”

Our Mission

“To safeguard the health and comfort of the citizens of San Mateo County through a science-based program of integrated vector management.”

Our Goals

1. Reduce or eliminate host-seeking vector populations and maintain consistency in control operations by evaluating vector populations before and after they are carried out.
2. Use scientific methods to evaluate the distribution of vectors and vector-borne diseases in nature and work toward preventing the occurrence of human cases among District residents.
3. Engage in research and development to optimize the District's ability to carry out its mission with available resources.
4. Maintain a highly motivated, productive staff that is aware of, and has access to, the latest materials, technologies, and techniques in vector control.
5. Ensure residents are aware of the District's Integrated Vector Management Program and cooperate with recommendations to reduce populations of vectors and minimize the risk to human health posed by vectors.
6. Ensure that residents are aware of District services, utilize them as needed, and are satisfied with the service they receive.
7. Cultivate strong, mutually beneficial relationships with local, state, county, and federal agencies.
8. Conduct all aspects of District business in a transparent and accountable manner.
9. Adequately maintain the District's physical assets and keep them up to date with the best technology available.
10. Anticipate and be prepared to respond to future scientific, operational, and financial challenges.
11. Ensure that the Board of Trustees operates in an ethical manner, makes sound decisions based on current and complete information, and has the capacity to lead the agency effectively.
12. Ensure that District finances are adequately managed to provide for long term financial stability and sustainability.

The Board of Trustees

As an independent special district, the San Mateo County Mosquito and Vector Control District delivers specific services to citizens within its boundaries under the guidance of its own Board of Trustees. The District's Board of Trustees consists of one resident from each city, appointed by their respective City Council, and one appointed by the County Board of Supervisors to govern the Mosquito and Vector Control District knowledgeably and effectively. They serve for a term of two or four years and are highly dedicated to this community service.

CITY	REPRESENTED BY
Atherton	Mason Brutschy
Belmont	Wade Leschyn
Brisbane	Carolyn Parker
Burlingame	Joe Galligan
Colma.....	Joe Silva
Daly City.....	Glenn R. Sylvester
East Palo Alto.....	Donna Rutherford
Foster City.....	Rick Wykoff
Half Moon Bay.....	Kati Martin
Hillsborough	Dr. D. Scott Smith
Menlo Park.....	Justin Evans
Millbrae.....	Dr. Muhammad Baluom
Pacifica	Peter DeJarnatt
Portola Valley	Raymond Williams
Redwood City	Kathryn Wuelfing Lion
San Bruno	Robert Riechel
San Carlos.....	Dr. Mairin Joseph-Talreja, Ross Graves
San Mateo	Ed Degliantoni
San Mateo County, at Large.....	Claudia Mazzetti
South San Francisco.....	Chris Levin-Young
Woodside	Dave Tanner, Paul Fregulia

BOARD OFFICERS

Jan 2017 –Dec 2018

Board President
Joe Galligan

Board Vice President
Wade Leschyn

Board Secretary
Kati Martin

Board Assistant Secretary
Kathryn Wuelfing Lion

District Staff

ADMINISTRATION

Chindi Peavey, Ph.D., *District Manager*
 Brian Weber, *Assistant Manager*
 Richard Arrow, CPA, *Finance Director*
 Megan Sebay, MPH, *Public Health Education
& Outreach Officer*
 Mary Leong, *Accountant*
 Devina Walker, *Office Administrator*
 Paul Weber, *Facility Maintenance Technician*

LABORATORY

Angie Nakano, MS, *Laboratory Director*
 Warren Macdonald, MS, *Vector Ecologist*
 Tara Roth, Ph.D., *Vector Ecologist*
 Cheryl Tina Sebay, *Vector Ecologist*
 Theresa Shelton, MS, *Vector Ecologist*

OPERATIONS

Casey Stevenson, *Field Operations Supervisor*
 David Allen, *Vector Control Technician*
 Walter Bruj, *Vector Control Technician*
 Stephanie Busam, *Vector Control Technician*
 Hector Cardenas, *Vector Control Technician*
 Eric Eckstein, *Vector Control Technician*
 Sean Jones, *Vector Control Technician-Mechanic*
 Kim Keyser, *Vector Control Technician*
 James P. O'Brien, *Vector Control Technician*
 Ryan Thorndike, *Vector Control Technician*

SERVICE REQUESTS

Resident Services

In addition to ongoing work to prevent the emergence of adult mosquitoes, the District provides a variety of services directly to residents upon request, including residential mosquito surveillance and larval control, delivery of mosquito fish to backyard water features, control of ground-nesting yellowjackets and wasps, property inspections and information on rodents and nuisance wildlife, pick-up of dead bird specimens for disease testing, identification of insects or ticks, presentations, and public outreach events.

District staff responded to a total of 3,317 requests for service during 2018 (Fig. 1). This was a decrease of 15% over the previous year, and it seems that the rapid increase in service requests from 2016 to 2017 has stabilized. However, requests for yellowjacket and wasp control and rodent inspection have continued to increase, perhaps reflecting warmer average temperatures. Mosquito-related service requests decreased dramatically in 2018, a change attributable in part to improvements in the efficiency of the District’s summer stormwater treatment program. Innovative techniques and the implementation of a mobile app aided staff in identifying and treating the thousands of stormwater catch basins located in urban and suburban areas throughout the county, reducing mosquito breeding and preventing resident complaints.

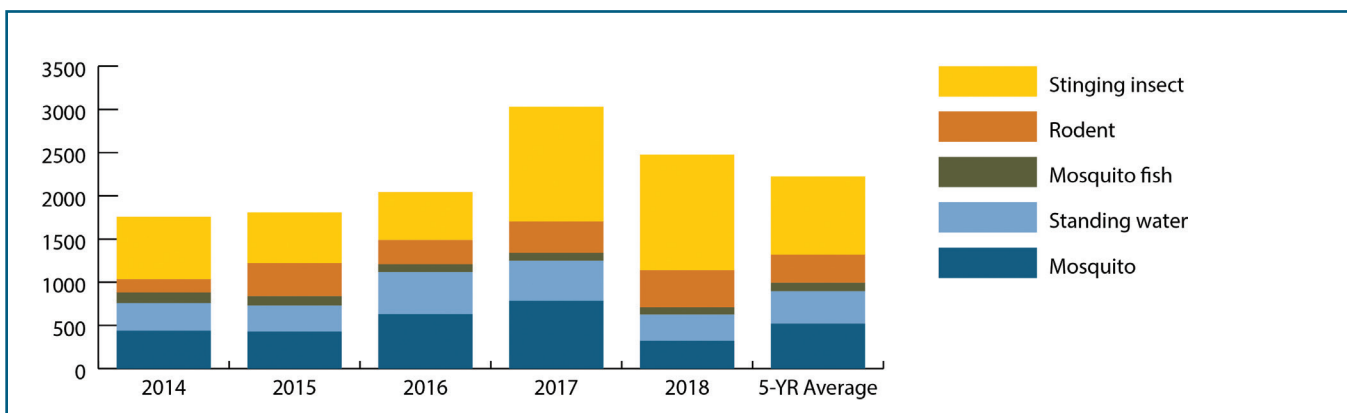


Figure 1: Service Requests by category with 5-year average, 2014-2018.

The majority of service requests are received over the summer (Fig. 2), with a seasonal peak occurring during late summer as the area’s warmest temperatures boost mosquito populations. Likewise, warm weather allows yellowjacket and wasp populations to rise, resulting in dozens of resident service requests during the warmest months of the year. As temperatures cool in fall, mosquito populations decrease, despite the increased abundance of standing water left by seasonal rainstorms.

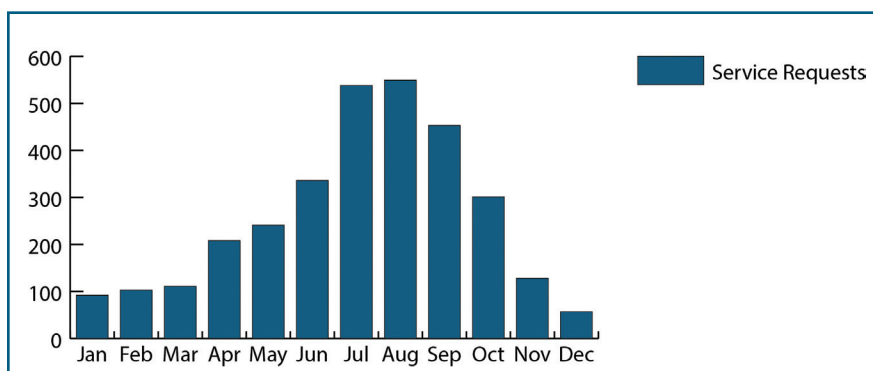


Figure 2: Total number of service requests by month in 2018.

MOSQUITO PROGRAMS

Mosquito Population Surveillance

The District laboratory uses traps to conduct surveillance year-round for both native and invasive mosquito species. The results of these trap collections are used to estimate population levels of various mosquito species in San Mateo County and to provide comparative data on changing mosquito populations from year to year.

Mosquito population data is compared over time, and seasonally, at specific locations. This data is used to optimize mosquito control and disease surveillance efforts in response to seasonal challenges throughout the year.

Although mosquitoes are present in San Mateo County throughout the year, each season brings new challenges. For example, *Aedes washinoi*, which breeds in shallow woodland pools, is most common in the spring, while *Culex erythrothorax*, the tule mosquito, begins emerging in early summer and requires a large larviciding effort to prevent its natural peak in the fall. However, *Culex pipiens*, the mosquito most commonly detected carrying West Nile virus in San Mateo County, makes up a large portion of local mosquito populations year-round, and is the biggest cause of mosquito-related complaints.

The total abundance of adult mosquitoes was close to or below average during the 2018 calendar year, except for during July, August and September. During this time, there was a spike in adult mosquito numbers, mostly *Culex pipiens* and *Culex erythrothorax*. The northern house mosquito, *Cx. pipiens*, was developing in urban areas along the bay, including sewer plants, fresh water pools that continuously hold water throughout the summer, and water under buildings. The warmer August temperatures increased production. The tule mosquito, *Cx. erythrothorax*, is a seasonal mosquito that emerges from tule marshes in summer and fall. The tules can make it difficult for larvicide materials to penetrate into mosquito larval sites, and sometimes these mosquitoes will emerge in high numbers, despite the efforts of the District. Both species were effectively targeted and the abundance plummeted to below average in September.

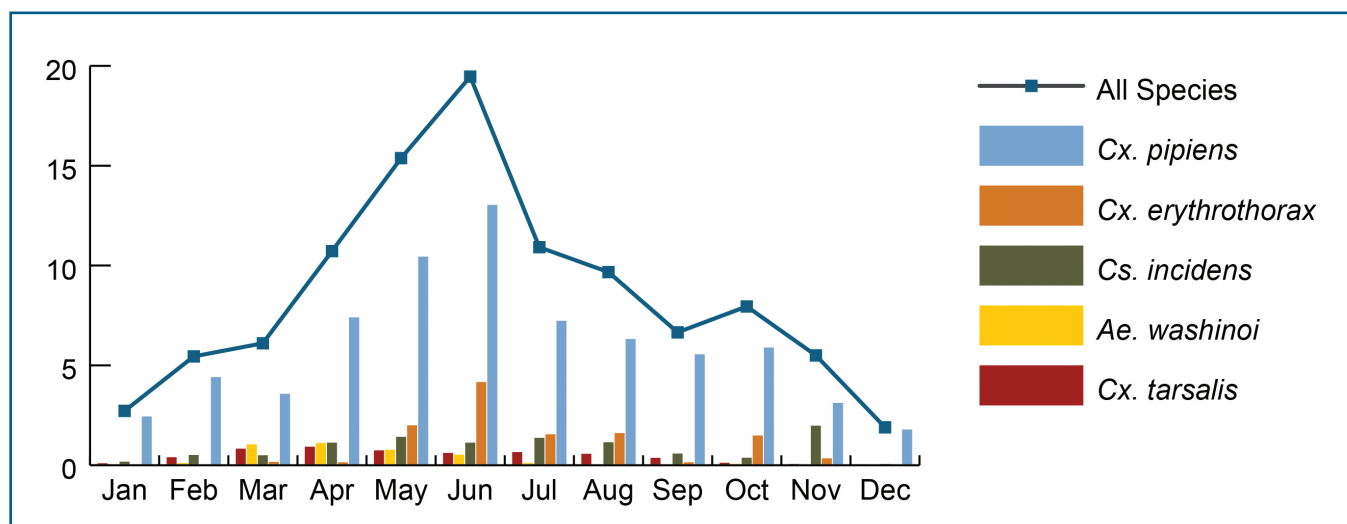


Figure 3: Average number of common adult mosquito species collected in carbon-dioxide baited traps during 2018 compared to the combined total of these common species.

West Nile Virus Surveillance

The District's year-round surveillance program for West Nile virus is part of CalSurv, the surveillance program for mosquito-borne encephalitis coordinated by the California Department of Public Health. This program includes surveillance for western equine encephalitis, St. Louis encephalitis, and other mosquito-borne viruses. These viruses are maintained through mosquito/bird transmission cycles. Surveillance for these viruses is carried out by multiple methods. The District tests carcasses of dead birds and live adult mosquitoes collected from CO₂-baited traps. The viruses are detected using real-time PCR and other molecular techniques. In addition, the District maintains two flocks of sentinel chickens, located in San Mateo and East Palo Alto, as a method for monitoring the transmission of virus by local mosquitoes.

During the 2018 season, the overall risk of West Nile virus infection in San Mateo County remained low (Table 1). Five dead birds (one from Foster City, one from South San Francisco, two from Menlo Park, and one from East Palo Alto) tested positive for West Nile virus between February and August 2018. West Nile virus was detected in two samples of adult mosquitoes in 2018. Both were collected from East Palo Alto at the beginning of August 2018.

DETECTION TYPE	2014	2015	2016	2017	2018
Human Case	0	0	0	0	0
Sentinel Chicken Seroconversion	0	0	0	0	0
Mosquito	15	5	5	0	2
Bird	21	23	15	1	5
Squirrel	0	0	0	0	0

Table 1: West Nile virus detections in San Mateo County 2014-2018



Mosquito Trapping and Testing

Mosquito trapping for detection of West Nile virus is typically conducted when there is reason to believe the virus is present in adult mosquitoes in a particular geographical area, such as when bird carcasses test positive for West Nile virus or when a human case of West Nile virus is reported. *Culex* mosquitoes (the genus that transmits West Nile virus) are separated by species and pooled from each trap for testing. The results of mosquito testing for West Nile virus are used to plan mosquito control treatments.

SAN MATEO COUNTY	2014	2015	2016	2017	2018
Mosquito Pools Tested	437	205	291	4	131
Positive Mosquito Pools	15	5	5	0	2
Percent Positive Mosquito Pools	3.4%	2.4%	1.7%	0%	1.5%

Table 2: West Nile Virus Surveillance of Mosquito Samples, 2014-2018



Control of Mosquito Larvae

The vast majority of the District's mosquito control program consists of controlling mosquitoes in the larval stage (larviciding). Mosquito larviciding is both efficient and cost-effective. This tactic eliminates mosquito larvae before they develop into adult mosquitoes capable of transmitting diseases to humans. Products used for control of mosquito larvae are specific to mosquitoes and have minimal to no effects on non-target animals. These products include bacterial larvicides, insect growth regulators, and mosquito fish.



The type of water source treated varies seasonally, with natural water sources – creeks, ponds, marshes, and impounds – treated frequently in response to winter and spring rain. In summer and fall, backyard water sources and municipal sources – including water treatment plants, storm drains, and ditches – make up the majority of the District's mosquito larvicide treatments. The county's storm water system also requires extensive treatment during the dry season (April through October). The District hires seasonal staff to complete the more than 200,000 treatments needed annually to keep these stormwater catch basins mosquito-free. In addition to conducting their usual water treatments, in 2017 seasonal staff members collected the tens of thousands of GPS data points needed to add each stormwater catch basin in San Mateo County to the District's data management system. This important, though time-consuming, process facilitated better mosquito control in the county's stormwater system, leading to improved mosquito control and a noticeable decrease in the number of resident reports of mosquito problems during the summer of 2018.

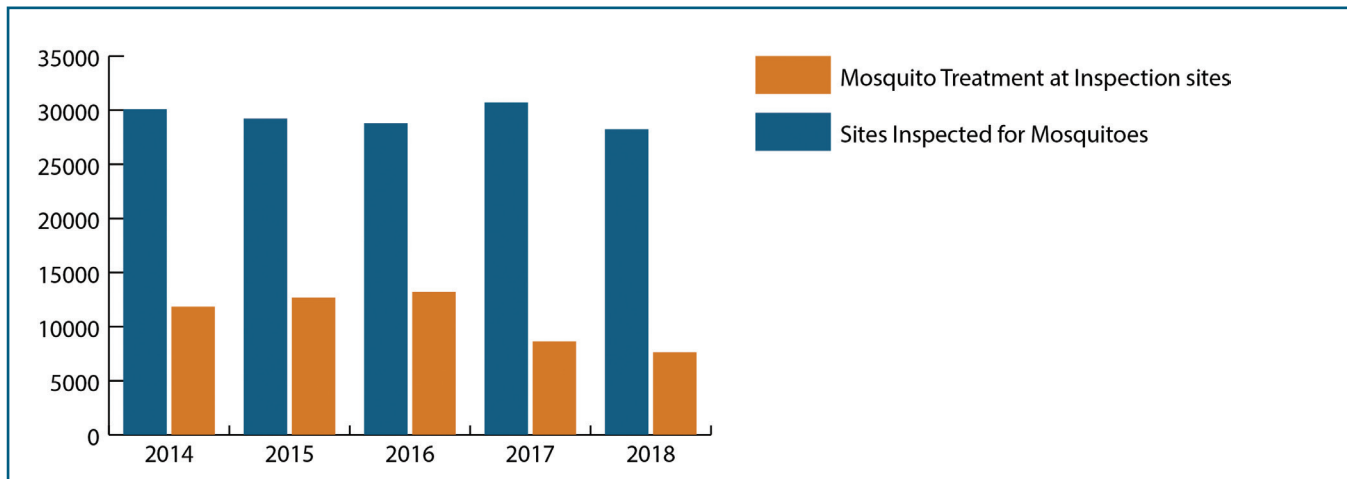


Figure 4: Inspections and treatments for mosquito larvae, 2014-2018.

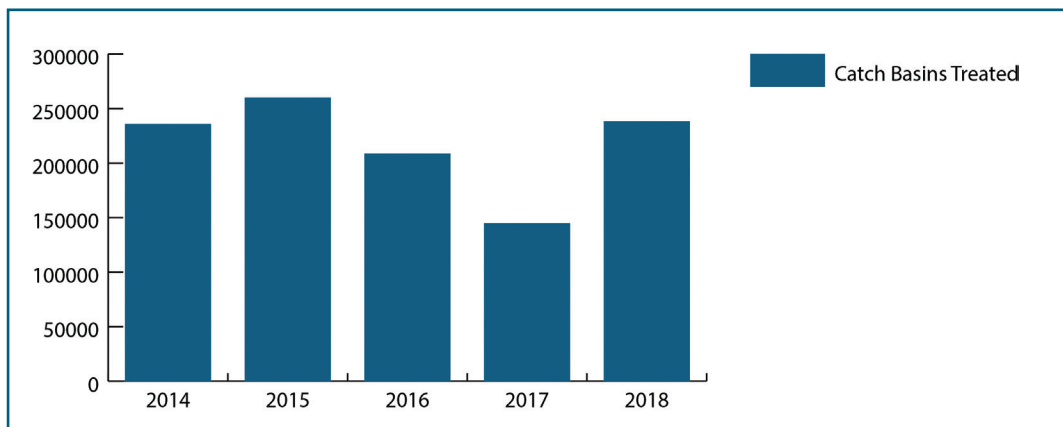


Figure 5: Stormwater catch basin treatments, 2014-2018.

Control of Adult Mosquitoes

San Mateo County Mosquito and Vector Control District takes a preventative approach to mosquito control. Whenever possible, mosquitoes are controlled in their immature stages, before they emerge as biting adults capable of transmitting disease to humans. Sometimes, however, adult mosquito populations become a threat to human health, including when they are found to be infected with West Nile virus. When this happens, information collected through mosquito surveillance is used to make the decision on whether to reduce adult mosquito populations by conducting an adult mosquito control treatment. Adult mosquito control, or adulticiding, is used to quickly reduce the number of adult mosquitoes and interrupt the disease transmission cycle in an area with elevated West Nile virus activity. Adulticiding is always conducted in conjunction with intensified efforts to locate and reduce mosquito larvae in standing water, so that additional adult mosquitoes cannot emerge.

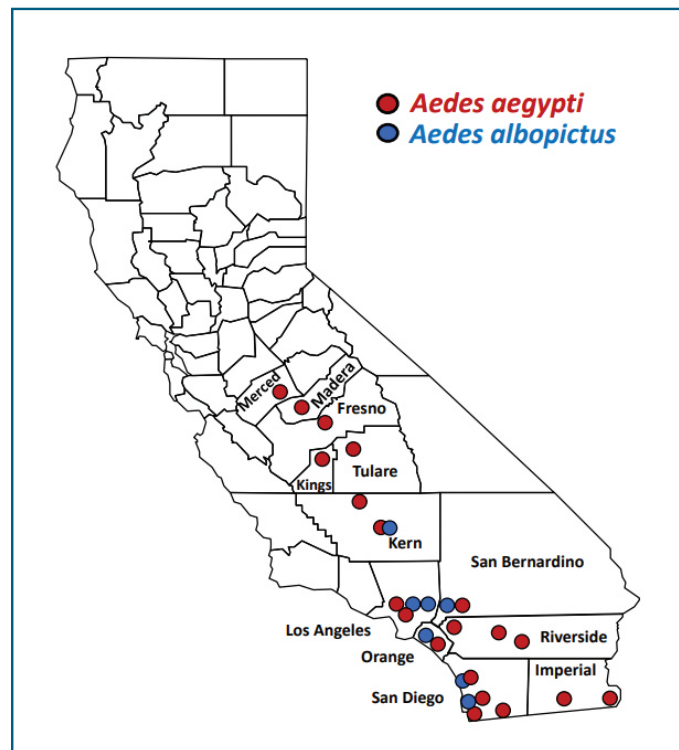
During the 2018 West Nile virus season, infected adult mosquitoes were detected in East Palo Alto. In response, the District conducted truck-mounted control of adult mosquitoes in the Pulgas Gardens, Palo Mobile Estates, and Weeks Gateway neighborhoods on August 12th. Fortunately, follow-up disease surveillance detected no subsequent infected adult mosquitoes in this area.

Surveillance for Invasive Aedes Mosquitoes

Three species of non-native *Aedes* genus mosquitoes – *Aedes aegypti*, *Aedes albopictus*, and *Aedes notoscriptus* – have been identified in California to date (Figure 6). These species are concerning for vector control agencies across the state because they are highly invasive, difficult to control, and are vectors for a variety of diseases affecting humans, including Zika virus, chikungunya, dengue, and yellow fever. Allowing large populations of these invasive *Aedes* mosquito species to become established creates the risk that travel-acquired human cases of these diseases may lead to local outbreaks in California. Both *Aedes aegypti* and *Aedes albopictus* have been detected in San Mateo County in the past. Most recently, *Aedes aegypti* was found inhabiting a one square mile area in the city of Menlo Park in 2013. Following two years of intensive control efforts, there have been no detections of invasive *Aedes* mosquitoes in San Mateo County since May of 2015. However, new introductions of invasive mosquitoes could occur at any time, and surveillance for invasive *Aedes* mosquitoes will continue indefinitely.

The District conducts surveillance for invasive *Aedes* species throughout San Mateo County in order to reduce the risk of these mosquitoes becoming established again. A variety of mosquito traps are used which are specific to invasive *Aedes*. These include ovicups, and Biogents BG-Sentinel traps and BG-GAT (Gravid *Aedes* Trap) traps. Additional surveillance is conducted in areas where there have been human cases of illnesses that can be transmitted by invasive *Aedes*, including chikungunya, dengue, Zika, and yellow fever. The District is alerted to these cases by the San Mateo County Health System. This ensures that there is no risk that the infection will be transmitted by mosquitoes locally. In 2018, all human cases of these diseases were acquired outside California by people travelling to other countries.

Figure 6: California counties and cities where invasive *Aedes* mosquitoes are currently found as of January 4, 2019. *Aedes notoscriptus* not included. (Map from California Department of Public Health)



In early 2017, the District was awarded a grant to enhance our ability to detect invasive *Aedes* mosquitoes. The grant funding came from the Centers for Disease Control and Prevention, and was administered by the nonprofit corporation Public Health Foundation Enterprises (now Heluna Health), on behalf of the California Department of Public Health. The District used these funds to hire a seasonal employee dedicated to surveillance for invasive *Aedes* mosquitoes. This allowed the District to continue a comprehensive invasive *Aedes* surveillance program. The District placed *Aedes* specific mosquito traps throughout the county, including the placement of 2,766 ovicup traps and 30 BG-GAT traps in 2018. Additionally, 36 BG-Sentinel traps were placed near imported disease cases. The funds supported this project until the grant ended at the end of July 2018.

Despite additional surveillance, invasive *Aedes* mosquitoes were not detected in any area of San Mateo County during Fiscal Year 2017/2018. However, the risk of introduction of invasive *Aedes* mosquito species from other parts of California (see Figure 7) remains high.



Figure 7: Invasive *Aedes* mosquito surveillance locations, 2018

Resident's Remarks

“It was easy to schedule an appointment and the person who came out was super professional and knowledgeable.”

RODENT PROGRAMS

Rodent Service Requests

The District's vector control technicians responded to an average of 348 service requests related to rodents per year over the last 5 years. However, during 2018, the District responded to 494 rodent-related service requests. These requests came from urban and suburban areas throughout the District's service area and were not concentrated in any particular city.

Rodent Control in Sewers and Creeks

In 2010, San Mateo County turned over a large portion of residential rodent control responsibilities to the District. The District oversees contracts between private pest control operators and several local cities and sanitary districts to provide rodent control in sewers and creeks. These control programs use tamper-resistant bait stations and a reduced-risk rodenticide to control commensal rats. The cities of San Mateo and San Carlos also contract directly with the District for rat control services along above-ground public storm control waterways and urban creekways.

Surveillance for Rodent-Borne Disease

The District conducts surveillance annually for pathogens in wild rodents that may cause disease in humans, including hantavirus. Hantavirus causes fatal respiratory disease in humans. The virus is carried by wild mice and can be acquired by inhalation or ingestion of virus particles from the urine or feces of infected animals. There are several different strains of Hantavirus; each is carried by a different species of wild mice. Only the Sin Nombre strain of hantavirus, which occurs in the deer mouse (*Peromyscus maniculatus*), has been associated with human disease cases.

The District laboratory selects locations for rodent-borne disease surveys based on historical patterns of disease detection. Staff conduct humane live trapping at these sites in order to collect biological samples for testing. During 2018, the District conducted surveys for rodent-borne disease at two sites: San Bruno Mountain in May, and La Honda in June. Hantavirus has been historically detected in wild rodents at San Bruno Mountain whereas the La Honda site was a new location for hantavirus surveillance for the District. Evidence of hantavirus infection was detected in four (4) out of 19 deer mice trapped at San Bruno Mountain which is statistically similar to previous years. In La Honda, one (1) out of 35 mice tested positive for hantavirus in June. While these results indicate that hantavirus is present at these locations, because only a few mice were collected during surveillance we cannot be certain of the true prevalence and relative risk of exposure between locations.

DATE	PARK/CITY	TOTAL CAPTURES	# POSITIVE	SPECIES
5/3/2018	San Bruno Mountain State and County Park	19	4	<i>Peromyscus maniculatus</i>
6/5/2018	La Honda	20	1	<i>Peromyscus truei</i>
6/5/2018	La Honda	15	0	<i>Peromyscus californicus</i>

Table 3: Summary of animals captured and test results from hantavirus surveys in 2018.

Methods and Surveillance Techniques for Rodent Control



The District frequently employs various methods to evaluate our rodent baiting programs to make sure they are safe, effective, and efficient. Monitoring techniques are used to determine rodent distribution in the environment, so bait stations can be placed where they will be the most effective and where they will be least likely to be attractive to non-target rodents. One way of determining this is to set up trail cameras that are equipped with a sensor that detects movement and will automatically take pictures or videos when triggered. Another method includes looking for evidence of rat presence or activity such as droppings, urine markings, chew marks, or rub marks. Rub marks are the most common sign detected in urban environments. They occur on structures, branches, pipes, or walls and are created when the oil from the rat's fur rubs off on the structure and cakes with soil, creating a black smudge. Large numbers of rub marks or other signs in an area can indicate the presence of a rodent infestation and help technicians decide where to put bait stations for maximum efficiency.



Since January 2018 the District has been developing a new surveillance technique in order to determine the efficacy of rodent control programs: a modified track pad for use in bait stations. Animal tracks are frequently used by biologists as a means to determine the species present in an environment when the use of cameras isn't possible. The size of the print, number of toes, structure of the foot, and gait can all be used to identify which species is visiting a bait station. This technique may be used to determine which stations are being utilized, that the species utilizing the bait stations are the intended target species, and that the number of individuals visiting the station is sufficient to justify placement of the station at that location.



In 2018, the District applied this technique at three different sites in the city of San Mateo where bait stations are routinely deployed. Track pads were placed in bait stations for three weeks and changed at the end of every week in order to track rodent activity throughout the month. Our results show that the track pads are more sensitive at detecting activity than conventional methods (chew markings on the bait or urine/feces in the station) and were able to detect when bait avoidance was occurring. The pads were also able to differentiate between target and non-target species – allowing us to reevaluate station placement. As the track pads are inexpensive, easy to produce, and easy to deploy, this technique can be applied widely to evaluate rodent populations and control programs throughout the county.

TICKS PROGRAMS

Surveillance for Ticks and Tick-Borne Disease

The District conducts annual surveillance for pathogens in ticks that may cause disease in humans including Lyme disease, hard-tick relapsing fever, and anaplasmosis. Surveillance for tick-borne disease in adult ticks was conducted on trails from November 2017 through April 2018 at 14 city and county parks. Surveillance was also conducted for larval and nymphal ticks from April to May of 2018 at eight city and county parks with appropriate habitat.

All western black-legged ticks (*Ixodes pacificus*) collected by the District in 2017/2018 were tested for *Borrelia burgdorferi* (the agent of Lyme disease), *B. miyamotoi* (the agent of *Borrelia miyamotoi* disease, sometimes called hard-tick relapsing fever), and *Anaplasma phagocytophilum* (the agent of anaplasmosis). Lyme disease is an infection that involves flu-like symptoms, a characteristic bulls-eye rash, and can lead to severe joint pain and neurological problems. A related bacterium, *B. miyamotoi*, causes symptoms similar to Lyme disease but without a rash and the fever may reoccur multiple times before the infection clears. While *Borrelia miyamotoi* disease cases associated with tick bite have been reported on the east coast of the United States and abroad, it is currently unknown if local ticks on the west coast of the United States are capable of successfully transmitting the disease. Anaplasmosis is also similar to Lyme disease with fever, abdominal pain, aching joints, fatigue and other flu-like symptoms. Like hard-tick relapsing fever, these bouts of fever may reoccur multiple times before the infection clears. All three of these bacteria are transmitted by the same tick species, the western black-legged tick. All three pathogens have been detected in both the nymph and adult stages of this tick, but only *B. miyamotoi* has been also found in larval ticks.

Adult and larval ticks are tested in groups, or “pools,” of a maximum of five individuals. Nymphal ticks are tested in pools of a maximum of two individuals. The results are reported as a minimum infection prevalence, or MIP. This is the standard way of expressing the proportion of vectors tested that are infected with a particular pathogen and assumes that only one tick in a given pool is infected. An MIP of 1-3% is typical for *B. burgdorferi* in adult *Ixodes pacificus* ticks in our county, and does not indicate an elevated level of risk. In the 2017/18 collection period, a total of 3,555 adult, 534 nymphal, and 442 larval *Ix. pacificus* ticks were collected from 14 parks. County-wide, *B. burgdorferi*, *B. miyamotoi*, and *A. phagocytophilum* were detected in 0.7%, 0.53%, and 0.42% respectively of adult *Ix. pacificus* ticks; 1.31%, 0.94%, and 0.19% respectively of nymphal *Ix. pacificus* ticks; and 0.0%, 0.23%, and 0.0% respectively in larval ticks (Table 4). This represents a slight increase for both *B. burgdorferi* (reported as 0.6% in 2017) and *B. miyamotoi* (reported as 0.5% in 2017) but these differences are not statistically different from other years. Individual park MIPs did not exceed normal levels.



Park Name	Life Stage	Total Ticks Collected	MIP ^a <i>Borrelia burgdorferi</i> s.l.	MIP ^a <i>Borrelia miyamotoi</i>	MIP ^a <i>Anaplasma phagocytophilum</i>
Ano Nuevo State Park	Adult	211	2.84%	0.00%	0.00%
Big Canyon Park	Adult	200	0.00%	0.00%	1.00%
Coal Creek Open Space Preserve	Adult	229	0.00%	0.00%	1.75%
	Nymph	81	1.23%	1.23%	1.23%
Crystal Springs Regional Trail	Adult	245	0.41%	0.82%	0.00%
	Nymph	72	1.39%	0.00%	0.00%
Eaton Park	Adult	393	0.00%	0.51%	0.25%
Laurelwood Park	Adult	304	0.66%	0.33%	0.33%
	Nymph	62	3.23%	1.61%	0.00%
Los Trancos Open Space Preserve	Adult	225	0.89%	0.89%	1.78%
	Nymph	66	4.55%	0.00%	0.00%
Memorial County Park	Adult	145	1.38%	0.00%	0.69%
Montara Mountain	Adult	148	0.00%	0.68%	0.00%
Purisima Creek Redwoods OSP	Adult	234	1.28%	0.85%	0.85%
Skyline Ridge Open Space Preserve	Adult	476	0.84%	0.63%	0.00%
	Nymph	74	0.00%	2.70%	0.00%
Thornewood Open Space Preserve	Adult	211	1.90%	1.42%	0.00%
	Nymph	83	0.00%	1.20%	0.00%
Water Dog Lake Park	Adult	293	0.34%	0.34%	0.00%
	Nymph	27	0.00%	0.00%	0.00%
Wunderlich County Park	Adult	241	0.00%	0.83%	0.00%
	Nymph	69	0.00%	0.00%	0.00%
County-wide Totals	Adult	3555	0.70%	0.53%	0.42%
	Nymph	534	1.31%	0.94%	0.19%

^a MIP - Minimum Infection Prevalence. A measure of pathogen prevalence equal to the number of positive testing pools divided by the total number of ticks tested, expressed as a percentage.
Abbreviations for Park Names: **OSP** Open Space Preserve

Table 4: Results from surveillance for tick-borne disease in *Ixodes pacificus* ticks collected from October 2017 through September 2018 from local parks.

Surveillance for Tularemia

In 2018, the District laboratory staff conducted surveillance for the tick-borne disease tularemia at Costanoa/northern Año Nuevo State Park. This location has a history of human cases of tularemia from 2004 and 2006. Tularemia is a febrile illness that causes fever, malaise, aches and pains, vomiting, diarrhea, and enlarged lymph nodes. The disease is caused by the bacterium *Francisella tularensis* and can be very serious if left untreated. Tularemia is transmitted in California by the west coast tick (*Dermacentor occidentalis*) and the American dog tick (*D. variabilis*) which may be found year-round but are most abundant during the summer. During the months of May and June in 2017, the District collected a total of 403 *Dermacentor* ticks from Costanoa/northern Año Nuevo State Park. Ticks were pooled in groups of 5 for disease testing. Out of these ticks, two pools (one pool of *D. occidentalis* and one pool of *D. variabilis*) were positive by PCR for *F. tularensis* for an MIP of 0.49%. These positive pools were confirmed by multiplex real-time PCR analysis by the CDPH Vector Borne Disease Laboratory (VBDL) in Richmond, CA. In addition, CDPH detected one positive pool of *F. philomiragia*, which is considered a fish pathogen and rarely infects humans. The District continued surveillance for tularemia in 2018, extending the collection period from June through November. A total of 586 *Dermacentor* ticks were collected during this period including 523 adults, 6 nymphs, and 57 larvae from Costanoa/ Año Nuevo State Park. These ticks will be tested for tularemia by the District with confirmatory testing by the CDPH VBDL to follow.

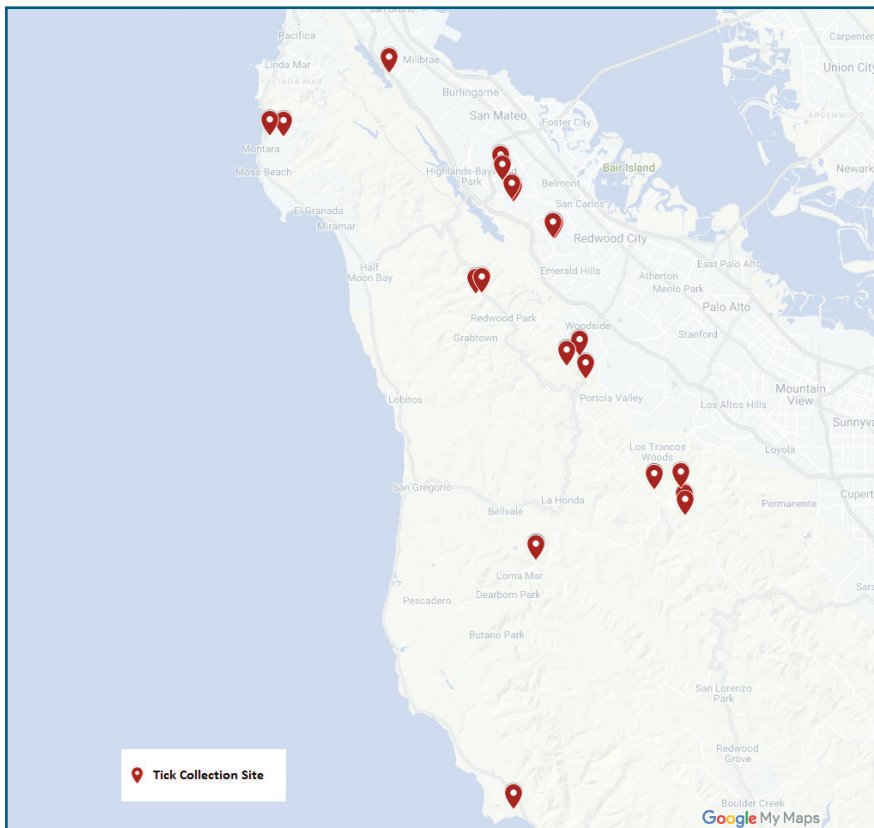


Figure 8: Tick collection sites, water year 2017/2018

Resident's Remarks

“I appreciate the expertise, speed, and advice given each time I have asked for assistance. Your department is a joy to deal when there are pest control problems.”

PUBLIC HEALTH EDUCATION AND OUTREACH

The District's integrated vector management program includes extensive public outreach aimed at improving public awareness of and participation in vector-borne disease prevention, including vector attractant/source reduction and behaviors to reduce the risk of vector-borne disease transmission.

A post-service online survey is used to collect information on where residents first heard about the District, how often and what kind of services were requested, and whether they were satisfied with those services. An invitation to complete the survey is sent to every resident who provides an email address when requesting service. Nearly 600 residents responded during 2018.

In 2018, the most important sources of referrals to the District were internet sources (internet search results, internet advertising, social media posts, and email subscriptions) and word-of-mouth (friends, neighbors, city and county staff, pest control professionals, and others). Other significant sources of resident referrals included transit and television advertising, as well as outreach events.

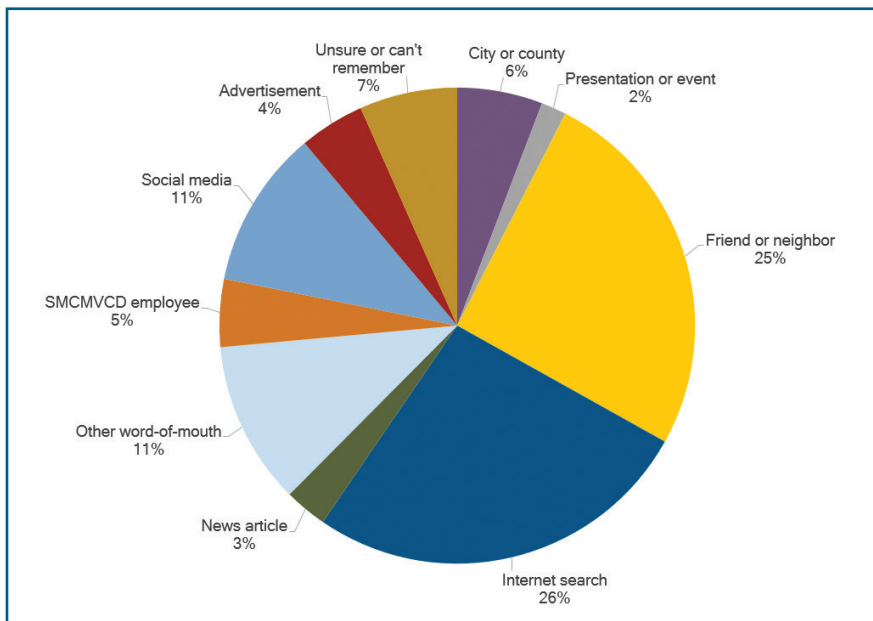


Figure 9: Resident-reported source of referrals to the District during 2018

Resident's Remarks

“Wonderful informative and prompt service! Thank you!”

The District website received more than 35,000 visits during 2018, an increase of 83% compared to the previous year. 78% of these visitors accessed the site from within the United States; more than half of all visitors accessed the site from within California. The average user visited the site 1.2 times, viewed 2.46 pages per session and spent just over 1.5 minutes on the site per visit. As in previous years, site visits are higher during summer, particularly during years when adult mosquito control treatments are required to control the risk of West Nile virus.

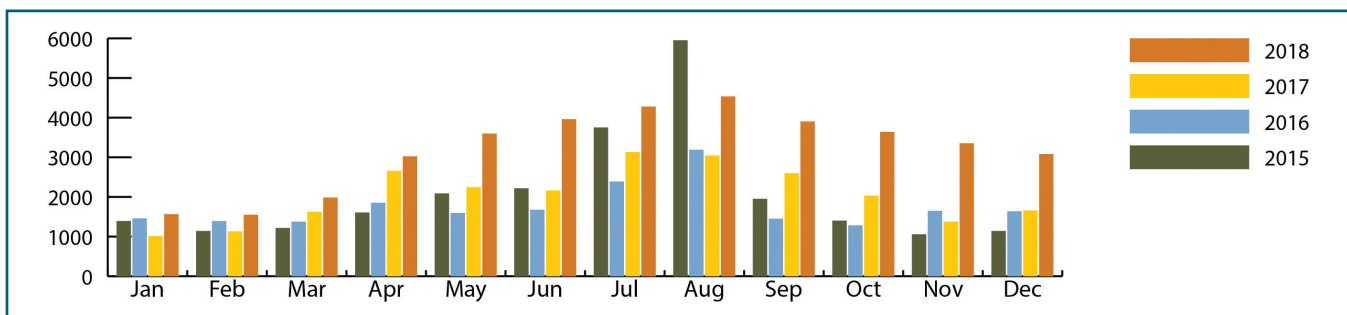


Figure 10: User visits to the District website by month 2015 to 2018.

PUBLICATIONS AND PRESENTATIONS

TARA ROTH

Investigating an Outbreak of Tularemia in the California Central Valley

Reeves New Investigator Award – Runner Up
 2018 Mosquito and Vector Control Association of California Annual Conference

MEGAN SEBAY

Using a Web-Based Survey Interface for Real-Time Data Collection for Invasive Aedes Mosquito Response

2018 Mosquito and Vector Control Association of California Annual Conference



EVENTS AND PRESENTATIONS

- San Mateo County Fair
- Peninsula Infectious Diseases Conference
- San Mateo Health System Patient Experience Fair
- San Mateo County Disaster Service Workers Day
- San Mateo County Dept. of Agriculture Growers' Workshop
- Colma Wildlife Town Hall
- San Mateo County Beekeepers' Guild
- San Francisco Zoo Bug Day
- Foster City Rotary Club
- San Mateo College
- San Bruno Community Day in the Park
- Menlo Park Library Science Night
- Pacific Skyline Council Camp Takima
- San Bruno Girl Scouts
- Burlingame Mills Intermediate Girl Scouts
- Randall Museum Bug Day
- Coyote Point Kite Festival
- Portola Valley Earth Day
- Belmont Earth Day
- Daly City Farmers Market
- Pacifica Farmers Market
- Brisbane Farmers Market
- Hillsborough City Council
- Foster City City Council
- Brisbane City Council
- South San Francisco City Council
- San Carlos City Council
- East Palo Alto City Council
- Mosquito Awareness Week Open House
- Canada Cove Homeowners' Association
- San Mateo Highlands Association
- Verano Homeowners' Association
- Harbor Industrial Association
- San Francisco Bay Area Koi Club
- Fernando Rivera Middle School Career Day



FINANCIAL REPORTS

In 2018, in addition to its Annual Financial Audit, the District published a Comprehensive Annual Financial Report (CAFR), which gives a deeper look into the District finances for Fiscal year 2017-18. The CAFR for FY 2017-18 can be found on the District website.

Balance Sheet

The Balance Sheet shows the composition of District assets, liabilities, and fund balances as of June 30, 2018 and June 30, 2017. Cash and investments make up the majority of the District's assets. In FY 2017-18, the District's cash and investments were higher than in the previous fiscal year and its near-term liabilities were lower

	30-JUN-18	30-JUN-17	CHANGE
ASSETS			
CASH AND INVESTMENTS	\$5,396,900	\$4,504,866	\$892,034
ACCRUED INTEREST RECEIVABLE	24,483	13,484	10,999
ACCOUNTS RECEIVABLE	37,701	20,622	17,079
OTHER RECEIVABLES	24,571	54,524	(29,953)
MATERIALS & SUPPLIES INVENTORY	101,281	81,187	20,094
VCJPA CONTINGENCY FUNDS	463,501	462,849	652
PREPAID ITEMS	5,009	10,287	(5,278)
TOTAL ASSETS	\$6,053,446	\$5,147,819	\$905,627
LIABILITIES			
ACCOUNTS PAYABLE & ACCRUED EXPENDITURES	\$140,821	\$160,776	(\$19,955)
ACCRUED SALARIES & BENEFITS	48,195	45,712	2,483
TOTAL LIABILITIES	189,016	206,488	(17,472)
FUND BALANCE			
TOTAL FUND BALANCE	5,864,430	4,941,331	923,099
TOTAL LIABILITIES AND FUND BALANCE	\$6,053,446	\$5,147,819	\$905,627

Financial Highlights for Fiscal Year 2017/2018

In Fiscal Year 2017-18, the District's Fund Balance increased 16% or \$905,627 from the prior year. Actual revenues were higher than expected and expenditures were lower than budgeted, primarily due to vacant positions which the District expects to fill in FY 2018-19.

- Total revenues from all sources increased by 8.7%, or \$437,265 from the prior year, primarily due to an increase of \$262,413 in tax revenues and increases of program revenue of \$91,738.
- Actual revenues exceeded the amount budgeted by of \$295,079, primarily due to the amount received for ERAF rebate and Redevelopment Pass-Through receipts being higher than expected. These amounts can vary from year to year.

Statement of Revenues, Expenditures and Changes in Fund Balance

This statement shows the District's revenues and expenditures in FY 2017-18. From this statement and the explanation on the next page, the reader can see how the District's operations are funded and what the funds are used for.

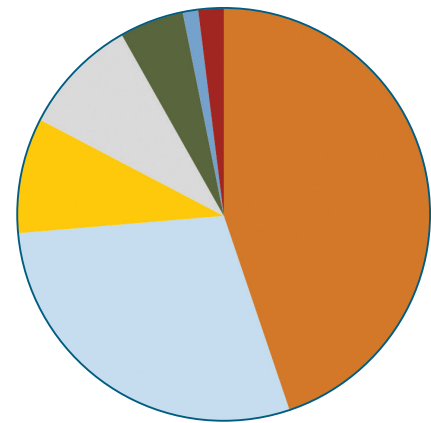
	BUDGET	ACTUAL	VARIANCE
REVENUES			
PROPERTY TAX REVENUES	\$2,354,878	\$2,450,549	\$95,671
SPECIAL BENEFIT ASSESSMENT	1,577,737	1,579,436	1,699
SPECIAL MOSQUITO CONTROL TAX	510,334	491,930	(18,404)
OTHER TAX REVENUES	356,559	500,749	144,190
SERVICE ABATEMENT AGREEMENTS	240,782	273,725	32,943
INVESTMENT EARNINGS	80,100	65,816	(14,284)
OTHER REVENUES	55,000	108,264	53,264
TOTAL REVENUES	\$5,175,390	\$5,470,469	\$295,079
EXPENDITURES			
SALARIES & BENEFITS	\$3,350,481	\$3,125,648	\$224,833
ADMINISTRATION & INSURANCE	960,949	805,354	155,595
FACILITIES MAINTENANCE & UTILITIES	207,160	165,836	41,324
VECTOR CONTROL OPERATIONS	344,500	305,954	38,546
LABORATORY	91,300	47,523	43,777
PUBLIC OUTREACH	85,000	73,991	11,009
CAPITAL IMPROVEMENTS	136,000	23,064	112,936
TOTAL EXPENDITURES	\$5,175,390	\$4,547,370	\$628,020

- Total expenses for the District's operations in FY 2017-18 increased by 7.3% or \$348,658 over the previous year.
- The District had no outstanding debt, other than capital leases for District vehicles.
- The District liabilities for Other Post Employee Benefits (OPEB) are fully funded and paid for by a trust established for this purpose in 2015.

Who Pays for Services

In Fiscal Year 2017-18, the District received \$5.5 million of revenue. County property owners, who pay property taxes and assessments are the source of almost all District revenue. The District's top three revenue sources – ad valorem property taxes, a special mosquito tax and a benefit assessment – provide 87% of revenue. Property owners in the Southeast portion of the county pay for services through a small portion of the ad valorem property taxes (0.000018505 cents per \$1.00 of property taxes) and a Special Mosquito Control tax of \$3.74 per parcel. Property owners in the northern part of the county, on the coast, and in the mountainous areas pay a benefit assessment of approximately \$18.15 per Single Family Equivalent (SFE).

In fiscal year 2017-18, total revenues from all sources increased by 8.7%, or \$437,265 from the prior year. The District's revenue from ad valorem property tax increased by 8.8% or \$198,917, while revenue received from the benefit assessment increased by 5.3% or \$80,098.

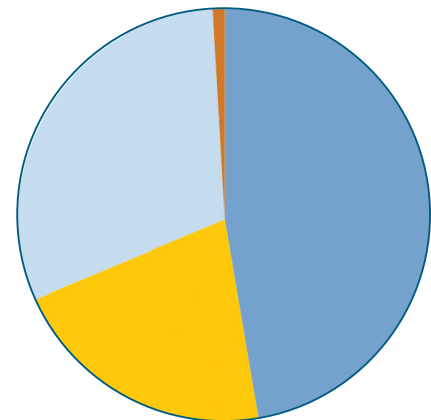


- 45% Property Tax Revenues
- 29% Special Benefit Assessment
- 9% Special Mosquito Control Tax
- 9% Other Tax Revenues
- 5% Service Abatement Agreements
- 2% Other Revenues
- 1% Investment Earnings

Figure 11: Sources of Revenue for Fiscal Year Ending: June 30, 2018

How Revenue is Used

Total annual operating expenditures in Fiscal Year 2017/2018 were \$4.5 million. As is typical for local government agencies, most District expenditures were for employee salaries and benefits. The District's Integrated Vector Management (IVM) program reduces pesticide use but is labor-intensive and requires highly trained staff. Field staff conduct inspections and choose from a variety of control strategies and tools depending on the conditions present at a given site. Field and Laboratory staff monitor vector populations by trapping vectors and identifying the species present. Figure 12 shows the distribution of Expenditures by category.



- 47% Salaries
- 22% Materials and Service
- 22% Benefits
- 1% Capital Improvements

Figure 12: Expenditures for Fiscal Year Ending: June 30, 2018

Financial Reserves

As of June 30, 2018, the District reported a total fund balance of \$5,864,430. At the beginning of the fiscal year, the District allocated unassigned fund balance equal to 60% of budgeted expenditures to provide working capital requirements from the beginning of the fiscal year on July 1, until the receipt of property tax revenue in November of each year.

FUND BALANCE AND RESERVE ALLOCATION	Amount	% of Fund Balance
CAPITAL ASSET & EQUIPMENT REPLACEMENT RESERVE	\$900,000	15%
PUBLIC HEALTH EMERGENCY RESERVE	800,000	14%
NATURAL DISASTER EMERGENCY RESERVE	650,000	11%
PENSION RATE STABILIZATION RESERVE	100,000	2%
UNASSIGNED FUND BALANCE (WORKING CAPITAL)	3,145,301	54%
UNASSIGNED FUND BALANCE	162,839	2%
NONSPENDABLE (Inventory & prepaid items)	106,290	2%
TOTAL FUND BALANCE	\$5,864,430	100%

San Mateo County Mosquito & Vector Control District

Protecting Public Health since 1916

The mosquito control program in San Mateo County is one of the oldest in the United States. Control work was initiated in 1904, when the Burlingame Improvement Club asked entomologists from the University of California to assist them in developing a plan to fight the city's mosquito infestations. A control plan was developed which included ditching, repair of existing dikes and tide gates, and filling of low areas. These physical control measures were to be supplemented with oiling of the remaining standing water.

On April 8th, 2008, San Mateo County Board of Supervisors passed a resolution to transfer specific vector control operations and responsibilities to San Mateo County Mosquito Abatement District. Our Board of Trustees reviewed and approved the transfer of services resolution during the board meeting on April 9th, 2008. San Mateo County Mosquito Abatement District Board of Trustees also approved a name change to San Mateo County Mosquito and Vector Control District.

OUR SERVICES

for San Mateo County Residents

Mosquito Control

FREE Mosquitofish

**Tick Identification
& Education**

**Public Education
& Treatment Notifications**

**Rodent & Wildlife
Inspections**

**Disease
Surveillance**



SAN MATEO COUNTY
MOSQUITO & VECTOR
CONTROL DISTRICT

(650) 344 - 8592
1351 Rollins Road
Burlingame, CA 94010

Monday-Friday
8a.m. to 4:30p.m.
www.smcmvcd.org